



Mindfulness-based interventions for Rumination, Anxiety and Problematic Smartphone use among College Students

¹**Dr. Pooja Varma**, *Department of Psychology, Jain (Deemed-to-be University), Bangalore*
v.pooja@jainuniversity.ac.in

²**Nivetha S**, *Department of Psychology, Jain (Deemed-to-be University), Bangalore*
nivethasivan03@gmail.com

Abstract: The increasing prevalence of smartphone use among young adults has raised concerns about its potential impact on mental health, making it crucial to understand the underlying psychological factors that contribute to problematic smartphone use (PSU). This study investigates the interrelationships between rumination, social anxiety, and PSU among young adults aged 18-25. Utilizing a cross-sectional design, data were collected from 183 participants using validated scales: the Smartphone Addiction Scale (SAS), Rumination Response Scale (RRS), and Social Interaction Anxiety Scale (SIAS). The results revealed significant positive correlations between all three variables, indicating that higher levels of rumination and social anxiety are associated with increased PSU. The correlations between PSU and rumination ($r = 0.486$, $p < 0.01$), PSU and social anxiety ($r = 0.436$, $p < 0.01$), and rumination and social anxiety ($r = 0.444$, $p < 0.01$) suggest a cyclical relationship where each factor exacerbates the others. The study also explored the potential effectiveness of a mindfulness-based intervention in reducing these interconnected issues. The findings suggest that mindfulness techniques could be an effective tool in addressing the psychological factors contributing to PSU and its associated mental health challenges. In conclusion, this study provides insights into the complex relationships between rumination, social anxiety, and PSU, highlighting the potential of mindfulness-based interventions in mitigating these challenges.

Keywords: *Problematic Smartphone Use (PSU), Rumination, Social Anxiety, Mindfulness*

1. Introduction

The digital age has assisted in a world of constant connection, with smartphones serving as portals to social interaction, information, and entertainment. However, for a growing number of young adults, this ever-present connectivity has become a double-edged sword. While smartphones offer undeniable benefits, their excessive or problematic use can exacerbate underlying emotional struggles, creating a vicious cycle that can negatively impact mental well-being. This research delves into the complex interplay between three key factors: rumination, social anxiety, and problematic smartphone use, specifically focusing on young adults (aged 18-25).

The interplay between these three factors creates a vicious cycle. This research aims to break this cycle by investigating the specific relationships between rumination, social anxiety, and problematic smartphone use in young adults. By understanding the underlying mechanisms, we can develop effective interventions to address these interconnected issues.

Some interventions may include Cognitive Behavioural Therapy (CBT), Mindfulness Based Intervention, Social Skills Training and Smartphone Addiction Treatment.

The target population is young adults aged 18-25 years, with a sample size of 183 participants recruited via offline and online platforms like university forums and social media groups with the help of convenience sampling techniques. All Participants completed an initial screening survey of all the three scales (Rumination Response Scale-Short Form (RRS-SF), Social Interaction Anxiety Scale (SIAS-6) and Smartphone Addiction Scale-Short Version (SAS-SV)). The participants with the highest SAS-SV scores were selected for further intervention based on voluntary participation (N=5). A mindfulness-based intervention was implemented over three months, focusing on mindfulness techniques including mindful breathing exercise, Body scan meditation, mindful journaling and mindful smartphone use to reduce anxiety, rumination and promote healthy gadget usage. A follow-up survey was conducted after the intervention on the participants using the same instruments to measure changes in smartphone addiction, rumination, and social anxiety.

2. Results

Descriptive Analysis shows 183 participants with an age distribution of 29.0% aged 18-19, 32.8% aged 20-21, and 38.2% aged 22-23. Gender distribution of 42.6% male and 57.4% female. Regarding education, 60.1% were undergraduates, 33.9% were postgraduates, 5.5% had completed high school, and 0.5% were pursuing an MPhil. In terms of employment status, 71.6% were students, 19.7% were employed, and 8.7% were unemployed. Daily

smartphone usage was reported as follows: 1.1% used their phones for less than an hour, 15.8% for 1-2 hours, 43.7% for 3-4 hours, 23.0% for 5-6 hours, and 16.4% for more than 6 hours. Descriptive Statistics showed that the Smartphone Addiction Scale had a mean score of 33.13 (SD = 10.87), with a score range from 10 to 60. This indicates a moderate level of smartphone addiction among participants. The Rumination Response Scale had a mean score of 22.69 (SD = 5.454), with scores ranging from 10 to 40, reflecting a moderate tendency to engage in ruminative thinking. The Social Interaction Anxiety Scale had a mean score of 6.31 (SD = 4.880), with scores ranging from 0 to 21, indicating that participants generally experienced moderate levels of social anxiety.

Reliability Analysis showed the internal consistency of the scales used which was evaluated using Cronbach's Alpha. The Smartphone Addiction Scale had a Cronbach's Alpha of 0.872, indicating a high level of reliability. The Rumination Response Scale showed a Cronbach's Alpha of 0.795, indicating that the scale is reliable. The Social Interaction Anxiety Scale demonstrated a Cronbach's Alpha of 0.831, which also indicates good reliability.

The normality of the data was assessed using the Shapiro-Wilk test. The Smartphone Addiction Scale had a p-value of 0.071, which is greater than the standard threshold of 0.05, indicating that the data for smartphone addiction was normally distributed. In contrast, the Rumination Response Scale had a p-value of 0.001, and the Social Interaction Anxiety Scale had a p-value of 0.000, both of which are less than 0.05, indicating that the data for both rumination and social anxiety do not follow a normal distribution.

Nonparametric Correlation analysis (Spearman's rho) was used to assess the relationships between smartphone addiction, rumination, and social anxiety. The Smartphone Addiction Scale and the Rumination Response Scale showed a significant positive correlation ($r = 0.486$, $p < 0.01$), the Smartphone Addiction Scale and the Social Interaction Anxiety Scale were positively correlated ($r = 0.436$, $p < 0.01$), The Rumination Response Scale and the Social Interaction Anxiety Scale also showed a positive correlation ($r = 0.444$, $p < 0.01$). These correlations highlight the interconnectedness of these variables, with each one contributing to the others in a cycle that can exacerbate mental health issues.

A regression analysis was conducted to assess how rumination and social anxiety predict smartphone addiction. The model explained 32.9% of the variance in smartphone addiction ($R^2 = 0.329$), which suggests that rumination and social anxiety are important predictors of problematic smartphone use. The ANOVA showed that the regression model was statistically significant ($F(2,180) = 44.062$, $p < 0.001$), meaning that the model reliably

predicts smartphone addiction. In the coefficients table, both rumination ($\beta = 0.361$, $p < 0.001$) and social anxiety ($\beta = 0.308$, $p < 0.001$) were found to be significant predictors of smartphone addiction.

To assess the effectiveness of the mindfulness-based intervention, a Wilcoxon Signed Ranks Test was used to compare pre- and post-intervention scores for five participants who exhibited high levels of smartphone addiction. The test revealed significant reductions in smartphone addiction ($Z = -2.041$, $p = 0.041$), rumination ($Z = -2.032$, $p = 0.042$), and social interaction anxiety ($Z = -2.032$, $p = 0.042$) following the intervention. This suggests that the mindfulness-based intervention was effective in reducing all three variables.

3. Discussion

The primary aim of this study was to investigate the relationships between rumination, social anxiety, and problematic smartphone use (PSU) among young adults. This study aimed to determine whether mindfulness-based interventions could serve as an effective strategy in reducing rumination, social anxiety, and PSU, and how these interventions could break the cycle of negative reinforcement between these factors (Cheng, Zhang & Qiu Wu, 2020; Kashefinishabouri, Saadi & Pasha, 2021).

Mindfulness-based intervention significantly reduces problematic smartphone use, rumination, and social anxiety among young adults. The Wilcoxon Signed Ranks Test revealed significant reductions in all three variables after the intervention: smartphone addiction ($Z = -2.041$, $p = 0.041$), rumination ($Z = -2.032$, $p = 0.042$), and social interaction anxiety ($Z = -2.032$, $p = 0.042$). These findings suggest that mindfulness practices, such as mindful breathing exercise, body scan meditation, mindful journaling, and mindful smartphone use can mitigate the psychological factors contributing to PSU.

The results of these hypotheses suggest a complex interaction between rumination, social anxiety, and PSU. Also, the mindfulness-based intervention was effective in reducing problematic smartphone use (PSU), rumination, and social anxiety among the participants. The findings from this study add to the growing body of evidence supporting mindfulness as an effective treatment for a range of psychological issues, including smartphone addiction.

The majority of the participants scored low (43.8), followed by moderate (32.2%) and High (24.0%).

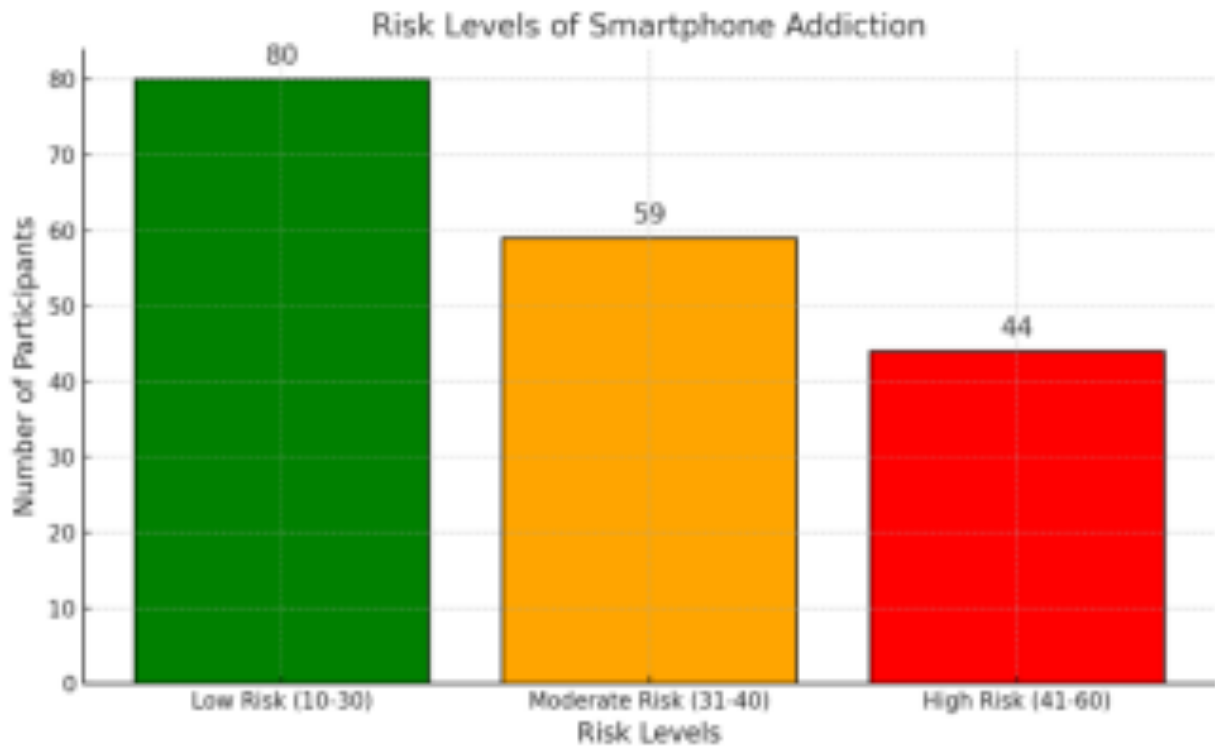


Figure 1. This bar chart illustrates the scores of Smartphone Addiction Scale of the participants.

Table 1. Mindfulness interventions to reduce problematic smartphone use (PSU)

Activity	Sessions	Daily Practice	Result	Feedback
Introduction to Mindfulness	Session 1: In the first session, participants were introduced to mindfulness concepts, focusing on how it can reduce rumination, social anxiety, and problematic smartphone use (PSU). The benefits of staying present and being non-judgmental were discussed.	Participants were encouraged to spend 5 minutes each day reflecting on their thoughts and emotions without judgment.	Participants gained clarity on how mindfulness helps address their emotional challenges and smartphone habits.	Participants appreciated the introduction and expressed enthusiasm to begin the intervention. They were eager to explore mindfulness further.

Mindful Breathing Exercises	Session 2: Participants learned deep breathing techniques, focusing on inhaling and exhaling slowly for anxiety and stress management. Emphasis was placed on staying present during the practice.	Practice 10 minutes of mindful breathing twice daily, particularly during moments of stress or rumination.	Immediate reductions in stress and anxiety levels were reported. Participants felt more aware of their thought patterns.	They found it challenging to focus initially but experienced calming effects with consistent practice.
Body Scan Meditation	Session 3: A guided meditation session focused on scanning the body from head to toe, promoting relaxation and awareness of physical tension linked to emotional stress.	Practice 15-minute body scan meditation daily before bedtime to promote relaxation and better sleep.	Participants reported improved relaxation, reduced rumination, and better awareness of physical responses to anxiety and smartphone use.	Participants noted it required discipline to integrate into their nightly routine. Over time, most found it highly beneficial.
Mindful Journaling	Session 4: Participants began maintaining a journal to track moments of rumination, social anxiety, and excessive smartphone use. Journaling prompts were provided to help them reflect on triggers and patterns.	Write for 10 minutes daily about their thoughts, emotions, and smartphone use patterns, noting triggers and coping strategies.	Increased self-awareness of triggers for rumination and PSU. Participants began recognizing emotional patterns and identifying alternative coping strategies.	Most participants found journaling therapeutic and insightful, though a few struggled with consistency during the first few weeks.
Mindful smartphone use	Session 5: Participants set boundaries for smartphone use, such as screen-free zones, specific times for use, and mindful engagement with apps.	Limit smartphone uses to 2 hours per day. Engage in a 30-minute screen-free activity daily, such as reading, walking, or talking to friends.	Participants significantly reduced screen time, reported improved focus, and showed lower PSU scores by the end of 3 months.	While some participants struggled initially with reducing smartphone use, they later appreciated the sense of control and mental clarity gained.

The session includes Introduction to Mindfulness, Mindful Breathing Exercises, Body Scan Meditation, Mindful Journaling, and Mindful smartphone use. The findings emphasize the effectiveness of these strategies in enhancing focus, reducing anxiety, and promoting wellbeing.

Table 2. Pre and post intervention scores of participants with high smartphone addiction.

Participants (N=5)	Daily Smartphone Use-Screentime (Pre)	Pre SAS Score	Pre RRS Score	Pre SIAS Score	Daily Smartphone Use-Screen time (Post)	Post SAS Score	Post RRS Score	Post SIAS Score
1	3 - 4 hours	60	40	21	1 - 2 hours	30	20	10
2	More than 6 hours	57	34	11	3 - 4 hours	27	15	8
3	3 - 4 hours	60	28	10	1 - 2 hours	29	18	7
4	More than 6 hours	56	30	17	3 - 4 hours	25	19	9
5	More than 6 hours	60	30	17	3 - 4 hours	21	19	8

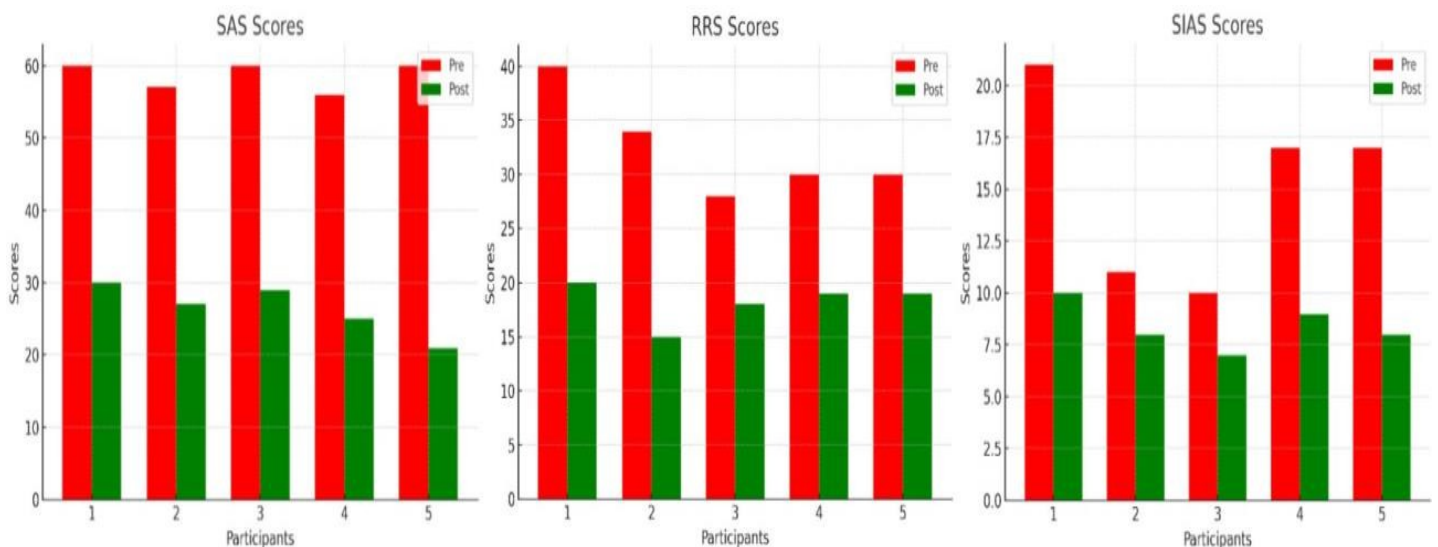


Figure 2. The bar chart illustrates the pre-and-post intervention scores of participants with high smartphone addiction. The Mindfulness based intervention was carried out for 3 months which effectively reduces scores across Smartphone addiction, Rumination and Social Anxiety.

Table 3. Ranks of pre and post test

	N	Mean Rank		Sum of Ranks
Post TOTAL SAS – Pre TOTAL SAS	Negative Ranks	5 ^a	3.00	15.00
	Positive Ranks	0 ^b	.00	.00
	Ties	0 ^c		
	Total	5		
Post TOTAL RRS – Pre TOTAL RRS	Negative Ranks	5 ^d	3.00	15.00
	Positive Ranks	0 ^e	.00	.00
	Ties	0 ^f		
	Total	5		
Post TOTAL SIAS – Pre TOTAL SIAS	Negative Ranks	5 ^g	3.00	15.00
	Positive Ranks	0 ^h	.00	.00
	Ties	0 ⁱ		
	Total	5		

Table 4. Z value and p value of pre and post test

Post TOTALSAS- Pre TOTAL SAS		Post TOTALRRS- Pre TOTAL RRS	Post TOTALSIAS – Pre TOTAL SIAS
Z	-2.041 ^b	-2.032 ^b	-2.032^b
Asymp. Sig. (2-tailed)	.041	.042	.042

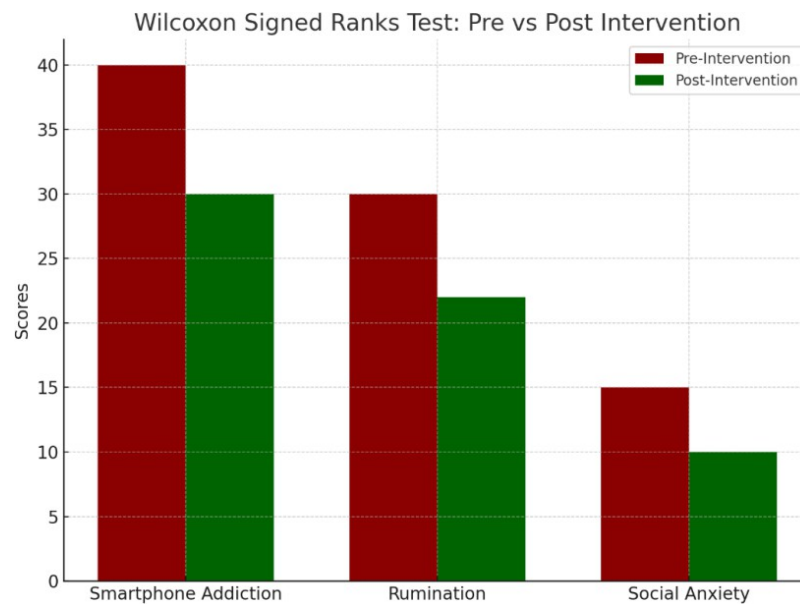


Figure 3. The paired bar chart compares pre- and post-intervention scores for Smartphone Addiction, Rumination, and Social Anxiety. The results show significant reductions across all three variables following the mindfulness-based intervention.

Mindfulness, a therapeutic approach that focuses on fostering non-judgmental awareness of the present moment, has been shown to be effective in reducing symptoms of anxiety, depression, and other mental health issues (Kabat-Zinn, 1990). Mindfulness interventions aim to help individuals break the cycle of negative thinking by promoting a more accepting and aware stance toward their thoughts and emotions. The results of this study indicated that mindfulness-based interventions were effective in reducing PSU, rumination, and social anxiety in a small group of participants. This aligns with existing research that has demonstrated the effectiveness of mindfulness in reducing problematic behaviours, including excessive smartphone use. For example, a study by Cheng et al. (2020) showed that mindfulness training could reduce smartphone addiction by enhancing participants' self-control and reducing rumination. The present study builds on this literature by providing evidence that mindfulness interventions can reduce not only smartphone addiction, but also the cognitive and emotional factors (rumination and social anxiety) that contribute to PSU.

However, it is important to note that the intervention group in this study was small, although the findings are promising, indicating the importance of mindfulness-based interventions. Future research with larger sample sizes and control groups is needed to

validate these findings and determine the long-term effectiveness of mindfulness-based interventions. Given that PSU and mental health issues like rumination and social anxiety are chronic in nature, it is important to explore whether the positive effects of mindfulness can be maintained over the long term. Future research should examine the long-term impact of mindfulness-based interventions on reducing PSU, rumination, and social anxiety, as well as whether the intervention can be adapted for broader populations contributing to PSU and that interventions targeting rumination and social anxiety may help alleviate problematic smartphone use. However, the study's small sample size, reliance on self-report data, and the lack of a control group limit the ability to generalize the findings. Future research should aim to include larger, more diverse samples and incorporate control groups to validate these results and explore the long-term impact of mindfulness-based interventions.

References

- Beck, A. T., & Clark, D. A. (1997). *An information processing model of social phobia*. *Cognitive Therapy and Research*, 21(1), 61-90.
- Billieux, J. (2012). Problematic mobile phone use and mental health: A review of evidence. *Journal of Behavioral Addictions*, 1(1), 5-25.
- Buehlman, C., McNally, R. J., & Ivory, D. (1995). Rumination as a predictor of course of generalized anxiety disorder. *Journal of Abnormal Psychology*, 104(3), 406-411.
- Mindfulness and smartphone addiction before going to sleep among college students: The mediating roles of self-control and rumination. (2020, August 29). MDPI. <https://www.mdpi.com/2624-5175/2/3/26>
- Elhai, J. D., Levine, J. C., Dvorak, R. D., & Hall, B. J. (2017). Non-social features of smartphone use are most related to depression, anxiety and problematic smartphone use. *Computers in Human Behavior*, 69, 75-82.
- Horwood, S., & Anglim, J. (2018). Problematic smartphone usage and subjective and psychological well-being [Preprint]. OSF. <https://www.scielo.br/j/rbp/a/8jL85kwBNNpFkYv5w5DDnKq/?format=pdf&lang=en>
- Kashefinabouri J, Eftekhari Saadi Z, Pasha R, Heidari A, Makvandi B. The Effect of Mindfulness-Based Cognitive Therapy and Emotion-Regulation Training on Rumination and Social Anxiety in Teenagers Prone to Addiction. *J Occup Health Epidemiol* 2021; 10 (1) :1-11. URL: <http://johe.rums.ac.ir/article-1-407-en.html>
- Lin, Y., Liu, Y., Huang, Y., & Shan, A. (2019). Prevalence of problematic smartphone usage

and associated mental health outcomes amongst children and young people: a systematic review, meta-analysis and GRADE of the evidence. *BMC Psychiatry*, 19(1), 127.

Muris, P., Meijer-Bos, S., & van den Hout, M. A. (1999). Childhood experiences of parental criticism and praise and their relation to social anxiety and self-esteem in adulthood. *Journal of Youth and Adolescence*, 28(6), 741-750.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8933824/>

Toker, S., & Ozturk, A. A. (2020). Problematic smartphone use. In *Encyclopedia of Psychology and Behavioral Sciences* (Vol. 11, pp. 1-5). Elsevier.