



RESEARCH ARTICLE

# The Mediation Role of Psychological Immunity in the Association Between Loneliness and Subjective Well-Being Among University Students

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## Abstract

Subjective well-being is a crucial indicator of positive psychological functioning among university students. However, loneliness remains a prevalent psychosocial issue in this population and is consistently associated with lower levels of subjective well-being. While previous studies have established a strong negative association between loneliness and subjective well-being, the psychological mechanisms underlying this relationship require further examination. This study aimed to investigate the mediating role of psychological immunity in the association between loneliness and subjective well-being among university students. Data were collected from 347 undergraduate students aged 18–25 years using standardized self-report measures assessing loneliness, psychological immunity, and subjective well-being. Mediation analysis revealed that loneliness was negatively associated with psychological immunity, while psychological immunity was positively associated with subjective well-being. Furthermore, psychological immunity partially mediated the relationship between loneliness and subjective well-being (indirect effect =  $-0.246$ , 95% CI [ $-0.395$ ,  $-0.098$ ]). These findings suggest that psychological immunity may represent an important internal psychological process linking loneliness and subjective well-being. The results highlight the potential value of strengthening psychological immunity as a target for interventions aimed at enhancing subjective well-being among university students experiencing loneliness.

**Keywords:** loneliness, university student, psychological immunity, subjective well being

## INTRODUCTION

Subjective well-being represents an individual's cognitive and affective evaluation of life and is widely regarded as a core component of positive psychological functioning (Diener et al., 1999; Diener & Ryan, 2009). In the context of higher education, subjective well-being has been associated with a range of adaptive outcomes, including academic engagement, persistence, and overall mental health (Chambel & Curral, 2005; Kokkinos et al., 2023). Conversely, low levels of subjective well-being among university students have been linked to maladaptive behaviours, psychological distress, and academic difficulties (Angkurawaranon et al., 2016), underscoring the importance of identifying factors that may undermine or enhance students' well-being.

One psychosocial factor that has received substantial empirical attention in relation to students' well-being is loneliness. Loneliness refers to the subjective experience

arising from a perceived discrepancy between desired and actual social relationships (Perlman & Peplau, 1981). University students, particularly those in emerging adulthood, are considered a vulnerable group for experiencing loneliness due to developmental transitions, increased academic demands, and changes in social networks (Hunt & Eisenberg, 2010; Auerbach et al., 2018). Previous research has consistently demonstrated a robust negative association between loneliness and subjective well-being, indicating that students who experience higher levels of loneliness tend to report lower life satisfaction and more negative affect (Bhagchandani, 2017; Ye & Lin, 2015; Korzhina et al., 2022).

Despite strong evidence linking loneliness and subjective well-being, the psychological processes through which loneliness exerts its influence on well-being remain insufficiently understood. Prior studies have primarily focused on social support, self-esteem, or general health indicators as explanatory mechanisms (Wan Mohd Azam et al., 2013; Tu & Zhang, 2014; Qin et al., 2024). However, scholars have emphasized the need to examine broader cognitive and psychological mechanisms that explain how loneliness affects subjective well-being (Perlman & Peplau, 1984; VanderWeele et al., 2012).

Psychological immunity is a multidimensional construct grounded in positive psychology that

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encompasses cognitive, emotional, and behavioural resources enabling individuals to cope effectively with stress and environmental challenges (Oláh, 2010; Kaur & Som, 2020). It includes interrelated components such as resilience, mindfulness, adaptive coping, hope, and self-reliance, which collectively contribute to individuals' capacity to maintain psychological balance and positive functioning (Choochom, 2013; Essa, 2020). Empirical studies have shown that psychological immunity is positively associated with indicators of mental health and well-being (Ijntema et al., 2021; Kaur & Som, 2020).

Previous studies have identified several psychological and social mechanisms underlying the relationship between loneliness and subjective well-being, including self-esteem, social support, and general health indicators (Wan Mohd Azam et al., 2013; Tu & Zhang, 2014; Qin et al., 2024). While these factors provide valuable insights, they tend to capture specific aspects of individuals' functioning and may not fully account for the broader internal processes through which loneliness affects well-being.

In contrast, psychological immunity offers a more comprehensive framework by integrating multiple cognitive, emotional, and behavioural resources, such as resilience, mindfulness, coping, hope, and self-reliance. This multidimensional perspective allows for a more holistic understanding of how individuals respond to stress and maintain psychological balance. Therefore, examining psychological immunity as a mediator may provide added value by capturing the complex interplay of internal psychological resources that are not fully addressed by more narrowly defined constructs.

From a theoretical perspective, loneliness may influence subjective well-being not only directly but also through internal psychological processes. Loneliness is associated with negative cognitive biases, heightened emotional distress, and reduced perceived social support, which can impair individuals' ability to regulate emotions and cope effectively with stress (Cacioppo et al., 2006; Hawkey & Cacioppo, 2010). These disruptions may weaken key components of psychological immunity, including resilience, mindfulness, and adaptive coping.

When psychological immunity is compromised, individuals may experience greater difficulty adapting to stressors, maintaining positive affect, and sustaining life satisfaction. In addition, reduced levels of hope and self-reliance may further limit individuals' confidence in managing challenges and achieving personal goals. In this way, psychological immunity may serve as an underlying mechanism through which loneliness exerts its detrimental effects on subjective well-being. Although psychological immunity has been examined in relation to stress and resilience, empirical research investigating its mediating role in the relationship between loneliness and subjective well-being remains limited, particularly among university students in non-Western contexts.

Addressing this gap, the present study aims to examine whether psychological immunity mediates the relationship between loneliness and subjective well-being among university students. By clarifying this mechanism, the study seeks to contribute to the literature on student mental health and provide empirical support for the development of interventions that strengthen internal psychological resources to enhance well-being. It is hypothesized that loneliness will be negatively associated with subjective well-being, loneliness will be negatively associated with psychological immunity, and psychological immunity will mediate the relationship between loneliness and subjective well-being.

## MATERIALS AND METHODS

### Participant characteristics and research design

This study employed a quantitative cross-sectional survey design. Participants were undergraduate university students aged between 18 and 25 years. A total of 347 students participated in the study, consisting of both male and female students. Participants were recruited using a voluntary self-selection sampling approach through an online survey. Individuals who met the inclusion criteria were invited to participate, and participation was entirely voluntary. Data screening procedures were conducted prior to analysis. Responses with incomplete data were excluded from the analysis. In addition, duplicate entries were checked and removed to ensure data quality. Only participants who met the inclusion criteria (i.e., undergraduate students aged 18–25 years) were included in the final sample.

**Table 1.** Demographic Characteristics of Participants ( $N=347$ )

Variable	Category	n	%
Gender	Male	109	31.4 %
	Female	238	68.6 %
Age	18-21	243	70 %
	22-25	104	30 %
Academic year	2016	2	0.6 %
	2017	10	2.9 %
	2018	32	9.2 %
	2019	68	19.6 %
	2020	97	28 %
	2021	63	18.2 %
	2022	73	21 %
Marital Status	2023	2	0.6 %
	Married	3	0.9 %
	Unmarried	343	99.1 %
	Divorced	-	-
Living Arrangement	Widowed	-	-
	With Parents	131	37.7 %
	Living Alone	206	59.4 %
	With Friends	10	2.9 %

### Sampling procedures

Participants were recruited through voluntary online self-selection. Data were collected between March and June 2023 using an online survey. An invitation to participate in the study was disseminated via social media platforms and student communication channels. Students who met the inclusion criteria voluntarily accessed the survey link and completed the questionnaire. All data were collected online, allowing participants to complete the survey in their own settings. Participants were not provided with direct financial incentives for participation; however, a lottery-based reward in the form of electronic money vouchers valued at IDR 25,000 was offered to ten randomly selected participants.

Ethical approval for the study was obtained from the relevant institutional ethics committee prior to data collection. All participants were informed about the purpose of the study, the voluntary nature of participation, confidentiality of responses, and their right to withdraw at any time without penalty. Informed consent was obtained electronically before participants proceeded to the questionnaire. The study adhered to ethical standards for

research involving human participants, and no adverse events were reported during data collection.

### Sample size, power, and precision

The intended sample size was determined based on a priori power analysis using G\*Power Software (version 3.1.9) to ensure adequate statistical power for mediation analysis. The final sample consisted of 347 participants, which exceeded the minimum required sample size to detect medium effect sizes with a statistical power greater than .80 at an alpha level of .05. No interim analyses or stopping rules were applied, as data collection was completed within a predefined period.

### Measures and covariates

**Loneliness.** Loneliness was measured using the UCLA Loneliness Scale Version 3 by Russell (1996) adapted to Indonesian version by Widyastuti (2018). The loneliness scale items can be classified into two main dimensions of loneliness, namely emotional loneliness and social loneliness. Emotional loneliness reflects the absence of close, intimate relationships, while social loneliness refers to the lack of a broader social network or sense of belonging within a group (Perlman & Peplau, 1981). The instrument demonstrated excellent internal consistency, with a Cronbach's alpha coefficient of .899 ( $n = 305$ ), and item-total correlation values exceeding .30 for all items, indicating good item discrimination. The scale consists of 20 items assessing subjective feelings of social and emotional loneliness consisting of 11 favourable items and 9 unfavourable items. Responses are rated on a five-point Likert scale ranging from 1 (almost never) to 5 (always), with higher scores indicating greater levels of loneliness. Based on the number of items and response scale, the theoretical score range was 20 to 100.

**Psychological Immunity.** Psychological immunity was assessed using a self-report scale developed by the researchers and colleagues (Lestari, 2023), based on the conceptual framework of psychological immunity proposed by Choochom (2013), which conceptualizes psychological immunity as a system of internal psychological resources. The scale measures five dimensions: resilience, mindfulness, coping, hope, and self-reliance. The initial scale consisted of 30 items. Content validity was assessed through expert judgment, yielding Aiken's  $V$  values ranging from 0.611 to 1.00. Items with lower Aiken's  $V$  values were reviewed and refined based on expert feedback prior to pilot testing. The scale was subsequently tested on 40 emerging adults (aged 18–29 years). Based on the item analysis, two items from the coping dimension were removed due to low item discrimination, resulting in a final scale consisting of 28 items. The final composition included resilience (6 items), mindfulness (6 items), coping (4 items), hope (6 items), and self-reliance (6 items). The scale demonstrated good internal consistency reliability, with a Cronbach's alpha coefficient of .861. The instrument uses a five-point Likert response format ranging from strongly disagree to strongly agree. Higher scores reflect stronger psychological immunity. Total scores were calculated by summing all 28 items after reverse-coding unfavourable items. Thus, the theoretical score range was 28 to 140, with higher scores indicating higher levels of psychological immunity.

**Subjective Well-Being.** Subjective well-being was measured using two components: affective and cognitive well-being. The affective component was assessed using

the Positive and Negative Affect Schedule (PANAS), consisting of 56 items, including 27 positive affect items and 29 negative affect items. Each item was rated on a five-point Likert scale ranging from 1 (very slightly or not at all) to 5 (extremely). Positive affect (PA) and negative affect (NA) scores were calculated separately by summing the respective items. Higher scores on each subscale indicate greater levels of the corresponding affect. Based on the number of items and response scale, the theoretical score range was 27 to 135 for positive affect and 29 to 145 for negative affect. In the present study, the PANAS demonstrated good internal consistency, with a Cronbach's alpha coefficient of 0.898. The cognitive component of subjective well-being was measured using the Satisfaction with Life Scale (SWLS) developed by Pavot and Diener and adapted into Indonesian by Utami (2010). The scale consists of 5 items rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Total scores were calculated by summing all item responses, with higher scores indicating greater life satisfaction. Based on the number of items and response scale, the theoretical score range was 5 to 25. Previous studies reported good reliability for the adapted scale ( $\alpha = 0.908$ ; Utami, 2010). In the present study, the scale demonstrated good internal consistency, with a Cronbach's alpha coefficient of .816. Subjective well-being was computed as a composite score by combining the affective and cognitive components. Specifically, positive affect (PA) and life satisfaction (LS) scores were summed, while negative affect (NA) scores were subtracted from the total. Thus, the final subjective well-being score was calculated as:  $SWB = (PA + LS) - NA$ . This scoring procedure allows the resulting values to range from negative to positive, depending on the balance between positive and negative emotional experiences.

### Data analysis

Data were analyzed using mediation analysis to examine the indirect effect of loneliness on subjective well-being through psychological immunity. Prior to hypothesis testing, assumptions of normality, multicollinearity, and homoscedasticity were evaluated and met. Mediation analysis was conducted using a regression-based approach. Indirect effects were tested using bootstrap confidence intervals with 1,000 resamples and a 95% confidence level. Unstandardized coefficients ( $B$ ) are reported. Mediation effects were tested using a regression-based approach with bias-corrected confidence intervals. Statistical analyses were conducted using JAMOVI statistical software (version 2.3.21).

## RESULTS OF STUDY

### Descriptive Statistics

Descriptive statistics were calculated to summarize participants scores on loneliness, psychological immunity, and subjective well-being. As shown in Table 2, students reported moderate levels of loneliness, psychological immunity, and subjective well-being. Loneliness, measured using a 20-item scale with a possible score range of 20 to 100, an empirical mean score of 31.5 ( $SD = 9.29$ ), with observed scores ranging from 11 to 55. This indicates that, on average, participants experienced relatively low levels of loneliness compared to the hypothetical midpoint of the scale ( $M = 60$ ). Psychological immunity was assessed using

a 28-item scale with a hypothetical score range of 28 to 140. Participants reported an average empirical score of 50.9 (SD = 9.32), with scores ranging from 16 to 70. Compared to the hypothetical mean of 84, these results suggest that students' levels of psychological immunity tended to fall in the low to moderate range. Subjective well-being was measured using a composite scale consisting of 56 items, with a possible score range from -40 to 140. The empirical mean score was 50.1 (SD = 22.7), with observed scores ranging from -21 to 107. The mean score closely approximated the hypothetical midpoint of the scale (M = 50), indicating that, overall, participants reported moderate levels of subjective well-being. Reliability analysis indicated that all variables demonstrated good internal consistency, with Cronbach's alpha coefficients of .878 for loneliness, .879 for psychological immunity, and .816 for subjective well-being.

### Assumption Testing

Prior to hypothesis testing, several assumption tests were conducted to ensure the appropriateness of the mediation analysis. Normality was assessed using the Kolmogorov-Smirnov test, as the sample size exceeded 50 participants. The results indicated that the distributions of loneliness, psychological immunity, and subjective well-being did not significantly deviate from normality ( $p = .486$ ,  $p > .05$ ). Visual inspection of Q-Q plots further supported this finding, showing that the residuals were clustered around the diagonal line, indicating approximately normal distributions.

Multicollinearity was examined using tolerance and variance inflation factor (VIF) values. The results showed that all variables had tolerance values greater than .10 and VIF values below 10, indicating that multicollinearity was not present among the study variables. Homoscedasticity was evaluated through inspection of scatterplots of standardized residuals. The distribution patterns of loneliness, psychological immunity, and subjective well-being did not exhibit systematic variance, indicating that the assumption of homoscedasticity was met.

### Mediation Analysis

A mediation analysis was conducted to examine whether psychological immunity mediated the relationship between loneliness and subjective well-being.

The detailed statistical results are presented in Table 3, and the corresponding path model is illustrated in Figure 1. The results indicated that loneliness significantly predicted psychological immunity (path a), such that higher levels of loneliness were associated with lower levels of psychological immunity ( $B = -0.176$ ,  $SE = 0.053$ , 95% CI [-0.280, -0.072],  $p < .001$ ). Psychological immunity, in turn, significantly predicted subjective well-being (path b), with higher psychological immunity associated with higher subjective well-being ( $B = 1.403$ ,  $SE = 0.085$ , 95% CI [1.236, 1.569],  $p < .001$ ).

The direct effect of loneliness on subjective well-being remained significant after controlling for psychological immunity (path c';  $B = -1.031$ ,  $SE = 0.085$ , 95% CI [-1.198, -0.864],  $p < .001$ ), indicating partial mediation. The indirect effect was also significant ( $ab = -0.246$ ,  $SE = 0.076$ , 95% CI [-0.395, -0.098],  $p < .001$ ) and accounted for approximately 19.3% of the total effect. The model explained 3.1% of the variance in psychological immunity ( $R^2 = .031$ ) and 59.3% of the variance in subjective well-being ( $R^2 = .593$ ). The total effect of loneliness on subjective well-being was also significant ( $B = -1.277$ ,  $SE = 0.112$ , 95% CI [-1.497, -1.058],  $p < .001$ ).

### Additional Analyses

Additional analyses were conducted to provide further insight into the study findings. Independent samples *t*-tests were performed to examine gender differences in loneliness, psychological immunity, and subjective well-being. Preliminary assumption testing indicated that the data met the assumptions of normality and homogeneity of variance ( $p > .05$ ), supporting the appropriateness of the analyses.

As shown in Table 4, a significant gender difference was observed in loneliness, with female students reporting higher levels of loneliness than male students ( $M = 32.3$  vs. 29.8),  $t(345) = 2.29$ ,  $p = .023$ ,  $d = 0.26$ , indicating a small effect size. In contrast, no significant gender difference was found in psychological immunity,  $t(345) = -0.67$ ,  $p = .506$ ,  $d = -0.08$ . A significant gender difference was also found in subjective well-being, with male students reporting higher levels than female students ( $M = 54.7$  vs. 48.0),  $t(345) = -2.58$ ,  $p = .010$ ,  $d = -0.30$ , also reflecting a small effect size. No significant differences were observed in loneliness, psychological immunity, or subjective well-being across marital status, academic cohort, or living arrangement (all  $p > .05$ ).

**Table 2.** Descriptive Statistics

Variable	Items	Theoretical Score Range				Empirical Distribution			
		Min	Max	M	SD	Min	Max	M	SD
Loneliness	20	20	100	60	13.3	11	55	31.5	9.29
Psychological Immunity	28	28	140	84	18.7	16	70	50.9	9.32
Subjective Well-Being	56	-40	140	50	30	-21	107	50.1	22.7

**Table 3.** Mediation Analysis

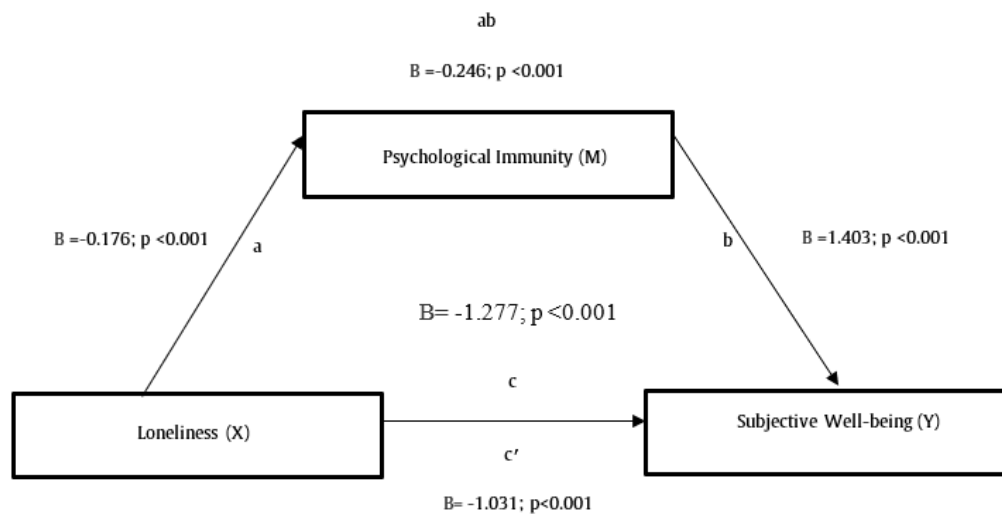
Path	Effect	B	SE	95% CI	p
X → M (a)	-	-0.176	0.053	[-0.280, -0.072]	< .001
M → Y (b)	-	1.403	0.085	[1.236, 1.569]	< .001
X → Y (c')	Direct	-1.031	0.085	[-1.198, -0.864]	< .001
X → M → Y (ab)	Indirect	-0.246	0.076	[-0.395, -0.098]	< .001
X → Y (c)	Total	-1.277	0.112	[-1.497, -1.058]	< .001

Note. N=347. X = Loneliness; M = Psychological Immunity; Y = Subjective Well-Being. Values represent unstandardized coefficients (B).

**Table 4.** Gender Differences in Loneliness, Psychological Immunity, and Subjective Well-Being

Variable	Male (n=109) M	Female (n=238) M	t	df	p	d
Loneliness	29.8	32.3	2.29	345	.023	0.26
Psychological Immunity	51.4	50.7	-0.67	345	.506	-0.08
Subjective Well-Being	54.7	48.0	-2.58	345	.010	-0.30

Note. M = mean; d = Cohen's d.



Note. a = path X→M; b = path M→Y; ab = path X → M → Y; c = total effect; c' = direct effect

**Figure 1.** Pathway of Mediation Analysis

## DISCUSSION

The present study examined the mediating role of psychological immunity in the relationship between loneliness and subjective well-being among university students. Consistent with the proposed hypotheses, the findings indicate that loneliness is negatively associated with subjective well-being and that psychological immunity partially mediates this relationship. Specifically, higher levels of loneliness were associated with lower psychological immunity, which in turn predicted lower levels of subjective well-being. These results highlight psychological immunity as an important internal mechanism through which loneliness may undermine well-being.

The negative association between loneliness and subjective well-being observed in this study is consistent with previous research showing that perceived social disconnection is linked to lower life satisfaction and increased negative affect (Cacioppo & Patrick, 2008; Bhagchandani, 2017; Korzhina et al., 2022). University students experiencing loneliness may perceive their social environment as less supportive, thereby increasing emotional distress and diminishing overall well-being (Ye & Lin, 2015). The persistence of a significant direct effect of loneliness on subjective well-being further supports prior research indicating that loneliness independently predicts poorer psychological outcomes (Hawkey & Cacioppo, 2010).

Importantly, the findings provide empirical support for psychological immunity as a partial mediator. Higher loneliness was associated with lower levels of psychological immunity, including resilience, mindfulness, adaptive coping, hope, and self-reliance, which in turn

were linked to lower subjective well-being. This pattern is consistent with theoretical perspectives suggesting that loneliness may weaken internal psychological resources that support effective coping and emotional regulation (Cacioppo et al., 2006; Murat, 2019). When these dimensions of psychological immunity are reduced, individuals may experience greater difficulty adapting to stressors and maintaining positive evaluations of life (Choochom, 2013; Oláh, 2010).

The partial nature of the mediation suggests that other factors may also contribute to the relationship between loneliness and subjective well-being. Previous studies have identified variables such as social activity and health-related processes as relevant contributors (Zhang et al., 2018; Hawkey & Cacioppo et al, 2010). However, the present findings specifically highlight the role of psychological immunity as a measurable internal resource within this relationship.

The findings of this study have important practical implications. Efforts to enhance students' subjective well-being should not be limited to reducing loneliness but should also focus on strengthening psychological immunity. Interventions aimed at reducing loneliness among university students may be enhanced by incorporating strategies to strengthen psychological immunity. Programs focusing on resilience training, mindfulness-based interventions, adaptive coping skills, and hope enhancement have been shown to improve psychological functioning and well-being (Keng et al., 2011; Abulfaraj et al., 2024; Yıldırım & Arslan, 2022). Such approaches may help students maintain subjective well-being even when social stressors cannot be fully eliminated.

In addition, exploratory analyses indicated significant gender differences in loneliness and subjective well-being, although the effect sizes were small. This suggests that gender may not be a primary determinant of these variables, reinforcing the importance of focusing on internal psychological resources. Several limitations should be acknowledged. The cross-sectional design limits causal inference regarding the relationships among loneliness, psychological immunity, and subjective well-being (Maxwell & Cole, 2007; Spector, 2019). In addition, reliance on self-report measures may introduce common method bias. Future research should employ longitudinal, multi-method, and experimental designs to clarify causal mechanisms and further examine the role of psychological immunity across different contexts.

## CONCLUSIONS

This study demonstrates that psychological immunity partially mediates the relationship between loneliness and subjective well-being among university students. Higher levels of loneliness are associated with lower psychological immunity, which in turn contributes to reduced subjective well-being. These findings highlight the importance of strengthening specific dimensions of psychological immunity, including resilience, mindfulness, adaptive coping, hope, and self-reliance, as key targets for intervention. Efforts to enhance these internal psychological capacities may help mitigate the negative impact of loneliness and support the maintenance of subjective well-being among students. Interventions in higher education settings should therefore not only focus on reducing loneliness but also on fostering adaptive psychological resources to help students manage social stressors and sustain positive psychological functioning.

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## DECLARATION

### Ethics approval and consent to participate

Ethical approval for this study was obtained from the relevant institutional ethics committee. Data collection commenced after obtaining ethical approval from the Research Ethics Committee of Universitas Gadjah Mada (Approval No. 6494/UN1/FPSi.1.3/SD/PT.01.04/2023). All participants were informed about the purpose of the study, the voluntary nature of participation, confidentiality of their responses, and their right to withdraw at any time without penalty. Informed consent was obtained from all participants prior to data collection.

### Consent for publication

Not applicable.

## Availability of data and materials

The datasets generated and analysed during the current study are available from the corresponding author upon request.

## Conflicts of interest Statement

The authors declare that they have no competing interests.

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## Artificial Intelligence-Assisted Technology

Artificial intelligence-assisted tools were used for language editing and manuscript preparation. The authors take full responsibility for the content of the manuscript and ensure the integrity and originality of the work.

## Authors' contributions

The first author contributed to the study conception and design, data collection, data analysis, and manuscript drafting. The second author contributed to research supervision, conceptual refinement, and critical revision of the manuscript. Both authors read and approved the final manuscript.

## ABOUT THE AUTHORS

**Zerlinda Christine Aldira Sanam** completed her graduate studies in psychology at the Faculty of Psychology, Universitas Gadjah Mada with a research focus on student mental health and subjective well-being. In addition to student mental health, her research interests also include issues related to violence against women, particularly from psychological perspectives on trauma, well-being, and recovery. She is especially interested in applying psychological research to the development of preventive and promotive mental health interventions in educational and community settings. She is currently a psychology lecturer at Universitas Nusa Cendana.

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