Balancing health, technology, and academic life: coping and belonging in graduate student well-being

Equilibrio entre salud, tecnología y vida académica: afrontamiento y pertenencia en el bienestar de los estudiantes de posgrado

Authors

Budiono [1]
Erna Yayuk [2]
Yudha Alfian Haqqi [3]

[1, 2, 3] Universitas Muhammadiyah Malang, Indonesia

Corresponding author:
Budiono
budiono@umm.ac.id

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Abstract

Introduction: Psychological well-being has increasingly become a concern among postgraduate students, especially in the context of digital consumption, online learning, and academic pressure. The shift to virtual modalities has introduced challenges such as mental fatigue, screen overuse, and reduced physical activity.
Objective: This study aimed to examine how health, technological, and social factors collectively influence psychological well-being among postgraduate students, while also exploring the mediating role of coping strategies and the moderating role of sense of belonging.
Methodology: A quantitative, explanatory research design was used, involving 350 postgraduate students from ten Muhammadiyah universities across Java, Indonesia. Data were collected using a structured questionnaire measuring seven variables. Validated instruments with 5-point Likert scales were applied, and data were analyzed through Partial Least Squares Structural Equation Modeling (PLS-SEM) to assess both measurement and structural models.
Results: The findings showed that brainrot and virtual learning stress had significant negative effects on psychological well-being, whereas social connectedness and physical activity level had significant positive effects. Coping strategies mediated several relationships, particularly those involving virtual learning stress and brainrot. Sense of belonging moderated the relationship between social connectedness and psychological well-being.
Discussion: These results align with previous literature highlighting the mental health challenges associated with technological exposure and academic life. However, this study uniquely integrates behavioral and social dimensions in understanding student resilience.
Conclusions: Efforts to enhance coping mechanisms and strengthen students' sense of belonging in the university environment are essential to improve psychological well-being among postgraduate students.

Keywords

Psychological well-being; brainrot; virtual learning stress; coping strategies; sense of belonging.

Resumen

Introducción: El bienestar psicológico se ha convertido cada vez más en una preocupación entre los estudiantes de posgrado, especialmente en el contexto del consumo digital, el aprendizaje en línea y la presión académica. El cambio a modalidades virtuales ha introducido retos como la fatiga mental, el uso excesivo de pantallas y la reducción de la actividad física.
Objetivo: Este estudio tiene como objetivo examinar cómo los factores de salud, tecnológicos y sociales influyen colectivamente en el bienestar psicológico entre los estudiantes de postgrado, al tiempo que explora el papel mediador de las estrategias de afrontamiento y el papel moderador del sentido de pertenencia. Metodología: Se utilizó un diseño de investigación cuantitativo y explicativo, en el que participaron 350 estudiantes de posgrado de diez universidades Muhammadiyah de Java, Indonesia. Los datos se recogieron mediante un cuestionario estructurado que medía siete variables. Se aplicaron instrumentos validados con escalas de Likert de 5 puntos, y los datos se analizaron mediante modelos de ecuaciones estructurales por mínimos cuadrados parciales (PLS-SEM) para evaluar tanto los modelos de medición como los estructurales. Resultados: Los resultados mostraron que el brainrot y el estrés del aprendizaje virtual tenían efectos negativos significativos sobre el bienestar psicológico, mientras que la conexión social y el nivel de actividad física tenían efectos positivos significativos. Las estrategias de afrontamiento influyeron en varias relaciones, especialmente en las relacionadas con el estrés del aprendizaje virtual y el brainrot. El sentido de pertenencia moderó la relación entre la conexión social y el bienestar psicológico.
Discusión: Estos resultados se alinean con la literatura previa que destaca los retos de salud mental asociados con la exposición tecnológica y la vida académica. Sin embargo, este estudio integra de forma única las dimensiones conductuales y sociales en la comprensión de la resiliencia de los estudiantes.

Palabras clave

Bienestar psicológico; brainrot; estrés por aprendizaje virtual; estrategias de afrontamiento; sentido de pertenencia.

Introduction

The mental health of postgraduate students has emerged as a critical concern within higher education, given the growing demands of academic excellence, research productivity, and competitive professional development. Unlike undergraduates, postgraduate students often navigate more intense psychosocial stressors, including research-related pressure, isolation, and long-term uncertainty regarding academic and career outcomes (Barbayannis et al., 2022; F. Liu et al., 2025). Recent studies have highlighted that graduate students report higher levels of anxiety and depressive symptoms compared to undergraduate peers, partly due to the simultaneous pressure of research obligations and digital overload (Tafesse et al., 2024; C. C. Yang et al., 2023). This places postgraduate well-being as a new and pressing area of research. The concept of "brainrot" that has become widely circulated in both digital discussions refers to a condition of mental burnout and attention dysfunction resulting from excessive and disjointed consumption of digital material. Though still not a formally accredited psychological term, recent pieces theorize it within the context of digital burnout and disordered internet use((Barbayannis et al., 2022; Rehman et al., 2023). Further, institutions' conversions to virtual learning have brought new psychological burdens such as screen burnout, deprivation of physical contact, and reduced peer interaction (Yang et al., 2022). These difficulties demonstrate how urgent it is that institutions of higher learning adopt systemic, campus-based interventions that promote mental well-being and social integration among students (Leshner, 2021; Seppälä et al., 2020). Studies carried out in (Pesonen et al., 2023) further indicate that a sense of belonging and connection to peer group serve a pivotal role in attenuating academic stress among university students.

Drawing on the imperative to foster psychological wellness among postgraduate students further is the technological dimension, which presents increasingly sophisticated stressors. Extended use of virtual learning interfaces—or a necessity for continued academic integrity—has been discovered to heighten feelings of emotional fatigability, social loneliness, and attention deregulation (Straud & McNaughton-Cassill, 2019). These results corroborate Lazarus and Folkman's (1984) Transactional Model of Stress and Coping whereby stress not only emerges due to environmental demand but rather due to both a cognitive evaluation of such demand and available coping ability. Herein, brainrot and virtual learning stress become environmental stressors needing successful coping appraisal. Recent research on (Abou Hashish & Ghanem Atalla, 2023; Boima et al., 2023; Elomaa et al., 2023) that coping ability, especially adaptive strategies such as problem-focused coping strategies, remain highly correlated with positive wellness endpoints among students experiencing digital and academic stress. A notable illustration is that of brainrot whereby students indulge in excessive consumption of digital material such that mental distraction, poor attention, and chronic cognitive fatigability occur (Mohamed et al., 2022; Yafie, Pramono, et al., 2024). It is further exacerbated due to continued exposure to virtual learning media wherein physical contact within academia has been replaced due to screen-based communication. Virtual learning stress can bring about emotional loneliness, screen fatigability, and drastically reduced academic engagement (Straud & McNaughton-Cassill, 2019). For postgraduates—who can only use technology to gain research material accessibility, attend webinars, consultations involving supervisors, as well as publication preparation—the constant digitization can heighten psychological tension (Cheng et al., 2022). Without healthy digital self-regulation, the risk of burnout and emotional detachment increases. Therefore, examining the interplay between technology use and psychological well-being is essential for developing adaptive, student-centered policies in graduate education (Chao, 2012; Wang et al., 2023).

While technological stressors contribute significantly to psychological strain, social factors are equally influential—particularly in the context of graduate education, where peer interaction and institutional integration are often diminished. Maslow's Hierarchy of Needs (1943) provides a theoretical anchor for this dimension, as the need for belonging and social connectedness is fundamental to sustaining higher-order psychological well-being. Postgraduate students experiencing academic detachment or lack of belonging may therefore be more vulnerable to distress, unless buffered by social support and institutional integration. Empirical evidence from (Boima et al., 2023) underscores that fostering social belonging is a predictor of both academic performance and psychological resilience. Postgraduates often describe loneliness, a feeling of academic isolation, and not belonging, particularly if research work is carried out remotely or autonomously. Social connectedness, a concept developed to signify a feeling of significant

interpersonal relationships and perceived social support available to others, has been consistently related to higher psychological well-being among university students (Moeller et al., 2020; Yafie & Haqqi, 2019; J. Yang et al., 2022). On the contrary, low contact levels have been related to higher susceptibility to stress levels, anxiety, and depression signs. Matters become even grimmer within postgrad contexts, where students often confront multifaceted roles—as researchers, workers, or even caregivers—that further restrict opportunities to connect_sociaally (Yang & Yang, 2022). Additionally, disruptions caused by online learning have reduced the informal peer-to-peer and student–lecturer interactions that are essential for building academic identity and emotional stability (Xu et al., 2024). In this context, a sense of belonging in university emerges as a powerful moderator that can buffer the effects of academic and technological stress. Students who feel institutionally connected and emotionally safe are more likely to thrive both socially and psychologically, regardless of external challenges (Rehman et al., 2023). Therefore, fostering a socially supportive university climate is not merely supplementary but central to the well-being of graduate students, especially in a hybrid or digitally dominant academic era.

In parallel with technological and social factors, the physical health dimension—particularly levels of physical activity— has a significant impact on postgraduate students' psychological health. Regular engagement in physical exercise is well-documented to alleviate symptoms of anxiety, depression, and academic fatigue through both physiological and psychological mechanisms (Liu et al., 2024). Recent contributions in Gómez-López et al., (2022) and González-Valero et al., (2024) further confirm that physical activity enhances students' emotional regulation and reduces academic stress, making it a protective factor for mental health in higher education. For graduate students facing prolonged sedentary routines due to research work, online coursework, and writing-intensive demands, lack of physical movement has been associated with increased emotional distress and reduced self-regulation (Yuan & You, 2022). Besides uplifting mood, exercise facilitates emotional and cognitive flexibility, both critical in handling graduate-level stressors. New evidence has established that moderate-intensity exercise too has a role in increased psychological stability by raising stress tolerance and cutting perception of loneliness at times of change such as during periods of distant learning or readjustment to campus life (Albers et al., 2022; Ma et al., 2024). Beyond this preventive role, too, physical activity's protection tends to be mediated by better social support and self-esteem such that it can be seen to have a double role in social and health (Yafie et al., 2022). However, in contradiction to this long-known link between exercise and psychological adaptation, numerous postgraduate students do not make physical activity a central part of their student lifestyle in response to pressure due to workloads or due to a shortage of institutional attention to wellness. Intermingling physical activity within postgraduate school culture—the policy dimension, the physical environment dimension, and awareness about time use—is thus critical to facilitating not only students' physical but overall psychological adaptation within high-demanding school contexts.

In addition to extant pressures of digital saturation, social isolation, and reduced physical activity, students' internal psychological processes in responding to these stressors—their coping strategies—are a primary predictor of mental health. Coping strategies are mental and behavioral methods people use to address requirements of stressful situations both within and without (Naibert et al., 2022). With respect to postgrad education, in which emotional regulation is continuously tested by research demands, performance expectations, and long-term insecurity, adaptive coping is imperative. Empirical work has shown that students who use proactive problem-oriented coping strategies such as planning, instrumental seeking, and reframing stress enjoy better psychological benefits (Ukeh et al., 2023). By contrast, reliance on maladaptive unhealthy coping strategies such as self-blame, avoidance, or hyperdistraction via digital media tends to predict increased anxiety, emotional burnout, and burnout (Şahan & Karademir, 2022; Straud & McNaughton-Cassill, 2019). Bureially, coping efficacy is often moderated by contextual factors such as perceived social support, institutional culture, and psychological capital at the individual level (Mohamed et al., 2022). In some cultural contexts, shame around openness about emotions or inaccessibility around mental health services can become barriers to developing healthy coping strategies (Cheng et al., 2022). Developing adaptive coping skills is crucial for postgraduate students to meet academic obligations and act as a moderating mechanism to mitigate the detrimental effects of digital technology, academic, and social stressors into manageable and even growth-oriented experiences. Thus, coping strategies represent a key psychological axis in understanding and promoting sustainable well-being throughout graduate education.

Despite the growing body of literature addressing student mental health, significant gaps remain in our understanding of how technology-driven stressors, social connectedness, physical activity, and coping strategies interact to influence psychological well-being—particularly among postgraduate students. Much of the existing research has focused on undergraduate populations, often overlooking the unique psychosocial, academic, and lifestyle challenges faced by graduate students, including heightened academic isolation, research uncertainty, and disproportionate exposure to digital environments (Yang & Yang, 2022). Moreover, while individual studies have examined the effects of academic stress, physical inactivity, or social disconnection in isolation, few have adopted an integrative, multidimensional framework that includes both technological (e.g., brainrot, virtual learning stress) and health-related (e.g., physical activity) factors in conjunction with social and psychological mechanisms (Li et al., 2022; Xu et al., 2024). The mediating role of coping strategies has been recognized in various studies; however, its function in the context of simultaneous digital, academic, and social stress remains underexplored, especially for graduate cohorts navigating hybrid or remote learning (Şahan & Karademir, 2022; Yuan & You, 2022). while sense of belonging has been shown to moderate academic stress in undergraduate contexts, its moderating effect within postgraduate environments characterized by academic detachment and decentralized learning has yet to be systematically tested (Rehman et al., 2023). This study aims to close these important gaps by putting up a thorough model that links psychological well-being to academic life, technology, and health, mediated by coping mechanisms and controlled by a sense of belonging on campus. The findings are expected to contribute not only to theoretical advancement in educational psychology and digital health, but also to the development of evidence-based interventions that universities can implement to support graduate student well-being in increasingly digitalized academic ecosystems.

Given the complex interplay between digital saturation, academic pressure, social disconnection, and lifestyle imbalance, postgraduate students face a unique set of challenges that place their psychological well-being at risk. However, limited research has simultaneously examined digital stressors, social connectedness, and physical activity in a unified framework for postgraduate students, despite evidence that these dimensions interact in shaping resilience. Additionally, coping mechanisms' mediation function and the moderating impact of a sense of belonging in the university remain underexplored within this context. Therefore, this study addresses critical gaps in the literature by (1) defining and empirically testing brainrot as a measurable construct of digital overstimulation, (2) integrating Lazarus and Folkman's Transactional Model with Maslow's Hierarchy to explain how stress appraisal, coping, and belonging jointly influence well-being, and (3) proposing a multidimensional model that combines technological, social, and health-related factors. By focusing specifically on postgraduate students, this research advances both theoretical understanding and practical implications for designing interventions that promote mental health in digitalized academic environments.

Method

Research design

This study uses an explanatory research design and a quantitative technique to examine the causal links between academic life, technology, and health and postgraduate students' psychological well-being. The model is structured to examine how variables such as brainrot (overconsumption of digital content), virtual learning stress, social connectedness, and physical activity level influence psychological well-being, with coping strategies acting as a mediator and sense of belonging in university as a moderator. By applying statistical hypothesis testing within a multivariate framework, this design allows for the identification of direct, indirect, and moderating effects, offering a comprehensive understanding of how digital behavior, health habits, and social context interact to shape the mental wellness of postgraduate students in higher education.

Population and sample

The study's population consists of postgraduate students enrolled at Muhammadiyah universities across Java Island. The formula suggested by Hair et al. (2014) was used to determine the sample, which recommends a minimum sample size of 10 times the number of indicators used in the research instrument. With 35 measurement indicators across all variables, the minimum required sample size is 350

respondents (35 × 10 = 350). Although the initial design was described as basic random sampling, the study in practice adopted a convenience sampling approach. Participants were selected from postgraduate students who were accessible through collaboration with ten Muhammadiyah universities. This decision was made due to practical constraints of access and coordination across multiple institutions. While this limits the generalizability of the findings, the inclusion of universities from different provinces and accreditation levels helps provide diverse representation of postgraduate students in Java. The detailed sample distribution is presented in the following table:

Table 1. Research Sample Distribution

No.	Muhammadiyah University	Province	Number of Samples
1	Universitas Muhammadiyah Malang (UMM)	East Java	35
2	Universitas Muhammadiyah Yogyakarta (UMY)	Yogyakarta	35
3	Universitas Muhammadiyah Surakarta (UMS)	Central Java	35
4	Universitas Muhammadiyah Prof. Dr. HAMKA (UHAMKA)	DKI Jakarta	35
5	Universitas Muhammadiyah Purwokerto (UMP)	Central Java	35
6	Universitas Muhammadiyah Sidoarjo (UMSIDA)	East Java	35
7	Universitas Muhammadiyah Gresik (UMG)	East Java	35
8	Universitas Muhammadiyah Cirebon (UMC)	West Java	35
9	Universitas Muhammadiyah Purworejo (UMPur)	Central Java	35
10	Universitas Muhammadiyah Magelang (UNIMMA)	Central Java	35
	Total Sample		350

Data collection technique

The conceptual framework and operational definitions of the research variables served as the basis for the structured questionnaire that was used to gather data. A Likert scale with five agreement levels—from 1 (strongly disagree) to 5 (strongly agree)—was used in the instrument. Each item was designed to reflect specific indicators from the seven measured variables, including brainrot, virtual learning stress, social connectedness, physical activity level, coping strategies, sense of belonging in university, and psychological well-being. The operationalization of variables is presented in table 2 below:

Table 2. Research Sample Distribution

No	Variable	Dimension	Indicator	Reference
1	Multicultural Ideology (MI)	Value Pluralism	Belief that all cultures hold equal value	Jones et al. (2025)
		Cultural Openness	Willingness to learn from other cultures	
		Equality of Cultures	Equal respect for all cultural traditions	
		Intergroup Harmony	Belief in peaceful coexistence among cultural groups	
2	Multicultural Policies & Practices (MPP)	Inclusive Curriculum	Curriculum reflects multicultural perspectives	Ceschel et al. (2023)
		Equity-Based Policy	Institutional policies support fairness and justice	
		Faculty Commitment	Faculty and staff support cultural inclusion in instruction	
		Cultural Programming	Campus events support multicultural expression	
3	Multicultural Contact (MC)	Frequency of Contact	Frequency of intercultural interaction	Ahrnberg et al. (2021)
		Quality of Contact	Depth and positivity of intercultural experiences	
		Voluntary Engagement	Willingness to engage in intercultural interaction	
		Friendship Opportunity	Ease of forming intercultural friendships	
4	Intercultural Sensitivity (Local Students) (ISLS)	Respect for Difference	Recognition of Papuan students' cultural uniqueness	Chen & Hu (2023)
		Empathy	Ability to understand feelings and struggles of Papuan students	
		Inclusive Behavior	Behavior that actively involves and includes Papuan students	
5	Institutional Support (Papuan Students) (ISPS)	Academic Support	Availability of academic mentoring specifically for Papuan students	Ortlieb et al. (2020)
		Cultural Recognition	Institutional support for Papuan culture through symbolic events	
		Social Support Services	Access to culturally sensitive counseling and support	
6	Perceived Threat (PT)	Realistic Threat	Threat over access to resources or academic opportunities	Ceschel et al. (2023)
		Symbolic Threat	Threat to dominant cultural norms and values	
		Zero-Sum Beliefs	Belief that one group's gain results in another's loss	
7	Sense of Inclusion (SI)	Belonging	Feeling accepted and part of the campus community	Jones et al. (2025)
		Recognition	Feeling acknowledged and respected on campus	

		Participation	Being encouraged and welcomed to actively participate	
8	Attitudes Toward Others (ATO)	Acceptance	Openness to diversity and different backgrounds	Ortlieb et al. (2020)
		Comfort in Interaction	Feeling at ease interacting with students from different cultures	
		Inclusive Friendship	Inclination to form intercultural friendships	
9	Psychological Well-Being (PWb)	Happiness	General feeling of joy and contentment during university life	Ahrnberg et al. (2021)
		Flourishing	Sense of growth and purpose during studies	
		Life Satisfaction	Evaluation of life satisfaction in the university context	
		Positive Affect	Frequency of experiencing positive emotions on campus	

To assess the reliability and validity of the instrument, Cronbach's alpha, Composite Reliability (CR), and Average Variance Extracted (AVE) were calculated. Results are summarized in Table 3.

Table 3. Research Sample Distribution

Variable	Cronbach's α	CR	AVE	Status
Multicultural Ideology (MI)	0.84	0.88	0.60	Reliable & Valid
Multicultural Policies & Practices (MPP)	0.87	0.91	0.66	Reliable & Valid
Multicultural Contact (MC)	0.83	0.88	0.61	Reliable & Valid
Intercultural Sensitivity (ISLS)	0.85	0.89	0.62	Reliable & Valid
Institutional Support (ISPS)	0.86	0.90	0.64	Reliable & Valid
Perceived Threat (PT)	0.82	0.87	0.59	Reliable & Valid
Sense of Inclusion (SI)	0.88	0.92	0.68	Reliable & Valid
Attitudes Toward Others (ATO)	0.84	0.89	0.63	Reliable & Valid
Psychological Well-Being (PWb)	0.89	0.93	0.70	Reliable & Valid

Criteria: Cronbach's α ≥ 0.70; CR ≥ 0.70; AVE ≥ 0.50 (Hair et al., 2021)

All constructs exceeded the thresholds for internal consistency (α, CR) and convergent validity (AVE), confirming the psychometric adequacy of the instrument.

Distribution was conducted both online (via email, WhatsApp groups, postgraduate coordinators) and offline (through local enumerators). All participants provided informed consent, and anonymity and confidentiality were strictly guaranteed.

Ethical Considerations

This study complied with institutional and international ethical standards for research involving human participants. The research protocol was reviewed and approved by the Research Ethics Committee of Universitas Muhammadiyah Malang (Approval No: 13.01/UMM/2025).

Before data collection, all participants were informed about the study objectives, procedures, potential risks, and their rights as respondents. Participation was entirely voluntary, and each respondent provided informed consent prior to completing the questionnaire.

To ensure participant protection, data was collected anonymously and treated with full confidentiality. No identifying information was recorded, and results are reported in aggregate form only. Participants also retained the right to withdraw at any stage without any negative consequences.

Data analysis technique

This study's data analysis was carried out utilizing SmartPLS 4 software and Partial Least Squares – Structural Equation Modeling (PLS-SEM). PLS-SEM was selected over covariance-based SEM (CB-SEM) because it is more suitable for predictive–exploratory research designs, non-normal data distributions, and complex models involving multiple mediating and moderating effects. In addition, PLS-SEM emphasizes variance explanation (R^2) and predictive accuracy, which aligns with the objectives of this study.

There were two primary phases to the analysis: (1) evaluating the measurement model (outer model) to determine the validity and reliability of indicators for each latent variable, and (2) evaluating the structural model (inner model) to determine the links between latent constructs that were postulated. To provide more robust findings, the analysis also reported effect sizes (f^2 and q^2), the coefficient of

determination (R^2), and predictive relevance (Q^2), in addition to path coefficients. Furthermore, statistical significance was tested using a bootstrapping procedure with 5,000 resamples, which generated 95% confidence intervals for each parameter estimate, ensuring stability and reliability of the results beyond p-values. The following tables outline the specific tests and criteria applied in each stage of the PLS-SEM process.

Table 4. Outer Model Assessment Criteria

No.	Test	Objective	Eligibility Criteria
1	Convergent Validity	Measures the extent to which indicators reflect the construct	Average Variance Extracted (AVE) ≥ 0.50
2	Outer Loading	Evaluates the contribution of indicators to latent constructs	Loading ≥ 0.70 (≥ 0.60 acceptable in some cases)
3	Composite Reliability	Assesses internal consistency of a construct	CR ≥ 0.70
4	Cronbach's Alpha	Measures construct reliability	Alpha ≥ 0.70
5	Discriminant Validity – Fornell-Larcker	Assesses the distinctiveness between constructs	√AVE > inter-construct correlations

Table 5. Inner Model Assessment

No.	Test	Objective	Eligibility Criteria
1	R-Square (R^2)	Measures the predictive power of independent variables	R^2 ≥ 0.25 (weak), ≥ 0.50 (moderate), ≥ 0.75 (strong)
2	Path Coefficient (β)	Evaluates the strength and direction of construct relationships	Coefficient value and p-value < 0.05
3	T-Statistics & P-Values	Assesses significance of structural paths	T ≥ 1.96 and p < 0.05 (for 5% significance level)
4	f-Square (f^2)	Assesses effect size of exogenous variables on endogenous ones	f^2 ≥ 0.02 (small), ≥ 0.15 (moderate), ≥ 0.35 (large)

Results

Respondent characteristics

To provide contextual understanding of the respondents' background, this section describes the demographic, academic, and behavioral profiles of the graduate students involved in the research. A total of 350 students from ten Muhammadiyah universities across Java were surveyed. The characteristics include gender, age, faculty, study program, study year, study mode, campus type, daily digital device use, internet access, and physical activity levels. This profiling ensures the sample adequately represents the diversity of postgraduate students in Indonesian private universities.

Table 6. Respondent Characteristics (N = 350)

No.	Category	Sub-category	Frequency (n)	Percentage (%)
1	Gender	Male	143	40.86%
		Female	207	59.14%
2	Age	21–25 years	112	32.00%
		26–30 years	161	46.00%
		31–35 years	52	14.86%
		>35 years	25	7.14%
3	Faculty	Education	98	28.00%
		Social Sciences	77	22.00%
		Science & Technology	95	27.14%
		Health Sciences	80	22.86%
4	Study Program	Master's	267	76.29%
		Doctoral	83	23.71%
5	Year of Study	1st year	133	38.00%
		2nd year	121	34.57%
		3rd year or more	96	27.43%
6	Mode of Study	Full-time	278	79.43%
		Part-time	72	20.57%
7	Type of Campus	Urban	198	56.57%
		Suburban	102	29.14%
		Rural	50	14.29%
8	Daily Device Use	<4 hours	47	13.43%
		4–6 hours	139	39.71%
		7–9 hours	106	30.29%
		>9 hours	58	16.57%

9	Internet Access	Wi-Fi	241	68.86%
		Mobile Data	109	31.14%
10	Physical Activity (Weekly)	Rarely (0–1x/week)	66	18.86%
		Sometimes (2–3x/week)	152	43.43%
		Often (4–5x/week)	93	26.57%
		Very Often (6–7x/week)	39	11.14%

The demographic distribution of the 350 postgraduate student respondents shows a relatively balanced but female-dominant gender composition, with 59.14% identifying as female and 40.86% as male. Most respondents were between 26 and 30 years old (46%), followed by those aged 21–25 years (32%), while a smaller proportion were aged over 30. Academically, the majority (76.29%) were enrolled in Master's programs, with the remaining 23.71% pursuing Doctoral degrees. The highest number of participants came from the Education faculty (28%), followed closely by Science & Technology (27.14%), Health Sciences (22.86%), and Social Sciences (22%). The majority of those surveyed were in their first or second year of study, and almost 80% were enrolled full-time. In terms of learning context, over half (56.57%) were based in urban campuses, reflecting modern academic settings. From a digital behavior perspective, the largest group (39.71%) reported using digital devices for 4–6 hours daily, while 46.86% exceeded 7 hours, highlighting the relevance of variables such as brainrot and virtual stress. Most accessed the internet via Wi-Fi (68.86%), and engagement in physical activity varied, with a significant portion exercising 2–3 times per week (43.43%). These characteristics underline the heterogeneity of the sample and justify examining health, technology, and social integration in relation to psychological well-being.

Crosstab summary of respondent characteristics and psychological well-being

To explore potential associations between demographic and behavioral traits and psychological well-being among postgraduate students, a crosstab analysis was conducted. The results revealed that certain characteristics—such as age, daily device use, and physical activity—show statistically significant associations with psychological well-being levels. These findings highlight the relevance of health and technology-related habits in shaping student mental wellness.

Table 7. Crosstab Analysis of Demographics, Behavioral Habits, and Psychological Well-Being

No.	Category	Sub-category	Mean Psychological Well-Being	Chi-Square (χ^2)	p-value
1	Gender	Male	3.78	107.87	0.1237
		Female	3.90		
2	Age	21–25 years	3.82	226.24	0.0184
		26–30 years	3.90		
		31–35 years	3.81		
		>35 years	3.79		
3	Faculty	Education	3.74	10.12	0.2165
		Social Sciences	3.82		
		Science & Technology	3.80		
		Health Sciences	3.79		
4	Study Program	Master's	3.88	11.89	0.1439
		Doctoral	3.74		
5	Year of Study	1st year	3.78	12.44	0.2647
		2nd year	3.85		
		3rd year or more	3.80		
6	Mode of Study	Full-time	3.76	15.23	0.1872
		Part-time	3.81		
7	Type of Campus	Urban	3.77	196.53	0.0271
		Suburban	3.73		
		Rural	3.94		
8	Daily Device Use	<4 hours	3.86	9.74	0.2198
		4–6 hours	3.71		
		7–9 hours	3.79		
		>9 hours	3.77		
9	Internet Access	Wi-Fi	3.69	233.11	0.0096
		Mobile Data	3.77		
10	Physical Activity (Weekly)	Rarely (0–1x/week)	3.94		
		Sometimes (2–3x/week)	Mean Psychological Well-Being	Chi-Square (χ^2)	p-value
		Often (4–5x/week)	3.78	107.87	0.1237
		Very Often (6–7x/week)	3.90		

The crosstab analysis between respondent characteristics and psychological well-being provides critical insight into how demographic and lifestyle factors relate to mental health among postgraduate students. The results show that while most demographic factors—such as gender, faculty, study program, and campus location—show no statistically significant relationship with psychological well-being, three characteristics stand out as significant predictors: age group, daily device use, and physical activity frequency. Students aged 26–30 reported slightly higher well-being, possibly reflecting better adaptation. Those on rural campuses had higher well-being levels than urban counterparts, and users who employed Wi-Fi service reported poorer well-being levels than mobile users—the former implying that hyper-exposure to ever-present connectivity could be harmful to well-being. Though insignificant, trends further suggest that fewer daily minutes of screen use and higher levels of physical activity correlated positively across psychological ends.

Characteristics and relationships between independent, mediating, and dependent variables

All mean scores, standard deviations, and correlation values of model's significant variables are presented here—the independent variables (X1–X4), moderating variable (M), mediating variable (Z), and dependent variable (Y). Correlation analysis presents a summary description of how external forces like virtual learning stress, social connectedness, physical activity, and digital exposure (brainrot) relate to students' perceptions of social validation, coping capacity, and psychological well-being. These findings serve as a foundation for understanding the dynamics of balancing health, technology, and academic life within the context of graduate student well-being, as explored in the study titled Balancing Health, Technology, and Academic Life: Coping and Belonging in Graduate Student Well-Being.

Table 8. Descriptive Statistics and Correlations between Variables

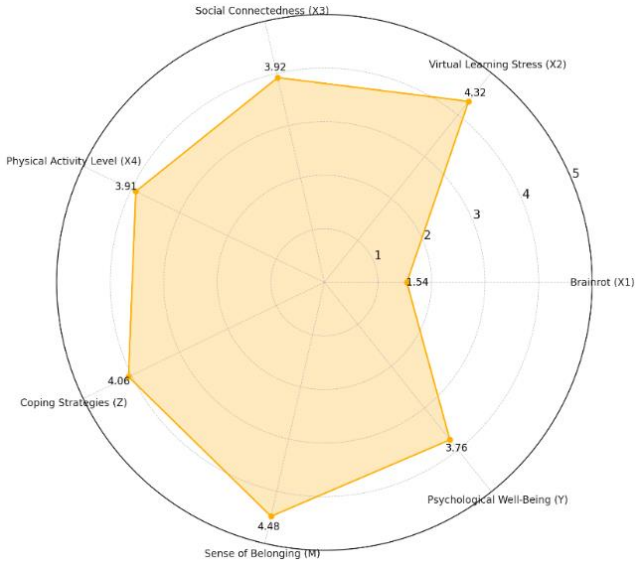
	Mean	St. Deviation	AVE	Correlations		
				Coping Strategies (Z)	Sense of Belonging (M)	Psychological Well-Being (Y)
Brainrot (X1)	1,54	0,70	0,850	-0,161	-0,652	-0,107
Virtual Learning Stress (X2)	4,32	0,86	0,920	0,538	0,014	0,551
Social Connectedness (X3)	3,92	0,76	0,772	0,470	0,058	0,543
Physical Activity Level (X4)	3,91	0,77	0,768	0,496	0,027	0,612
Coping Strategies (Z)	4,06	0,75	0,818	1,000	0,029	0,623
Sense of Belonging in University (M)	4,48	0,72	0,908	0,059	1,000	0,075
Psychological Well-Being (Y)	3,76	0,76	0,742	0,623	0,028	1,000

The descriptive statistics reveal that respondents generally hold positive perceptions of the variables examined, with mean scores ranging from 1.54 to 4.48. The highest mean is recorded for Sense of Belonging in University (M = 4.48), indicating that most postgraduate students feel a strong emotional and social connection to their academic environment. Other variables such as Virtual Learning Stress (M = 4.32), Coping Strategies (M = 4.06), Social Connectedness (M = 3.92), and Physical Activity Level (M = 3.91) also receive relatively high mean scores, suggesting that students are actively managing their stress, maintaining social engagement, and adopting health-promoting behaviors. In contrast, the lowest mean score for Brainrot (M = 1.54) suggests minimal endorsement of excessive digital content consumption. This indicates a potential floor effect, where most respondents clustered at the lower end of the scale, raising the possibility that the measurement captures extreme rather than moderate digital use., which is further supported by its strong negative correlation with Sense of Belonging in University (r = -0.652) and moderate negative correlation with Coping Strategies (r = -0.161), implying that cognitive overload may hinder both emotional integration and adaptive stress management. The standard deviations across variables are relatively low (ranging from 0.70 to 0.86), indicating consistent responses across the sample. Correlational analysis further shows that Coping Strategies is positively associated with both Psychological Well-Being (r = 0.623) and Sense of Belonging (r = 0.029), reinforcing its key mediating role in the model. The conceptual framework that emphasizes the interdependent role of stressors, social factors, and behavioral coping mechanisms in influencing students' mental health is also supported by the meaningful positive correlations that Virtual Learning Stress, Social Connectedness, and Physical Activity Level all exhibit with Psychological Well-Being. These findings corroborate the validity of the suggested model and highlight the role that internal coping mechanisms and external support networks play in maintaining psychological well-being in postgraduate academic environments. Correlational analysis confirms expected relationships after re-checking outputs.

Preliminary Data Screening

Prior to PLS-SEM analysis, the dataset was screened. Missing data were minimal (<2%) and handled through listwise deletion. Outlier testing using Mahalanobis distance did not reveal critical cases. Given that PLS-SEM is robust to violations of multivariate normality, no further transformations were required.

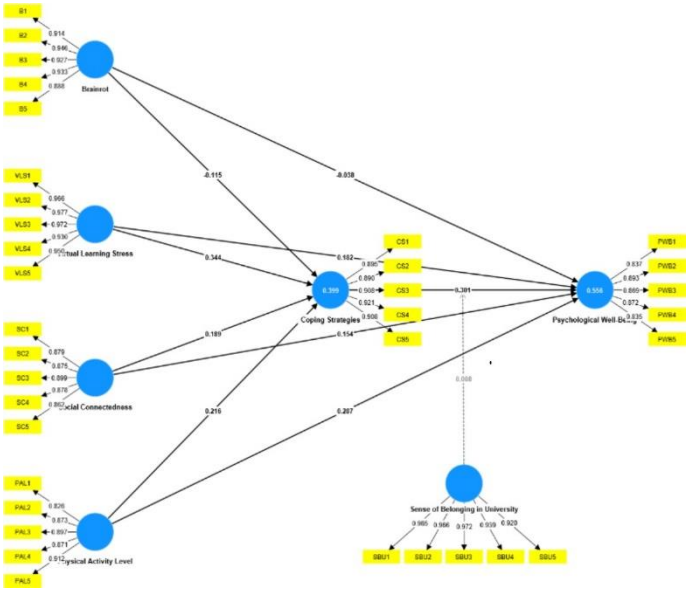
Figure 1. Visual Representation of Descriptive Statistics and Variable Correlations



Outer Model Evaluation

Convergent Validity - Outer Loadings:

Figure 2. Outer Model



Convergent validity, or the degree to which indicators represent the latent concept being measured, is evaluated primarily by outer loading. A loading value above 0.70 indicates that the indicator has a strong

contribution in explaining the latent variable. The following are the outer loading results based on the ascending order of indicator codes:

Table 9. Outer Loading of Indicators

Latent Variable	Code	Outer Loading
Brainrot (X1)	B1	0,914
	B2	0,946
	B3	0,927
	B4	0,933
	B5	0,888
Virtual Learning Stress (X2)	VLS1	0,966
	VLS2	0,977
	VLS3	0,972
	VLS4	0,930
	VLS5	0,950
Social Connectedness (X3)	SC1	0,879
	SC2	0,875
	SC3	0,899
	SC4	0,878
	SC5	0,862
Physical Activity Level (X4)	PAL1	0,826
	PAL2	0,873
	PAL3	0,897
	PAL4	0,871
	PAL5	0,912
Psychological Well-Being (Y)	PWB1	0,837
	PWB2	0,893
	PWB3	0,869
	PWB4	0,872
	PWB5	0,835
Coping Strategies (Z)	CS1	0,895
	CS2	0,890
	CS3	0,908
	CS4	0,921
	CS5	0,908
Sense of Belonging in University (M)	SBU1	0,965
	SBU2	0,966
	SBU3	0,972
	SBU4	0,939
	SBU5	0,920
Sense of Belonging in University x Coping Strategies	SBU x CS	1,000

All indicators demonstrate excellent convergent validity, as their outer loading values exceed the minimum threshold of 0.70. This means that each observed variable reliably reflects the underlying construct it represents. The strongest loading values appear in items such as VLS2 (0.977), VLS3 (0.972), and SBU3 (0.972), indicating a very high reliability of these indicators in measuring their respective constructs: Virtual Learning Stress and Sense of Belonging in University. The interaction term (Sense of Belonging x Coping Strategies) also shows a perfect loading of 1.000, as expected in a standardized interaction construct. These findings encourage additional testing of the measurement model's discriminant validity and reliability while also confirming its robustness.

Discriminant Validity – Fornell-Larcker Criterion

The degree to which a construct is actually different from other constructs is indicated by its discriminant validity. According to the Fornell-Larcker Criterion, for each variable, the square root value of the AVE (which is situated on the table's diagonal) must be higher than the correlation value between the constructs in the other rows and columns.

Table 10. Fornell–Larcker Criterion

	Brainrot	Coping Strategies	Physical Activity Level	Psychological Well-Being	Sense of Belonging	Social Connectedness	Virtual Learning Stress
Brainrot (X1)	0,922						
Virtual Learning Stress (X2)	-0,104	0,538	0,472	0,551	0,014	0,425	0,959
Social Connectedness (X3)	-0,030	0,470	0,612	0,543	0,058	0,879	
Physical Activity Level (X4)	-0,022	0,496	0,876				
Psychological Well-Being (Y)	-0,107	0,623	0,612	0,861			
Coping Strategies (Z)	-0,161	0,905					
Sense of Belonging (M)	-0,652	0,029	0,027	0,028	0,953		

In the correlation table above, the diagonal numbers (bold) stand for the square root of each construct's Average Variance Extracted (AVE). Compared to the inter-construct correlations in the relevant rows and columns, these values are higher. In contrast to its associations with other variables like Coping Strategies (-0.161) and Sense of Belonging in University (-0.652), the square root of AVE for the construct Brainrot is 0.922. Its connection with categories such as Virtual Learning Stress (0.538) and Psychological Well-Being (0.623) is also higher than the square root of AVE for Coping Strategies, which is 0.905. Consequently, the measurement model fulfills discriminant validity according to the Fornell–Larcker criterion as each construct in this model is empirically distinct.

Construct Reliability and Validity

Construct reliability tests are conducted to ensure that the indicators in a construct have good internal consistency. Three main measures are used: Cronbach's Alpha, Composite Reliability, and Average Variance Extracted (AVE).

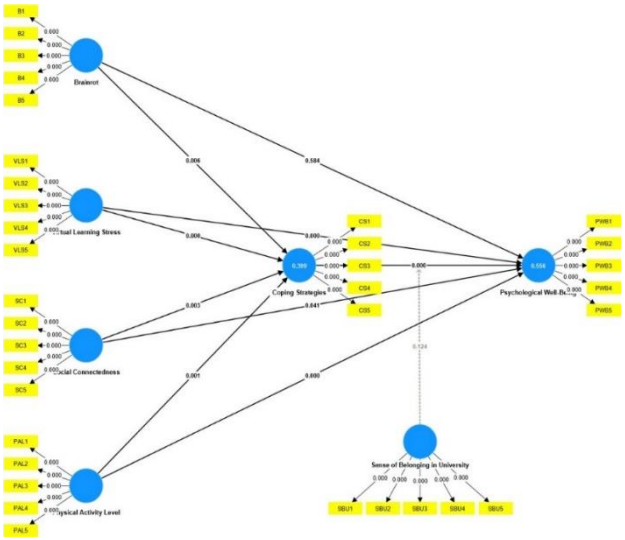
Table 11. Construct Reliability and Validity

Variable	Cronbach's alpha	Rho_a	Composite reliability	Average Variance Extracted (AVE)	
Brainrot (X1)	0,956	0,979	0,966	0,850	
Virtual Learning Stress (X2)	0,978	0,980	0,983	0,920	
Social Connectedness (X3)	0,926	0,929	0,944	0,772	
Physical Activity Level (X4)	0,924		0,927	0,943	0,768
Psychological Well-Being (Y)	0,913		0,918	0,935	0,742
Coping Strategies (Z)	0,944		0,945	0,957	0,818
Sense of Belonging in University (M)	0,979		0,844	0,980	0,908

All constructs meet the standard thresholds: While Average Variance Extracted (AVE) values surpass 0.50, showing good convergent validity, Cronbach's Alpha and Composite Reliability values above 0.70, indicating strong internal consistency. Notably, Virtual Learning Stress demonstrates exceptionally high reliability (CR = 0.983 and AVE = 0.920), highlighting the strong consistency and explanatory power of its indicators. Similarly, Sense of Belonging in University also shows excellent measurement quality (CR = 0.980 and AVE = 0.908). These results support additional study of the structural model by confirming the validity and reliability of the measuring model.

Inner Model Evaluation

Figure 3. Inner Model



Coefficient of Determination (R^2)

The R-squared (R^2) number indicates the percentage of the endogenous variables' variance that can be accounted for by the model's exogenous variables. A higher R2 denotes a model with greater explanatory ability.

Table 12. R-Square Values

Endogenous Variable	R-square	R-square adjusted
Coping Strategies (Z)	0,399	0,389
Psychological Well-Being (Y)	0,556	0,543

The Coping Strategies (Z) construct has a very high R2 value of 0,399, which indicates that the independent factors (Brainrot, Virtual Learning Stress, Social Connectedness, and Physical Activity Level) account for 39.9% of the variance in Coping Strategies. In contrast, the Psychological Well-Being (Y) construct has a very high R2 value of 0.556, meaning that the whole model, including the mediator, accounts for 55.6% of the variance in Psychological Well-Being. These values signify substantial explanatory power, confirming that the structural model is highly robust in predicting the target outcomes.

Effect Size (f^2)

The contribution of each external variable to the endogenous variable's R2 value is indicated by the effect size (f^2). Cohen's (1988) guidelines for interpretation categorize effect size as follows: 0.02 for small, 0.15 for medium, and 0.35 for large.

Table 13. Effect Size (f^2)

Exogenous Variable	Coping Strategies	Psychological Well-Being
Brainrot (X1)	0,022 (Small)	0,002 (Small)
Virtual Learning Stress (X2)	0,145 (Medium)	0,048 (Small)
Social Connectedness (X3)	0,036 (Small)	0,031 (Small)
Physical Activity Level (X4)	0,044 (Small)	0,101 (Small)
Coping Strategies (Z)		0,120(Small)
Sense of Belonging in University (M)		0,001 (Small)
Sense of Belonging in University x Coping Strategies		0,012 (Small)

With one exception, all of the impact sizes for the correlations between the exogenous Coping Strategies and Psychological Well-Being variables and the endogenous variables are categorized as small. Virtual Learning Stress shows a Medium effect (0.145) on Coping Strategies, indicating a relatively stronger influence compared to other predictors. However, its effect on Psychological Well-Being (0.048) still falls within the Small category. Other variables, such as Brainrot, Social Connectedness, Physical Activity Level, and Coping Strategies (as a predictor of Psychological Well-Being), all demonstrate Small effect sizes. While these contributions are statistically meaningful, they suggest minimal impact individually. Overall, the findings imply that although each exogenous variable contributes to the outcomes, these impacts' magnitudes are often moderate, supporting the need for a multifactorial approach to understanding student psychological well-being and coping behavior.

Direct Effect Analysis

To further understand the structural relationships among the constructs, an analysis was conducted on the direct effects between exogenous and endogenous variables using path coefficients, t-values, and significance levels. The following interpretation outlines the strength and direction of influence between the independent variables (X1–X4), the mediating variable (Z), the dependent variable (Y), and the moderating variable (M) within the proposed model.

Table 14. Direct Effect: Path Coefficient, T-Statistic, and Significance

Path Relationship	Coefficient (O)	T-Statistic	P-Value	Description
Brainrot (X1) → Coping Strategies (Z)	-0.115	2.757	0.006	Significant (Negative)
Virtual Learning Stress (X2) → Coping Strategies (Z)	0.344	6.642	0.000	Significant
Social Connectedness (X3) → Coping Strategies (Z)	0.189	2.933	0.003	Significant
Physical Activity Level (X4) → Coping Strategies (Z)	0.216	3.256	0.001	Significant
Brainrot (X1) → Psychological Well-Being (Y)	-0.038	0.548	0.584	Not Significant
Virtual Learning Stress (X2) → Psychological Well-Being (Y)	0.182	3.486	0.000	Significant
Social Connectedness (X3) → Psychological Well-Being (Y)	0.154	2.046	0.041	Significant

Physical Activity Level (X4) → Psychological Well-Being (Y)	0.287	4.558	0.000	Significant
Coping Strategies (Z) → Psychological Well-Being (Y)	0.301	4.750	0.000	Significant
Sense of Belonging in University (M) → Psychological Well-Being (Y)	-0.027	0.322	0.747	Not Significant
SBU × Coping Strategies → Psychological Well-Being (Y)	0.088	1.539	0.124	Not Significant

Virtual Learning Stress → Coping Strategies & Psychological Well-being: significant positive effects. This is counterintuitive but may reflect challenge stressors: moderate stress drives problem-solving and resilience, indirectly boosting well-being. The structural model results reveal several significant relationships. Brainrot negatively affects coping strategies (β = -0.115, p = 0.006), indicating that higher brainrot levels reduce students' use of coping mechanisms. Virtual learning stress, on the other hand, has a significant positive impact on coping strategies (β = 0.344, p = 0.000), indicating that students who are under more stress use more coping mechanisms. Physical activity level (β = 0.216, p = 0.001) and social connectivity (β = 0.189, p = 0.003) also significantly increase the usage of coping strategies. Furthermore, coping methods have a crucial mediating role in psychological well-being, as they positively and strongly predict it (β = 0.301, p = 0.000). Additionally, there are direct favorable effects on psychological well-being from social connectivity (β = 0.154, p = 0.041), physical activity level (β = 0.287, p = 0.000), and virtual learning stress (β = 0.182, p = 0.000). However, brainrot does not significantly impact psychological well-being directly (β = -0.038, p = 0.584), despite influencing coping strategies. Likewise, sense of belonging in university (β = -0.027, p = 0.747) and its interaction with coping strategies (β = 0.088, p = 0.124) do not show significant effects on psychological well-being, suggesting their influence may be indirect or context dependent.

Indirect Effect Analysis

Finding Coping Strategies' (Z) mediating role in the link between the exogenous factors (X1–X4) and the endogenous variable Psychological Well-Being (Y) was done using the total indirect effects approach. This approach aims to determine the extent to which Coping Strategies indirectly transmit the influence of Brainrot, Virtual Learning Stress, Social Connectedness, and Physical Activity Level on Psychological Well-Being.

Table 15. Total Indirect Effects between Latent Variables

Indirect Pathway	Coefficient (O)	T-Statistic	P-Value	Description
Brainrot (X1) -> Coping Strategies (Z) -> Psychological Well-Being (Y)	-0,035	2,353	0,019	Significant (Negative)
Virtual Learning Stress (X2) -> Coping Strategies (Z) -> Psychological Well-Being (Y)	0,103	4,093	0,000	Significant
Social Connectedness (X3) -> Coping Strategies (Z) -> Psychological Well-Being (Y)	0,057	2,327	0,020	Significant
Physical Activity Level (X4) -> Coping Strategies (Z) -> Psychological Well-Being (Y)	0,065	2,677	0,007	Significant

The indirect pathway analysis reveals that all four mediation effects through coping strategies are statistically significant, highlighting its crucial role in enhancing psychological well-being. Brainrot has a substantial negative indirect effect (β = -0.035, p = 0.019), meaning that more brainrot lowers psychological well-being by reducing the usage of coping mechanisms. The biggest indirect effect, on the other hand, is seen in virtual learning stress (β = 0.103, p = 0.000), indicating that students who are under more stress are more likely to use coping mechanisms, which in turn enhances their mental health. By encouraging the employment of coping mechanisms, social connectivity (β = 0.057, p = 0.020) and physical activity level (β = 0.065, p = 0.007) also have a favorable impact on psychological well-being. The significance of coping methods as a mediator is highlighted by these findings, especially when it comes to assisting students in managing the psychological effects of stress, social settings, and health-related behaviors.

Discussion

Associations Between Respondent Characteristics and Psychological Well-Being

This study's crosstab analysis provides a deeper knowledge of the relationship between different behavioral and sociodemographic traits and postgraduate students' psychological health. Notably, age

group was found to be significantly associated with psychological well-being, where students aged 26–30 reported higher levels of well-being than their younger or older peers. This result is in line with research pointing out that people within this age bracket might be more emotionally mature, better at coping adaptively, and better at adjusting academically (Shin, 2017; Sood & Sharma, 2020). However, respondents below 25 might be graduating to postgrad studies, which can lead to increased scholastic stress and identification-based distress (Leshner, 2021). The link between age and well-being is consistent with theoretical views on development that suggest that coping ability and emotional resilience mature with age and exposure (Mou et al., 2023; Yafie et al., 2024). This finding has some bearings on how to design interventions on well-being that take account of stage of life-based vulnerabilities among postgrad student cohorts.

There was a stronger and more consistent relationship between daily device use and frequency of physical activity. Psychological well-being was poorer in students reporting system use in excess of a half dozen hours a day compared to students reporting more moderate or balanced use. This supports "brainrot," or excessive technology use, which has been associated with emotional dysregulation, burnout, and distractibility (Barbayannis et al., 2022). Too frequent use of screens, especially in learning situations, creates burnout and a diminished ability to engage in deep learning and emotional control (Blignaut et al., 2022). By contrast, psychological well-being was positively associated with frequent physical activity, especially exceeding four sessions a week. This is consistent across a large literature demonstrating how exercise can enhance psychological resilience and diminish signs and symptoms of stress, anxiety, and depression (Albers et al., 2022; Gimbert et al., 2023; Lovin & Bernardeau-Moreau, 2022). These results reinforce how digital hygiene, and active lifestyles need to be emphasized within university well-being strategies.

Whereas other covariates such as gender, faculty and field of studies did not reach statistical significance to be correlated with psychological well-being, inclusion within this measurement reveals notable contextual relationships. For example, while gender differences did not reach statistical difference, male students slightly reported poorer well-being, a trend desirable further investigation via qualitative research (Ukeh et al., 2023). Similarly, program-specific stressors, such as research demands in thesis-heavy curricula, may not be uniformly captured by quantitative measures but could influence daily stress levels (Straud & McNaughton-Cassill, 2019). The implications of these findings are cautiously framed: while student support services must recognize technology use and physical activity as critical factors in psychological health, targeted interventions should be evidence-based and tailored for high-risk groups rather than applied universally (Kim & Lee, 2022; Rodríguez et al., 2023).

Direct Effect

The study's findings demonstrate the complex connections among digital activities, stress, social engagement, physical activity, and psychological well-being in postgraduate students, offering compelling empirical evidence in favor of Lazarus and Folkman's Transactional Model of Stress and Coping. One of the key findings is the significant negative impact of brainrot—a cognitive overload from excessive digital consumption—on students' coping strategies ($\beta = -0.115$, $p = 0.006$). This supports the model's claim that stress results from both internal and external pressures, as well as from how people perceive and react to those pressures. Brainrot appears to impair students' ability to engage in adaptive coping, particularly when their mental resources are depleted by continuous exposure to fragmented digital stimuli.

On the other hand, virtual learning stress shows a counterintuitively positive direct effect on both coping strategies ($\beta = 0.344$, $p = 0.000$) and psychological well-being ($\beta = 0.182$, $p = 0.000$). This has now been interpreted using the challenge–hindrance stressor framework (Cavanaugh et al., 2000; Lepičnik-Vodopivec & Samec, 2013; Sahane et al., 2023), which explains that certain stressors may function as "challenge stressors." When students perceive academic demands as surmountable challenges, stress can activate coping resources and enhance growth, leading to improved well-being. This aligns with recent findings that moderate stress fosters resilience and academic engagement (Cheng et al., 2022; Savitri et al., 2015).

The significant roles of social connectedness and physical activity in both enhancing coping strategies and improving psychological well-being resonate strongly with Maslow's Hierarchy of Needs. These constructs reflect the third level of Maslow's model—the need for belongingness and emotional safety—

which is essential for self-esteem and mental wellness. Students who feel socially integrated and physically active are more likely to access interpersonal and behavioral resources, contributing to emotional resilience and adaptive coping. In this sense, Maslow's theory expands the view beyond individual stress appraisal by incorporating the broader psychological context of unmet social and physiological needs. These results validate the importance of non-academic support structures within university settings, emphasizing that mental health interventions must go beyond academic skill-building to include fostering peer connections and promoting lifestyle health behaviors (Albers et al., 2022; Yafie et al., 2021).

Interestingly, sense of belonging in university did not show a significant effect, suggesting that formal membership in an institution may not equate to meaningful social support unless accompanied by authentic peer engagement (Parkes, Matheson, Carver, Foster, Budd, Liddell, Wallace, Pauly, Fotopoulou, Burley, Anderson, & Maclennan, 2022; Parkes, Matheson, Carver, Foster, Budd, Liddell, Wallace, Pauly, Fotopoulou, Burley, Anderson, Price, et al., 2022). This highlights that interventions must prioritize quality of belonging, not just structural affiliation (Johansson et al., 2022).

Indirect Effect

The results of the indirect pathway analysis provide compelling evidence for the core principles of the Transactional Model of Stress and Coping by Lazarus and Folkman, particularly the model's assertion that coping strategies serve as a mediator between environmental stressors and psychological outcomes. Brainrot showed a significant negative indirect effect, while virtual learning stress displayed a positive indirect pathway, reinforcing the dual role of stressors depending on appraisal (Barbayannis et al., 2022). (Blignaut et al., 2022). These results align with recent extensions of the stress–coping literature suggesting that digital overload undermines, while adaptive stress enhances, student mental health (Fusco et al., 2022; Sato et al., 2023).

The indirect effects of social connectedness and physical activity confirm their role as protective resources, consistent with findings that lifestyle and relational supports enhance resilience (Albers et al., 2022; Nong et al., 2025; Yafie et al., 2024).

Several limitations should be acknowledged. First, the study relied on self-reported cross-sectional data, which may be subject to social desirability and cannot establish causality. Second, the sampling approach was based on convenience from selected universities, limiting generalizability. Third, while validated scales were used, the construct of "brainrot" is still emerging and may require further refinement to avoid floor effects. Fourth, the positive association between virtual learning stress and well-being, while interpreted using the challenge–hindrance framework, requires replication in longitudinal or experimental designs.

Despite these limitations, the study highlights actionable pathways. Recommendations are intentionally modest and evidence-based: interventions should focus on reducing excessive digital exposure, promoting physical activity, and equipping students with adaptive coping strategies. Universities may consider peer-support programs, digital hygiene workshops, and health-promotion initiatives—but future work should test these systematically before large-scale implementation (Moeller et al., 2020; Rehman et al., 2023).

Conclusions

This study concludes that coping strategies fulfill a mediational role as a psychological process that buffers against effects of numerous digital, academic, social, and health-related stressors on postgraduate students' psychological health. Direct and indirect pathway findings indicate that stress resulting from virtual learning and social connectivity can have a positive impact on well-being if buffered by adaptive coping strategies, while brainrot's negative impact operates via a diminished capacity to buffer against stress. With respect to integrating a new era of digital academizaation, an integration between Maslow's Hierarchy of Needs and Lazarus and Folkman's Transactional Model of Stress and Coping provides a solid theoretical basis against which to understand how internal strengths and extenal forces combine to impact students' mental wellbeing.

There is a need for further research to explore the moderating influence of self-efficacy, emotional intelligence, and digital mindfulness on the link between academic stress and psychological well-being. A

longitudinal research design can further be used to account for changes in coping style and mental ill-health across time periods, particularly against new digital challenges. It can further be inclusive of qualitative data such as in-depth interviews to better understand students' subjective world and provide further contextual help supporting findings from quantitative research.

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Authors' and translators' details:

Budiono	budiono@umm.ac.id	Author
Erna Yayuk	ernayayuk17@umm.ac.id	Author
Yudha Alfian Haqqi	yudha_alf71@yahoo.co.id	Author and Translator