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Well-being among Medical Students in Digital Learning Environments

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Abstract

This study examines how subjective well-being varies across psychological well-being levels among medical students in online learning (via Microsoft Teams). A cross-sectional survey involving 250 undergraduate medical students from a Ukrainian state university was conducted using validated instruments (the 84-item version of Ryff's Scales of Psychological Well-Being and the Oxford Happiness Inventory). Results revealed significant group differences in subjective well-being based on psychological well-being ($p < 0.001$), with mean scores increasing from 39.4 in the low well-being group to 62.0 in the high group. The findings suggest that psychological well-being is associated with subjective well-being and highlight the need for support for students with lower well-being. Furthermore, online platforms facilitated research, demonstrating their potential for future studies, although data accuracy and ethical adherence concerns persist. This research supports the development of targeted interventions within digital learning settings and encourages further exploration of the long-term psychological impacts of online education.

Keywords: *Psychological well-being; medical students; online learning; subjective well-being; digital education.*

1. Introduction

The mental health of medical students has become a growing concern in medical education, with elevated rates of anxiety, depression, and burnout documented across different academic stages (Haykal et al., 2022). Moreover, societal disruptions, such as the COVID-19 pandemic and the ongoing military conflicts, have worsened these conditions, disrupting traditional learning environments and limiting access to support systems (Aristovnik et al., 2023; Savelyuk, 2022). As a result, the psychological burden on students has intensified, particularly within digitally mediated academic environments (Wang, 2023). While extensive research has

addressed the negative impact of stress on medical students, much less is known about how psychological and subjective well-being relate to each other, particularly in remote learning contexts (Wang et al., 2023). These constructs are often treated independently in empirical work, despite growing interest in their possible interconnections in digital education settings (McGee et al., 2024). Furthermore, psychological well-being and subjective well-being are often treated as separate constructs, with limited integration in empirical studies, highlighting the need to better understand their relationship in digital educational contexts. Thus, the purpose of this study is to examine differences in subjective well-being among medical students with varying levels of psychological well-being in an online learning environment.

2. Related Work

To better understand student well-being in digital learning contexts, this section briefly reviews recent literature, focusing on key theoretical ideas, common assessment methods, and psychological factors relevant to medical students. It first explains the main differences between hedonic and eudaimonic well-being, then describes typical methodological approaches used in digital educational research. Afterwards, factors influencing medical student well-being are discussed. Finally, current gaps in research are highlighted to suggest areas for further investigation.

2.1. Concepts and Methods of Assessing Well-being in Digital Education

Hedonic and eudaimonic well-being represent two interrelated yet conceptually distinct approaches to assessing an individual's psychological state; the former primarily reflects subjective life satisfaction and positive emotions, whereas the latter encompasses deeper dimensions such as purpose in life, autonomy, and personal growth (Ryff et al., 2021). Despite the lack of full consensus in terminology, subjective well-being is most often equated with happiness, while psychological well-being is associated with more complex dimensions of optimal functioning and personal growth (Ryan & Deci, 2001).

Despite decades of separate empirical research on hedonic and eudaimonic well-being, little work has addressed how these dimensions function together in digitally mediated academic contexts (McGee et al., 2024; Wang et al., 2023). Concurrently, research addressing sociodemographic factors (age, gender, racial and economic disparities) has shown that hedonic and eudaimonic components follow different developmental trajectories and are linked to distinct pathways of influence on health outcomes (Wilkes et al., 2019; Ryff et al., 2021). In the context of increasing digitalization in medical education, adopting a more integrated perspective on well-being may contribute to a deeper understanding of students' psychological functioning under changing educational conditions (Hill et al., 2018; Wilkes et al., 2019).

As a comprehensive framework for evaluating well-being in digital settings remains underdeveloped, the available measurement tools display considerable variability, and some may be insufficiently grounded in theory or lack conceptual alignment (Zhang et al., 2024; Linton et al., 2016). Furthermore, instruments created to measure well-being in digital educational settings have not been clearly defined or widely accepted. The transition to online education has led to significant advancements, including adapting traditional assessment tools such as Ryff's Psychological Well-Being Scale for digital use. However, validating these adapted tools remains challenging and requires careful review and thorough testing to ensure they are reliable and suitable for online use (Palma-Gómez et al., 2020; Mustika et al., 2021). Additionally, assessing medical students' well-being introduces further complexity, requiring specialized instruments such as the Medical Student Stress Profile or the Medical Student Well-Being Index (Haykal et al., 2022). Refining existing tools through context-sensitive modifications through context-specific adaptations may help improve the precision of student well-being assessments and better support evolving psychological needs in digital educational contexts (Linton et al., 2016).

2.2. Factors Affecting Medical Student Well-being

Previous studies have identified significant adverse effects of academic and personal stressors on medical students' mental health, including burnout, depression, and emotional fatigue (Hill et al., 2018; Wilkes et al., 2019). Meanwhile, recent research underscores the significant influence of individual psychological factors, specifically perfectionism, resilience, and self-efficacy, on students' stress levels and overall mental health (Hill et al., 2018; Wilkes et al., 2019). Simultaneously, recent shifts toward digital learning have introduced additional stressors that differ in nature and intensity. In particular, long hours of screen time and less face-to-face contact can increase feelings of isolation and hurt students' mental health (Mustika et al., 2021; Wang, 2023). Therefore, these findings draw attention to the broader context in which medical students experience psychological distress and highlight the importance of further examining how digital learning environments affect their mental health and well-being.

2.3. Benefits and Challenges of Digital Learning

Recent shifts toward digital education in medical curricula have generated new pedagogical opportunities and notable psychological risks, which require careful consideration. One significant advantage is the capability of digital platforms to support autonomous emotional regulation through technology-based interventions. For instance, a meta-analysis reported that mindfulness apps were associated with reduced stress and anxiety while improving overall well-being and attentional control among university students (Chen et al., 2023). Although this analysis focused primarily on general university populations, similar positive outcomes have

been explicitly observed among medical students, suggesting potential for targeted applications in medical education (Fazia et al., 2023).

Moreover, beyond mindfulness-focused interventions, digital education in medical training has been associated with a variety of pedagogical benefits, including improved clinical skill acquisition through video-based instruction (Morgado et al., 2024), enhanced anatomical learning via virtual reality platforms (Minouei et al., 2024), increased accessibility of academic content (Li et al., 2024), strengthened diagnostic reasoning with the aid of artificial intelligence tools (Wang et al., 2024), and better preparation for telemedicine and remote patient communication (Shende and Wagh, 2024). Overall, these findings suggest that digital education may offer indirect mental health benefits by promoting emotional regulation and adaptive skill development.

Despite these pedagogical advantages, recent studies highlight significant psychological and physiological challenges associated with digital learning, especially within high-pressure fields such as medicine. Prolonged screen exposure, for example, has been associated with visual discomfort, as well as reduced concentration and cognitive fatigue (Devi & Singh, 2023; Jakhar et al., 2023). Additionally, the multitasking demands and informational overload common in digital environments negatively affect working memory and learning efficiency (Kirschner and De Bruyckere, 2017).

In addition, certain psychological vulnerabilities have been documented in digital learning environments. For instance, Groenestein et al. emphasize the ambiguity and insufficient empirical clarity surrounding the Fear of Missing Out, a digitally intensified phenomenon rooted in social comparison and informational hyperexposure, which has been empirically associated with increased psychological distress among student populations (Groenestein et al., 2024). This underscores the importance of carefully examining digital learning contexts from a psychological perspective.

Overall, while digital learning has introduced new formats for delivering medical education, it has also raised questions related to students' psychological and cognitive experiences. Although psychological well-being and happiness have been examined separately, their relationship in the context of online learning is not yet well understood. The following section outlines the empirical approach adopted to explore this relationship.

3. Methods

3.1. Participants and Procedure

Participants were medical students enrolled at Zaporizhzhia State Medical University during the 2020–2021 academic year. Due to the COVID-19 pandemic, this cross-sectional study was

conducted fully online. Students aged 18 or older with internet access participated voluntarily after providing informed consent. Ethical approval was obtained from Zaporizhzhia National University and Zaporizhzhia State Medical University. Participants were recruited through announcements on the university's website, inviting them to complete a one-time anonymous survey. Invitations containing background information and a direct link to the questionnaire were sent via email using Microsoft Forms, integrated into Office 365 Education. During this period, students primarily engaged in synchronous online academic activities (lectures, seminars, consultations) via Microsoft Teams, supplemented by asynchronous elements such as recorded lectures and self-paced work materials.

3.2. Assessment Instruments

Data collection included demographic information (age, gender, year of study) and responses to two validated questionnaires. First, psychological well-being was assessed using the Ryff's Scales of Psychological Wellbeing, adapted into an 84-item Ukrainian version (Karskanova, 2011). This instrument evaluates six dimensions: self-acceptance, positive relations with others, autonomy, environmental mastery, purpose in life, and personal growth. Responses were measured on a 6-point scale, ranging from «strongly agree» to «strongly disagree». Second, subjective well-being was evaluated using the Oxford Happiness Inventory (Argyle et al., 1989), which was validated and appropriate for the population studied. The 29-item questionnaire utilized a 4-point response format.

3.3. Data Analysis

Survey data were exported to Microsoft Excel and securely stored. Only complete responses to both questionnaires were included in the final analysis to ensure accuracy and minimize bias. A total of 254 respondents (42.3%) completed both scales, 521 participants (86.8%) answered the 29-item questionnaire, and 257 (42.8%) completed the 84-item test.

Statistical analyses were performed using Stata 15 (StataCorp, College Station, TX, USA). Continuous variables were reported as means and 95% confidence intervals (CIs), while categorical variables were presented as frequencies and percentages (n, %). Group differences were evaluated using one-way ANOVA with Bonferroni post-hoc tests for pairwise comparisons. Cases with incomplete data were excluded to minimize bias. Statistical significance was set at $p<0.05$.

4. Results

4.1. Characteristics of the Study Population

The final analytic sample comprised 250 medical students, of whom 24.8% were male, with participants ranging in age from 18 to 35 years. Students were recruited from the second (8.3%), third (42.5%), fourth (25.6%), and fifth (23.6%) years of undergraduate study. All responses were collected during the 2020–2021 academic year via a digital survey platform (Microsoft Forms) during remote instruction necessitated by the COVID-19 pandemic.

4.2. Descriptive Statistics and Group Categorization

To assess psychological well-being, the 84-item version of Ryff's Scales of Psychological Well-Being was utilized, while subjective well-being was evaluated using the 29-item Oxford Happiness Inventory. As no validated normative thresholds exist for these instruments in the target population, quartile-based categorization was applied. Specifically, for the psychological well-being scale, the total scores corresponding to low and high levels were calculated as 332 and 391. Similarly, these thresholds were determined as 40 and 60 for the subjective well-being scale.

The cross-distribution of psychological and subjective well-being levels is summarized in Table 1, reflecting patterns of co-occurrence across the respective low, medium, and high categories.

Table 1. Cross-distribution of psychological and subjective well-being levels among medical students.

	Psychological well-being		
	Low-score (n=63)	**Med-score (n=126)**	**High-score (n=61)**
Subjective well-being			
Low-score (n=60)	31	25	4
Medium-score (n=128)	26	80	22
High-score (n=62)	6	21	35

The findings reveal that a substantial proportion of students with low psychological well-being (49.2%) also report low subjective well-being, while 39.7% exhibit medium levels. This pattern suggests a predominant association between lower psychological well-being and reduced subjective satisfaction. As presented, most individuals with medium psychological well-being (63.5%) align with medium subjective well-being. However, some variability exists, as 20.6% report low subjective well-being, and 17.5% achieve high levels. This variability highlights the

potential influence of external or contextual factors on the psychological and subjective well-being relationship.

In contrast, high psychological well-being demonstrates a robust positive correlation with high subjective well-being, with 57.4% reporting high levels, 34.4% indicating medium levels, and only 9.8% reporting low levels. Overall, these results underscore the importance of well-being in influencing subjective experiences and propose that focused interventions targeting psychological health could lead to substantial improvements, particularly for individuals in the low and medium categories.

4.3. Statistical Comparison of Subjective Well-being Across Psychological Profiles

A one-way ANOVA was conducted to assess whether psychological well-being category significantly predicted subjective well-being scores. The data indicate a significant effect of psychological well-being on subjective well-being scores ($F(2,247)=44.84$, $p<0.001$). Additionally, post-hoc analysis using the Bonferroni test revealed statistically significant differences across psychological well-being groups (low, medium, and high). More specifically, the difference between the low and medium groups was 10.2 points ($p<0.001$), with mean subjective well-being scores increasing from 39.4 (95% CI: 35.18–43.50) in the low group to 49.5 (95% CI: 47.46–51.59) in the medium group. Importantly, a greater difference of 22.6 points ($p < 0.001$) was observed between the low and high groups, with the latter achieving a mean score of 62.0 (95% CI: 58.69–65.22). Finally, the medium and high groups differed by 12.4 points ($p < 0.001$), indicating a progressive increase in subjective well-being with higher levels of psychological well-being. The analysis found a positive relationship between psychological and subjective well-being. Students with better psychological well-being tended to feel happier.

4.4. Summary of Key Findings

In summary, the final analytic sample consisted of 250 medical students aged 18 and 35, with participants fairly distributed across academic years. Quartile-level psychological and subjective well-being comparisons showed a recognizable co-occurrence pattern among the student groups. Specifically, most students with low psychological well-being also reported low subjective well-being, whereas students with high psychological well-being more frequently demonstrated high subjective well-being levels. Furthermore, a one-way ANOVA revealed statistically significant differences in subjective well-being scores across the three psychological well-being categories ($F(2,247)=44.84$, $p<0.001$). Post-hoc Bonferroni tests confirmed that subjective well-being scores increased significantly and progressively from the low to the high psychological well-being groups. Notably, however, a subgroup of students with high psychological well-being reported only medium levels of subjective well-being, and a smaller number even reported low subjective well-being. These discrepancies indicate that the

relationship between psychological and subjective well-being is not uniform and may be influenced by individual traits or learning conditions that were beyond the scope of the current work. Overall, the results demonstrate a generally positive link between psychological and subjective well-being, though individual variations within groups indicate the need for more detailed analysis.

5. Discussion

The observed association between psychological and subjective well-being provides a foundation for interpreting the diverse patterns found within the student population.

5.1. Personal Factors

In line with previous research (Wilkes et al., 2019; Hill et al., 2018), our results indicate that subjective well-being can vary considerably among students with moderate or high levels of psychological well-being. One possible explanation for this variation lies in personality traits like maladaptive perfectionism or low self-acceptance. Even students with pronounced perfectionistic traits, such as excessive self-demands and fear of failure, may perform well in specific areas of psychological functioning, particularly autonomy and environmental mastery. However, their levels of subjective well-being may remain low due to constant internal pressure and dissatisfaction. Similar patterns have been observed in recent Ukrainian studies, which identified a strong link between perfectionism and emotional difficulties among medical students, particularly in online and blended learning (Savina, & Malakhovetska, 2021). These patterns suggest that even strong psychological functioning may not ensure emotional satisfaction if undermined by maladaptive personality traits.

5.2. Educational and Environmental Factors in Digitally Mediated Medical Training

Another important consideration is the possibility that discrepancies between psychological and subjective well-being reflect difficulties in forming a coherent professional identity. Limited clinical exposure and fewer interpersonal interactions can impede students' sense of belonging within the medical profession. As a result, students' personal growth and life purpose may be compromised, affecting core dimensions of well-being such as life purpose and personal growth. Evidence from Ukrainian universities affected by war further highlights this trend: students frequently reported emotional burnout and increased uncertainty regarding their academic and professional trajectories (Shulhai, Fedchyshyn, & Shulhai, 2023).

Another group of relevant factors relates to structural and pedagogical pressures within digital learning environments. These perspective align with theoretical models emphasising self-acceptance and personal growth (Ryff, 1989; Ryff & Keyes, 1995). Notably, a subgroup of students with high psychological well-being but medium subjective well-being suggests the

influence of contextual or individual factors (Hill et al., 2018). Overall, these observations point to the need for further research into the conditions that moderate the link between psychological and subjective well-being.

In particular, digital learning environments introduce additional academic and technological stressors. Personality traits aside, structural and educational factors also play a significant role. High-stakes assessments and the extended use of digital learning platforms may lead to cognitive fatigue and decreased social connection. Even psychologically resilient students may feel less satisfied when lacking emotionally supportive communication and peer engagement in online environments.

Beyond psychological and educational factors, methodological aspects of digital data collection also deserve attention. In practical terms, present analysis highlights the advantages of concise psychometric instruments in online research, which facilitate higher response rates and participant engagement (Reips, 2021). Nonetheless, ensuring honesty, maintaining anonymity, and addressing potential biases in digital settings remain critical for methodological refinement.

5.3. Directions for Intervention and Further Research

When considered as a whole, these findings emphasize the importance of implementing feasible and widely applicable interventions such as peer mentoring, structured reflection, and hybrid learning models. These strategies can help reduce psychological strain while supporting students' identity development and emotional well-being in digital and crisis-affected academic contexts (Palma-Gómez et al., 2020; Wang, 2023).

5.4. Summary of Discussion

The present findings suggest that the relationship between psychological and subjective well-being in digital medical education may not be straightforward. While a generally positive link was observed, some students demonstrated unexpected combinations of well-being levels, for example reporting high psychological well-being but only moderate or low subjective happiness. This variation may be related to influences that were beyond the scope of this work. Future research could explore both personal and sociocultural contributors to these discrepancies, including personality traits, academic adaptation, the structure of remote learning, and the broader cultural context in which students experience emotional well-being. Altogether, this discussion illustrates the importance of approaching student well-being as a multidimensional construct shaped by both individual characteristics and the specific conditions of digitally mediated education.

6. Limitations

Despite its contributions, this study has several limitations. First, the cross-sectional design limits the ability to draw causal conclusions. Second, caution is warranted when generalizing the findings, as the sample was limited to Ukrainian medical students, whose experiences may not fully represent broader student populations. Although validated instruments were used, the research did not include tools specifically designed for medical students, such as the Medical Student Well-Being Index, which may have provided additional insight.

Furthermore, a limitation concerns the cultural and contextual relevance of the instruments applied. The conceptual foundations of the Ryff Scales and the Oxford Happiness Inventory reflect psychological constructs rooted in individualistic cultural frameworks. These may not fully align with the values of more collectivist societies, such as Ukraine, where interpersonal connectedness, social roles, and group belonging play a more central role in self-perception and well-being.

In addition, the current work utilized earlier adapted versions of both instruments (Ryff Scales, 84 items), as more current, culturally validated versions were not available at the time. In contrast, recent international studies often use updated and shorter formats, such as the 18- or 42-item Ryff Scales and the Oxford Happiness Questionnaire Short Form. This indicates the importance of selecting tools that are not only linguistically and culturally appropriate but also aligned with current methodological practices.

The timing of data collection also presents limitations. Conducted during the COVID-19 pandemic, the study raises important considerations regarding the long-term psychological effects of digital learning. However, the lack of follow-up assessments restricts our understanding of how these effects evolve over time. In Ukraine, where digital education continues in regions affected by ongoing conflict, the long-term mental health implications of remote learning remain a critical direction for further research. Nonetheless, the present analysis demonstrates that psychometric instruments can be effectively used in digital environments to assess student well-being.

Within this context, the findings may serve as a reference point for future research and help inform institutional strategies aimed at supporting mental health in online learning environments.

7. Conclusions

The current research examined how subjective well-being differs depending on psychological well-being levels among medical students in an online learning context. The results suggest a generally positive association between the two constructs. At the same time, individual-level variation indicates that this relationship is not entirely uniform and may be shaped by additional

personal and contextual factors not directly addressed in the present design. This observation points to the need for further investigation into the mechanisms underlying these well-being differences.

In light of these findings, it may be helpful to develop student support strategies that take into account psychological diversity and the specific demands of digital medical education. Furthermore, future studies could explore how longer-term exposure to remote learning, in combination with individual dispositions and sociocultural conditions, affects emotional adjustment in medical training. Overall, these results may support the implementation of evidence-based approaches to student well-being and contribute to the adaptation of educational practices within increasingly digital learning environments.

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