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Physical and Mental Health Technology-based Learning and its Impact on among Nursing Student: A Cross-Sectional Survey

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Abstract

Background

Technology-based learning has become an essential component of education, particularly during and after the COVID-19 pandemic. Although it offers flexibility and accessibility, increased reliance on technology has raised concerns regarding its impact on students' physical and mental health. Nursing students, who are exposed to intensive academic and technological demands, may experience significant health consequences. Therefore, this study aims to explore the relationship between technology-based learning and its effect on the physical and mental health of undergraduate nursing students.

Methodology

A quantitative cross-sectional survey research design was adopted for the study. A total sample of 92 students was selected using a convenience sampling technique. Data were collected using socio-demographic variables, smartphone usage data, physical and academic health information, and the Kessler Psychological Distress Scale (K6) to assess psychological distress. Academic performance was evaluated based on the Grade Point Average (GPA) method.

Results

The study results showed that most undergraduate students (96%) used smartphones for multiple purposes, with a majority using them for more than four hours daily. Despite high smartphone usage, academic performance remained strong, with 61% achieving excellent GPA scores. However, 78% of students reported experiencing physical discomfort such as headaches, neck pain, and eye strain. Psychological distress levels were moderate to high among students with extensive smartphone usage. The data indicated a substantial association between excessive technology use and negative impacts on physical and mental health.

Conclusion

The study concluded that although technology-based learning supports academic success among undergraduate nursing students, excessive use is associated with adverse physical and mental health outcomes. Implementing strategies to regulate technology use and promote health awareness is necessary to optimize the benefits of e-learning while minimizing health risks.

Keywords: Technology-based Learning, Physical Health, Mental Health, Smartphone Use, Academic Performance, Nursing Students

Introduction

Technology-based learning became essential during the COVID-19 pandemic when traditional lectures were abruptly replaced by online education to ensure the continuity of learning. Students adapted to distance education while seated in front of screens at their homes. With the increased adoption of mobile devices and educational applications, online learning offered flexibility and interactive experiences [1, 2].

However, the extended exposure to screens and technology has raised concerns regarding physical discomfort and psychological stress among students [3, 4]. Excessive smartphone use has been linked to vision strain, headaches, and cognitive and emotional issues [5, 6]. Therefore, this study aims to evaluate the effect of technology-based learning on the physical and mental health of undergraduate nursing students.

Aim

The main aim of the study is to evaluate the effect of technology-based learning on students' physical and mental health among undergraduate nursing students.

Research Objectives

1. To determine the influence of technology-based learning on the physical health of nursing students.
2. To determine the influence of technology-based learning on the mental health of nursing students.

Hypotheses

1. There is no correlation between technology use and academic performance among undergraduate students.
2. There is no association between smartphone usage patterns across demographic characteristics.
3. There is no association between academic performances across demographic variables.

Materials and Methods

Research Design

The research adopted a descriptive, cross-sectional design aiming to assess the impact of technology-based learning on the physical and mental health of undergraduate nursing students.

Study Subjects/Samples

The study subjects were undergraduate nursing students at Riyadh ELM University.

Sample Selection and Size

A convenience sampling technique was used to select the study participants. A total of 92 students was the calculated sample size, using the PASS11 program with a 95% confidence level and a 5% margin of error.

Inclusion and Exclusion Criteria

Inclusion criteria: Undergraduate nursing students at REU, both males and females, aged between 18 and 40 years.

Exclusion criteria: Non-nursing students or those not currently enrolled at REU.

Instrument for Data Collection

Data were collected using four tools:

1. Socio-demographic data (gender, age, marital status, family size, semester of study).
2. Smartphone use data (duration of ownership, daily usage hours, and purpose of use).
3. Academic and physical health information (GPA score, physical activity status, BMI calculation, and reported pain/discomfort).
4. Kessler Psychological Distress Scale (K6) to assess mental stress levels.

Data Collection Procedure

Following approval from the Research Ethics Committee at Riyadh ELM University, data collection was initiated. A questionnaire based on a literature review was translated into simple Arabic and validated by a panel of experts. A pilot study involving 10% of the sample was conducted to test the tool's feasibility. After obtaining informed consent, data were collected from students across various academic levels using Google Forms.

Ethical Considerations

Ethical approval was obtained from the Research Ethics Committee at Riyadh ELM University. Participation was voluntary, and participants were informed about the study's nature, purpose, and confidentiality assurances. Anonymity, privacy, and safety of participants were strictly maintained.

Statistical Analysis Methods

Collected data were checked for completeness and analyzed using SPSS software version 28. Quantitative data were presented as mean and standard deviation, while qualitative data were presented as frequencies and percentages. The chi-square test was used to assess associations, with a significance level set at $p \leq 0.05$.

Results and Discussion

Table 1: Demographic Characteristics of the Study Participants

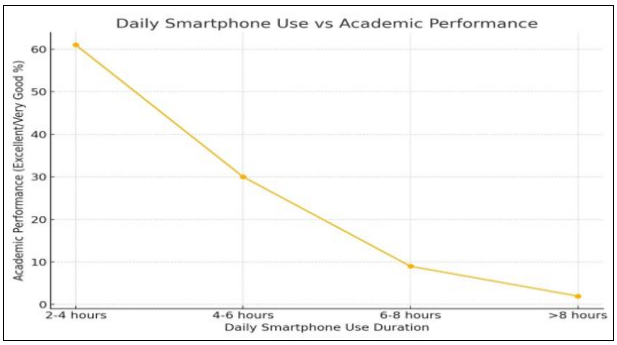
S. No	Variables	Categories	Frequency	Percentage (%)
1	Gender	Female	74	82.0
		Male	18	18.0
2	Age	18–19 years	Few cases	~
		20–23 years	Majority	~
		Average Age	22.7 years	~
3	Marital Status	Single	72	80.0
		Married	16	18.0
		Divorced	3	2.0
4	Academic Level	Internship (Training Year)	16	18.0
		Level 8	21	23.0
		Level 5	19	21.0
		Level 4	18	20.0
		Level 6	5	5.5
		Level 1	8	9.0
		Level 2	5	5.5
		Level 3	3	3.0
		Level 7	3	3.0

Table 1 shows the demographic characteristics of undergraduate nursing students. Based on the table, the majority of the nursing students were female with 82% of the total population as male accounted for nearly one-fifth of the undergraduate students. While majority of the students ages ranging from 223 years old, 80% of them were single and nearly two-third of the undergraduate study participants were from academic level 4,5 and 8.

Table 2: Frequency Distribution of Smartphone Use Characteristics

S. No	Variables	Categories	Frequency	Percentage (%)
1	Purpose of Smartphone Use	All purposes (education, communication, entertainment)	88	96.0
		Messaging only	3	3.0
		Research only	1	1.0
		Study only	2	2.0
		Gaming only	1	1.0
2	Age of First Smartphone Use	Less than 6 years	8	9.0
		6–12 years	20	22.0
		12–18 years	49	54.0
		More than 18 years	14	15.0
3	Daily Smartphone Use Duration	2–4 hours	27	30.0
		4–6 hours	35	39.0
		6–8 hours	22	25.0
		More than 8 hours	6	6.0

Table 2 presents the frequency distribution of smartphone use characteristics among undergraduate students. The results reveal that almost all undergraduates intend to use smart phone for the purpose of education, communication and entertainment. Unfortunately, only one of them has a reason of research as 1218 years old they started to utilize smart phone and stay with their smartphone for about 4-6 hours.



Line Chart: Smartphone Usage vs GPA

Table 3: Academic Performance of the Undergraduate Students

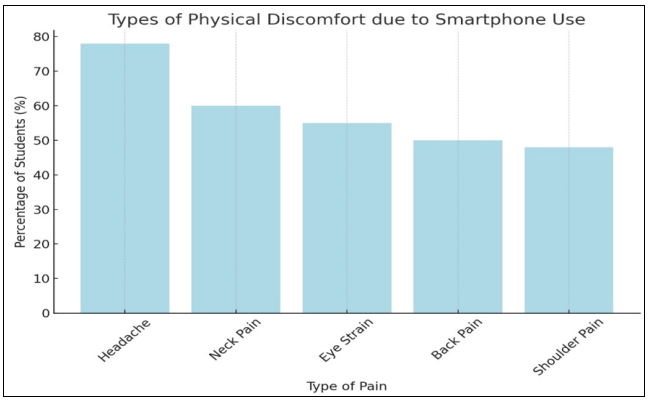
Academic Performance (GPA)	Frequency	Percentage (%)
Excellent	55	61.0
Very Good	27	30.0
Good	8	9.0
Pass	2	2.0

Table 3 depicts the academic performance of the undergraduate students. The table shows that 61% of the students have excellent academic performance and nearly one-third was very academic performance.

Table 4: Physical Activity, Health Status and Pain Experience as to smartphone use

S. No	Variables	Categories	Frequency	Percentage (%)
1	Physical Activity (Hours/Week)	1–2 hours	54	58.0
		2–4 hours	26	28.0
		4–6 hours	15	16.0
		>6 hours	5	5.0
2	BMI Status	Normal weight	Majority	~
		Overweight	Several	~
		Obese	Some cases	~
3	Smoking Status	Non-smokers	89%	~
		Former smokers	9%	~
		Current smokers	2%	~
4	Pain due to Smartphone Use	Yes (Sometimes or Always)		
		No or Rarely	22	22.0
5	Type of Pain Experienced	Headache	Most common	~
		Neck pain, Eye strain, Back pain, Shoulder pain	Frequent	~

The above table illustrates the frequency distribution of students' physical activity levels, BMI, smoking status, and pain associated with smartphone use. It can be seen on the table that more than half of the students spend 1-2 hours per week of physical activity. Majority of the undergraduate students experience pain as a result from the use of smartphone. Most common pain experienced are headache and frequent neck pain, eye strain, back and shoulder pain.



Bar Chart: Physical Discomforts Reported

Table 5: Correlation between Technology Use and Academic Performance among Undergraduate Students

Variables	Technology Use	Academic Performance
Mean	5.4 hours/day	3.61
SD	1.4	0.74
Correlation (r)	-0.162	
Level of significance	P = 0.028 (S)	

***p<0.05, S-Significant**

The above table portrays that the mean technology use among students was 5.4 ±1.4 hours per day, and the mean academic performance (GPA) was 3.61 ±0.74. The calculated Karl Pearson's Correlation value of r = -0.162 showed a slight negative correlation between Technology Use and Academic Performance among undergraduate students.

Table 6: Association between Smartphone Usage Patterns across Demographic characteristics

Variables	High Smartphone Usage (≥6 hours)	Moderate Smartphone Usage (4–6 hours)	Low Smartphone Usage (2–4 hours)	x^2	df	P-value	Significance
Age 20–23 years	20 (22%)	26 (28%)	18 (20%)	7.92	6	0.243	NS
Gender (Female)	39 (43%)	25 (28%)	10 (11%)	6.17	2	0.045	S
Marital Status (Single)	50 (55%)	18 (20%)	6 (7%)	7.36	2	0.025	S
Academic Level (Internship)	8 (9%)	6 (7%)	2 (2%)	5.12	6	0.529	NS

***p<0.05, S-Significant; NS = Not Significant**

The table indicates that Gender and Marital Status showed a statistically significant association with smartphone usage patterns among undergraduate students ($p<0.05$), while Age and Academic Level were not significantly associated.

Table 7: Association between Academic Performances across Demographic Variable

Variables	GPA ≥ 3.5 (Excellent/Very Good)	GPA < 3.5 (Good/Pass)	x^2	df	P-value	Significance
Age 20–23 years	60 (66%)	12 (13%)	6.52	6	0.371	NS
Gender (Female)	65 (72%)	9 (10%)	7.89	2	0.019	S
Marital Status (Single)	67 (74%)	5 (6%)	8.23	2	0.017	S
Academic Level (Internship)	13 (14%)	3 (3%)	10.44	6	0.104	NS
Daily Smartphone Use (>6 hours)	14 (15%)	14 (15%)	9.24	2	0.009	S

***p<0.05, S-Significant; NS = Not Significant**

Table 6 depicts that Gender, Marital Status, and Smartphone Use Hours had statistically significant associations with academic performance among undergraduate students ($p<0.05$). Age and Academic Level did not show significant associations.

Discussions

The study findings reveal that the majority of students (96%) used smartphones for multiple purposes, with a significant portion spending more than four hours daily on their devices. Despite this high usage, academic performance remained strong, as 61% of the students achieved excellent GPA scores, and 30% achieved very good scores. However, the majority of students (78%) reported experiencing physical discomfort associated with technology use, including headaches, neck pain, eye strain, back pain, and shoulder pain. In addition, psychological distress levels were found to be moderate to high among students with extensive smartphone usage. To identify the relationship between technology use and academic performance, Karl Pearson's correlation was applied. The calculated correlation value of $r = -0.162$ showed a slight negative correlation between technology use and academic performance among undergraduate students, indicating that increased smartphone use tends to slightly lower academic performance. Thus, Hypothesis RQ_1 was partially supported: While technology supports academic engagement, excessive use has a negative health and cognitive effect. Regarding the association between smartphone usage patterns and selected demographic variables, the results showed that gender and marital status had statistically significant associations with smartphone usage patterns ($p < 0.05$), while age and academic level did not. Similarly, gender, marital status, and the duration of smartphone use showed significant associations with academic performance, whereas age and academic level did not. These findings suggest that although technology-based learning facilitates educational achievement, unregulated technology use may compromise students' physical and mental well-being.

Conclusion

The study concluded that technology-based learning plays a vital role in supporting academic performance among undergraduate nursing students. However, excessive use of technology is associated with negative physical symptoms such as musculoskeletal pain and vision strain, and elevated levels of psychological distress. A slight negative correlation was observed between the hours of technology use and academic performance. Furthermore, significant associations were found between health indicators and demographic factors, highlighting the need for controlled and mindful technology use. Thus, while technology remains an essential educational tool, attention to health risks is crucial for ensuring the well-being of students.

Recommendations

Based on the findings of the study, the following recommendations were drawn

1. Future studies should be conducted with larger samples across multiple universities to generalize the findings.
2. An interventional study could be designed to introduce and assess the impact of technology usage awareness programs among nursing students.
3. Comparative studies could be carried out between male and female students to examine gender-specific patterns in technology use and health outcomes.
4. Wellness programs promoting physical activity, healthy technology habits, and regular breaks during study should be integrated into nursing education curricula.
5. Additional research focusing on long-term consequences of technology overuse on academic performance and health should be considered.

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