

The Somatic Triad: Influence of Screen Time, Postural Load, and Breathing Pattern Dysfunction on Psychological Distress in University Students- A cross-sectional Study.

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Abstract

Background: Psychological distress among university students has increased significantly and is commonly addressed through cognitive or pharmacological approaches. However, the modern academic environment involves prolonged screen use, which contributes to increased postural load and breathing pattern dysfunction. These physiological changes may influence psychological distress but remain underexplored within student mental health frameworks.

Objective: Psychological distress among university students has increased significantly and is commonly addressed through cognitive or pharmacological approaches. However, the modern academic environment involves prolonged screen use, which contributes to increased postural load and breathing pattern dysfunction. These physiological changes may influence psychological distress but remain underexplored within student mental health frameworks.

Methods: A total of 150 university students aged 18–30 years were included in this cross-sectional correlational study. Screen time was assessed using self-reported daily duration. Postural load was evaluated using the Rapid Upper Limb Assessment (RULA). Breathing pattern dysfunction was assessed using the Nijmegen Questionnaire. Psychological distress was measured using the Depression Anxiety Stress Scale (DASS-21). Data were analyzed using correlation and multiple regression analysis.

Outcome Measures: Screen time (hours/day), postural load (RULA score), breathing pattern dysfunction (Nijmegen score), and psychological distress (DASS-21 scores) were assessed using standardized tools.

Results: The study demonstrated that increased screen time was significantly associated with higher postural load and breathing dysfunction. Postural load and Nijmegen scores showed stronger positive correlations with depression, anxiety, and stress compared to screen time. Regression analysis revealed that somatic variables significantly predicted psychological distress and accounted for a substantial proportion of variance.

Conclusion: The findings suggest that screen time influences psychological distress through its impact on posture and breathing. Addressing these somatic factors through ergonomic correction and breathing interventions may enhance current approaches to student mental health.

Keywords:Screen time, Postural load, Breathing pattern dysfunction, psychological distress, University students

INTRODUCTION

Psychological distress among university students has emerged as a significant public health concern, with increasing prevalence of anxiety, depression, and stress reported across higher education settings^{1, 2}. Academic demands, competitive environments, and uncertainties regarding future careers contribute substantially to this burden. While institutional responses have largely focused on counselling services and pharmacological management, these approaches predominantly address cognitive and emotional domains, often overlooking the physiological and somatic factors that may contribute to psychological distress³.

The rapid digitization of education has fundamentally altered student lifestyles. Learning management systems, digital assignments, online resources, and prolonged device usage have resulted in sustained screen exposure as an integral part of academic functioning. This shift has inadvertently increased sedentary behaviour and imposed continuous biomechanical stress on the body⁴. Prolonged screen time is commonly associated with forward head posture, rounded shoulders, and increased postural load, collectively referred to as maladaptive digital posture⁵. These biomechanical alterations are not merely musculoskeletal concerns but may also influence neurological and psychological processes.

Emerging evidence suggests that posture is closely linked to emotional and cognitive states through the concept of embodied cognition⁶. Slouched or constrained postures have been associated with reduced energy levels, increased fatigue, and negative affective states. In addition, sustained postural load can lead to musculoskeletal discomfort, which acts as a persistent physical stressor, potentially exacerbating psychological distress³. Despite this, postural factors are rarely considered within conventional mental health frameworks in higher education.

Another critical yet underrecognized component is breathing pattern dysfunction. Prolonged screen engagement often leads to shallow, thoracic breathing patterns, sometimes referred to as dysfunctional breathing⁷. This pattern is characterized by reduced diaphragmatic activity and increased reliance on accessory respiratory muscles. Breathing pattern dysfunction has been associated with symptoms such as anxiety, dizziness, fatigue, and reduced concentration⁸. Physiologically, altered breathing patterns can disrupt carbon dioxide balance, influence

cerebral blood flow, and contribute to autonomic nervous system imbalance, particularly increased sympathetic activation^{9,10}.

The interrelationship between posture and breathing further strengthens the need for an integrated perspective. Forward head posture and thoracic stiffness can mechanically restrict diaphragmatic movement, promoting inefficient breathing patterns. In turn, dysfunctional breathing increases muscular tension in the neck and upper chest, reinforcing postural strain⁵. This creates a self-perpetuating physiological loop, where biomechanical and respiratory dysfunctions interact to amplify stress responses within the body³.

Within this context, the concept of the “Somatic Triad” is proposed, integrating screen time, postural load, and breathing pattern dysfunction as interconnected contributors to psychological distress³. Rather than viewing these factors in isolation, this framework considers their combined and potentially synergistic effects on mental health. Understanding this triad provides a more comprehensive model that bridges behavioural, physical, and physiological domains.

This study investigates the influence of the Somatic Triad on psychological distress among university students. By examining the relationships between screen time, postural load, breathing pattern dysfunction, and mental health outcomes, the study aims to provide empirical evidence supporting a multidimensional approach to student wellbeing. Such an approach may inform physiotherapy-led interventions that extend beyond traditional musculoskeletal management to include breathing retraining and ergonomic correction, thereby contributing to more holistic mental health strategies within higher education settings.

NEED OF THE STUDY

Psychological distress among university students continues to rise despite existing mental health interventions, indicating limitations in current approaches that primarily focus on cognitive and emotional factors. The increasing reliance on digital learning has led to prolonged screen exposure, resulting in sustained sedentary behaviour and associated physiological changes.

Prolonged screen use contributes to increased postural load and altered breathing patterns, both of which are known to influence physiological stress responses. However, these factors are often examined independently and are rarely integrated within mental health research. The

combined effect of screen time, postural load, and breathing pattern dysfunction remains insufficiently explored, particularly in the context of student populations.

There is a need to investigate these interconnected factors within a unified framework to better understand their contribution to psychological distress. This may provide a more comprehensive perspective and support the development of physiotherapy-based interventions targeting both physical and psychological wellbeing.

AIM AND OBJECTIVES

Aim

To examine the influence of screen time, postural load, and breathing pattern dysfunction on psychological distress among university students.

Objectives

1. To assess screen time, postural load (RULA), breathing pattern dysfunction (Nijmegen Questionnaire), and psychological distress (DASS-21) among university students.
2. To determine the relationship between screen time and psychological distress.
3. To analyse the association of postural load and breathing pattern dysfunction with psychological distress.
4. To evaluate the combined contribution of screen time, postural load, and breathing pattern dysfunction in predicting psychological distress.
5. To determine whether somatic variables predict psychological distress after controlling for perceived stress.

Current university mental health approaches primarily focus on cognitive and social factors, while the physiological effects of prolonged screen use—such as postural load and breathing pattern dysfunction—remain underexplored in relation to psychological distress.

RESEARCH QUESTIONS

1. Is screen time associated with psychological distress among university students?
2. Are postural load and breathing pattern dysfunction related to psychological distress?

3. Do somatic factors contribute to psychological distress beyond perceived stress?

HYPOTHESES

H0: There is no relationship between screen time, postural load, breathing pattern dysfunction, and psychological distress among university students, and these variables do not significantly predict psychological distress after controlling for perceived stress.

H1: There is a relationship between screen time, postural load, breathing pattern dysfunction, and psychological distress among university students, and these variables significantly predict psychological distress after controlling for perceived stress.

METHODOLOGY

Sample Size & Study Design & Method:

A cross-sectional analytical study was conducted among 150 undergraduate and postgraduate students aged 18–30 years in Pune city over a period of 6 months. Participants who met the inclusion criteria were recruited using a convenience sampling method, and allocation was carried out using simple randomization. After obtaining informed consent, they were assessed using self-reported average daily screen time (in hours)

Inclusion Criteria

- Students aged 18–30 years
- Both male and female participants
- Individuals using digital devices regularly for academic purposes
- Willing to participate and provide informed consent

Exclusion Criteria

- Students with diagnosed psychiatric disorders under active treatment
- Individuals with known respiratory disorders (e.g., asthma, COPD)
- Recent musculoskeletal injuries affecting posture
- Any neurological or systemic condition influencing breathing or posture

Materials: 1. Pen, 2. Assessment sheet, 3. Consent Form, 4. Patient evaluation sheet, 5. Data collection forms / demographic sheet, 6. Digital devices (smartphones/laptops) for screen time recording

Outcome Measures

1. Screen Time

Assessed using self-reported average daily screen time (in hours), including academic and non-academic usage. they were categorized into three groups based on their self-reported daily screen time.

- Low screen time: ≤ 3 hours/day
- Moderate screen time: 4–6 hours/day
- High screen time: ≥ 7 hours/day

2. Postural Load

Rapid Upper Limb Assessment (RULA) is a widely used observational tool for assessing postural load and ergonomic risk. It has demonstrated good validity in identifying musculoskeletal risk factors associated with upper limb and neck postures. RULA has demonstrated good validity for assessing postural risk in occupational and clinical settings. It shows high inter-rater reliability (ICC = 0.86–0.91) and intra-rater reliability (ICC = 0.88–0.93), indicating strong consistency in scoring.

3. Breathing Pattern Dysfunction

Nijmegen Questionnaire is a validated tool for assessing breathing pattern dysfunction and hyperventilation syndrome. It demonstrates good validity with sensitivity of 91% and specificity of 95%. The tool also shows high internal consistency (Cronbach's $\alpha \approx 0.87$ –0.90) and good test–retest reliability (ICC ≈ 0.85 –0.90).

4. Psychological Distress

Measured using the **Depression Anxiety Stress Scale (DASS-21)**, which evaluates levels of depression, anxiety, and stress. It shows high internal consistency with Cronbach's α of 0.88 for Depression, 0.82 for Anxiety, and 0.90 for Stress. The scale also demonstrates good construct validity and test–retest reliability (ICC ≈ 0.71 –0.81).

5. Perceived Stress (Control Variable)

Assessed using the **Perceived Stress Scale (PSS)**. The Perceived Stress Scale is a validated tool for measuring perceived stress levels. It demonstrates good internal consistency with Cronbach's α ranging from 0.78 to 0.91. The scale also shows acceptable test-retest reliability ($ICC \approx 0.70-0.85$) and good construct validity across different populations.

Procedure

Ethical approval was obtained from the institutional review committee. Participation was voluntary, and confidentiality of data was ensured. Participants had the right to withdraw from the study at any time without any consequences. Participants were informed about the purpose of the study and written consent was obtained prior to data collection. Data were collected using standardized questionnaires administered in a controlled setting.

Participants first completed a demographic data sheet followed by assessment of screen time, Nijmegen Questionnaire, DASS-21, and PSS. Postural assessment using RULA was conducted by the investigator based on observation of the participant's usual sitting posture during device use.

All data were recorded systematically and maintained confidentially.

Data Analysis

Data analysis was performed using SPSS (v.26). Data were analysed using appropriate statistical methods. Descriptive statistics (mean and standard deviation) were used to summarize the data.

Pearson correlation analysis was performed to examine relationships between variables. Multiple regression analysis was used to determine the combined predictive effect of screen time, postural load, and breathing pattern dysfunction on psychological distress.

Statistical significance was set at $p < 0.05$.

RESULTS

Table 1: Descriptive Statistics of Study Variables

Variable	Mean	Standard Deviation (SD)
Screen Time (hours/day)	6.8	2.1
Postural Load (RULA Score)	5.6	1.3
Nijmegen Score (BPD)	24.2	8.5
DASS-21 Total Score	32.5	10.2
Perceived Stress (PSS)	21.4	6.7

Interpretation:

The findings indicate that students reported relatively high screen time along with moderate postural load. Nijmegen scores suggest the presence of breathing pattern dysfunction in a considerable proportion of participants. The DASS-21 scores reflect moderate levels of psychological distress, indicating that both physiological and psychological factors are present within the study population.

Table 2: Pearson Correlation Matrix

Variables	Screen Time	RULA Score	Nijmegen Score	DASS-21
Screen Time	1	0.48**	0.42**	0.32*
RULA Score	0.48**	1	0.52**	0.54**
Nijmegen Score	0.42**	0.52**	1	0.61**
DASS-21	0.32*	0.54**	0.61**	1

* $p < 0.05$

** $p < 0.001$

Interpretation:

Screen time showed a weak to moderate relationship with psychological distress. In comparison, postural load and breathing pattern dysfunction demonstrated stronger correlations with DASS-21 scores. This suggests that somatic factors are more closely associated with psychological distress than screen exposure alone.

Table 3: Multiple Linear Regression Analysis

Predictor Variable	B	β	p-value
Screen Time	1.12	0.18	<0.05
Postural Load (RULA)	2.85	0.34	<0.001
Nijmegen Score	0.76	0.41	<0.001
Perceived Stress (PSS)	0.91	0.29	<0.01

Model Summary: $R^2 = 0.52$

Interpretation:

Regression analysis showed that all variables significantly contributed to psychological distress. Breathing pattern dysfunction emerged as the strongest predictor, followed by postural load. Screen time had a smaller but significant effect. The model explained a substantial portion of variance, indicating the importance of somatic factors in predicting distress.

DISCUSSION

The findings of the present study highlight the significant role of physiological factors in psychological distress among university students. While screen time demonstrated a moderate association with distress, postural load and breathing pattern dysfunction showed stronger relationships, indicating that the body may act as a critical yet often overlooked link in student mental health. These results suggest that prolonged screen exposure may not directly cause distress but rather contributes through its impact on posture and breathing. This supports the

idea that when the body remains in a state of mechanical strain and altered respiratory patterns, it may promote sustained physiological stress responses.

These findings also provide insight into the limitations of purely cognitive approaches to mental health. Interventions that focus only on thought processes may be less effective if the individual remains in a state of physiological arousal due to dysfunctional breathing and postural strain. Poor breathing mechanics, particularly shallow or thoracic breathing, may contribute to sympathetic dominance, thereby maintaining or amplifying anxiety and stress responses despite cognitive intervention.

From a theoretical perspective, the study expands the traditional biopsychosocial model by incorporating somatic and physiological dimensions, particularly those related to modern digital lifestyles. It also provides support for the concept of embodied cognition, suggesting that physical states such as posture can influence emotional and psychological outcomes. The integration of biomechanical and respiratory factors offers a more comprehensive understanding of mental health in young adults.

The findings have important practical implications for universities. Ergonomic modifications, such as the use of laptop stands and external keyboards, may help reduce postural strain during prolonged screen use. Incorporating structured micro-breaks that include postural correction and simple breathing exercises may assist in reducing physiological stress during academic activities. Additionally, there is a need for a clinical shift where early signs of breathing pattern dysfunction are identified, and appropriate physiotherapy-based interventions are integrated alongside conventional mental health support.

Despite these contributions, certain limitations must be acknowledged. The cross-sectional design limits the ability to establish causality between variables. It remains unclear whether psychological distress leads to poor posture and breathing changes or whether these factors contribute to distress. Furthermore, reliance on self-reported measures may introduce reporting bias.

Future research should focus on longitudinal designs to better understand the temporal relationship between these variables. Experimental studies, particularly randomized controlled trials, are needed to evaluate the effectiveness of interventions targeting posture and breathing in reducing psychological distress. Such research may further strengthen the role of somatic approaches in student mental health management.

CONCLUSION

The present study highlights that psychological distress in university students is closely linked to the physiological demands of prolonged screen use. Increased postural load and breathing pattern dysfunction were found to play a significant role, suggesting that mental health cannot be viewed independently of the body.

The Somatic Triad provides a more integrated understanding of student wellbeing, where screen time influences posture and breathing, which in turn contribute to psychological distress. Addressing these interconnected factors may help in developing more effective and holistic approaches to student mental health management.

STRENGTHS

The study adopts a multidimensional approach by integrating behavioral, biomechanical, and physiological factors, providing a comprehensive understanding of psychological distress. The use of standardized and validated tools such as DASS-21, RULA, and the Nijmegen Questionnaire enhances the reliability of the findings. Additionally, the concept of the Somatic Triad offers a novel and clinically relevant perspective within physiotherapy practice.

LIMITATIONS

The cross-sectional design limits the ability to establish causality between variables. The study relies partly on self-reported measures, which may introduce reporting bias. Furthermore, the sample is restricted to a specific student population, which may limit the generalizability of the findings.

FUTURE SCOPE

Future research should focus on longitudinal studies to understand the direction of relationships over time. Randomized controlled trials are needed to evaluate the effectiveness of posture and breathing interventions in reducing psychological distress. Expanding the study to diverse populations and incorporating objective measurements may further strengthen the findings.

Conflicts of Interest

The author declares that there are no conflicts of interest related to this study.

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