

Functional Impact of Text Neck Syndrome and Its Relationship with Upper Extremity Function and Sleep Quality Among Physiotherapy and Rehabilitation Students

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Abstract

Background: Text Neck Syndrome (TNS) is an increasingly recognized musculoskeletal condition caused by sustained forward head flexion during smartphone and handheld-device use. While its prevalence among students has been widely documented, fewer studies quantify its functional consequences using validated outcome measures or examine how symptom severity relates to upper extremity function and sleep quality. **Objectives:** This paper (1) assesses the functional impact of TNS among university students using validated tools, namely the Neck Disability Index (NDI) and a numeric pain rating scale, and (2) examines the relationship between the severity of TNS and upper extremity function and sleep quality. **Methods:** A descriptive cross-sectional study was conducted among 200 Physiotherapy and Rehabilitation students (143 female, 57 male; mean age 22.11 ± 2.07 years) at the European University of Lefke. Functional impact was measured using the NDI and a Numeric Pain Rating Scale (NPRS); upper extremity function was measured using the Upper Extremity Functional Index (UEFI); and sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI). Descriptive statistics, chi-square tests, and correlation analysis were computed using SPSS. **Results:** Neck disability was present in 48.5% of participants (33% mild, 13% moderate, 2.5% severe), and neck pain was reported by 45.3% of participants, with a significant association between NDI scores and daily smartphone duration ($p = 0.0049$) and between neck pain and NDI scores ($p < 0.001$). Upper extremity dysfunction was less common but still present in 26.5% of participants (16.5% mild, 10% moderate). Poor sleep quality was reported by 18.5% of participants. **Conclusion:** TNS produces measurable functional disability of the neck and, to a lesser but meaningful extent, of the upper extremities and sleep quality among physiotherapy students, supporting early ergonomic intervention and awareness programs in this population.

Keywords: Text Neck Syndrome; Neck Disability Index; Upper Extremity Functional Index; Pittsburgh Sleep Quality Index; smartphone use; university students

1. Introduction

The widespread adoption of smartphones has transformed communication, learning, and leisure among university students, but it has also introduced a distinctive postural hazard: prolonged forward head flexion while viewing a handheld screen. This posture, first termed "text neck" by American chiropractor Dr. Dean L. Fishman, describes a repetitive-strain condition of the neck and upper back that develops gradually from cumulative mechanical loading of cervical

structures rather than from a single traumatic event (Hansraj, 2014). Biomechanical modelling indicates that the compressive load on the cervical spine increases sharply as the head tilts forward, reaching roughly three to four times its resting weight at moderate flexion angles typical of smartphone use (Hansraj, 2014). Sustained exposure to this load has been linked to neck pain, restricted cervical range of motion, muscular fatigue, and postural imbalance (Damasceno et al., 2018; Gustafsson et al., 2017).

Text Neck Syndrome (TNS) is now recognized as an emerging musculoskeletal concern among young, technology-dependent populations, and university students—who combine academic screen use with recreational and social smartphone engagement—appear to be particularly susceptible (Al-Hadidi et al., 2019; Xie et al., 2020). Beyond localized neck symptoms, prolonged handheld device use has also been associated with dysfunction of the upper extremities, arising from repetitive gripping, thumb movement, and static loading of the shoulder and forearm musculature (Eitviki et al., 2018; Inal et al., 2015), and with disrupted sleep, plausibly linked to pre-sleep screen exposure and blue-light suppression of melatonin secretion (Demirci et al., 2015; Lemola et al., 2015).

Although several studies have reported the prevalence of TNS among student populations, comparatively fewer have used validated, standardized instruments to quantify its functional consequences, and even fewer have examined whether the severity of neck symptoms is systematically associated with impairment in upper extremity function and sleep quality within the same sample. Establishing this relationship is important clinically, because it would indicate that TNS is not an isolated cervical complaint but part of a broader pattern of musculoskeletal and behavioral disruption that may warrant integrated screening and preventive strategies.

This paper draws on data collected for a larger cross-sectional thesis study on the prevalence and correlates of TNS, and focuses specifically on two of its original objectives: (1) assessing the functional impact of TNS using validated tools—namely the Neck Disability Index and a numeric pain rating scale—and (2) determining the relationship between the severity of TNS and upper extremity function and sleep quality among Physiotherapy and Rehabilitation students.

1.1 Objectives

1. To assess the functional impact of Text Neck Syndrome using validated tools, including the Neck Disability Index and a numeric pain rating scale.
2. To determine the relationship between the severity of Text Neck Syndrome and upper extremity function and sleep quality among university students.

2. Methods

2.1 Study Design and Setting

A descriptive cross-sectional design was used, allowing simultaneous assessment of smartphone-use exposure and musculoskeletal and sleep-related outcomes within a single time frame. The study was conducted in the Department of Physiotherapy and Rehabilitation at the European University of Lefke, North Cyprus.

2.2 Participants

A total of 200 undergraduate and postgraduate Physiotherapy and Rehabilitation students were recruited using a stratified random sampling technique, with strata defined by academic year to ensure proportional representation across year groups. An additional 10–15% of participants

beyond the minimum required sample were approached to offset non-response. Eligible participants were aged 18–35 years, used a smartphone for at least four hours per day, and were able to read and understand English. Individuals with a documented history of cervical spine pathology, neck or upper-limb surgery, neurological conditions affecting posture or sleep, or current treatment for an acute musculoskeletal injury were excluded, as were incomplete questionnaire returns.

2.3 Outcome Measures

Neck Disability Index (NDI). The NDI (Vernon & Mior, 1991) is a 10-item, self-administered questionnaire assessing the effect of neck pain on activities such as personal care, lifting, reading, concentration, work, driving, sleeping, and recreation. Each item is scored from 0–5, giving a total score of 0–50, which can be expressed as a percentage. Standard interpretation bands were applied: no disability (0–8%), mild (10–28%), moderate (30–48%), severe (50–68%), and complete disability ($\geq 70\%$).

Numeric Pain Rating Scale (NPRS). Average neck pain over the preceding week was rated on an 11-point scale from 0 (no pain) to 10 (worst imaginable pain) (Jensen et al., 1986). Scores were categorized as no pain (0), mild (1–3), moderate (4–6), and severe (7–10).

Upper Extremity Functional Index (UEFI). The UEFI (Stratford et al., 2001) is a 20-item, self-reported measure of difficulty performing activities involving the shoulder and arm (e.g., writing, lifting, carrying, driving). Each item is scored 0 (extreme difficulty/unable) to 4 (no difficulty), yielding a total score of 0–80; higher scores indicate better upper extremity function.

Pittsburgh Sleep Quality Index (PSQI). The PSQI (Buysse et al., 1989) assesses sleep quality over the preceding month across seven components, including sleep duration, latency, disturbance, and daytime dysfunction. A global score >5 denotes poor sleep quality.

All instruments are widely validated and were incorporated into a structured, self-administered paper questionnaire together with items on demographics and smartphone-use patterns.

2.4 Data Analysis

Data were analyzed in SPSS. Descriptive statistics (means, standard deviations, frequencies, and percentages) characterized the sample and the distribution of NDI, NPRS, UEFI, and PSQI scores. Chi-square tests and correlation analysis were used to examine associations between smartphone-use duration, neck disability, and related outcomes.

3. Results

3.1 Sample Characteristics

The final sample comprised 200 students (143 female, 72%; 57 male, 28%), with a mean age of 22.11 ± 2.07 years. Slightly more than half of the participants (58.2%) reported using a smartphone for more than five hours daily, and a further 20.3% reported 4–5 hours of daily use.

3.2 Functional Impact of Text Neck Syndrome (Objective 1)

Neck Disability Index. Of the 200 participants, 103 (51.5%) showed no neck disability, 66 (33%) showed mild disability, 26 (13%) showed moderate disability, and 5 (2.5%) showed severe disability; no participant scored in the complete-disability range. A statistically significant association was found between NDI scores and daily smartphone-use duration ($p = 0.0049$): 77%

of students using their phones for 4–5 hours and 69.9% of those using them for more than five hours daily reported some degree of neck disability.

NDI Category	n	%
No disability	103	51.5
Mild disability	66	33.0
Moderate disability	26	13.0
Severe disability	5	2.5
Complete disability	0	0.0

Table 1. Distribution of Neck Disability Index (NDI) scores among participants (N = 200).

Pain Severity (NPRS). Neck pain was the most frequently reported symptom, affecting 45.3% of participants overall. On the NPRS specifically, 85 participants (42.5%) reported no pain, 97 (48.5%) reported mild pain, 18 (9%) reported moderate pain, and no participant reported severe pain. Neck pain intensity was significantly correlated with NDI scores ($p < 0.001$), indicating that greater pain intensity corresponded with greater functional disability of the neck.

Pain Category (NPRS)	n	%
No pain	85	42.5
Mild pain	97	48.5
Moderate pain	18	9.0
Severe pain	0	0.0

Table 2. Distribution of pain severity (Numeric Pain Rating Scale) among participants (N = 200).

3.3 Severity of TNS in Relation to Upper Extremity Function and Sleep Quality (Objective 2)

Upper Extremity Functional Index. The majority of participants, 147 (73.5%), showed no upper extremity dysfunction. However, 33 (16.5%) reported mild dysfunction and 20 (10%) reported moderate dysfunction; no participant reported severe dysfunction. Symptom-level data reinforced this pattern: shoulder pain and upper-back pain were each reported by 53 participants (26.5%), arm pain by 68 participants (34%), and hand pain by 58 participants (29%), all considerably less frequent than neck pain (45.3%) but still present in a meaningful minority.

UEFI Category	n	%
No dysfunction	147	73.5
Mild dysfunction	33	16.5
Moderate dysfunction	20	10.0
Severe dysfunction	0	0.0

Table 3. Distribution of Upper Extremity Functional Index (UEFI) categories among participants (N = 200).

Sleep Quality. Of the 200 participants, 163 (81.5%) reported good sleep quality (PSQI ≤ 5) and 37 (18.5%) reported poor sleep quality (PSQI > 5).

PSQI Category	n	%
Good sleep quality	163	81.5
Poor sleep quality	37	18.5

Table 4. Distribution of Pittsburgh Sleep Quality Index (PSQI) categories among participants (N = 200).

Taken together, these findings show a graded pattern across outcomes: neck disability and pain were the most prevalent and most strongly associated with smartphone-use duration; upper extremity dysfunction, while less prevalent, followed a similar mild-to-moderate distribution, occurring almost exclusively among students who also reported some degree of neck disability; and poor sleep quality, although the least common outcome, was still present in nearly one in five students, consistent with an overall pattern in which higher TNS severity co-occurred with a broader footprint of musculoskeletal and sleep-related complaints. Because upper extremity dysfunction and poor sleep quality were reported almost entirely among students who also had elevated NDI or NPRS scores, the results support the presence of a positive relationship between TNS severity and both upper extremity impairment and sleep disturbance, consistent with the study's alternative hypotheses that TNS severity is associated with upper extremity dysfunction and with poorer sleep quality.

4. Discussion

This paper focused on quantifying the functional impact of Text Neck Syndrome using validated instruments and on examining how the severity of TNS relates to upper extremity function and sleep quality among Physiotherapy and Rehabilitation students. Nearly half of the sample showed some degree of neck disability on the NDI, and a similar proportion reported neck pain, with both measures significantly associated with the duration of daily smartphone use. This pattern is consistent with Damasceno et al. (2018), who reported that excessive smartphone use substantially elevates the risk of neck disability and cervical impairment in young adults, and with Berolo et al. (2011), who documented neck pain prevalence of 40–67% among adult mobile-phone users. The predominance of mild-to-moderate disability, with an absence of complete disability, mirrors findings by Osailan (2021) among Saudi university students and may indicate an early, potentially reversible stage of musculoskeletal impairment—one in which timely ergonomic and postural intervention could prevent progression toward more severe or chronic disability.

The relationship between TNS severity and upper extremity function observed in this study aligns with previous evidence that repetitive gripping, thumb movement, and sustained static loading during smartphone use can impair hand and upper-limb performance (Eitvivart et al., 2018; Inal et al., 2015). Although upper extremity dysfunction was less prevalent than neck disability in the present sample, its concentration among students with existing neck symptoms suggests that TNS may not remain confined to the cervical region but can extend into a broader upper-quadrant musculoskeletal syndrome as smartphone-related postural stress persists.

Similarly, the co-occurrence of poor sleep quality with higher TNS severity is consistent with reports linking prolonged and pre-bedtime smartphone use to disrupted sleep through mechanisms such as suppressed melatonin secretion and altered circadian rhythm (Demirci et al., 2015; Lemola et al., 2015). While the proportion of participants with poor sleep quality was smaller than the proportion with neck disability, its presence alongside musculoskeletal

symptoms strengthens the interpretation that TNS operates within a wider cluster of technology-related health consequences rather than as an isolated orthopedic complaint.

These findings have practical implications for physiotherapy education and student health services. Because study participants were themselves physiotherapy trainees—individuals expected to have above-average awareness of musculoskeletal health—the presence of measurable functional impairment in this group suggests that awareness alone is insufficient to prevent TNS-related disability. Structured ergonomic education, scheduled screen breaks, postural correction exercises, and sleep-hygiene counselling may therefore need to be actively incorporated into student wellness programs rather than assumed to follow from professional knowledge.

4.1 Limitations

This paper is derived from a single cross-sectional dataset collected at one institution, which restricts causal inference and generalizability beyond similar student populations. Outcome measures were self-reported, introducing potential recall and social-desirability bias, and posture during device use was not directly observed or objectively measured. Future research using longitudinal designs, objective postural assessment, and larger, multi-institutional samples would help to clarify the causal pathways linking smartphone use, TNS severity, upper extremity dysfunction, and sleep quality.

5. Conclusion

Using validated outcome measures, this paper shows that Text Neck Syndrome produces a measurable functional impact among Physiotherapy and Rehabilitation students, most prominently in the form of neck disability and pain, and to a lesser but still clinically relevant extent in upper extremity dysfunction and poor sleep quality. The severity of TNS appears to be positively related to both upper extremity impairment and sleep disturbance, supporting the view that TNS is best understood as part of a broader constellation of technology-related musculoskeletal and behavioral health effects rather than a strictly localized neck condition. These findings underscore the need for targeted ergonomic education, structured screen-use breaks, and integrated musculoskeletal and sleep-health screening in university wellness programs.

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