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To Study the Impact of Text Neck Syndrome on Static Scapula Position, Hand Eye Coordination and Quality of Sleep Among College Students

Aastha Bhanu Soni[1], Dr. Jyoti Kataria[2], Dr. Chanchal Jain[3], Dr. Vanshika Aggarwal[4]
[1]Aastha Bhanu Soni MPT (Musculoskeletal), Banarsidas Chandiwala Institute of Physiotherapy, New Delhi
[2]Kataria Jyoti, Phd., Associate Professor, Banarsidas Chandiwala Institute of Physiotherapy, New Delhi
[3]Chanchal Jain, Assistant Professor Banarsidas Chandiwala Institute of Physiotherapy, New Delhi
[4]Vanshika Aggarwal, Assistant Professor Banarsidas Chandiwala Institute of Physiotherapy, New Delhi

Abstract
Text Neck Syndrome (TNS), resulting from prolonged smartphone use and forward head posture (FHP), has become a significant public health issue among university students. This cross-sectional study examined its effects on scapular positioning, hand-eye coordination, and sleep quality in 222 college students (aged 18–25.5 years) from Delhi NCR, selected via convenience sampling. Participants included those with ≥3 hours/day of smartphone use and FHP (cranio-vertebral angle <50°), while individuals with high anxiety/depression scores (HADS >7), prior injuries, or neurological conditions were excluded.
*Assessments revealed significant correlations between FHP and altered scapular kinematics, including increased upward rotation at 60°–90° abduction (*p* < 0.01) and reduced protraction (*p* < 0.05). Hand-eye coordination, measured via the Alternate Hand Wall Toss Test, was negatively impacted by pain levels (*r* = 0.145, *p* = 0.031). Additionally, 83.3% of participants reported poor sleep quality (PSQI >5), which was associated with higher pain levels (*r* = 0.165, *p* = 0.014) and increased screen time (*r* = 0.202, *p* = 0.002). Notably, 94.6% exhibited mild FHP (CV angle: 40°–50°).*
The findings highlight the detrimental effects of TNS on musculoskeletal function and sleep quality among students. The study underscores the urgent need for ergonomic interventions, posture correction strategies, and screen-time moderation in academic settings to mitigate the growing health risks associated with TNS.
Keywords: Text Neck Syndrome, forward head posture, scapular dyskinesis, sleep quality, hand-eye coordination

INTRODUCTION

In the digital age, the widespread adoption of smartphones and handheld electronic devices has given rise to a novel musculoskeletal disorder known as text neck syndrome. This condition, clinically referred to as "turtle neck posture". results from the sustained forward flexion of the cervical spine during prolonged device use [1]. Characterised by a constellation of symptoms including cervicalgia, upper back pain, shoulder dysfunction, and cephalalgia, text neck syndrome represents a significant public health concern with increasing prevalence across all age groups [2].

The pathomechanics of this condition involve a complex interplay of postural deviations and biomechanical stressors. When the head assumes a forward-tilted position during device use, the cervical spine experiences a substantial increase in gravitational load - with every inch of forward head posture adding approximately 10 pounds of additional weight bearing on cervical structures [3]. This mechanical disadvantage leads to flattening of the normal cervical lordosis, overstretching of the nuchal ligament, and compensatory hyper-activation of the deep cervical flexors and upper trapezius muscles [4]. Over time, these adaptations result in muscular fatigue, myofascial trigger point development, and potential compromise of neural structures within the cervical region [5].

Epidemiological data reveals alarming trends in device usage patterns that predispose to text neck syndrome. Contemporary research indicates that 79% of young adults maintain near-continuous smartphone accessibility, with average usage exceeding 4-6 hours daily [6]. This behavioural pattern is particularly concerning given the established dose-response relationship between device usage duration and musculoskeletal symptom severity [7]. Secondary manifestations including tension-type headaches, temporomandibular joint dysfunction, and scapular dyskinesia further compound the clinical presentation [8].

The ramifications of text neck syndrome extend beyond the musculoskeletal system, with emerging evidence linking poor cervical posture to respiratory compromise, sleep disturbances, and diminished

quality of life [9]. The blue light emission from digital screens may exacerbate these effects by disrupting circadian rhythms and sleep architecture [10]. Furthermore, the syndrome's impact on proprioceptive acuity and cervico-ocular reflexes may impair postural control and increase injury risk during physical activities [11].
The aim of this study the impact of text neck syndrome on static scapula position, hand eye coordination and quality of sleep among college students.

METHODS

Text neck was assessed symptomatically. Scapular position used Lateral Scapular Slide Test, hand-eye coordination via Alternate Hand Wall Toss Test, and sleep quality with Pittsburgh Sleep Quality Index. Standardised tools (goniometer, inclinometer, weighing machine) ensured measurement accuracy. The study aimed to identify correlations between text neck syndrome and musculoskeletal/sleep impairments in young adults.
This cross-sectional study examined text neck syndrome and its effects on scapular position, hand-eye coordination, and sleep quality among college students (18-25.5 years) in Delhi NCR. Using convenience sampling, 82 participants (G*Power calculation, α=0.05, power=0.80, effect size=0.30) with ≥3 hours/day smartphone use and forward head posture (CV angle<50°) were included. Exclusions: HADS score>7, injuries, or neurological/cardiovascular conditions.

Measurement Procedures

Cranio-vertebral Angle Assessment

The cranio-vertebral angle (CVA) was measured using the On Protractor mobile application with participants seated on a stool maintaining eye-level gaze. Two reflective markers were placed at the C7 spinous process and tragus. The angle formed between the line connecting these markers and a vertical plumb line from C7 was measured three times, with the mean value recorded. This non-invasive measurement demonstrated excellent reliability, with inter-rater reliability of 0.879 and intra-rater reliability of 0.991, ensuring consistent postural assessment across participants.

Scapular Position Evaluation

Scapular kinematics were assessed through two complementary methods. The Lateral Scapular Slide Test (LSST) quantified scapular protraction in three standardised positions: neutral standing (0°), hands-on-hips (45° abduction), and 90° glenohumeral abduction with internal rotation. A digital inclinometer precisely measured scapular upward rotation at rest and during progressive humeral elevation (60°, 90°, and 120° abduction). Three consecutive measurements were taken for each position, with the average used for analysis. Scapular dysfunction was operationally defined as ≥1.5cm side-to-side difference in any test position.

Hand-Eye Coordination Testing

Motor coordination was evaluated using the standardised Alternate Hand Wall Toss Test. Participants performed rapid alternating ball throws against a wall-mounted target from 2 meters distance during three 30-second trials. The total number of successful catches was recorded, with higher scores indicating better hand-eye coordination. This test provided quantitative assessment of visuomotor integration capabilities potentially affected by cervical dysfunction.

Sleep Quality Assessment

The Pittsburgh Sleep Quality Index (PSQI) was administered to evaluate seven sleep domains over the preceding month. This validated 19-item questionnaire generated component scores (0-3) for sleep quality, latency, duration, efficiency, disturbances, medication use, and daytime dysfunction. A global PSQI score ≥5 served as the cutoff for clinically significant sleep disturbance, allowing categorisation of participants' sleep quality.

Psychological Screening

The Hospital Anxiety and Depression Scale (HADS) screened for mood disturbances using its 14-item format (7 anxiety, 7 depression items). Participants scoring >7 on either subscale were excluded to control for psychological confounders. The scale demonstrated good clinical utility with established cutoff values (0-7 normal, 8-10 mild, 11-15 moderate, 16-21 severe) for both anxiety and depression symptoms.

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Data Analysis
All statistical analyses were conducted using IBM SPSS Statistics Version 26. This software was employed for both descriptive and inferential statistical procedures to evaluate the study data accurately and systematically.

RESULT

Gender	Frequency	Percent	Mean	Std. Deviation
Female	122	55.0%	1.45	0.499
Male	100	45.0%		

Table 1 Gender
Table 1 shows the distribution of gender among the respondents, with females comprising the majority at 55.0% (122 individuals) and males representing 45.0% (100 individuals). The mean value for females is 1.45, with a standard deviation of 0.499, suggesting a relatively low variability in the measured variable for this.

Age Group	Frequency	Percent	Mean	Std. Deviation
18	13	5.9%	21.34	1.884
19	26	11.7%		
20	36	16.2%		
21	60	27%		
22	25	11.3%		
23	23	10.4%		
24	27	12.2%		
25	12	5.4%		

Table 2 Age Group
Table 2 shows The age distribution of the respondents is presented in Table 2, with the largest proportion falling within the 21-year-old group (27.0%, n=60), followed by 20-year-olds (16.2%, n=36) and 24-year-olds (12.2%, n=27). The 19-year-old group accounted for 11.7% (n=26), while 22-year-olds and 23-year-olds represented 11.3% (n=25) and 10.4% (n=23), respectively. Younger participants (18 years old) constituted 5.9% (n=13), and the smallest group was 25-year-olds (5.4%, n=12). The mean age for 18-year-olds was 21.34 with a standard deviation of 1.884, suggesting slight variability in this subgroup. However, mean and standard deviation values were not provided for the remaining age group.

Weight	Frequency	Percent	Mean ± Std.Dev
31-40 kgs	4	1.8%	61.86 ± 10.65
41-50 kgs	19	8.6%	
51-60 kgs	98	44.1%	
61-70 kgs	55	24.8%	
71-80 kgs	40	18.%	

> 80 kg	6	2.7%	
Total	222	100.0%	

Table 3
Table 3 Shows The weight distribution of respondents, the majority, 44.1% (98 students), fall within the 51–60 kg range. Subsequently, 24.8% (55 students) belong to the 61–70 kg bracket, while 18.0% (40 students) weigh in between 71–80 kg. A limited percentage of students' weight is in between lower and upper extremities, with 8.6% (19 students) in the 41–50 kg category, 2.7% (6 students) beyond 80 kg, and merely 1.8% (4 students) in the 31–40 kg range. The average weight of the sampled student is 61.86 kg, with a standard deviation of ±10.65 kg, signifying a moderate range in body weight.

Height (cm)	Frequency	Percent	Mean ± Std.Dev
141-150	6	2.7%	164.93 ± 20.69
151-160	53	23.9%	
161-170	102	45.9%	
171-180	38	17.1%	
> 180	23	10.4%	
Total	222	100.0%	

Table 4 Height
Table 4 The majority of respondents (31.5%, n=70) fell within the 160.0–164.9 cm range, followed by 165.0–169.9 cm (21.2%, n=47) and 170.0–174.9 cm (17.1%, n=38). Fewer individuals were in the shorter (<160 cm) or taller (≥180 cm) categories, with the smallest groups being 145.0–149.9 cm (0.9%, n=2) and 190.0–194.9 cm (0.9%, n=2). The mean height for the 145.0–149.9 cm group was 164.9 cm (SD=20.68), though means for other ranges were not provided.

BMI Category	Frequency	Percent	Mean ± Std.Dev
Underweight (BMI < 18.5)	18	4.10%	22.01 ± 2.83
Normal weight (18.5 ≤ BMI < 25)	149	33.60%	
Overweight (25 ≤ BMI < 30)	42	9.50%	
Obese (BMI ≥ 30)	13	2.90%	

Table 5 BMI
The provided Table 5 summarises BMI (Body Mass Index) data categorized into four groups: Underweight, Normal weight, Overweight, and Obese, along with their respective frequencies, percentages, mean, and standard deviation.
The Underweight category (BMI < 18.5) includes 18 individuals, accounting for 4.10% of the total sample. The mean BMI for this group is 22.01, with a standard deviation of 2.83, indicating some variability in BMI values within this category.
The Normal weight group (18.5 ≤ BMI < 25) is the largest, comprising 149 individuals (33.60%). However, the mean and standard deviation for this category are not provided in the table.
The Overweight category (25 ≤ BMI < 30) includes 42 individuals (9.50%), while the Obese group (BMI ≥ 30) consists of 13 individuals (2.90%). Similar to the normal weight group, the mean and standard deviation for these categories are missing in the data.

CV Angle Range FHP(in °)	Frequency	Percent(%)	Mean	Std. Deviation
>50°	Excluded	0	42.79	1.63
40°-50°	210	94.6		
30°-40•	12	5.4		

Table 6 CV Angle

Table 6 displays The evaluation of Forward Head Posture (FHP) among the students indicated that a substantial majority, 94.6% (210 participants), displayed mild FHP(40°-50°), whereas merely 5.4% (12 participants) demonstrated moderate FHP(30°-40°). This suggests that modest forward head posture is frequent among college students, perhaps resulting from extended usage of digital gadgets in suboptimal ergonomic situations. The average FHP angle was measured at 42.78 degrees, with a standard deviation of ±1.63, indicating a very uniform pattern of postural variation within the cohort.

FHP Category	Frequency (n)	Percent (%)
Mild	210	94.6
Moderate	12	5.4

Table 7 FHP

Table 7 displays the prevalence of Forward Head Posture among the participants. The majority of cases (94.6%, n=210) were classified as mild, while only a small proportion (5.4%, n=12) fell into the moderate category. This indicates that the condition was predominantly mild in the studied sample.

NPRS Score	Frequency (n)	Percent (%)	Mean ± Std.Dev
3	1	0.50%	5.96 ± 1.06
4	24	10.80%	
5	41	18.50%	
6	82	36.90%	
7	66	29.70%	
8	7	3.20%	
9	1	0.50%	

Table 8 NPRS

Category	Frequency (n)	Percent (%)
3–4 hours	83	37.4
More than 4 hours	139	62.6

Table 8 illustrates the self-reported pain levels of participants using the NPRS. The majority of respondents reported moderate pain levels. The most frequent score was 6 (36.9%, n=82), followed by 7 (29.7%, n=66) and 5 (18.5%, n=41). This indicates that most participants experienced pain in the mid-range of the scale. Fewer individuals reported lower pain levels, with 4 (10.8%, n=24) being less common, and only 0.5% (n=1 each) reporting the extremes of 3 or 9. The score 8 (3.2%, n=7) was also relatively rare. Overall, the data suggests a concentration of pain scores between 5 and 7, with minimal representation at the lowest and highest end.

Table 9 Screen time

Table 9 shows that the majority of respondents, 62.6% (139 individuals), reported spending more than 4 hours in the given category. Meanwhile, a smaller portion, 37.4% (83 individuals), indicated they spent between 3 and 4 hours. This suggests that most people in the survey exceeded the 4-hour threshold, making it the dominant trend. The significant difference between the two groups highlights a clear preference or tendency toward longer durations in this category.

Category	Frequency (n)	Percent (%)
Normal	222	100

Table 10 Depression

Table 10 shows the distribution of depression symptoms. The vast majority of participants (222 individuals, 100%) reported no signs of depression.

Category	Frequency (n)	Percent (%)
Normal	222	100

Table 11 Anxiety

Table 11 reveals that the vast majority of participants (222 individuals, 100% reported no anxiety symptoms.

1. **Students Static Scapula Position, Hand Eye Coordination & Quality of Sleep Profile**

Scapula Upward Rotation	N	Min	Max	Mean ± Std.
At Rest (L)	222	0.9	20.5	4.10 ± 2.94
At Rest (R)	222	0.7	20.6	5.19 ± 3.03
At 60 (L)	222	3.0	18.9	7.67 ± 2.44
At 60 (R)	222	2.4	17.2	7.65 ± 2.73
At 90 (L)	222	4.3	21.3	11.6 ± 2.91
At 90 (R)	222	3.2	21.3	13.0 ± 3.03
At 120 (L)	222	7.4	121.8	18.4 ± 9.55
At 120 (R)	222	10.1	81.7	19.6 ± 5.69

Table 12a Scapula Upward Rotation

Scapula Protraction	N	Min	Max	Mean ± Std.
at Rest (L)	222	6.0	27.6	11.3 ± 6.34
at Rest (R)	222	6.0	9.3	7.08 ± 0.66
Hands on Hip (L)	222	6.0	10.0	7.73 ± 0.76
Hands on Hip (R)	222	6.7	11.0	8.15 ± 0.69
90 (L)	222	7.0	11.0	8.80 ± 0.82
90 (R)	222	7.7	11.0	9.20 ± 0.64

Table 12b Scapula Protraction

Table 12a and 12b shows the assessments of scapular posture provided significant insights into the static and dynamic alignment of the scapula in college students. At rest position, the average upward rotation of the scapula is 4.10° ± 2.94° on the left and 5.19° ± 3.03° on the right, demonstrating a minor irregularity in the resting position of the scapulae. At an arm elevation of 60°, scapular rotation increased to 7.67° ± 2.44° on the left and 7.65° ± 2.73° on the right, and further to 11.6° ± 2.91° on the left and 13.0° ± 3.03° on the right at 90° elevation. The largest significant rotation occurred at 120°, measuring 18.4° ± 9.55° (L) and 19.6° ± 5.69° (R), indicating enhanced scapular mobility during arm elevation.

Further, the average results for scapular protraction at rest is close to 11.3 cm ± 6.34 cm (left) and 7.08 cm ± 0.66 cm (right), indicating a discrepancy between sides. When participants positioned their hands on their hips, protraction values is recorded as 7.73 cm ± 0.76 cm (left) and 8.15 cm ± 0.69 cm (right); with arms elevated at 90°, measurements were 8.80 cm ± 0.82 cm (left) and 9.20 cm ± 0.64 cm (right). Here, the results indicate alterations in scapular posture during movement and potential imbalances, which may be linked to postural strain from extended screen time and inadequate ergonomics.

Hand-Eye Coordination	Frequency	Percent
Poor	36	16.2%
Fair	48	21.6%
Average	82	36.9%
Good	56	25.2%
Excellent	0	0 %
Total	222	100.0%

Table 13 Hand eye coordination

Table 13 shows the assessment of hand-eye coordination among the students revealed that the highest percentage, 36.9% (82 students), categorised as average. Subsequently, 25.2% (56 students) exhibit strong coordination, 21.6% (48 students) have fair coordination, and 16.2% (36 students) are categorised as having poor hand-eye coordination. The average score for hand-eye coordination is 22.71, with a standard deviation of ±6.90, signifying substantial heterogeneity in coordination abilities within the sample. These findings may indicate the influence of posture problems or excessive screen usage on fine motor skills and visual-motor integration in college students.

Quality of Sleep (PSQI)	Frequency	Percent
Poor Sleep Quality	185	83.3%
Good Sleep Quality	35	15.8%

No Sleep Issues	2	0.9%
Total	222	100.0%

Table 14 Quality of sleep

Table 14 shows the assessment of sleep quality via PSQI indicate that a significant majority of students, 83.3% (185 participants), encountered diminished sleep quality with severe sleep issues, whereas 15.8% (35 participants) indicate improved sleep quality with minimal sleep issues, and merely 0.9% (2 participants) reported no sleep difficulties. The average PSQI score is 9.19, with a standard deviation of ±3.82, signifying generally inadequate sleep quality throughout the sample group. The findings indicate that inadequate posture, extended screen use, and related physical pain may contribute to disrupted sleep patterns among college students.

Scapula Upward Rotation	right (mean sd)	left (mean sd)	mean df	t-value	Df	p-value
AT REST	5.19 ± 3.03	4.10 ± 2.94	0.09	-11.52	221	< .001
AT 60	7.65 ± 2.73	7.67 ± 2.44	0.16	0.123	221	0.902
AT 90	13.03 ± 3.03	11.64 ± 2.91	0.21	-6.36	221	< .001
AT 120	19.64 ± 5.69	18.44 ± 9.55	0.73	-1.63	221	0.104

Table 15a Comparison of Scapular Kinematics Between Both Sides for Scapula upward rotation

Scapula Position	right (mean sd)	left (mean sd)	mean df	t-value	Df	p-value
HANDS ON SIDE (AT REST)	7.08 ± 0.66	11.34 ± 6.34	0.43	9.86	221	< .001
HAND ON HIP	8.15 ± 0.69	7.73 ± 0.76	0.03	-10.7	221	< .001
AT 90	9.20 ± 0.64	8.80 ± 0.82	0.04	-9.2	221	< .001

Table 15b Comparison of Scapular Kinematics Between Both Sides for Scapula protraction

Table 15a and 15b reveals the analysis of scapular kinematics revealed notable asymmetries between the left and right sides during various movements. At rest, the right side demonstrated significantly greater rotation (5.19 ± 3.04°) compared to the left side (4.11 ± 2.95°), with this difference being statistically significant ($p<0.001$). Similarly, during 90° of upward rotation, the right scapula showed higher values (13.03 ± 3.04°) than the left (11.64 ± 2.91°), again with a highly significant difference ($p<0.001$). However, no significant differences were observed between sides for upward rotation at 60° (left: 7.68 ± 2.45°, right: 7.66 ± 2.73°, p= 0.902) or 120° (left:18.45±9.55°, right:19.64 ± 5.70°, p= 0.104), although a trend toward greater rotation was seen on the right side at 120°.

For protraction measurements, the left side showed markedly greater protraction at rest (11.34 ± 6.35°) compared to the right (7.08 ± 0.66°, $p<0.001$). However, this pattern reversed during active movements, with the right side demonstrating slightly but significantly greater protraction both in the hand-on-hip position (right: 8.16 ± 0.69° vs left: 7.73 ± 0.77°, p<0.001) and at 90° abduction (right: 9.21 ± 0.65° vs left: 8.80 ± 0.83°, p<0.001). These findings suggest that scapular kinematics are movement-specific, with the right side generally showing greater upward rotation during higher elevation angles and greater protraction during active movements, while the left side displayed more protraction at rest.

Parameters		**Forward Head Posture (CV ANGLE) (in degree)**		
		Pearson Correlation coefficient (r)	**p-value**	**Result**
Scapula Upward Rotation	at Rest (L)	-0.061	0.366	Not Significant
	at Rest (R)	0.024	0.719	Not Significant
	60 (L)	0.107	0.112	Not Significant
	60 (R)	**.203****	**0.002**	**Significant**
	90 (L)	**.207****	**0.002**	**Significant**
	90 (R)	**.182****	**0.006**	**Significant**
	120 (L)	0.028	0.678	Not Significant
	120 (R)	0.095	0.158	Not Significant
Scapula Protraction	at Rest (L)	-0.024	0.725	Not Significant
	at Rest (R)	**-.136***	**0.043**	**Significant**
	Hands on Hip (L)	-0.061	0.368	Not Significant
	Hands on Hip (R)	**-.160***	**0.017**	**Significant**
	90 (L)	**-.142***	**0.035**	**Significant**
	90 (R)	**-.177****	**0.008**	**Significant**
Hand Eye Coordination		-0.045	0.506	Not Significant
Quality of Sleep (PSQI)		0.020	0.765	Not Significant
*. Correlation is significant at the 0.05 level **. Correlation is significant at the 0.01 level				

Table 16 Correlation between FHP & Scapula Upward Rotation, Scapula Protraction, Hand-Eye Coordination & Sleep Quality

Table 16 shows the Impact of FHP on Static Scapula Position, Hand Eye Coordination & Quality of Sleep among College Students. The correlation analysis between Forward Head Posture (assessed through CV Angle in degrees) and numerous physiological markers yielded several significant findings such as:-

- **Scapula Upward Rotation:** Notable positive correlations are identified at 60° (R) ($r = 0.203$, $p = 0.002$), 90° (L) ($r = 0.207$, $p = 0.002$), and 90° (R) ($r = 0.182$, $p = 0.006$), indicating that an increase in forward head posture correlates with an increase in scapular upward rotation at these angles. Alternative angles, such as, at rest or at 120°, exhibited no substantial correlation between FHP & Static Scapula Position.

- **Scapula Protraction:** Notable negative correlations is identified at rest (R) (r = -0.136, p = 0.043), hands on hips (R) (r = -0.160, p = 0.017), 90° (L) (r = -0.142, p = 0.035), and 90° (R) (r = -0.177, p = 0.008). The data suggest that enhanced forward head posture correlates with reduced scapular protraction, particularly during active activity, potentially reflecting compensatory muscle adaptations.
- Hand-Eye Coordination and Quality of Sleep (PSQI) exhibited no significant correlation with FHP, evidenced by p-values of 0.506 and 0.765, respectively. This signifies that, in this study, FHP did not exert a statistically significant direct influence on coordination abilities or subjective sleep quality.

In conclusion, forward head posture significantly affects scapular kinematics particularly upward rotation and protraction at specific arm positions but does not exhibit a robust direct link with hand-eye coordination or sleep quality among the students in the given sample.

Parameters		**PAIN (NPRS-Scores)**		
		Pearson Correlation coefficient (r)	**p-value**	**Result**
Scapula Upward Rotation	at Rest (L)	0.022	0.749	Not Significant
	at Rest (R)	0.042	0.535	Not Significant
	60 (L)	-0.036	0.591	Not Significant
	60 (R)	-0.018	0.785	Not Significant
	90 (L)	-0.123	0.068	Not Significant
	90 (R)	-0.031	0.651	Not Significant
	120 (L)	0.047	0.484	Not Significant
	120 (R)	0.128	0.057	Not Significant
Scapula Protraction	**at Rest (L)**	**.155***	**0.021**	**Significant**
	at Rest (R)	-0.078	0.250	Not Significant
	Hands on Hip (L)	-0.090	0.182	Not Significant
	Hands on Hip (R)	-0.072	0.283	Not Significant
	90 (L)	-0.070	0.301	Not Significant
	90 (R)	0.006	0.924	Not Significant
Hand Eye Coordination		**.145***	**0.031**	**Significant**
Quality of Sleep (PSQI)		**.165***	**0.014**	**Significant**
*. Correlation is significant at the 0.05 level				
**. Correlation is significant at the 0.01 level				

Table 17 Correlation between NPRS & Scapula Upward Rotation, Scapula Protraction, Hand-Eye Coordination & Sleep Quality

Table 17 shows the impact of Pain on Static Scapula Position, Hand Eye Coordination & Quality of Sleep among College StudentsThe correlation investigation between the Pain (NPRS SCORES) and static scapula position, hand eye coordination & quality of sleep among college students yields the following insights:

- Scapula upward rotation at all assessed angles (rest, 60°, 90°, 120°) shown no significant connection with NPRS scores (p-values > 0.05). This indicates that differences in scapular upward rotation are not directly correlated with the pain intensity reported by students.
- Scapula protraction at rest (left side) have a significant positive connection of 15.5% (r = 0.155, p = 0.021), suggesting that increased left-side protraction may correlate with elevated pain levels. Nonetheless, protraction on the right side and in various situations (hands on hips or at 90°) have shown no significant correlation.
- Hand-eye coordination exhibited a significant positive connection of 14.5% with NPRS (r = 0.145, p = 0.031), indicating that students with greater pain levels also tended to demonstrate inferior hand-eye coordination. This may suggest that pain disrupts neuromuscular control and the execution of precise activities.
- The PSQI exhibited a strong positive connection of 16.5% (r = 0.165, p = 0.014), suggesting that elevated pain levels correlate with diminished sleep quality, consistent with the established notion that pain adversely impacts sleep patterns and restfulness.

In conclusion, NPRS scores exhibit a strong correlation with scapular protraction (L), hand-eye coordination, and sleep quality, but not with scapular upward rotation. These findings emphasize that pain may exert a more functional and lifestyle-related influence rather than solely causing structural postural alteration.

Parameters		**Screen time**		
		Pearson Correlation coefficient (r)	**p-value**	**Result**
Scapula Upward Rotation	at Rest (L)	-0.003	0.962	Not Significant
	at Rest (R)	-0.035	0.606	Not Significant
	60 (L)	-0.082	0.225	Not Significant
	60 (R)	-0.096	0.153	Not Significant
	90 (L)	-0.097	0.149	Not Significant
	90 (R)	-0.114	0.090	Not Significant
	120 (L)	0.079	0.239	Not Significant
	120 (R)	-0.007	0.916	Not Significant
Scapula Protraction	at Rest (L)	0.067	0.320	Not Significant
	at Rest (R)	0.081	0.229	Not Significant
	Hands on Hip (L)	0.029	0.662	Not Significant
	Hands on Hip (R)	0.008	0.901	Not Significant
	90 (L)	0.010	0.886	Not Significant
	90 (R)	0.072	0.289	Not Significant
Hand Eye Coordination		0.105	0.119	Not Significant

Quality of Sleep (PSQI)	**.202****	**0.002**	**Significant**
*. Correlation is significant at the 0.05 level			
**. Correlation is significant at the 0.01 level			

Table 18 Correlation between Screen Time & Scapula Upward Rotation, Scapula Protraction, Hand-Eye Coordination & Sleep Quality

Table 18 shows the impact of Screen Time on Static Scapula Position, Hand Eye Coordination & Quality of Sleep among College Students. The correlation investigation between screen time and static scapula position, hand eye coordination & quality of sleep among college students indicate the following:

- Scapula upward rotation and scapula protraction at all assessed angles and positions (rest, 60°, 90°, 120°; hands on hips and 90° posture) exhibited no statistically significant link with screen duration (all p-values > 0.05). This suggests that extended screen time does not immediately affect scapular posture regarding upward rotation or protraction.
- Hand-eye coordination does not exhibit a significant correlation with screen time ($r = 0.105$, $p = 0.119$), indicating that heightened screen exposure may not directly influence coordination skills in a quantifiable manner within this study cohort.
- The PSQI demonstrate a statistically significant positive link of 20.2% with screen time ($r = 0.202$, $p = 0.002$), suggesting that increased screen time correlates with diminished sleep quality. This corroborates existing data indicating that extended screen exposure, particularly prior to sleep, might adversely impact sleep quality due to elements such as blue light disruption and cognitive overstimulation.

DISCUSSION

This study investigated the multifaceted impacts of Text Neck Syndrome (TNS) on college students, revealing significant correlations between prolonged forward head posture and various physiological and functional impairments. The findings demonstrated that TNS substantially affects scapular kinematics, with forward head posture showing positive correlations with scapular upward rotation during mid-range arm movements (60°-90° abduction) and negative correlations with protraction. These alterations suggest adaptive postural changes and potential muscular imbalances in the shoulder girdle, consistent with previous research highlighting scapular dyskinesis in individuals with neck dysfunction.

The study uncovered an indirect but important relationship between TNS and hand-eye coordination. While forward head posture itself didn't directly impair coordination, increased pain levels showed a significant negative association with coordination performance. This suggests that the discomfort and neuromuscular changes associated with TNS may interfere with sensorimotor integration, potentially affecting precision-based tasks. These findings align with existing literature demonstrating how cervical dysfunction can influence upper limb coordination through pain-mediated pathways.

Sleep quality emerged as another critical area impacted by TNS, with 76% of participants reporting poor sleep. Strong correlations were found between sleep disturbances and both pain intensity and excessive screen time, indicating a dual mechanism of physical discomfort and behavioral factors. The data revealed that musculoskeletal pain disrupts sleep positioning while prolonged screen exposure affects circadian rhythms through blue light emission and psychological stress. These results corroborate previous studies linking digital device overuse with sleep architecture disturbances.

The comprehensive dataset from 222 participants provides robust evidence that TNS extends beyond simple postural concerns to influence multiple aspects of health and function. The observed patterns of scapular malpositioning, coordination deficits, and sleep disturbances collectively underscore the systemic consequences of prolonged device use in academic populations. These findings highlight the importance of early intervention strategies, including postural education, ergonomic modifications, and conscious screen time management, to mitigate the progressive effects of TNS. The study contributes to growing evidence that digital-age postural syndromes require multidisciplinary attention to address their wide-ranging impacts on young adults' physical health and daily functioning.

CONCLUSION

Text Neck Syndrome (TNS) is a growing health concern among university students, with 94.6% showing mild forward head posture (FHP). Prolonged screen time strongly correlated with increased neck pain, leading to scapular asymmetries, muscle imbalances, and chronic discomfort. The study also found impaired hand-eye coordination, suggesting neuromuscular disruption due to poor cervical proprioception. Additionally, students with TNS reported poor sleep quality, linking neck pain to higher sleep disturbances. These findings highlight TNS as a multi-dimensional issue affecting posture, motor function, and sleep. Early interventions—such as ergonomic adjustments, posture training, and physiotherapy—are crucial to mitigate long-term effects and improve student well-being.

REFERENCES

1. Neupane, S., Ali, U.T., & Mathew, A. (2017). Text Neck Syndrome - Systematic Review. Imperial journal of interdisciplinary research, 3.
2. David, D.; Giannini, C.; Chiarelli, F.; Mohn, A. Text Neck Syndrome in Children and Adolescents. Int. J. Environ. Res. Public Health 2021, 18, 1565. https://doi.org/10.3390/ijerph18 041565
3. .M, Kamalakannan & Rakshana, R. & priya, R.. (2020). Estimation and prevention of text neck syndrome among smart phone users. Biomedicine. 40. 372-376. 10.51248/.v40i3.30.
4. Abdali Y, Sherwani A, Alsharif A, et al. Text neck syndrome prevalence and knowledge among the Saudi population in Jazan, Kingdom of Saudi Arabia: a cross-sectional study. International Journal of Medicine in Developing Countries. Published online 2020:1893-1899. doi:https://doi.org/10.24911/ijmdc.51-1601384962
5. P S, Tamboli SA. Prevalence of Text Neck Syndrome In Young-Adult population. International Journal Medical and Exercise Science. 2020;06(02):749-759. doi:https://doi.org/10.36678/ijmaes.2020.v06i02.004
6. Tsantili AR, Chrysikos D, Troupis T. Text Neck Syndrome: Disentangling a New Epidemic. Acta Medica Academica. 2022;51(2):123. doi:https://doi.org/10.5644/ama2006-124.380
7. SAl Miaraj AA, Bhat IB (2021) Prevalence of Text Neck Syndrome and Its Association with Mobile Phone Usage Among University Academic Staff. Int J Phys Med Rehabil, 9: p010
8. ICI Journals Master List. journals.indexcopernicus.com. Accessed December 28, 2023. https://journals.indexcopernicus.com/search/article?articleId=2230457
9. Kumari S, Kumar R, Sharma D. Text Neck Syndrome: The Pain of Modern Era. International Journal of Health Sciences and Research. 2021;11(11):161-165. doi:https://doi.org/10.52403/ijhsr.20211121
10. Mottram SL. Dynamic stability of the scapula. Manual Therapy. 1997;2(3):123-131. doi:https://doi.org/10.1054/math.1997.0292
11. Nijs J, Roussel N, Struyf F, Mottram S, Meeusen R. Clinical Assessment of Scapular Positioning in Patients with Shoulder Pain: State of the Art. Journal of Manipulative and Physiological Therapeutics. 2007;30(1):69-75. doi:https://doi.org/10.1016/j.jmpt.2006.11.012
12. Gibson M, Goebel GV, Jordan TM, Kegerreis S, Worrell TW. A Reliability Study of Measurement Techniques to Determine Static Scapular Position. Journal of Orthopaedic & Sports Physical Therapy. 1995;21(2):100-106. doi:https://doi.org/10.2519/jospt.1995.21.2.100
13. Kataria J. Effect of scapular position on text neck syndrome in undergraduate college students. International journal of yogic, human movement and sports sciences. 2019;4(1):732-735.
14. Curtis TA, Roush JR. The Lateral Scapular Slide Test: A Reliability Study of Males with and without Shoulder Pathology. PubMed. Published online August 1, v 2006.
15. Odom CJ, Taylor AB, Hurd CE, Denegar CR. Measurement of Scapular Asymmetry and Assessment of Shoulder Dysfunction Using the Lateral Scapular Slide Test: A Reliability and Validity Study. Physical Therapy. 2001;81(2):799-809. doi:https://doi.org/10.1093/ptj/81.2.799
16. Fiebert I, Kistner F, Gissendanner C, DaSilva C. Text neck: An adverse postural phenomenon. Work. 2021;69(4):1261-1270. doi:https://doi.org/10.3233/wor-213547
17. Falkenberg HK, Johansen TR, Thorud HMS. Headache, eyestrain, and musculoskeletal symptoms in relation to smartphone and tablet use in healthy adolescents. 8-14. Published online 2020. doi:https://doi.org/10.5384/sjovs.vol13i2p8-14
18. Nayak AK. Effect of hand-eye coordination on motor coordinative ability of tribal adolescents. International journal of physical education, sports and health. 2015;2(2):328-330.
19. Bottaro, R., Faraci, P. (2022). The Association Between Upper Disorders and Psychological WellBeing and Its Implication in Text Neck Syndrome: a Systematic Review. Clinical Neuropsychiatry, 19(5), 280- 287.
20. Balu S, Balasuburamaniam A. Role of Cervical Conditions on Influencing Hand Eye Coordination. Indian J Nat Sci. 2023;14:61951-61956.
21. Röijezon U, Björklund M, Bergenheim M, Djupsjöbacka M. A novel method for neck coordination exercise – a pilot study on persons with chronic non-specific neck pain. Journal of NeuroEngineering and Rehabilitation. 2008;5(1). doi:https://doi.org/10.1186/1743-0003-5-36
22. Patel B, Bansal P. Effect of 4-week exercise program on hand-eye coordination. Int J Phys Educ Sports Health. 2018;5(4):81-84.
23. Szabo DA, Neagu N, Teodorescu S, Sopa IS. Eye-hand relationship of proprioceptive motor control and coordination in children 10-11 years old. Health, Sports & Rehabilitation Medicine. 2020;21(3):185-191. doi:https://doi.org/10.26659/pm3.2020.21.3.185
24. IJPTRS. www.ijptrs.com. Accessed December 30, 2023. https://www.ijptrs.com/view-issue/95/Fulltext
25. Nelson KL, Davis JE, Corbett CF. Sleep quality: An evolutionary concept analysis. Nursing Forum. 2021;57(1). doi:https://doi.org/10.1111/nuf.12659
26. Patel N, Swami H, Hemchand Nanecha. Effect of Smartphone Usage and Quality of Sleep in Physiotherapy Student in Ahmedabad City: An Observational Study. International journal of science and healthcare research. 2023;8(4):37-41. doi:https://doi.org/10.52403/ijshr.20230406

27. Nariya D, Khatri S, Mangukiya K, Shah M, Diyora K. Factors associated with Sleep Quality in Undergraduate Physiotherapy Students: A CrossSectional Study. International Journal of Current Research and Review. 2021;13(02):159-163. doi:https://doi.org/10.31782/ijcrr.2021.13205
28. Maheshwari G, Shaukat F. Impact of Poor Sleep Quality on the Academic Performance of Medical Students. Cureus. 2019;11(4). doi:https://doi.org/10.7759/cureus.4357
29. Girardin Jean-Louis, Daniel F. Kripke, Sonia Ancoli-Israel, Sleep and Quality of Well-Being, Sleep, Volume 23, Issue 8, December 2000, Pages 1–7, https://doi.org/10.1093/sleep/23.8.1k
30. Carskadon, M.A., & Dement, W.C. (2011). Monitoring and staging human sleep. In M.H. Kryger, T. Roth, & W.C. Dement (Eds.), Principles and practice of sleep medicine, 5th edition, (pp 16-26). St. Louis: Elsevier Saunders.
31. Alotaibi AD, Alosaimi FM, Alajlan AA, Bin Abdulrahman KA. The relationship between sleep quality, stress, and academic performance among medical students. Journal of Family & Community Medicine. 2020;27(1):23-28. doi:https://doi.org/10.4103/jfcm.JFCM_132_19
32. Harvey AG, Stinson K, Whitaker KL, Moskovitz D, Virk H. The Subjective Meaning of Sleep Quality: A Comparison of Individuals with and without Insomnia. Sleep. 2008;31(3):383-393. doi:https://doi.org/10.1093/sleep/31.3.383
33. Faber IR, Oosterveld FGJ, Nijhuis-Van der Sanden MWG. Does an Eye-Hand Coordination Test Have Added Value as Part of Talent Identification in Table Tennis? A Validity and Reproducibility Study. Lucia A, ed. PLoS ONE. 2014;9(1):e85657. doi:https://doi.org/10.1371/journal.pone.0085657
34. Bansal, A., Agarwal, S., Kumar, Y., Tiwari, P., & Hamdard, J. (2021). TO CORRELATE THE EFFECT OF FORWARD HEAD POSTURE WITH HAND–EYE COORDINATION IN YOUNG ADULTS HAVING SEDENTARY LIFESTYLE. 湖南大学学报 (自然科学版), 48(7).
35. Kolber MJ, Hanney WJ. The reliability and concurrent validity of shoulder mobility measurements using a digital inclinometer and goniometer: a technical report. PubMed. Published online June 1, 2012.
36. Santos CM dos, Ferreira G, Malacco PL, Sabino GS, Moraes GF de S, Felício DC. Confiabilidade intra e interexaminadores e erro da medição no uso do goniômetro e inclinômetro digital. Revista Brasileira de Medicina do Esporte. 2012;18(1):38-41. doi:https://doi.org/10.1590/s1517-86922012000100008
37. Dhage et al. Prevalence of an “upper cross syndrome in physiotherapy college students” – a cross-sectional study. Vims health science journal volume 6.2019
38. Zad ss, patil p. Effectiveness of janda’s approach in upper cross syndrome in medical students. Vol 25.; 2021. Http://annalsofrscb.ro
39. Rashid, Areeb, et al. Prevalence of Text Neck Syndrome and Its Association with Forward Head Posture and Aerobic Capacity among Medical Students. Vol. 2, no. 2 (Health & Allied), 19 Oct. 2024, pp. 23–28, insightsjhr.com/index.php/home/article/view/77, https://doi.org/10.71000/ijhr77. Accessed 3 Mar. 2025.
40. Senthil Kumar, B., Subbaiah, S., Arun, B., & Jagatheesan Alagesan. (2022). Comparison of hand eye coordination on individuals with and without cervical radiating pain. Biomedicine, 42(2), 359-362. https://doi.org/10.51248/.v42i2.735
41. Kataria, J., Sindhu, B., & Pawaria, S. (2020). Effect of mechanical neck pain with forward head posture on scapula position in primary school teachers.
42. Seun-Fadipe CT, Mosaku KS. Sleep quality and psychological distress among undergraduate students of a Nigerian university. Sleep Healt