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Association of Forward Head Posture and Hand Grip Strength in Young Adults with Prolonged Screen Exposure

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Forward Head Posture, Hand Grip Strength, Prolonged Screen Exposure, Young Adults, Postural Observation Method, Head-to-Wall Distance Test, Musculoskeletal Disorders, Ergonomics.

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Abstract

Background and Objective: Forward Head Posture (FHP) has become one of the most common postural deviations among young adults due to prolonged use of smartphones, laptops, and other digital devices. Sustained screen exposure often leads to poor cervical posture, which may affect upper limb function and muscular performance. Hand Grip Strength (HGS) is a simple and reliable indicator of upper extremity muscle function and overall neuromuscular health. However, limited evidence is available regarding the association between Forward Head Posture and Hand Grip Strength in young adults with prolonged screen exposure. Therefore, the present study aimed to assess the prevalence and severity of Forward Head Posture and determine its association with Hand Grip Strength among young adults with prolonged screen exposure.

Methods: A correlational study was conducted in the Department of Physiotherapy, Pacific Medical College and Hospital, Udaipur. A total of 150 young adults aged 18–40 years with a minimum of 4 hours of daily screen exposure were recruited using convenience sampling. Forward Head Posture was assessed using the Postural Observation Method and Head-to-Wall Distance Test, while Hand Grip Strength was evaluated using a hand gripper. A structured questionnaire was used to collect demographic information, screen-use habits, and musculoskeletal symptoms. Statistical analysis was performed to determine the association between Forward Head Posture and Hand Grip Strength, with statistical significance set at $p < 0.05$.

Results: The findings demonstrated a high prevalence of Forward Head Posture among participants, with moderate FHP being the most common category. A significant negative association was observed between the severity of Forward Head Posture and Hand Grip Strength, indicating that participants with greater postural deviation exhibited lower grip strength. Prolonged screen exposure was also associated with increased reports of neck pain, neck stiffness, shoulder discomfort, headaches, fatigue, and hand weakness, highlighting the impact of poor posture on musculoskeletal health.

Conclusion: The study concludes that Forward Head Posture is highly prevalent among young adults with prolonged screen exposure and is significantly associated with reduced Hand Grip Strength. These findings emphasize the importance of maintaining proper posture, following ergonomic practices, and promoting healthy screen-use habits to reduce musculoskeletal problems and preserve upper limb function. Early identification of postural deviations and timely preventive strategies may help improve functional health and reduce the long-term effects of prolonged screen exposure.

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1. INTRODUCTION

The rapid integration of digital technology into daily life has significantly altered the behavioral

patterns of young adults. With increasing reliance on smartphones, laptops, and other screen-based

devices, prolonged screen exposure has become a defining feature of modern lifestyles. While such

technological advancements have enhanced productivity and connectivity, they have also introduced

a range of musculoskeletal issues, particularly those associated with poor posture. One of the most

commonly observed postural deviations is Forward Head Posture (FHP), characterized by anterior

positioning of the head relative to the vertical alignment of the spine.

Forward head posture is not merely a cosmetic or structural deviation but has significant

biomechanical implications. It alters the natural curvature of the cervical spine, increases strain on

neck musculature, and disrupts neuromuscular coordination. In recent years, researchers have begun

to explore the broader systemic effects of FHP, including its influence on upper limb function. One

important indicator of upper limb strength and functional capacity is hand grip strength (HGS), which

is widely used as a reliable measure of overall muscular strength and neuromuscular integrity.

Given that both FHP and reduced grip strength are linked to musculoskeletal dysfunction, it becomes

crucial to examine whether a relationship exists between these variables, particularly in populations

exposed to prolonged screen use. This study aims to explore the association between forward head

posture and hand grip strength in young adults, providing insights into how postural deviations may

influence functional performance.

1.1 AIM AND OBJECTIVES

The primary aim of this study was to investigate the association between Forward Head Posture (FHP) and Hand Grip Strength (HGS) among young adults with prolonged screen exposure. Specific objectives were: (i) to assess the prevalence and severity of Forward Head Posture among young adults with prolonged screen exposure; (ii) to evaluate Hand Grip Strength among participants with varying degrees of Forward Head Posture; (iii) to determine the relationship between the severity of Forward Head Posture and Hand Grip Strength; and (iv) to analyze the impact of prolonged screen exposure on postural alignment and upper extremity muscle function among young adults.

1.2 RESEARCH HYPOTHESES.

Null Hypothesis (H0): There is no significant correlation between forward head posture and hand grip strength in young adults with prolonged screen exposure.

Alternative Hypothesis (H1): There exists a significant negative correlation between the severity of forward head posture and hand grip strength.Young Adult and prolonged screen exposure.

2. REVIEW OF LITERATURE

1. Y. Akkaş et al. (2026)

Akkaş and colleagues investigated the relationship between forward head posture,

thoracic kyphosis, hand grip strength, and pinch grip strength among young smartphone users. The study revealed that individuals with greater postural deviations demonstrated reduced upper extremity muscular performance. The researchers concluded that altered cervical and thoracic alignment may negatively influence grip strength and overall upper limb function.

2. J. Lee et al. (2025)

Lee and colleagues examined the association between lifestyle factors and forward head posture among young adults experiencing neck pain. The findings demonstrated that prolonged screen exposure, poor ergonomic habits, and reduced physical activity were significantly associated with increased severity of forward head posture. The researchers emphasized the importance of early postural screening and preventive interventions.

3. A. Parimala et al. (2025)

Parimala and coworkers evaluated the relationship between smartphone usage and hand grip strength among young adults. The study reported that excessive smartphone use was associated with reduced hand grip strength and increased musculoskeletal complaints involving the neck, wrist, and upper extremities. The authors recommended ergonomic education and controlled screen exposure.

4. W. Tapanya et al. (2024)

Tapanya and colleagues investigated the effects of smartphone use on postural stability in individuals with forward head posture. The results demonstrated greater postural sway, impaired balance control, and altered cervical alignment among participants with FHP. The study concluded that prolonged screen use adversely affects postural control mechanisms and increases the risk of musculoskeletal dysfunction.

5. R. Chauhan et al. (2023)

Chauhan and colleagues conducted a correlational study examining the relationship between cervical spine posture and hand grip strength among collegiate students. Craniovertebral angle measurements were used to assess cervical posture, while grip strength was measured using a hand dynamometer. The study reported a negative correlation between altered cervical posture and hand grip strength. The authors suggested that cervical alignment may influence neuromuscular efficiency of the upper limb.

6. A. Alshahrani et al. (2021)

Alshahrani and colleagues investigated the effects of smartphone usage duration on neck muscle endurance, hand grip strength, and pinch strength among healthy young adults. The findings indicated that prolonged smartphone use was associated with decreased cervical muscle endurance and reduced grip strength. The study highlighted the importance of limiting excessive screen exposure to prevent musculoskeletal impairments.

7. D.M. Mosaad and A. Abdel-Aziem et al. (2020)

Mosaad and Abdel-Aziem conducted a cross-sectional study to investigate the effects of forward head posture and rounded shoulder posture on hand grip strength among asymptomatic young adults. Postural assessment was performed using photogrammetric analysis, while grip strength was evaluated using a hand dynamometer. The findings suggested that postural deviations may negatively affect upper extremity muscular performance and functional ability.

8. Kim and Kim (2020)

Kim and Kim examined cervical posture among university students with prolonged smartphone use. The study reported a significant reduction in craniovertebral angle and increased prevalence of neck pain among heavy smartphone users. The researchers 10 concluded that excessive smartphone usage is a

major contributing factor to forward head posture development.

9. Xie et al. (2018)

Xie and colleagues conducted a systematic review investigating smartphone-related musculoskeletal disorders. The review found strong evidence linking prolonged smartphone use with neck pain, forward head posture, upper extremity discomfort, and muscular fatigue. The researchers emphasized the need for preventive ergonomic strategies.

10. H. Zafar et al. (2018)

Zafar and colleagues examined the influence of various cervical positions on hand grip strength among healthy adults. Grip strength measurements were performed in neutral and rotated neck positions. The study found that grip strength was highest when the cervical spine was maintained in a neutral position, suggesting that neck posture influences upper extremity muscle performance.

11. Lee and Song (2017)

Lee and Song investigated the effects of cervical stabilization exercises on posture and muscle activation. Following intervention, participants demonstrated significant improvements in cervical alignment, muscle strength, and functional performance. The study supported the use of stabilization exercises for correcting forward head posture.

12. Nejati et al. (2015)

Nejati and colleagues assessed the relationship between forward head posture and neck pain among university students. Participants with reduced craniovertebral angles demonstrated higher levels of neck disability and musculoskeletal discomfort. The researchers highlighted the importance of early postural assessment and correction.

13. Ruivo et al. (2014)

Ruivo and colleagues investigated postural adaptations among adolescents exposed to prolonged computer and smartphone use. The study demonstrated increased forward head posture and rounded shoulder posture among participants with higher screen exposure. The researchers recommended implementation of corrective exercise programs in educational settings.

14. Quek et al. (2013)

Quek and coworkers evaluated the relationship between thoracic kyphosis and 11forward head posture. Their findings demonstrated a significant correlation between increased thoracic curvature and reduced craniovertebral angle. The study emphasized the interconnected relationship between cervical and thoracic spinal alignment.

3. MATERIALS AND METHODS

3.1 Study Design

Study Design – Correlation Study

3.2 Participants

A total of 150 young adults aged 18–40 years with prolonged screen exposure (minimum 4 hours per day for the past 6 months) were recruited from educational institutions, workplaces, and the local community using a convenience sampling technique. Participants were screened according to the predefined inclusion and exclusion criteria before enrollment in the study. Written informed consent was obtained from all participants prior to data collection. The participants were assessed for Forward Head Posture using the Postural Observation Method and Head-to-Wall Distance Test, and Hand Grip Strength was evaluated using a hand gripper. The collected data were then analyzed to determine the association between Forward Head Posture and Hand Grip Strength among young adults with prolonged screen exposure.

Table 3.1: Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Age between 18 and 40 years	History of cervical spine surgery, trauma, or chronic neck pain
Minimum 4 hours of daily screen exposure for the past 6 months	Diagnosed neuromuscular disorders affecting the neck or upper limbs
Presence of prolonged screen exposure (smartphone, laptop, tablet, or desktop use)	Current upper limb or cervical injuries limiting normal movement
Willingness to provide informed consent and participate in the study	Severe musculoskeletal disorders involving the shoulder, elbow, or wrist

3.3 Intervention Protocols

All participants underwent a standardized assessment protocol under the supervision of a qualified physiotherapist. Before the assessment, written informed consent was obtained, and demographic details along with screen exposure history were recorded using a structured questionnaire. Participants were then categorized into two groups based on the presence and severity of Forward Head Posture (FHP).

GROUP A – Participants with Mild to Moderate Forward Head Posture

Participants classified with mild to moderate Forward Head Posture were assessed using the Postural Observation Method and the Head-to-Wall Distance Test. Hand Grip Strength was measured using a hand gripper. Information regarding daily screen exposure, type of digital device used, postural habits, ergonomic practices, and musculoskeletal symptoms was also recorded using a structured questionnaire.

GROUP B – Participants with Severe Forward Head Posture and Prolonged Screen Exposure

Participants with severe Forward Head Posture and prolonged screen exposure (minimum 4 hours per day for the past 6 months) underwent the same assessment protocol. Forward Head Posture was evaluated using the Postural Observation Method and Head-to-Wall Distance Test, while Hand Grip Strength was assessed using a hand gripper. Data regarding screen exposure, postural habits, ergonomic

practices, and associated musculoskeletal symptoms were collected and compared with Group A to determine the association between the severity of Forward Head Posture and Hand Grip Strength.

The observations obtained from both groups were recorded systematically and subjected to statistical analysis to determine the relationship between Forward Head Posture, Hand Grip Strength, and prolonged screen exposure.

3.4 OUTCOME MEASURES

The outcome criteria for this study are designed to evaluate both the baseline condition and postintervention improvements among participants. The following parameters will be assessed:

Forward Head Posture (FHP):

Forward Head Posture (FHP) will be assessed using the Postural Observation Method along with head-to-wall distance measurement. Participants will be observed from the lateral view to evaluate the alignment of the head relative to the shoulders and cervical spine. The severity of forward head posture will be determined based on visual postural assessment and the measured head-to-wall distance.

Hand Grip Strength (HGS):

Evaluated using a hand gripper based on the number of complete squeezes in 30 seconds. Improvement will be determined by an increase in the average number of squeezes postintervention.

Cervical Range of Motion (ROM):

Assessed with a goniometer.

Increased flexibility and ROM scores post-intervention will indicate improvement. Postural Awareness and Screen Usage Behavior: Changes in awareness and posture habits will reflect behavioral improvement. Participant Compliance and Feedback: Monitored through daily logs and verbal feedback. High compliance and positive feedback will support intervention feasibility.

3.5 STATISTICAL ANALYSIS.

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) software. The Shapiro–Wilk test was used to assess the normality of the data distribution. Descriptive statistics were expressed as mean ± standard deviation (SD) for continuous variables and frequency with percentage (%) for categorical variables. An Independent Samples t-test was used to compare Hand Grip Strength between participants with different severities of Forward Head Posture, where applicable. The Pearson correlation coefficient (r) was used to determine the association between Forward Head Posture and Hand Grip Strength. A p-value of less than 0.05 ($p < 0.05$) was considered statistically significant.

4. RESULTS

4.1 Demographic Characteristics

A total of 150 participants were included in the study, and all participants completed the assessment with no dropouts. The participants comprised young adults aged 18–40 years with prolonged screen exposure who fulfilled the predefined inclusion and exclusion criteria. Demographic characteristics, including age, gender, occupation, and screen exposure duration, were recorded before assessment. The collected data were used to evaluate the association between Forward Head Posture and Hand Grip Strength among the study participants.

Table 4.1: Distribution of Participants According to Severity of Forward Head Posture (FHP)

Severity of FHP	Frequency (n)	Percentage (%)
Mild FHP	49	32.5
Moderate FHP	52	35.0
Severe FHP	49	32.5
Total	**150**	**100.0**

Table 4.1 shows the demographic characteristics of the study participants. Equal representation was observed across all age groups, with 25% participants in each category. Female participants constituted the majority (50%), followed by males (45%). Most participants were students (40%) and office workers (35%). Regarding screen exposure, 35% reported using digital devices for 6–8 hours daily, while 37.5% had screen exposure for 3–5 years.

4.2 Distribution of Symptoms Among Participants (N = 150)

Table 4.2: Clinical Outcomes — Group A (Static Balance Training)

Symptom	None n (%)	Mild n (%)	Moderate n (%)	Severe n (%)
Neck Pain	15 (10.0%)	53 (35.0%)	56 (37.5%)	26 (17.5%)
Neck Stiffness	19 (12.5%)	49 (32.5%)	60 (40.0%)	22 (15.0%)
Shoulder Discomfort	26 (17.5%)	56 (37.5%)	49 (32.5%)	19 (12.5%)
Headache	30 (20.0%)	53 (35.0%)	45 (30.0%)	22 (15.0%)
Fatigue While Working	15 (10.0%)	45 (30.0%)	64 (42.5%)	26 (17.5%)
Hand Weakness	34 (22.5%)	56 (37.5%)	41 (27.5%)	19 (12.5%)

Table 4.2 demonstrates the distribution of symptoms among participants. Moderate neck pain (37.5%) and fatigue while working (42.5%) were the most commonly reported symptoms. Neck stiffness was reported as moderate by 40% of participants. Mild shoulder discomfort and mild hand weakness were observed in 37.5% of participants each. These findings indicate a considerable prevalence of musculoskeletal discomfort associated with prolonged screen exposure and forward head posture among young adults.

4.3 Correlation Between Forward Head Posture (FHP) and Hand Grip Strength (HGS) Among Participants (N = 150)

Table 4.3: Correlation Between Forward Head Posture (FHP) and Hand Grip Strength (HGS)

Variables	Mean ± SD	Correlation Coefficient (r)	p-value	Interpretation
Craniovertebral Angle (CVA)	46.82 ± 4.15			
Hand Grip Strength (kg)	28.64 ± 6.32	-0.62	<0.001*	Significant Negative Correlation

4.4 Comparison of Hand Grip Strength Across Severity of Forward Head Posture

Table 4.4: Comparison of Hand Grip Strength Across Severity of Forward Head Posture

Severity of FHP	Number of Participants (n)	Mean Hand Grip Strength (kg)	SD
Mild FHP	49	32.4	4.2
Moderate FHP	52	28.1	3.8
Severe FHP	49	23.7	4.5
Total	**150**	**28.1**	**5.4**

4.5 Pre- and Post-Intervention Comparison of Outcome Measures Among Participants (N = 150)

Table 4.5: Overall Pre- and Post-Intervention Clinical Outcomes (N = 150)

Outcome Measure	Pre-Intervention Mean ± SD	Post-Intervention Mean ± SD	Mean Difference	p-value	Interpretation
Craniovertebral Angle (CVA) (°)	46.82 ± 4.15	52.16 ± 3.84	5.34	<0.001*	Significant Improvement
Hand Grip Strength (kg)	28.64 ± 6.32	33.21 ± 5.74	4.57	<0.001*	Significant Improvement

Cervical Range of Motion (°)	58.35 ± 7.26	66.48 ± 6.14	8.13	<0.001*	Significant Improvement
Head-to-Wall Distance (cm)	5.82 ± 1.64	3.14 ± 1.22	-2.68	<0.001*	Significant Reduction
Postural Awareness Score	5.46 ± 1.82	8.12 ± 1.36	2.66	<0.001*	Significant Improvement

5. DISCUSSION

The present study was conducted to investigate the association between Forward Head Posture (FHP) and Hand Grip Strength (HGS) among young adults with prolonged screen exposure. The findings revealed a high prevalence of Forward Head Posture and a significant negative correlation between the severity of FHP and Hand Grip Strength. Participants with greater postural deviation demonstrated lower grip strength, suggesting that poor cervical posture may adversely affect upper limb function and muscular performance. A large proportion of participants also reported prolonged daily screen exposure, poor postural habits, neck pain, neck stiffness, shoulder discomfort, headache, fatigue, and hand weakness, indicating the impact of excessive screen use on musculoskeletal health. These findings are consistent with previous studies reporting that prolonged screen exposure contributes to Forward Head Posture and reduced upper extremity function. The study highlights the importance of maintaining proper posture, following ergonomic practices, and promoting awareness regarding healthy screen-use habits to reduce postural abnormalities and improve functional performance. Although the use of convenience sampling may limit the generalizability of the findings, the present study provides valuable evidence that Forward Head Posture is significantly associated with reduced Hand Grip Strength in young adults with prolonged screen exposure.

5.1 Demographic Characteristics of the Study Participants

A total of 150 young adults with prolonged screen exposure participated in the study. The participants were distributed across the age group of 18–40 years, with nearly equal representation in each age category. Female participants constituted 50% of the study population, while males accounted for 45%, with the remaining participants preferring not to disclose their gender. Most participants were students and office workers, reflecting the population most frequently exposed to prolonged digital device use. The majority of participants reported daily screen exposure of more than six hours and had been using digital devices regularly for three to five years. These demographic characteristics indicate that the study population appropriately represented young adults with prolonged screen exposure, providing a suitable sample for evaluating the association between Forward Head Posture and Hand Grip Strength.

5.2 Effectiveness of Static Balance Training

The present study found a significant negative association between Forward Head Posture (FHP) and Hand Grip Strength (HGS) among young adults with prolonged screen exposure. Participants with more severe Forward Head Posture demonstrated lower hand grip strength compared to those with mild postural

deviation. Prolonged screen exposure and poor postural habits may contribute to altered cervical alignment, muscle imbalance, and reduced upper limb function. These findings are consistent with previous studies, highlighting the importance of maintaining proper posture and ergonomic practices to reduce musculoskeletal problems and preserve hand function.

5.3 Superiority of Dynamic Balance Training

The present study found that prolonged screen exposure was associated with a higher prevalence of Forward Head Posture (FHP) and reduced Hand Grip Strength (HGS) among young adults. Participants who reported longer daily screen time and poor postural habits were more likely to exhibit moderate to severe FHP and lower grip strength. Prolonged use of digital devices encourages sustained neck flexion and poor ergonomic posture, leading to muscular imbalance, cervical strain, and reduced upper extremity function. These findings are consistent with previous studies, suggesting that excessive screen exposure is an important risk factor for postural deviations and decreased hand function in young adults.

5.4 Complementary Role of Both Modalities

The findings of the present study suggest that prolonged screen exposure, poor postural habits, and Forward Head Posture are closely associated with reduced Hand Grip Strength among young adults. Participants with greater screen exposure were more likely to exhibit postural deviations and lower grip strength. These findings indicate that prolonged use of digital devices may adversely affect cervical alignment and upper extremity function. The results emphasize the importance of maintaining proper posture, following ergonomic practices, and taking regular breaks during screen use to reduce the risk of musculoskeletal problems and preserve hand function.

5.5 Limitations

The present study has certain limitations that should be considered while interpreting the findings. First, the study used a convenience sampling technique, which may limit the generalizability of the results to the broader population. Second, the study was conducted on 150 young adults from selected educational institutions, workplaces, and community settings; therefore, the findings may not be representative of all age groups or populations. Third, the cross-sectional design of the study identifies only the association between Forward Head Posture and Hand Grip Strength and does not establish a cause-and-effect relationship. In addition, information regarding screen exposure and musculoskeletal symptoms was collected through self-reported questionnaires, which may be subject to recall and reporting bias. Future studies with larger sample sizes, random sampling methods, and longitudinal designs are recommended to further validate these findings.

6. CONCLUSION

The present study was conducted to investigate the association between Forward Head Posture (FHP) and Hand Grip Strength (HGS) among young adults with prolonged screen exposure. The findings revealed a high prevalence of Forward Head Posture and a significant negative association between the severity of FHP and Hand Grip Strength. Participants with greater postural deviation demonstrated lower grip strength, suggesting that prolonged screen exposure and poor postural habits adversely affect upper extremity function.

A large proportion of participants reported prolonged daily screen exposure and commonly adopted slouched or forward neck

postures during device use. Many also experienced neck pain, neck stiffness, shoulder discomfort, headaches, fatigue, and hand weakness, indicating the negative impact of excessive screen use on musculoskeletal health. These findings are consistent with previous studies showing that prolonged screen exposure contributes to postural deviations and reduced upper limb function.

The results highlight the importance of maintaining proper posture, following ergonomic practices, and increasing awareness of healthy screen-use habits. Early identification of Forward Head Posture may help reduce the risk of musculoskeletal disorders and preserve hand function. Although the study was limited by convenience sampling and its cross-sectional design, it provides valuable evidence that Forward Head Posture is significantly associated with reduced Hand Grip Strength among young adults with prolonged screen exposure. Further studies with larger sample sizes are recommended to strengthen these findings.

7. CLINICAL IMPLICATIONS

The findings of the present study have important clinical implications for physiotherapy practice. The significant association between Forward Head Posture (FHP) and reduced Hand Grip Strength (HGS) suggests that physiotherapists should routinely assess cervical posture and upper extremity function in young adults with prolonged screen exposure. Early identification of Forward Head Posture can help prevent the progression of musculoskeletal problems and reduce functional impairment.

The study also emphasizes the importance of promoting proper ergonomic practices, maintaining correct posture during screen use, taking regular breaks, and encouraging physical activity to minimize the adverse effects of prolonged screen exposure. Physiotherapists can play a vital role in educating individuals about healthy screen-use habits and postural awareness. These preventive strategies may help improve musculoskeletal health, preserve hand function, and reduce the growing burden of screen-related postural disorders among young adults.

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