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Neck-Related Problems and Quality of Life Among Technology-Using Faculty Members at Majmaah University, Saudi Arabia: A Cross-Sectional Study

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ABSTRACT

Background: Neck pain is among the most prevalent musculoskeletal conditions affecting working populations globally, with annual prevalence rates ranging from 16.7% to 75.1%. Technology-dependent professionals, including university faculty, are particularly vulnerable due to prolonged static postures and extended device use. Despite growing evidence on neck pain in occupational settings, no published study has applied a disease-specific instrument to assess neck-related quality of life among Saudi academic faculty.

Methods: A cross-sectional study was conducted at various colleges of Majmaah University, Saudi Arabia. A total of 120 faculty members of both genders, aged between 30 and 60 years, with a minimum of one year of technology device exposure, were recruited using convenience sampling. The Neck Outcome Score (NOOS) English version was used to assess neck-related problems across five domains: mobility, symptoms, sleep disturbance, everyday activity, and participation in everyday life. A structured personal information questionnaire captured demographic and occupational data. Non-parametric statistical tests were applied following confirmation of non-normal data distributions.

Results: The sample was predominantly male (63.3%), with the largest age group in the 30–40-year range (46.7%). The Participation in Everyday Life domain recorded the lowest mean normalized score (76.83 ± 5.78), indicating it as the most affected functional area. Gender differences were non-significant across all five NOOS domains. Extended daily working hours (10–14 hours) were significantly associated with lower Participation scores ($p = 0.047$). Higher daily mobile device use was significantly associated with worse Symptoms scores ($p < 0.001$) and reduced Everyday Activity scores ($p = 0.028$). Age-related differences were significant in the Symptoms domain ($p = 0.002$), with faculty aged 40–50 years reporting the greatest symptom burden. Professional experience was significantly associated with Symptoms domain scores across experience groups ($H = 11.271$, $p = 0.010$), with faculty in the 5–10 years experience group reporting the highest symptom burden. Chi-square analyses revealed no statistically significant associations between age group and perceived break sufficiency ($\chi^2(2) = 0.008$, $p = 0.996$), nor between professional experience and ergonomic training participation ($\chi^2(3) = 4.651$, $p = 0.199$).

Conclusion: Neck-related functional impairment is measurable among technology-using faculty at Majmaah University, with daily working hours, mobile device use, age, and professional experience identified as the primary determinants of symptom burden. The findings support the need for institutional interventions including workload regulation, ergonomic training programs, and physical activity promotion to reduce cervical burden in academic settings.

Keywords: Neck pain; Neck OutcOme Score; NOOS; quality of life; technology use; faculty members; occupational health; Saudi Arabia; Majmaah University.

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INTRODUCTION

Neck pain, also referred to as cervicalgia, is one of the most common musculoskeletal disorders affecting the global working population. Annual prevalence rates range from 16.7% to 75.1% across different geographic regions, as reported by Hadamus et al. (2021) [1]. In 2019, the condition was recorded at an incidence rate of 27.0 cases per 1,000 individuals, placing it among the leading contributors to years lived with disability worldwide, according to Kazeminasab et al. (2022) [2]. The economic burden of neck pain is considerable; Lezin and Watkins-Castillo (2016) [3] reported that in 2012, approximately 25.5 million working-age Americans missed an average of 11.4 working days due to cervical pain. Cohen et al. (2015) [4] identified neck pain as the fourth leading cause of disability, with an annual prevalence exceeding 30%, and noted that nearly half of all affected individuals continue to experience symptoms despite receiving treatment. While around 10% of neck pain cases are linked to systemic conditions such as arthritis, tumors, and infections, the majority are non-specific and are associated with occupational, behavioral, and ergonomic factors. Duman and Timur (2018) [5] and Hallman et al. (2017) [6] confirmed that neck problems can affect sleep quality and reduce a person's ability to perform the physical demands of their daily work. James et al. (2018) [7] analyzed neck pain data from 195 countries and found consistent evidence of its negative impact on health-related quality of life. Safiri et al. (2020) [8] further showed that disability-adjusted life years attributable to neck pain remained largely unchanged between 1990 and 2017, indicating that the condition continues to represent a significant unresolved public health concern.

The increasing use of digital technology in professional and leisure settings has been widely identified as a modifiable risk factor for neck disorders. Jensen et al. (2003) [9] demonstrated a dose-response relationship between daily computer use and the onset of neck and upper-limb symptoms among office workers. Cagnie et al. (2007) [10] found that monitor positioning, psychosocial stress, and habitual posture were significant predictors of neck pain in office employees. Jahre et al. (2020) [11] conducted a systematic review. They concluded that prolonged sitting, high workloads, static postures, insufficient physical activity, and extended computer use were the most consistently reported risk factors for non-specific neck pain. Hoy et al. (2010) [12] reported that the 12-month incidence of neck pain among office and computer workers ranges from 10.4% to 21.3%, which is notably higher than the general population estimate, underscoring the particular vulnerability of technology-dependent professionals. Work-related musculoskeletal disorders, which include damage to muscles, tendons, nerves, ligaments, and intervertebral discs, most commonly present with pain, stiffness, and functional limitation, and neck disorders are their most frequent occupational expression in digital work environments.

Within the Saudi Arabian context, studies indicate that technology-related neck problems are prevalent and remain inadequately addressed at the institutional level. Almalki et al. (2017) [13] found significant associations between daily smartphone, laptop, and tablet use and non-specific neck pain among university students in Taif, identifying gender and device type as relevant correlates of symptom severity. Sirajudeen et al. (2018) [14] surveyed 60 faculty members at the College of Applied Medical Sciences, Majmaah University, and found that neck complaints were the most prevalent work-related musculoskeletal disorder, affecting 53.5% of participants. Algarni et al. (2022) [15] conducted a large cross-sectional study involving 2,042 Saudi workers using the SF-36 questionnaire. They reported that neck and back pain were the most frequently recorded musculoskeletal complaints in the preceding 12 months. Mohammadipour et al. (2018) [16] documented a 55.2% prevalence of neck musculoskeletal disorders among Iranian university office workers, while Hey et al. (2021) [17] found in a Singaporean population study that symptom chronicity and severity were directly associated with reduced quality of life. Kazeminasab et al. (2022) [2] also highlighted that age, sex, and long-term psychosocial stress independently influence the prevalence and progression of cervical pain, with older populations carrying a greater symptom burden.

Despite a growing body of evidence on neck pain prevalence and its functional consequences, a clear research gap exists regarding the domain-specific impact of technology use on cervical quality of life among Saudi academic faculty, who depend on digital devices as a central professional requirement. Most previous studies have used generic health instruments such as the SF-36, which are not designed to capture the specific functional dimensions of neck disability, including mobility restriction, activity-specific pain, and participation limitations. The Neck Outcome Score (NOOS), developed and validated by Juul et al. (2015) [18], is a disease-specific, self-administered questionnaire that measures neck-related problems across five domains: mobility, symptoms, sleep disturbance, everyday activity, and participation in everyday life. No published study to date has applied the NOOS or a comparable disease-specific instrument to examine the relationship between technology usage patterns and neck-related quality of life in Saudi university faculty, representing a clear gap in the occupational health literature.

Accordingly, this study was designed to address this gap through two objectives: (1) to assess the prevalence and severity of neck-related problems among technology-using faculty members at Majmaah University, Saudi Arabia, using the NOOS instrument across its five functional domains; and (2) to examine the associations between demographic and occupational characteristics — including age, gender, BMI, daily working hours, physical activity levels, ergonomic training, and technology device usage — and neck-related quality of life outcomes among the study population.

METHODOLOGY

2.1 Research Design

A cross-sectional observational study design was employed to assess the prevalence of neck-related problems and their association with technology usage patterns and demographic characteristics among faculty members at Majmaah University, Saudi Arabia.

2.2 Population

The target population comprised university faculty members of both genders, aged between 30 and 60 years, employed at various colleges of Majmaah University, Saudi Arabia, with a minimum of one year of occupational exposure to digital technology devices.

2.3 Sample and Sampling Method

A convenience sampling technique was adopted to recruit a total of 120 faculty members from various colleges across Majmaah University. A sample size of 120 participants was determined based on the recommendations of Krejcie and Morgan (1970) [19] for cross-sectional survey studies, which indicate that a minimum of 118 participants is required to adequately represent a finite population of approximately 200 faculty members at Majmaah University, with a confidence level of 95% and a margin of error of 5%. This sample size was further supported by reference to comparable published studies examining neck pain and musculoskeletal outcomes in similar academic populations; Sirajudeen et al. (2018) [14] employed a sample of 60 faculty members, while Algarni et al. (2022) [15] utilized a substantially larger sample of 2,042 workers, confirming that 120 participants represent an adequate and scientifically defensible sample for a single-institution cross-sectional study of this nature. Additionally, given the non-parametric statistical methods employed — specifically the Mann-Whitney U test and Kruskal-Wallis H test — a sample of 120 provides sufficient statistical power (> 0.80) to detect medium-effect-size differences across the demographic and occupational subgroups examined in this study.

2.4 Selection Criteria

Inclusion criteria: Faculty members of both genders aged between 30 and 60 years, with a minimum of one year of occupational experience involving regular use of technological devices, were eligible for inclusion.

Exclusion criteria: Individuals with chronic systemic conditions, recent bone fractures, those currently receiving pharmacological treatment for musculoskeletal disorders, undergoing active physiotherapy, or who had undergone surgery within the preceding six months were excluded from participation.

2.5 Study Setting

The study was conducted across multiple colleges of Majmaah University, Saudi Arabia.

2.6 Variables of the Study

Dependent variables: Neck-related quality of life outcomes as quantified by the five normalized domain scores of the NOOS instrument: mobility, symptoms, sleep disturbance, everyday activities, and participation in everyday life.

Independent variables: Demographic and occupational characteristics, including age, gender, body mass index, educational qualification, years of professional experience, daily working hours, light and hard physical activity levels, daily usage duration of technology devices (mobile phone, tablet, laptop, and entertainment devices), external mouse use, perceived break sufficiency, and prior ergonomic training participation.

2.7 Instruments Used

Two instruments were used for data collection. The first was a structured personal information questionnaire designed to capture relevant demographic and occupational data. The second was the Neck OutcOme Score (NOOS) English version, a disease-specific, self-administered patient-reported outcome measure developed and validated by Juul et al. (2015) [18] to assess patients' perception of neck-related problems in alignment with the International Classification of Functioning framework established by the World Health Organization. The NOOS English version comprises 34 items distributed across five subscales: Mobility (7 items), Symptoms (5 items), Sleep Disturbance (4 items), Everyday Activity and Pain (8 items), and Participation in Everyday Life (4 items, inclusive of quality of life). Each item is scored on a five-point Likert scale from 0 to 4, with participant responses reflecting their experience over the preceding week. Each subscale is assigned a normalized score ranging from 0 to 100, where 100 indicates no impairment, and 0 indicates maximum severity of symptoms. The instrument requires approximately 10–15 minutes to complete. Content validity was established through focus group interviews involving 24 neck pain patients and 12 healthcare professionals, and psychometric properties — including reliability, validity, interpretability, and responsiveness — were examined in a sample of 196 neck pain patients.

2.8 Procedure

Following ethical approval from the Institutional Review Board of Majmaah University and prior to data collection, eligible faculty members across the university's colleges were identified through departmental coordination. All potential participants received a clear written explanation of the study's purpose, procedures, confidentiality measures, and the voluntary nature of involvement, after which written informed consent was obtained from those who agreed to participate. Eligible participants then completed a two-part data collection package administered individually. The first component was the structured personal information questionnaire capturing demographic and occupational data, including age, gender, body mass index, educational qualification, years of professional experience, daily working hours, physical activity levels, types and daily durations of technology device usage, external mouse use, perceived break sufficiency, and prior ergonomic training history. The second component was the self-administered

NOOS English version questionnaire, distributed in paper form with individual guidance provided to each participant to ensure consistent comprehension of all items. A total of 120 completed questionnaire packages were returned, constituting the full study sample. All data were handled with strict confidentiality and used solely for research purposes.

The complete participant flow from eligibility assessment to final analysis is illustrated in Figure 1.

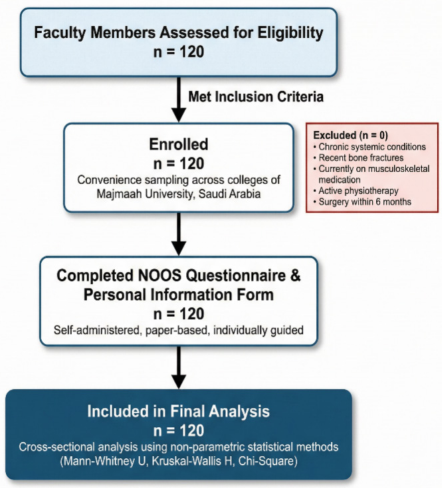

Figure 1. STROBE flow diagram illustrating participant enrollment, eligibility assessment, and inclusion in the final analysis.

Figure 1: STROBE flow diagram illustrating participant eligibility assessment, enrollment, and inclusion in the final analysis (n = 120).

2.9 Statistical Analysis

All data were entered and analyzed using IBM SPSS Statistics. Prior to inferential analysis, the normality of all continuous variables was assessed using the Kolmogorov-Smirnov and Shapiro-Wilk tests. All tested variables yielded statistically significant deviations from normality ($p < 0.05$), confirming non-normal data distributions across the entire dataset and necessitating the use of non-parametric statistical methods for all subsequent analyses. The Mann-Whitney U test was applied to compare NOOS domain scores between two independent groups — specifically gender (male vs. female) and daily working hours (6–10 hours vs. 10–14 hours) — as it represents the appropriate non-parametric equivalent of the independent samples t-test for non-normally distributed data. The Kruskal-Wallis H test was employed to examine differences in NOOS domain scores across three or more independent groups, including age categories (30–40, 40–50, and 50–60 years), daily mobile use categories (1–5, 5–10, and 10–15 hours per day), and professional experience groups (< 1, 1–5, 5–10, and 10–15 years), functioning as the non-parametric equivalent of one-way ANOVA. Chi-square tests of independence were used to assess associations between categorical variables, specifically the relationship between age group and perceived break sufficiency, and between professional experience category and ergonomic training participation. A p-value of < 0.05 was set as the threshold for statistical significance across all analyses. The sample size of 120 participants was verified to provide sufficient statistical power (> 0.80) for the non-parametric tests applied, consistent with the threshold established by Krejcie and Morgan (1970) [19] for populations of comparable size.

2.10 Ethical Issues

Ethical approval for this study was obtained from the Majmaah University Research Ethics Committee (MUREC) prior to data collection (IRB No.: MUREC-May.7COM-2023/15-3; MUREC Ref.: HA-01-R-088; Approval Date: 7 May 2023). All participants provided written informed consent before enrollment, and participation was entirely voluntary with the right to withdraw at any time without consequence. Participant confidentiality and data anonymity were strictly maintained throughout all stages of the study. The study was conducted in full accordance with the ethical conditions stipulated by MUREC, including prompt reporting of any protocol amendments, adverse effects, or unforeseen events affecting the ethical acceptability of the research.

RESULTS

The demographic and occupational characteristics of the 120 participants are summarised in Tables 1–10. The sample was predominantly male (63.3%, n=76), with the largest age group falling within the 30–40-year range (46.7%, n=56). The majority held doctoral qualifications (56.7%, n=68), and over half reported 10–15 years of professional experience (51.7%, n=62). A considerable proportion was classified as overweight by BMI criteria (56.7%, n=68). Regarding physical activity, 55.0% (n=66) reported no engagement in light physical activity and 83.3% (n=100) reported no engagement in hard physical activity. Daily working hours exceeded 10 hours for 53.3% of participants (n=64), and mobile device usage of 5–10 hours per day was reported by 65.0% (n=78).

Table 1: Gender Composition of Study Participants

Gender	Frequency (n)	Percent (%)	Valid %	Cumulative %
Male	76	63.30%	63.30%	63.30%
Female	44	36.70%	36.70%	100.00%
Total	**120**	**100.00%**	**100.00%**	

Table 2: Age Distribution of Study Participants

Age Group (Years)	Frequency (n)	Percent (%)	Valid %	Cumulative %
30–40 Years	56	46.70%	46.70%	46.70%
40–50 Years	36	30.00%	30.00%	76.70%
50–60 Years	28	23.30%	23.30%	100.00%
Total	**120**	**100.00%**	**100.00%**	

Table 3: BMI Distribution of Study Participants

BMI Category	Frequency (n)	Percent (%)	Valid %	Cumulative %
Normal Weight	36	30.00%	30.00%	30.00%
Overweight	68	56.70%	56.70%	86.70%
Obese	16	13.30%	13.30%	100.00%
Total	**120**	**100.00%**	**100.00%**	

Table 4: Education Level Distribution of Study Participants

Education Level	Frequency (n)	Percent (%)	Valid %	Cumulative %
Bachelor (BS)	14	11.70%	11.70%	11.70%
Master (MSc.)	38	31.70%	31.70%	43.30%
Doctorate (Ph.D.)	68	56.70%	56.70%	100.00%
Total	**120**	**100.00%**	**100.00%**	

Table 5: Physical Activity Levels Among Study Participants

Activity Type and Level	Frequency (n)	Percent (%)	Valid %	Cumulative %
Light Physical Activity — None (0 h/day)	66	55.00%	55.00%	55.00%
Light Physical Activity — < 2 h/day	54	45.00%	45.00%	100.00%
Light Physical Activity — Total	**120**	**100.00%**	**100.00%**	
Hard Physical Activity — None (0 h/day)	100	83.30%	83.30%	83.30%
Hard Physical Activity — < 2 h/day	20	16.70%	16.70%	100.00%
Hard Physical Activity — Total	**120**	**100.00%**	**100.00%**	

Table 6: Professional Experience Distribution Among Study Participants

Experience (Years)	Frequency (n)	Percent (%)	Valid %	Cumulative %
< 1 Year	14	11.70%	11.70%	11.70%
1–5 Years	26	21.70%	21.70%	33.40%
5–10 Years	18	15.00%	15.00%	48.40%
10–15 Years	62	51.70%	51.70%	100.00%
Total	**120**	**100.00%**	**100.00%**	

Table 7: Daily Working Hours Distribution

Daily Working Hours	Frequency (n)	Percent (%)	Valid %	Cumulative %
6–10 Hours	56	46.70%	46.70%	46.70%
10–14 Hours	64	53.30%	53.30%	100.00%
Total	**120**	**100.00%**	**100.00%**	

Table 8: Daily Mobile Use Hours Distribution

Daily Mobile Use (Hours)	Frequency (n)	Percent (%)	Valid %	Cumulative %
1–5 Hours	26	21.70%	21.70%	21.70%
5–10 Hours	78	65.00%	65.00%	86.70%
10–15 Hours	16	13.30%	13.30%	100.00%
Total	**120**	**100.00%**	**100.00%**	

Table 9: Daily Tablet Use Hours Distribution

Daily Tablet Use (Hours)	Frequency (n)	Percent (%)	Valid %	Cumulative %
None (0 Hours)	56	46.70%	46.70%	46.70%
1–5 Hours	64	53.30%	53.30%	100.00%
Total	**120**	**100.00%**	**100.00%**	

Table 10: Daily Entertainment Device Usage Distribution

Daily Entertainment Device Use (Hours)	Frequency (n)	Percent (%)	Valid %	Cumulative %
1–5 Hours	82	68.30%	68.30%	68.30%
5–10 Hours	38	31.70%	31.70%	100.00%
Total	**120**	**100.00%**	**100.00%**	

NOOS domain scores across the five subscales are presented in Table 11. Mean normalized scores are reported for each domain, with higher scores indicating fewer impairments.

Table 11: NOOS Domain Descriptive Statistics (n = 120)

NOOS Domain	N	Mean	SD (±)	Median	IQR	Min	Max	Shapiro-Wilk p	Distribution
Mobility	120	54.7	3.73	57.14	3.57	42.86	60.71	< 0.001	Non-normal
Symptoms	120	91.25	9.55	95	20	65	100	< 0.001	Non-normal

Sleep Disturbance	120	93.54	10.18	100	12.5	75	100	< 0.001	Non-normal
Everyday Activity and Pain	120	92.08	9.05	95.31	15.62	75	100	< 0.001	Non-normal
Participation in Everyday Life	120	76.83	5.78	80	5.62	60	85	< 0.001	Non-normal

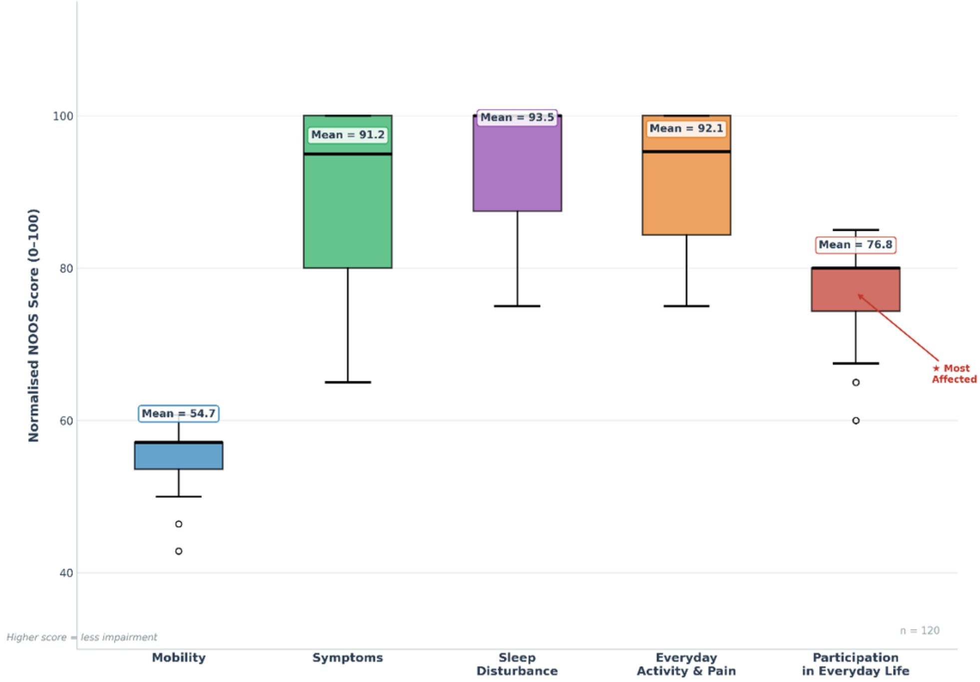

Figure 2. Box plot of normalized NOOS domain scores across five functional subscales (n = 120). The median is represented by the bold horizontal line; boxes denote the interquartile range (Q1–Q3); whiskers extend to minimum and maximum non-outlier values. Higher scores indicate less impairment. ★ Participation in Everyday Life recorded the lowest mean score (76.83), indicating the most affected functional domain.

Table 12A: Normality Assessment — Shapiro-Wilk Test

NOOS Domain	N	p-value	Decision	Justification
Mobility	120	< 0.001	Non-normal	Non-parametric tests required
Symptoms	120	< 0.001	Non-normal	Non-parametric tests required
Sleep Disturbance	120	< 0.001	Non-normal	Non-parametric tests required
Everyday Activity and Pain	120	< 0.001	Non-normal	Non-parametric tests required
Participation in Everyday Life	120	< 0.001	Non-normal	Non-parametric tests required

Gender and NOOS Domain Scores

Mann-Whitney U test comparisons between male and female participants revealed no statistically significant differences across any of the five NOOS domains ($p > 0.05$ for all domains), indicating that neck-related quality of life outcomes were broadly comparable between genders in this sample.

Table 12B — Mann-Whitney U Test: Gender (Male n = 76 vs Female n = 44)

NOOS Domain	Male Median	Female Median	U Statistic	p-value	Significance
Mobility	57.14	57.14	1,480.00	0.241	Not Significant
Symptoms	95	95	1,752.00	0.651	Not Significant
Sleep Disturbance	100	100	1,698.00	0.866	Not Significant
Everyday Activity and Pain	95.31	96.88	1,826.00	0.373	Not Significant
Participation in Everyday Life	80	80	1,716.00	0.781	Not Significant

No statistically significant gender differences were found across any NOOS domain (all $p > 0.05$).

Daily Working Hours and NOOS Domain Scores

Mann-Whitney U test analysis demonstrated a statistically significant difference between participants working 6–10 hours and those working 10–14 hours per day in the Participation in Everyday Life domain ($p < 0.05$), with participants reporting longer working hours yielding lower normalized scores, indicating greater functional limitation in daily participation. No significant differences were observed in the remaining four NOOS domains.

Table 12C — Mann-Whitney U Test: Daily Working Hours (6–10 h n = 56 vs 10–14 h n = 64)

NOOS Domain	6–10 h Median	10–14 h Median	U Statistic	p-value	Significance
Mobility	57.14	57.14	1,626.00	0.328	Not Significant
Symptoms	95	95	1,728.00	0.727	Not Significant
Sleep Disturbance	100	100	1,656.00	0.385	Not Significant
Everyday Activity and Pain	93.75	98.44	1,698.00	0.601	Not Significant
Participation in Everyday Life	**80**	**80**	**1,470.00**	**0.047**	**Significant**

Faculty working 10–14 hours daily demonstrated significantly greater limitation in participation in everyday life (p = 0.047).

Daily Mobile Use and NOOS Domain Scores

Kruskal-Wallis H test analysis revealed statistically significant differences across mobile use categories (1–5, 5–10, and 10–15 hours per day) in both the Symptoms domain ($H = 16.15$, $p < 0.001$), with higher daily mobile use associated with greater symptom burden, and the Everyday Activity and Pain domain ($H = 7.12$, $p = 0.028$), with higher daily mobile use associated with reduced everyday activity and pain scores. No statistically significant differences were identified in the Mobility, Sleep Disturbance, or Participation in Everyday Life domains across mobile use groups.

Table 12D — Kruskal-Wallis H Test: Daily Mobile Use (1–5 h n = 26 | 5–10 h n = 78 | 10–15 h n = 16)

NOOS Domain	1–5 h Median	5–10 h Median	10–15 h Median	H Statistic	p-value	Significance
Mobility	57.14	57.14	53.57	2.89	0.235	Not Significant
Symptoms	**95**	**95**	**80**	**16.15**	**< 0.001**	**Significant**
Sleep Disturbance	100	100	93.75	1.58	0.453	Not Significant
Everyday Activity and Pain	**93.75**	**100**	**87.5**	**7.12**	**0.028**	**Significant**
Participation in Everyday Life	80	80	80	2.04	0.361	Not Significant

Higher daily mobile use was significantly associated with worse Symptoms ($H = 16.15$, $p < 0.001$) and reduced Everyday Activity scores ($H = 7.12$, $p = 0.028$)

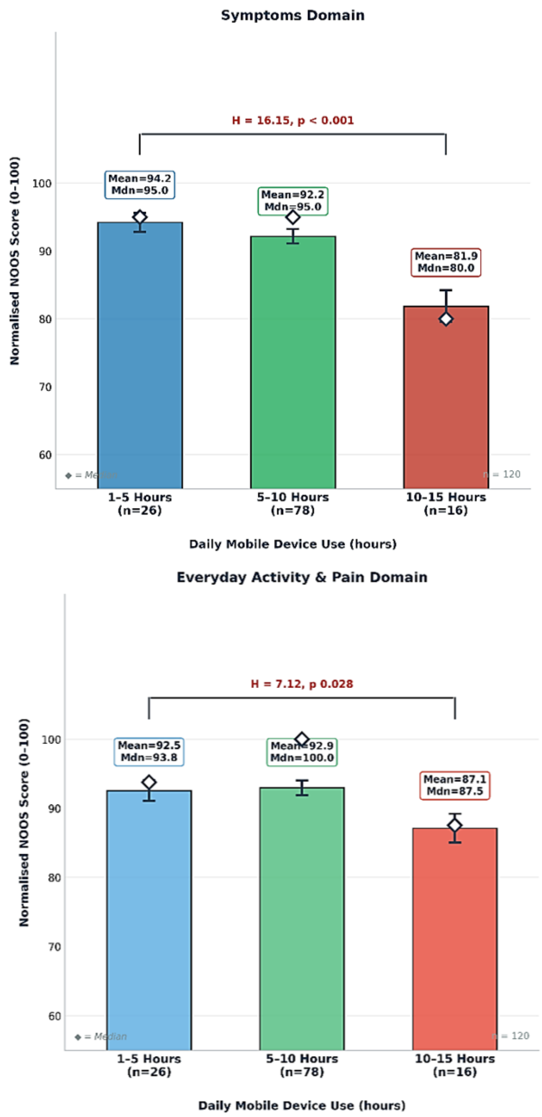

Figure 3. Mean normalised NOOS scores for the Symptoms and Everyday Activity & Pain domains across daily mobile device use categories (1–5 h, 5–10 h, 10–15 h). Bars represent group means; dashed horizontal lines indicate median values; error bars denote ±standard error of the mean. Statistical significance was assessed using the Kruskal–Wallis H test (Symptoms: $H = 16.15$, $p < 0.001$; Everyday Activity: $H = 7.12$, $p = 0.028$).

Age and NOOS Domain Scores

Kruskal-Wallis H test results indicated a statistically significant difference across age groups (30–40, 40–50, and 50–60 years) in the Symptoms domain ($H = 12.15$, $p = 0.002$). The pattern was non-linear: the 40–50-year age group reported the greatest symptom burden (Median = 87.50), while the 50–60-year group recorded the lowest impairment (Median = 100.00). No statistically significant differences were identified across the remaining four NOOS domains (all $p > 0.05$), as presented in Table 12E. The non-linear age-related pattern in the Symptoms domain is further illustrated in Figure 4.

Table 12E — Kruskal-Wallis H Test: Age Groups (30–40 n = 56 | 40–50 n = 36 | 50–60 n = 28)

NOOS Domain	30–40 Median	40–50 Median	50–60 Median	H Statistic	p-value	Significance
Mobility	57.14	57.14	57.14	0.193	0.908	Not Significant
Symptoms	**95**	**87.5**	**100**	**12.15**	**0.002**	**Significant**
Sleep Disturbance	100	100	100	1.63	0.442	Not Significant
Everyday Activity and Pain	96.88	93.75	100	4.4	0.111	Not Significant
Participation in Everyday Life	80	80	80	0.57	0.751	Not Significant

Significant age-related differences were found in the Symptoms domain (H = 12.15, p = 0.002), with the 40–50 age group reporting the greatest symptom burden (median = 87.50).

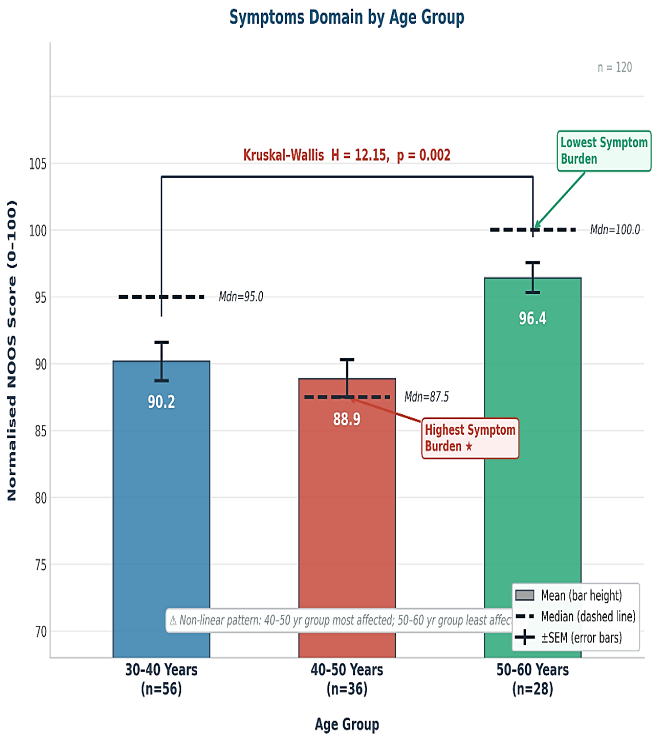

Figure 4. Mean normalised NOOS Symptoms domain scores across three age groups (30–40, 40–50, and 50–60 years). Bars represent group means; dashed horizontal lines indicate median values; error bars denote ±standard error of the mean. A statistically significant non-linear pattern was identified (Kruskal–Wallis H = 12.15, p = 0.002), with faculty aged 40–50 years recording the greatest symptom burden (Mean = 88.89, Median = 87.50) and the 50–60-year group recording the lowest (Mean = 96.43, Median = 100.00).

Chi-Square Analyses

Chi-square tests of independence were conducted to examine associations between categorical demographic variables and occupational health behaviors. No statistically significant association was found between age group and perceived break sufficiency ($\chi^2(2) = 0.008$, $p = 0.996$), nor between professional experience category and ergonomic training participation ($\chi^2(3) = 4.651$, $p = 0.199$). The observed frequencies and test statistics are presented in Tables 12F-A and 12F-B.

Table 12F-A — Chi-Square: Age Group × Perceived Break Sufficiency

Age Group	Breaks Insufficient (No)	Breaks Sufficient (Yes)	Total
30–40 Years	16	40	56
40–50 Years	10	26	36
50–60 Years	8	20	28
Total	**34**	**86**	**120**
$\chi^2(2) = 0.008$, df = 2, p = 0.996			

Note: No significant association was observed between age group and perceived break sufficiency (p = 0.996). Break patterns were proportionally distributed across all age groups.

Table 12F-B — Chi-Square: Professional Experience × Ergonomic Training

Experience (Years)	No Training	Underwent Training	Total
< 1 Year	6	8	**14**
1–5 Years	16	10	**26**
5–10 Years	14	4	**18**
10–15 Years	42	20	**62**
Total	78	42	**120**
$\chi^2(3) = 4.651$, df = 3, p = 0.199			

Note: No statistically significant association was observed between professional experience and ergonomic training participation. Training uptake was not significantly influenced by years of professional experience (p = 0.199).

Professional Experience and NOOS Domain Scores

Kruskal-Wallis H test was conducted to examine differences in NOOS domain scores across four professional experience groups (< 1, 1–5, 5–10, and 10–15 years). A statistically significant difference was identified in the Symptoms domain (H = 11.271, p = 0.010), with faculty members in the 5–10 years experience group reporting the highest symptom burden (Median = 85.00) compared to those with 1–5 years of experience (Median = 100.00). No statistically significant differences were found across the remaining four NOOS domains (Table 12G).

Table 12G — Kruskal-Wallis H Test: Professional Experience
(< 1 yr n = 14 | 1–5 yrs n = 26 | 5–10 yrs n = 18 | 10–15 yrs n = 62)

NOOS Domain	< 1 yr Median	1–5 yrs Median	5–10 yrs Median	10–15 yrs Median	H Statistic	p-value	Significance
Mobility	57.14	57.14	57.14	57.14	1.026	0.795	Not Significant
Symptoms	**90**	**100**	**85**	**95**	**11.271**	**0.01**	**Significant ✓**
Sleep Disturbance	100	100	93.75	100	4.086	0.252	Not Significant
Everyday Activity and Pain	93.75	100	87.5	93.75	2.552	0.466	Not Significant
Participation in Everyday Life	80	80	80	80	3.768	0.288	Not Significant

Note: Significant differences across professional experience groups were found in the Symptoms domain only ($H = 11.271$, $p = 0.010$), with faculty in the 5–10 years experience group reporting the greatest symptom burden (Median = 85.00). No significant differences were observed in the remaining four NOOS domains (all $p > 0.05$).

DISCUSSION

The findings of this study provide novel, institution-specific evidence regarding the prevalence and functional impact of neck-related problems among technology-using faculty members at Majmaah University, Saudi Arabia, as measured by the disease-specific NOOS instrument. The results are discussed in the context of existing literature across five thematic areas: symptom prevalence, the influence of working hours and technology usage, age-related patterns, professional experience and symptom burden, and physical activity and ergonomic training.

Neck Symptoms and General Prevalence

The NOOS domain scores obtained in the present study reflect a measurable degree of cervical functional impairment across the sample, consistent with the broader literature documenting high neck pain prevalence in technology-dependent occupational groups. These findings align with those of Sirajudeen et al. (2018) [14], who reported neck complaints in 53.5% of faculty members at Majmaah University's College of Applied Medical Sciences, and with Algarni et al. (2022) [15], who identified neck pain as the most frequently reported musculoskeletal complaint among 2,042 Saudi workers. The absence of statistically significant gender differences across all five NOOS domains in the present study is consistent with Kazeminasab et al. (2022) [2], who noted that while sex may modulate the long-term trajectory of neck pain, acute cross-sectional differences between genders are frequently non-significant in occupational cohorts, particularly where work demands and technology exposure are broadly comparable between male and female employees.

Daily Working Hours and Participation

The significant association between extended daily working hours (10–14 hours) and reduced scores in the Participation in Everyday Life domain corroborates the findings of Jahre et al. (2020), whose systematic review identified high workload and prolonged occupational sitting as primary determinants of functional cervical limitation. Faculty members working beyond 10 hours daily are exposed to substantially greater cumulative static postural loading, which, in the absence of structured rest intervals, is associated with progressive musculoskeletal fatigue and reduced functional participation in daily activities. This interpretation is further supported by Hoy et al. (2010), who documented a dose-dependent relationship between occupational computer exposure duration and the 12-month incidence of neck pain among office workers. Chi-square analysis, however, revealed no statistically significant association between age group and perceived break sufficiency ($\chi^2(2) = 0.008$, $p = 0.996$), indicating that break patterns were proportionally distributed across age groups and were not independently predictive of participation outcomes in this sample.

Mobile Device Usage and Cervical Symptoms

The significant association between high daily mobile use and elevated scores in the Symptoms domain is consistent with Almalki et al. (2017), who documented significant relationships between smartphone and tablet use duration and non-specific neck pain frequency in Saudi university students. The postural demands of prolonged handheld device use — characterized by sustained forward head positioning and cervical flexion — are mechanistically linked to increased compressive loads on the cervical spine, contributing to the symptom burden observed in the highest mobile use group (10–15 hours per day). These findings reinforce the observations of Cagnie et al. (2007), who identified device-related postural habits as independent predictors of neck symptom onset in office-based professionals, and suggest that mobile device usage patterns represent a particularly modifiable occupational health risk in the current sample.

Age-Related Patterns and Cumulative Exposure

The Kruskal-Wallis analysis revealed statistically significant differences across age groups in the Symptoms domain ($H = 12.15$, $p = 0.002$), with the 40–50-year age group reporting the greatest symptom burden (Median = 87.50), followed by the 30–40-year group (Median = 95.00) and the 50–60-year group (Median = 100.00). This pattern is consistent with Kazeminasab et al. (2022), who described the cumulative effect of age and long-term occupational stress on the severity and chronicity of cervical pain. The mid-career cohort (40–50 years) may represent a period of peak occupational demand — combining sustained technology exposure with high administrative and academic workload — contributing disproportionately to symptom accumulation. This pattern mirrors the findings of Hey et al. (2021), who reported that symptom chronicity was directly associated with measurable quality-of-life deterioration across multiple functional domains. Chi-square analysis revealed no statistically significant association between professional experience category and ergonomic training participation ($\chi^2(3) = 4.651$, $p = 0.199$), suggesting that training uptake was distributed independently of seniority level across this sample.

Professional Experience and Symptom Burden

Kruskal-Wallis analysis further revealed a statistically significant difference in Symptoms domain scores across professional experience groups ($H = 11.271$, $p = 0.010$). Faculty members with 5–10 years of experience reported the greatest symptom burden (Median = 85.00), while those with 1–5 years reported the lowest (Median = 100.00). This non-linear pattern may reflect a critical transition period in academic careers, during which faculty face increasing workload pressures, expanded research responsibilities, and sustained technology dependency, without yet having developed the ergonomic awareness or institutional support typically associated with more senior positions. No significant differences were observed across experience groups in the remaining four NOOS domains (all $p > 0.05$), suggesting that the impact of professional tenure is domain-specific and most pronounced in subjective symptom perception rather than in functional activity or participation outcomes.

Physical Activity and Ergonomic Training

The markedly sedentary profile of the present sample — with 55.0% reporting no light physical activity and 83.3% reporting no hard physical activity — constitutes an independent risk amplifier for cervical musculoskeletal morbidity. Jahre et al. (2020) identified physical inactivity as one of the most consistently reported modifiable risk factors for neck pain across both occupational and student populations, and the near-absence of vigorous physical activity in the majority of the current sample aligns with this risk profile. The low rates of ergonomic training participation across all experience levels further compound this vulnerability by limiting awareness of posture optimization, device positioning, and structured rest strategies that are clinically established as protective against technology-related cervical strain.

Limitations

Several methodological limitations of the present study warrant acknowledgment. First, the cross-sectional design precludes causal inference regarding the observed associations between technology usage patterns and neck-related quality of life outcomes; longitudinal designs will be required to establish directionality. Second, the use of convenience sampling from a single university limits the generalisability of findings to other Saudi academic institutions or broader occupational populations. Third, the gender imbalance in the sample—with males constituting 63.3% of participants—may have reduced statistical power for detecting gender-specific differences in NOOS outcomes. Fourth, the reliance on self-reported data for technology usage duration and physical activity levels introduces the potential for recall bias. Fifth, the absence of objective clinical measurements—such as cervical range of motion assessments or radiological findings—limits the depth of physiological characterization of the study population. Future research should address these limitations through prospective longitudinal designs, stratified random sampling across multiple institutions, and the integration of objective clinical measures alongside patient-reported outcomes.

CONCLUSION

The present study assessed the prevalence of neck-related problems and their association with technology usage patterns and demographic characteristics among faculty members at Majmaah University, Saudi Arabia, using the disease-specific Neck Outcome Score. The findings confirm that neck-related impairment is present across the sample, with the Participation in Everyday Life domain recording the lowest normalized scores (Mean = 76.83), indicating that daily quality of life is the functional area most affected by neck problems in this population. Extended daily working hours (10–14 hours) were significantly associated with greater limitation in participation outcomes ($p = 0.047$). In contrast, higher daily mobile device use was significantly associated with worse symptom scores ($p < 0.001$) and reduced everyday activity scores ($p = 0.028$). Age-related differences were most evident in the Symptoms domain ($p = 0.002$), with faculty aged 40–50 years reporting the greatest symptom burden (Median = 87.50). Gender did not significantly influence any NOOS domain, suggesting that occupational and technological exposure patterns are stronger determinants of neck-related quality of life than biological sex in this cohort. Chi-square tests of independence, however, revealed no statistically significant association between age group and perceived break sufficiency ($\chi^2(2) = 0.008$, $p = 0.996$), nor between professional experience and ergonomic training participation ($\chi^2(3) = 4.651$, $p = 0.199$), indicating that these behaviors were distributed proportionally across demographic subgroups.

Based on the findings, the following practical recommendations are proposed:

Workload management: Daily working hours for academic staff should be structured to prevent sustained exposure beyond 10 hours, with scheduled rest periods embedded in institutional policy.

Mobile device guidance: Awareness campaigns should be directed at faculty members to encourage limitation of prolonged mobile phone use, given the significant association between daily mobile use duration and cervical symptom burden.

Ergonomic training: Ergonomic education should be incorporated into faculty development programs, with emphasis on correct device positioning, workstation setup, and postural awareness, particularly targeting early-career staff who demonstrated the lowest training participation.

Health screening for older faculty: Routine cervical health monitoring and referral pathways to physiotherapy services should be established for faculty in the 40–60-year age range, given the age-related symptom deterioration identified.

Physical activity promotion: Institutional health programs should encourage regular physical activity among faculty, addressing the predominantly sedentary profile of the sample and its established relationship with musculoskeletal morbidity.

Future research should address the limitations of this study through the following directions:

- Longitudinal study designs are needed to establish causal relationships between technology usage and neck-related quality of life outcomes.
- Multi-institutional sampling across Saudi universities would improve the generalisability of these findings beyond the Majmaah University context.
- Integration of objective clinical measures, including cervical range of motion and postural assessment, would complement the self-reported outcomes used in the present study.
- Intervention studies evaluating the effectiveness of ergonomic training and workload management on NOOS domain scores are warranted to translate these findings into clinical practice.
- Device-specific analyses examining the individual contributions of mobile phone, laptop, and tablet use to cervical health outcomes would further refine targeted prevention strategies.

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