



Original Article

The role of psychological patterns and duration of smartphone and laptop use on neck pain

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Abstract

Introduction: The present study investigates the role of psychological patterns and the duration of smartphone and laptop use on neck pain.

Materials and Methods: The statistical population of this correlational study included all students of Ferdowsi University of Mashhad-Iran, in the academic year of 2021-2022. Two-hundred forty-two students were selected by the multi-stage cluster method. The data were gathered through NEO Personality Inventory (NEO-PI), Depression, Anxiety, Stress Scale (DASS-21), Nordic Neck Pain Scale, and a researcher-made questionnaire to check smartphone and laptop usage hours. Information and data were analyzed using the structural equation model.

Results: The results showed that personality traits and their dimensions (such as flexibility, neuroticism, introversion/extroversion, work conscientiousness, and agreeableness), psychological stress and its subscales (anxiety, depression, and stress), and the duration of using smartphone and laptop could not have a significant effect on neck pain ($P > 0.05$) (Power AGFI > 0.90 , Power RMSEA > 0.90).

Conclusion: Based on the findings, psychological patterns and the duration of smartphone and laptop use have no significant effects on neck pain, and it is necessary to use more accurate tools to investigate in a wider and deeper way.

Keywords: Neck pain, Personality traits, Smartphone use

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Introduction

One of the most common muscle pains is neck pain, which has a prevalence of 67-70% among the general population and is seen in most people (1,2). This phenomenon is caused by

discomfort and skeletal problems, and it leads to disturbances in academic and occupational functions and increased medical and health costs. It is considered the second most common musculoskeletal disorder after lower back pain

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(3,4). For this reason, it is necessary to investigate the effective factors in creating and aggravating it. So far, various research has tried to investigate the effective factors in this field, among which are head protrusion (5), age, gender (6), inappropriate physical position, vehicle accident history, physical activity, working environment conditions, working hours (7), general health, sleep quality, and aerobic exercise (8).

In this regard, there is a theoretical model for neck pain based on a neurological approach called the behavioral inhibition system (located in the parietal part of the hippocampus). According to this approach, pain in different parts of the body can increase due to high-stress levels and avoidant and incompatible behaviors, thus reducing people's tolerance to pain. In this case, people experience much physical pressure in the neck, shoulder, and other body parts (9,10).

In addition, other factors that can contribute to neck pain are psychological patterns and the duration of using smartphones and laptops. Psychological patterns mean personality traits and individual feelings and emotions such as anxiety, depression, and stress that affect people's behaviors and physical movements and ultimately can cause muscle and skeletal pain (4,11,12). These phenomena can also play a role in the perception and reporting of physical pain and affect the pain threshold, the cognitive evaluation of the amount of physical pain, and the bias of negative information related to muscle problems (12).

Besides the psychological patterns, mobile phone and laptop have also been considered factors affecting neck pain. Most of the users who use hand-held digital devices and tools such as laptops, smart mobile phones, and other similar materials have the potential to suffer from musculoskeletal problems and disorders that occur due to long-term exposure to incorrect body positions and conditions (13,14). In addition, one of the other causes of skeletal disorders and problems for frequent and long-term users of laptops and mobile phones is the force and pressure exerted on the neck and shoulder area (15-17), especially in repetitive activities with low load, such as using a mobile phone for a long time, which leads to excessive activation of low-threshold motor units (18,19).

In this way, people who are somehow dependent on smartphone and laptop stare at

these devices during use, which is associated with excessive bending of the head and neck and excessive force and pressure on these parts. It affects different parts of the body, especially the neck area, and this causes disorders in muscle and skeletal problems (4,20).

Therefore, neck pain is a chronic and sometimes debilitating problem, and due to its negative effects and consequences on various aspects of people's lives, it is necessary to examine its related components.

Among the components that play a role in neck pain are psychological patterns and the duration of laptop and smartphone use, which have been studied so far. However, the combined effect of these two important factors as a model for explaining neck pain has yet to be noticed.

For this reason, it is necessary to examine this issue in one of the communities involved with electronic devices (smartphones and laptops), that is, the students. Therefore, the issue raised here is whether or not the hours of use of the mentioned electronic tools and psychological patterns can affect and predict neck pain in university students.

Materials and Methods

The statistical population of this cross-sectional and correlational study consisted all students of Ferdowsi University in Mashhad-Iran (in the academic year 2021-2022), among whom 242 were selected by multi-stage cluster method (first stage random cluster selection, stage two random selection from the selected clusters).

The method is structural equations; in this model, 10 to 15 people are needed for each variable. The number of 200 people is sufficient for the present study. However, 242 people were collected (21).

The inclusion criteria are as follows: 1- having an age 19 to 50 years, 2- not having a history of accidents, 3- not having problems and disorders related to the growth period, such as the inability to walk and hold the head, and 4- not having multiple sclerosis, other similar diseases, and a history of neck surgery. The criteria for exiting the research are 1- use of special drugs that reduce attention and concentration to answer the questions. This was obtained through direct questioning of the participants and their observation and 2- addiction that makes the participants unable to answer the questions and not pay enough

attention. This issue was also obtained by direct questioning of the participants and their clinical observation.

Questionnaires were provided to students after introducing themselves and the purpose of the present study and obtaining informed consent. The researchers explained the needed information about the items of the questionnaires to participants.

Research instruments

A) The NEO Personality Inventory (NEO-PI): This questionnaire was developed and prepared by Costa and McCree in 1989 and has 60 items with a 4-choice Likert response (from 0 to 4). Its purpose is to examine personality traits. The subscales of this questionnaire include openness, neuroticism, introversion/extroversion, conscientiousness, and agreeableness (22). The validity and reliability of this questionnaire in Iran are 0.66 and 0.87, respectively. Cronbach's alpha dimensions of neuroticism, conscientiousness, openness, introversion/extroversion, and agreeableness are 0.819, 0.838, 0.712, 0.741, and 0.744, respectively. Moreover, the validity was reported as high (23). Costa and McCrae reported Cronbach's alpha ranging from 0.68 to 0.86 (For all subscales). The alpha coefficient reported by them varied from 0.74 to 0.89 with an average of 0.81, and validity was also above 0.70 (24).

B) Depression Anxiety Stress Scale (DASS-21): This questionnaire was developed by Lovibond and Lovibond in 1995 and has 21 questions with three subscales of anxiety, depression, and stress (each subscale has seven questions), along with the Likert scoring method from 0 to 3 (25,26). (0= Completely disagree, 3= Completely similar to me). A high score is a sign of the high intensity of these emotions. Cronbach's alpha of anxiety, depression, and stress in Lovibond and Lovibond study was reported as 0.97, 0.92, and 0.95, respectively, and its validity is also reported high (27). In Persian studies, it was reported as 0.80, 0.76, and 0.77, respectively (28). In addition, in Brown et al.'s study, the internal consistency of the three mentioned subscales is between 0.89 and 0.96. Its retest reliability is between 0.71 and 0.81 for three subscales (29).

C) Neck Pain Scale: This questionnaire has 12 closed-ended questions and was developed by English version studies by Kuorinka et al. in

1987 (30). This questionnaire measures the duration and intensity of neck pain and the history of this problem. Grading is based on 1 to 5. The higher score indicates the higher level of pain and disability. This questionnaire was designed and implemented to determine the prevalence of musculoskeletal disorders caused by work.

This questionnaire can be used for screening in the field of musculoskeletal disorders. The questions show the duration of neck pain problems, possible injuries, reasons for this injury, neck pain disorder in daily life, frequency of these problems, neck pain discomfort during 12 months, and visits to the doctor (30). The reliability of this questionnaire in Iran is reported to be 0.90, and its validity is favorable (31). In Crawford's study, the reliability of this questionnaire was reported as 0.92 with the test-retest method. Its validity was also high (32).

D) The questionnaire of duration of using smartphone and laptop: This researcher-made questionnaire measures the duration of using phone and laptop during 24 hours.

In the descriptive part, the frequency and percentage of gender, age, weight, body mass index, and height and descriptive statistics (mean, standard deviation, minimum, and maximum), the duration of using phone and laptop during 24 hours, and the discomfort of neck pain, personality characteristics, and psychological stress were also investigated. Structural equation model was used to investigate the effects.

The indexes used in this research are relative Chi-square, calculated by simply dividing the Chi-square value by the degree of freedom of the model (χ^2/df), and the acceptable value for this index is between 1 and 3. RMSEA index that acceptable models have a value less than 0.08. Also, for AGFI, GFI, IFI, CFI, and NFI indices, the acceptable value for these indices should be greater than 0.9. The software used were SPSS-22 and AMOS.

Results

Table 1 presents the demographic variables. Table 2 shows the descriptive statistics of the using phone and laptop during 24 hours and discomfort of neck pain.

Table 1. The demographic variables of the participants

Variables	Category	Frequency	Percent
Gender	Men	88	36.4
	Women	154	63.6
	Total	242	100.0
Age (Year)	19 to 25	170	70.2
	25 to 35	62	25.6
	Over 35	10	4.1
	Total	242	100.0
Weight (kg)	40 to 60	100	41.3
	60 to 80	108	44.6
	Above 90	34	14.0
	Total	242	100.0
Body mass index	17 to 20	60	24.8
	20 to 25	134	55.4
	25 to 28	48	19.8
	Total	242	100.0
Height (cm)	146 to 160	48	19.8
	160 to 175	134	55.4
	Above 175	60	24.8
	Total	242	100.0
Courses	Biotechnology	2	0.8
	Veterinary medicine	68	28.0
	Sociology	10	4.1
	Microbiology	2	0.8
	Surgery room	2	0.8
	Biology	126	52.1
	Physiology	8	3.3
	Political science	24	9.9
	Total	242	100.0

Table 2. Descriptive statistics of the duration of using phone and laptop during 24 hours and neck pain

Variables	Mean	SD	Maximum	Minimum
The duration of using the phone (Hour)	5.68	3.41	15	1
The duration of using the laptop (Hour)	0.89	0.31	1	0
Neck pain	7.69	3.10	21	3

Table 3. Descriptive statistics of personality trait and psychological stress variable

Variables	Mean	SD	Min	Max	
Personality trait	Neuroticism	35.29	8.35	15	71
	Extraversion	32.23	5.34	19	44
	Openness	39.29	4.83	29	49
	Agreeableness	41.79	5.59	27	59
	Conscientiousness	43.97	7.05	29	59
Psychological stress	Depression	17.66	7.31	0	34
	Anxiety	17.72	7.57	1	35
	Stress	17.70	6.08	3	33

Table 4 shows that all the indicators of the model do not have an acceptable value. The results of Table 5 show that personality traits, psychological stress, and duration of using mobile phones and laptops could not significantly affect neck pain ($P > 0.05$). Due to the insignificance of the proposed model, to

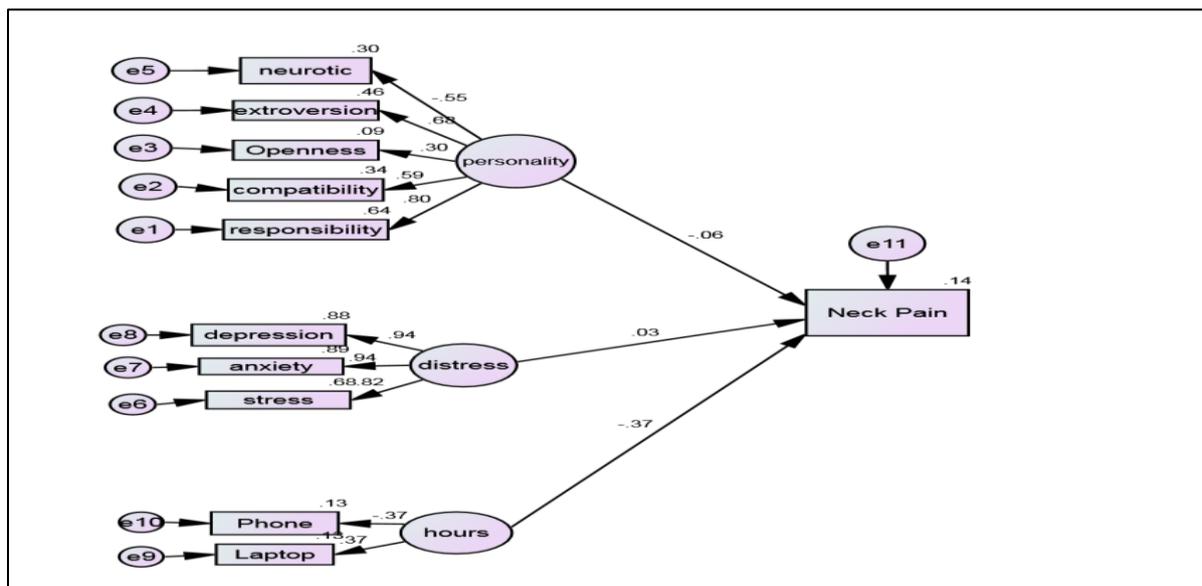
check the power level, power analysis using the method suggested by McCallum (33) and Kim (34) shows a power above 0.90 for AGFI and also RMSEA, so that we can be confident relatively about the non-randomness of the non-confirmation of the model.

Table 4. Fit indices of the research model

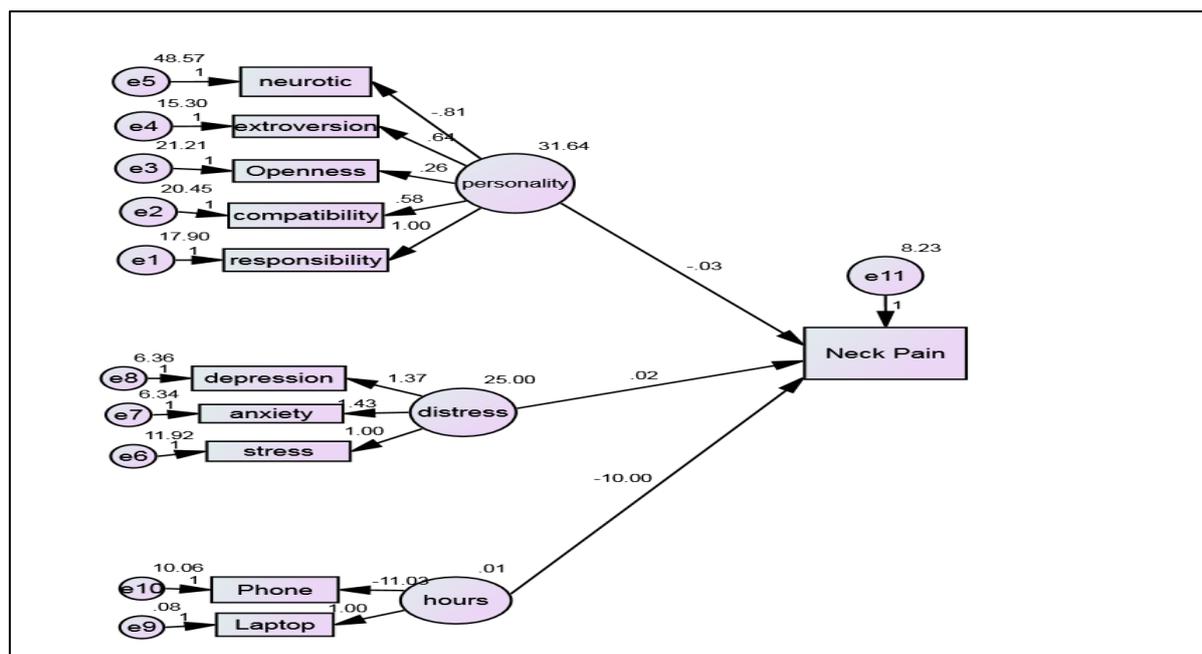
χ^2/df	RMSEA	NFI	CFI	IFI	GFI	AGFI
2.74	0.085	0.88	0.920	0.921	0.924	0.88

Table 5. Path coefficient of relationships between variables

Relationships examined	Path Coefficients	P	T-statistics	Result
Personality trait --> Neck pain	-0.06	0.393	-0.03	No significant
Psychological stress --> Neck pain	0.03	0.691	0.02	No significant
Duration of using mobile phones and laptops--> Neck pain	-0.37	0.112	-10	No Significant



Model 1. Path coefficient



Model 2. Research t-statistics

Discussion

The results showed that psychological patterns and duration of using smartphone and laptop could not significantly affect neck pain in university students. The first finding showed that personality traits and their dimensions could not affect neck pain. The results of this study are inconsistent with the research by Lin et al. Their results showed that the bad condition of neck and back pain causes chronic pain. The research method of this study was qualitative and reviewed, and from this point of view, it is different from the present research. The results could be more consistent because the mentioned study stated that some personality traits were able to influence muscle pain. Although this study covered only some aspects of personality, its working method differs from the current research (11). In explaining this finding, personality traits have different dimensions, such as neuroticism, extroversion, openness to new experiences, agreeableness, and conscientiousness, which affect people's general performance and behavior. However, it does not affect people's sitting habits and neck position. These personality traits, because of their psychological structure, are only capable of self-related behaviors such as the way of social interactions (extroversion/introversion), flexibility and adaptability to different conditions (openness and agreeableness), affect the acceptance of academic and non-academic responsibilities (conscientiousness) and the acceptance of new experiences. It does not affect the way of sitting and neck position.

The second finding showed that psychological stress and its dimensions, such as anxiety, depression, and stress, could not affect neck pain. This finding is inconsistent with the conducted studies. The working method and statistical population of this research differed from the present study. Although psychological stress has physical effects such as physical pains, it does not specifically affect the position of the neck and the occurrence of pain in this area (4).

Another finding of the current study also showed that the hours spent using a smartphone and laptop could not significantly affect neck pain. The results of this study are inconsistent with the findings of Aksüt et al. (16) and Dalimi et al. (17), who reported the effect of the way of using and the duration of using the phone on the muscles of the head, neck, and back. The

methods and statistical populations of these studies were not the same as the present study. The statistical population in the Aksüt et al.'s study included teachers as a large number of employees working in the service sector. These employees worked remotely and used a lot of laptops, tablets, and desktop computers. The research tools were questionnaires. Their investigation showed that excessive use of laptops, tablets, and computers causes problems in the muscles and skeleton of the neck and back of employees (16). The statistical population in Dalimi et al.'s study was all people with neck pain. The tools also included a body analyzer and the results of the study on these people showed that bending the neck too much and using it too much causes problems and pain in the neck and back area (17). In explaining the reason for this lack of significance, there would be unknown reasons beyond the researcher's control that have affected the final result, and it is felt necessary to investigate this matter further. It is also necessary to investigate this matter more carefully and use more accurate evaluation methods to measure the hours of use of smartphones and laptops.

One of the limitations of this study is that the duration of using smartphone and laptop has been examined. The amount of addiction to cyberspace and staying online has yet to be paid attention to, and it is suggested that this case be investigated in future studies. Another area for improvement is related to the cross-sectional nature of the research, which brings common variances. Also, the correlational nature of the data instead of the causal nature is another limitation of the present research. In the future, researchers should investigate the subject of this research longitudinally.

Conclusion

Based on the findings, psychological patterns and duration of using the smartphone and laptop have not significant effects on neck pain, and it seems that it is necessary to use more accurate tools to investigate research variables.

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