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Research Paper

Creating a score to assess weighting impacts of smartphone addiction among health and medical students

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ABSTRACT

Background: Smartphone addiction among university students is becoming a real public health issue, with reported physical and psycho-social results. But, there aren't that many tools already validated to help weigh, and basically give a score, to the relative contribution of its different domains.
Objective: The goal of this study was to build a new measurement score that could estimate how much importance is in the extracted factors, as they reflect the weighted contribution of the proposed domains, so we can check the current status of smartphone addiction and its effects, specifically among medical and health college students.
Method: This cross-sectional work used a convenience sample of 772 people, recruited across different academic levels in the medical and health faculties at Kirkuk University. We gathered data through the Smartphone Addiction Scale (SAS) , the Nordic Musculoskeletal Questionnaire, and a twelve-item scale used for measuring how severe Digital Vision Syndrome (DVS) is. For analysis, we applied principal component factor analysis in SPSS, version 22.
Result: The final sample included 347 males (44.9%) and 425 females (55.1%) , and the mean age was 21.09 ± 1.75 years. Preliminary results indicated strong significant associations ($P < 0.01$) among the domains that were studied. The factor analysis produced two main components, explaining 67.22% and 32.78% of the total covariance, and these were named the "Psycho-Socio Impact Factor" and the "Physical Impact Factor".
Conclusion: It was pretty clear that two main things came up. First, a psycho-socio factor seems tied to the family setup, the surrounding environment, and psychological aspects ,things like stress or coping. Second , there is a physical impact factor linked more to vision and musculoskeletal health, so basically what the body does while using a smartphone.

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1. INTRODUCTION

In fact, the development of Smartphone s over the past few years has made them more accessible and has led to an increase in their use by a diverse spectrum of people worldwide. Increasing reliance of society on Smartphone s has led to the emergence of a new problem known as Smartphone addiction [1]. Smartphone addiction is defined as the lack of ability to regulate Smartphone usage, even in the face of detrimental consequences for the users. College students endure elevated levels of stress, potentially stemming from the frequency of examinations, extensive and laborious academic workload, and apprehension regarding the future [2]. When confronting with these stresses, University students are more prone to becoming addiction to Smartphone technologies. Smartphone usage for Internet access and excessive video game playing is linked to lower academic achievement [3], it also effects on energy level, and food and exercise habits are all negatively impacted by Smartphone addiction. It also increases anxiety, sadness, insomnia, emotional instability, and even increases the risk of suicide due to cyberbullying and online fraud. Every university campus is linked to the Internet. Smartphones are commonly referred to as "handheld internet" devices [4]. A person develops Smartphone addiction when they use their phone excessively, which can have detrimental repercussions on their life and their physical and emotional well-being [5]. Individuals who actively participate in social media and frequently use Smartphone s are more prone to experiencing elevated levels of hopelessness and thoughts of suicide [6]. Moreover, physical issues, such as musculoskeletal problems, migraine headaches, neck and wrist pain, unclear eyesight, pinch strength, and hand function [7], [8]. Addiction to Smartphone s has four main characteristics: withdrawal, compulsion, functional impairment, and tolerance. Common symptoms of Smartphone addiction include anxiety, impaired function, and difficulty focusing and making decisions [9]. University student marks a crucial phase where one starts to physically distance themselves from family and friends, leading to the realization of loneliness. Loneliness is a prevalent experience that can be found among Smartphone users. Individuals develop with psycho-social issues to social isolation and loneliness, due to their excessive use Smartphone. Addiction to Smartphone s has an impact on mental health because people with depression or anxiety use Smartphone s as a coping mechanism to deal with depressing and negative emotions, melancholy and anxiety can lead to technology addiction. As well as to the adverse psychological impacts, prolonged use of Smartphone s can also lead to impaired vision [10]. Smartphone s emits electromagnetic radiation, including non-ionizing and ultraviolet UV radiations. Excessive use of Smartphone s can increase the exposure of the eye to this radiation, leading to biological damage to the eye cells or the appearance of defects. In addition, inadequate tear lubrication can lead to the development of dry eye disease, which can cause various eye conditions. Recognizing the gravity of Smartphone addiction and its increasing prevalence, nevertheless, there is a dearth of research on the prevalence of Smartphone addiction among university students in the country. Therefore, additional research on medical students is necessary to address the changes occurring in the healthcare and education system. This study aims to creating new weighted score for assessing addiction status impact of new observation misuse of Smartphone among "Medical Faculty Students".

2. RELATED WORK

Smartphone addiction leads to disruptions in daily life, with increased device use over time and anxiety when separated from the [11]. Smartphone addiction is believed to be derived from Internet addiction because of the similarity in symptoms and detrimental impact on users. Internet addiction is a

condition that falls under the category of impulse control disorders. It is characterized by excessive and pathological usage of the Internet. Smartphone addiction can be classified as a behavioral addiction, similar to Internet addiction. Research has demonstrated that excessive use of screen-based devices can lead to behavioral issues such as impulse control disorders, less social engagement, decreased physical activity, and difficulties in relationships [12].

This may involve conflicts, diminished familial engagement, and emotional detachment. When a Smartphone is used excessively in the outside world, it can negatively impact social connections, work or school performance, and overall involvement with the external environment. Furthermore, the significant correlation with psychological concerns implies that Smartphone addiction is connected to mental health difficulties, including anxiety, despair, and stress. These findings suggest that Interventions aimed at reducing Smartphone addiction should focus on improving family dynamics, social interactions, and providing psychological support. The significance of the physical impact factor Excessive Smartphone use can result in notable vision issues, including eye strain, dryness, and potentially enduring harm. Additionally, the significant strain on the musculoskeletal system indicates physical problems such as neck discomfort, back pain, and other related conditions caused by improper posture and lengthy periods of use, it is consistent with the results of a study conducted in Malaysia in 2020 by [13] these physical health issues Efforts to mitigate Smartphone addiction should include strategies to alleviate vision and musculoskeletal problems, such as promoting proper ergonomics and regular breaks.

3. METHODOLOGY

A cross-sectional design using of convenient sampling method, which were selected of data at Feb. 2024, with sample size 772 participants from different studying stages concerning of medical and health faculties in Kirkuk University.

Four colleges were included: Medicine, Dentist, Pharmacy and Nursing College, with a sampling rate of 20% of the student's sampling population had been selected for this study. The study excluded postgraduate students and those who did not agreed to be participate. A proposed questionnaire was used, that consisted of three parts, the first was dedicated for the socio-demographical characteristics variables (SDCv.) of studied sample, and the second was dedicated for the risk factors associated with addiction misuse of Smartphone, and the third part was dedicated five main domains, such as: Family environment, External environment, Health problems related to vision, Health problems related to musculoskeletal pain, and Psychological, and that depending mainly on what was scored and published by [14].

Also, Smartphone addiction scale (SAS) after taking permission from author of the instrument. Nordic questionnaires for the analysis of musculoskeletal symptoms, and the severity of Digital Vision Syndrome (DVS) was measured using a twelve-item.

The approval was obtained from the students with an explanation of the research objectives and the importance of the study.

The English, Arabic and Kurdi paper-based version of proposed questionnaires was distributed to participants. Participants were assured that their information would be kept confidential and that there was no need to provide any identifying information. Data have been collected and the duration of each interview was between 10-20 min. The students answered the questionnaire in a convenient space in their classroom. Using Likert scoring scales of 3 differentiated categories, such that: "Never, Sometimes, and always". Reliability of the questionnaire showed that a very high level of stability and internal consistency of the studied subjective at the level of items of the applied questionnaire. In this study, Cronbach's α coefficient was (0.8853).

3.1 Statistical Analysis

The statistical data analysis technique approaches were used to analyze and assess the study results using the statistical package for social science (SPSS) ver. (22.0) Descriptive data analysis included (Frequencies, Percentage, mean of score (MS), Standard Deviation (SD), Person's correlation coefficients, and inferential procedures were applied, such that: The Chi-Square test, Binomial test, The contingency

coefficients (C.C.) test. Factor analysis of using principal components method. The P-value<0.05in at least were considered statistically significant.

4. RESULTS AND DISCUSSION

Table 1. Distribution of Socio-Demographic Characteristics Variables of Studied Sampling Population with Comparison' Significant

SDCv.	Classes	No.	%	C.S. (*) P-Value
Gender	Male	347	44.9	P=0.006 (HS)
	Female	425	55.1	
Age Groups Yrs.	< 20 yrs.	177	22.9	χ^2= 152.67 P=0.000 (HS)
	20 _ 21	213	27.6	
	22 _ 23	342	44.3	
	> 24 yrs.	40	5.2	
	Mean ± SD	21.09 ± 1.75		
Marital Status	Married	30	3.9	P=0.000 (HS)
	Single	742	96.1	
Residency	Urban	719	93.1	P=0.000 (HS)
	Rural	53	6.9	
Socio-Economic Status	Low	95	12.3	χ^2= 152.67 P=0.000 (HS)
	Moderate	502	65.0	
	High	175	22.7	
Rate of hours using smart phone per 24hrs?	1 _ 3	65	8.40	χ^2= 261.11 P=0.000 (HS)
	3 _ 5	277	35.9	
	> 5	430	55.7	
Rate of sleeping hours during a day?	1 _ 3	513	66.5	χ^2= 381.87 P=0.000 (HS)
	3 _ 5	119	15.4	
	> 5	140	18.1	
Body Mass Index BMI	Under weight	4	0.50	χ^2= 668.155 P=0.000 (HS)
	Normal weight	407	52.7	
	Overweight	334	43.3	
	Obese	27	3.50	
	Total	772	100	

HS: Highly Sig. at P<0.01; Testing based on One-Sample Chi-Square test, and Binomial test.

The total number of participants in this study was 772, with 347 (44.9%) males and 425 (55.1%) females. The subjects who participated aged between 18 to 26 years, the average age was 21.09 ± 1.75. Regarding marital status, the majority of the analyzed sample were classified as "Single", accounting for 742 individuals (96.1%), while the remaining individuals were classified as married. the majority of the participants 719 (93.1%), were classified as having urban residency. moreover, socio-economic status almost three quarters of the sample into the "Low" and "Moderate" categories based on the WHO score, accounting for 597 individuals (77.3%), while leftover was assigned high level. 707(91.6%) of participants were used Smartphone at 3hrs and more. One-third of the sample (259 people, 33.5%) sleep 3 or more hours daily, while the remaining 513 (66.5%) sleep less than 3 hours. nearly half of the sample (361 people, 46.8%) are overweight or obese, with highly significant differences P<0.01 (Table 1).

Table 2. Distribution of Favorite and Purposes of Smartphone Application used

Favorite Smart Phone Application	Response	No.	%	C.S. (*) P-Value

Favorite Applications	Face book	None	457	59.2	P=0.002
		Favorite	315	40.8	(HS)
	Snap chat	None	403	52.2	P=0.235
		Favorite	369	47.8	(NS)
	Instagram	None	66	8.5	P=0.002
		Favorite	706	91.4	(HS)
	YouTube	None	324	42.0	P=0.002
		Favorite	448	58.0	(HS)
	Play games	None	456	59.1	P=0.002
		Favorite	316	40.9	(HS)
	Google	None	526	68.1	P=0.002
		Favorite	246	31.9	(HS)
	Twitter	None	605	78.4	P=0.002
		Favorite	167	21.6	(HS)
Purpose of Smart phone used	Study	None	140	18.1	P=0.002
		Favorite	632	81.9	(HS)
	Communication	None	110	14.2	P=0.002
		Favorite	662	85.8	(HS)
	Entertainment	None	136	17.6	P=0.002
		Favorite	636	82.4	(HS)

4.1 Hs: Highly Sig. At P<0.01; Testing Based on Binomial Test

The most favored smartphone applications, ranked from highest to lowest, are Instagram (91.4%), YouTube (58.0%), Snapchat (47.8%), gaming (40.9%), Facebook (40.8%), Google (31.9%), and Twitter (21.6%). The primary purposes for using smartphones, in order, are communication (85.8%), entertainment (82.4%), and study (81.9%). Significant differences were found between the observed and expected frequencies of smartphone use for all purposes (P<0.01).

Table 3. Summary Statistics of Student's Responding Items Concerning of Social Problems (Family Environment) Domain (N=772)

Main Domains	MS	SD	RS%
Family Environment			
I suffer from a lack of family support	1.58	0.70	52.67 L
My relationship with my family is not what it used to be	1.65	0.59	55.00 L
I do not participate with my family in social activities	1.81	0.65	60.33 M
I ignore my family members when I use a Smartphone	1.87	0.68	62.33 M
I experience a decrease in face-to-face contact with my family members	1.84	0.70	61.33 M
I feel comfortable staying alone at home	2.14	0.73	71.33 M
I became less interested in other daily tasks	2.06	0.67	68.67 M
I miss some important conversations and family events	1.97	0.68	65.67 M
Using Smartphone even in the main meals	1.91	0.71	63.67 M
I feel that my relationship with my family has changed	1.72	0.61	57.33 M
Preferring talking with my Smartphone buddies to hanging out with my real-life friends or with the other members of my family	1.72	0.60	57.33 M
(ExternalEnvironment)			
Missing planned work due to Smartphone use	2.10	0.73	70.00 M
Having a hard time concentrating in class, while doing assignments.	2.16	0.64	72.00 M
Having a hard time concentrating in working due to Smartphone use	2.06	0.68	68.67 M
I find it difficult to deal with others	1.73	0.62	57.67 M

I don't want to talk to others	1.7	0.64	56.67 M
I feel lonely and isolated from others	1.69	0.66	56.33 M
I feel like I don't have close friends	1.54	0.65	51.33 L
I feel unaccepted by others	1.55	0.69	51.67 L
I think using Smartphone negatively affects in my score in university	2.21	0.7	73.67 M
Preferring searching from my Smartphone to asking other people	1.93	0.61	64.33 M
Feeling that my Smartphone buddies understand me better than my real-life friends	1.75	0.68	58.33 M
Feeling that my relationships with my Smartphone buddies are more intimate than my relationships with my real-life friends	1.71	0.64	57.00 M
Health problems related to vision			
Experiencing light headedness due to excessive Smartphone use	1.80	0.71	60.00 M
Experiencing headache due to excessive Smartphone use	1.77	0.66	59.00 M
Experiencing blurred vision due to excessive Smartphone use	1.56	0.65	52.00 L
Experiencing double vision due to excessive Smartphone use	1.15	0.40	38.33 L
Tiredness in eyes	1.92	0.62	64.00 M
Straining of eyes	1.94	0.62	64.67 M
Heaviness in eyes	1.88	0.64	62.67 M
Burning sensation in eyes	1.76	0.66	58.67 M
Eye redness	1.65	0.65	55.00 L
Watery eyes	1.33	0.57	44.33 L
I feel ocular pain	1.83	0.72	61.00 M
Excessive use leads to weakness in the process of attention and concentration	1.97	0.60	65.67 M
Lack of attention to the radiant blue light from a Smartphone screen has the effect of a disruption of the biological clock in the body	1.93	0.57	64.33 M

Table 4. Mean Scores, Standard Deviations, and Relative Sufficiency Percentages of Musculoskeletal Pain and Psychological Problems among the Studied Participants

Main Domains	**MS**	**SD**	**RS%**
Health problems related to Musculoskeletal Pain			
Neck	2.12	0.70	70.67 M
Shoulder	1.94	0.68	64.67 M
Upper back pain	1.85	0.69	61.67 M
Elbow	1.61	0.67	53.67 L
Wrist/Hand	1.62	0.69	54.00 L
Lower back pain	1.56	0.63	52.00 L
Hips/Thigh	1.3	0.53	43.33 L
Knees	1.25	0.48	41.67 L
Ankles/Feet	1.28	0.53	42.67 L
Psychological Problems			
I feel like I don't have the energy to do my work	2.21	0.71	73.67 M
I feel uninterested in everything	2.00	0.61	66.67 M
I feel sad and depressed	1.87	0.63	62.33 M
I feel like I don't have any fun doing anything	1.71	0.66	57.00 M
I feel like life has no meaning	1.58	0.70	52.67 L
Feeling tired and lacking adequate sleep due to excessive Smartphone use	2.11	0.72	70.33 M
Being able to get rid of stress with a Smartphone	1.99	0.61	66.33 M
Having my Smartphone in my mind even when I am not using it	1.93	0.68	64.33 M

Feeling impatient and fretful when I am not holding my Smartphone	1.96	0.69	65.33 M
Getting irritated when bothered while using my Smartphone	1.96	0.71	65.33 M
Constantly checking my Smartphone so as not to miss conversations between other people on Twitter or Face book	2.25	0.73	75.00 M
Checking SNS (Social Networking Service) sites like Twitter or Face book right after waking up	2.40	0.71	80.00 H
Feeling the urge to use my Smartphone again right after I stopped using it	2.42	0.69	80.67 H
Having tried time and again to shorten my Smartphone use time, but failing all the time	2.01	0.77	67.00 M

4.2 RS%: Relative Sufficiency Assess By (L: Low; M: Moderate; H: High).

Table 3 represented studied main domain's items assessed, such that (Mean of score, Standard deviation, and Relative sufficiency) of likert score (Always, Sometimes, and Never) with scales assess (3, 2, and 1) respectively.

Most of studied items concerning of family environment main domain are assigned at a moderate level mostly, since they are accounted 9(81.81%), while only 2(18.18%) items were assessed at the low level, then followed mostly at a moderate level with respect to external environment main domain's items, since accounted 10(83.33%), while only 2(16.67%) items were assessed at the low level, then followed mostly at a moderate level with respect to health problems related to vision, since accounted 9(69.23%), while only 4(16.67%) items were assessed at the low level, then followed mostly at a low level with respect to health problems related to musculoskeletal pain, since they are accounted 6(66.67%), while only 3(33.33%) items were assessed at the moderate level, then followed mostly at a moderate level by the psychological problems, since they are accounted 11(78.57%), while only 2(14.29%) items were assessed at the a high level, and only 1(4.17%) of them assessed at a low level.

Table 5. Simple Pearson's Correlation Coefficients among Different Responses of the Studied Domains

Simple Pearson's Correlation Coefficients Among studied Domains		**External Environment**	**HPR to vision**	**HPR to Musculoskeletal pain**	**Psychological Problems**
rho	Family Environment	0.503	0.152	0.165	0.414
	External Environment		0.176	0.234	0.423
	HPR to vision			0.351	0.250
	HPR to Musculoskeletal pain				0.259
P-value	Family Environment	0.000	0.000	0.000	0.000
	External Environment		0.000	0.000	0.000
	HPR to vision			0.000	0.000
	HPR to Musculoskeletal pain				0.000

4.3 HS: Highly Sig. At P<0.01; Statistical Hypothesis Is Based on Pearson's Coefficient Test

Table 6. Component Matrix, Initial Eigenvalues, Explained Variance, and Suggested Factors of the Studied Domains

Component's Matrix	**Components**	
	1	2
Family Environment Domain	0.834	
External Environment Domain	0.811	
Health problems related to vision Domain		0.822
Health problems related to Musculoskeletal pain Domain		0.790

Psychological Domain	0.696	
Initial Eigen values	2.196	1071
% of covariance	67.22	32.78
Suggested Named of extracted Factors	Psycho-Socio Impact Factor	Physical Impact Factor

Table 4 shows in term simple correlation coefficients (Person's coefficients) of studied domains. There is a conventional significant level for extracted correlation coefficients among the studied domains in light of observing strong relationships at P<0.01 among all studied domains, and that indicated a meaningful limited interaction (The Covariance) that should be presented indeed.

Table 5 Extracted Factors Matrix in Rotated Method with the Suggested Named for the Studied Grousted named "Psycho-Socio impact Factor, and Physical Impact Factor". That extracted factors ordered in more powerful significant, with advantage at the first factor in (43.921%) of first total variance explained, then followed by second factor in (21.422%) of remaining total variance explained, and that led to be recorded (67.22%) of covariance explained for the first factor and (32.78%) of covariance explained for the second factor.

4.4 Discussion

In our study, the analysis Pearson's correlation coefficients aim to explore the interrelationships among different factors associated with Smartphone misuse. All the correlations presented in the table have a P<0.000, indicating that these correlations are statistically highly significant (P<0.01). The findings indicate a strong interconnectedness among various domains related to Smartphone misuse, this interconnectedness highlights the multifaceted impacts of Smartphone misuse on different aspects of an individual's life, from the family environment to health issues. pervious study reported, Students experienced sleep difficulties and visual changes, including dry eye disease, burning sensations in the eyes, conjunctival infection, reduced vision, and macular degeneration [9]. The studies on musculoskeletal disorders (MSDs) and Smartphone usage found that the most commonly affected body regions were the neck, followed by the shoulders, hands/wrists, and elbows in the general population [15], [16]. Researchers discovered that Smartphone addicts experience detrimental effects on their interpersonal connections and mental health. This phenomenon can be ascribed to the fact that those who are too dependent on Smartphone s may have hindered their in-person social connections, resulting in a fear of missing out (FOMO) and anxiety. Ultimately, this can lead to feelings of loneliness and melancholy [17], [18]. Our study the results show of a factor analysis performed on the studied domains, which were extracted into two meaningful and significant interactions. The factors are named "Psycho-Socio Factor" and "Physical Impact Factor." The significance of the Psycho-Socio Factor indicates that the excessive use of Smartphone s has a substantial impact on family interactions and dynamics.

5. CONCLUSION

The observed correlations also indicate that there is a significant interconnection between studied main domains. This interconnection means that these factors do not operate in isolation from each other, but rather influence each other in the context of Smartphone use and impact. The analysis extracted two significant factors; the result of a factor analysis performed on data, first, has a suggested named "Psycho-Socio Impact Factor". This factor is the most significant, and explaining about 43.921% of the total variance. It includes variables related to family environment, external environment, and psychological domains. The second, factor has a suggested named "Physical Impacts Factor". This factor explains about 21.422% of the total variance and is associated with health problems related to vision and musculoskeletal pain, and that led to be recorded (67.22%) of covariance explained for the first factor and (32.78%) of covariance explained for the second factor.

5.1 Recommendation

Developing an instructional program with the goal of enhancing the quality of life for individuals suffering from Smartphone addiction, as well as holding workshops, courses, and conferences to increase awareness and information about the detrimental impacts of Smartphone addiction.

The researchers suggested that for future studies should focus on the phenomenon of acquired autism, particularly in children who are addicted to misuse Smartphone.

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Author Contributions Statement

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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

Conflict of Interest Statement

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Informed Consent

All participants were informed about the purpose of the study, and their voluntary consent was obtained prior to data collection.

Ethical Approval

Not Applicable.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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