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INTERNET USAGE PROFILE OF MEDICAL STUDENTS AND EFFECTS OF INTERNET ADDICTION ON SAGITTAL BALANCE

TIP ÖĞRENCİLERİNİN İNTERNET KULLANIM PROFİLİ VE İNTERNET BAĞIMLILIĞININ SAGİTAL DENGEYE ETKİSİ

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Öz

Amaç
İnternet kullanımının artması ile internet bağımlılığı riski de artmaktadır. Uzun süreli internet kullanımı kişinin duruşunu etkileyebilmektedir. Bu durum, ağırlık merkezinin değişmesine ve segmental dejenerasyona neden olabilmektedir. Bu calismada, gençlerde internet kullanımının postur üzerindeki etkilerinin ortaya konması amaclanmıstır.

Gereç ve Yöntem
Bu çalışma kesitsel analitik tipte bir çalışmadır. Süleyman Demirel Üniversitesi'nde 168 tıp öğrencisine internet bağımlılığı skalası uygulandı. ≥81 skoru olanlar internet bağımlı olarak kabul edildi. Internet bağımlılığı tanısı almış ve almamış eşit sayıda adolesandan servikal / lomber direkt grafiler alındı. Sagital dizilim Cobb metodu ile değerlendirildi. Olası internet bağımlı tanımlayıcı analiz, İki basamak küme analizi, ANOVA, bağımsız örnekleme t-testi, Pearson korelasyonu, Mann-Whitney U analizi kullanıldı.

Bulgular
Dokuz öğrenci (%5,4) internet bağımlıydı. İnternet kullanım alışkanlıkları ile internet bağımlılık skoru arasında anlamlı fark tespit edildi, ancak en yüksek fark "aralıklı+uzun süre kullanan" ve "tek seferde total kullanan" grup arasında bulundu. Sadece internet bağımlılığı ve lomber Cobb açısı arasında negatif (r = -.341) ve anlamlı bir ilişki (p= .021) vardı. İnternet kullanım skoru arttıkça, lomber Cobb açı değeri azalmaktaydı. İnternet kullanımındaki farklı cihazlar için lomber Cobb açı değeri belirgin olarak farklıydı(p= .030). Rank değerlerine gore, laptop kullanan öğrencilerin lomber Cobb açı değeri(13,07), cep telefonu veya tablet kullananlardan(21,07) daha düşüktü.

Sonuç
Uzun süreli internet kullanımında aynı ve uygun olmayan anatomik pozisyonda durmak sagittal dizilimde değişikliklere neden olabilir. Spinal yapılar üzerindeki yüklenmeler ve stres spinal morfolojiyi etkiler ve disk dejenerasyonlarının ortaya çıkmasına neden olur. Erken yaşlarda ortaya çıkan bu dejenerasyonlar hastanın yasam kalitesini olumsuz yönde etkileyecektir.

Anahtar Kelimeler: İnternet bağımlılığı, sagittal dizilim, cobb açısı, sagittal vertikal aks, sagittal denge

Abstract

Objective
The risk of internet addiction increases as the time of internet usage increases. Long-term internet usage may effect the posture of the person. This may cause the change of the gravity center and may effect the segmental degeneration. In this study, it is aimed to

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point out the effect of internet usage on posture in young population.

Material and Methods
In Suleyman Demirel University, 168 medical students had internet addiction scale. The scores ≥81 accepted as internet addicted. Equal number of adolescents who got the diagnosis of internet addicted and not had cervical/lumbar x-ray graphics. Sagittal alignments were evaluated by using Cobb's method. Probable internet addicted descriptive analysis, TwoStep Cluster Analysis, ANOVA, Independent Samples t-Test, Product-Moment Correlation, Mann-Whitney U analysis were used.

Results
Nine(5,4%) students were internet addicted. There was a significant difference between internet usage habits and internet addiction scores, but the highest difference was found between "intermittent+long time usage" and "total usage in once". There was only a negative(r = -.341) and significant relation(p= .021) between internet addiction and lumbar Cobb angle. As the score of internet usage increases, value of lumbar Cobb angle decreases. Only lumbar Cobb angle values were significantly different(p= .030) for devices used for internet access. According to the Rank values, students' lumbar Cobb angle using laptop as internet access device(13,07) were lower than the students' using cell phone or pads(21,07).

Conclusion
Being in the same and unsuited anatomical position while using internet for a long time may cause changes in the sagittal alignment. Loadings and stresses on spinal structures influence the spinal morphology and cause the occurrence of disc degeneration.

Keywords: Internet addiction, sagittal alignment, Cobb angle, sagittal vertical axis, sagittal balance.

Introductıon

Internet usage is increasing rapidly in the developing world. Since it becomes the biggest library of the world, it is easier to achieve to the scientific resources within minutes (1). As the average time spending for internet can be a risk for addiction, preventive measures come into prominence. Postural deformity, that may occur with excessive usage of computer and internet with a loss of sense of time can improve degenerative disorders.

Sagittal alignment of the spine is important as it affects the distributions of the load on intervertebral discs, and normal lordotic alignment of cervical and lumbar spine is important for effective motion and function. Impairment of the normal lordosis may cause a degeneration of this functional unit, that causes spinal morbidities such as neck and back pain (2,3).

The aim of this study was to investigate the internet usage profile of medical students, and the effect of internet usage on cervical- lumbar sagittal alignment, and to reveal the relation of psychological and physical effects of internet.

Material and Methods

First, second, and third–year 168 medical students of Suleyman Demirel University, School of Medicine, Turkey were enrolled in this study. A self-administered schedule was used to all students. Permission for the study was obtained from the Suleyman Demirel University School of Medicine Scientific Research Projects Advisory Board (approval of the local ethics committee: date:07.03.2012; decision no:11), and the students that consent was obtained for radiographic studies evaluated for radiological evaluation.

After self-administered schedule applied to all of the 168 students, they were diagnosed as internet addicted or possible internet addicted. Then they were referred for cervical and lumbar lateral X-rays, and only X-rays of 29 students were obtained from 168 participants, on request and acceptance of them.

Internet Addiction Scores
Internet addiction scale of Gunuc was used (4). The questionnaire was composed of 4 parts. The questions consisted to test withdrawal symptom in part 1, to test control difficulty in part 2, to test disturbance of functionality in part 3, and to test social isolation in part 4. Data were collected by administering the questionnaires to the students.

Radiographic Analysis
On each cervical and lumbar X-rays 3 cervical (Cobb angle, sagittal balance and sagittal vertical axis) and 1 lumbar parameter (Cobb angle) were calculated. Cervical Cobb angle measured as the angle between the inferior margin of C2 and superior margin of C7 (5). Cervical sagittal vertical axis (SVA) was measured as the distance between C2 plumb line (extending from the centroid of C2 vertebra) and superior posterior corner of C7 vertebrae, and sagittal balance was

measured as the distance from a plum line drawn at the mid-point of the base of C2 to the plum line drawn at the mid-point of the base of C7 in a standing lateral cervical spine (6,7). Positive sagittal alignment defined as an anterior deviation (6). Lumbar Cobb angle was measured as the angle between the superior endplate of L1 and the superior endplate of S1 (8).

Cobb angle was classified as; kyphosis (Cobb angle$<0^0$), straight (Cobb angle $0^0<15^0$), hypolordosis (Cobb angle$15^0<30^0$), normal (Cobb angle $30^0<45^0$), hyperlordosis (Cobb angle$<45^0$) (3).

Statistical Analysis

In the analysis of the data different analysis were used according to the normal distribution of the parameters or not. In this respect, descriptive analysis, TwoStep Cluster Analysis to classify the participants according to the internet addiction scores, ANOVA and Independent Samples t-Test for the comparison analysis, Pearson Correlation, Mann-Whitney U analysis for the variables not showing normal distribution were used. Data were analyzed using SPSS 18.0.

Results

Sample Characteristics

The participants were between 18-22 years-old, and 67,3 % (n=113) was female, 32,7% (n=55) was male. 55,4 % was in the first class, 22,6 % was in second class, and 22 % was in third class.

Prevalance and Internet Usage Patterns

About 50% of the participants were using internet for more than 7 years, and of these 65% were using every day, also 71% was using 2 hours or less per day.

About 85% of the participants were using internet for research, lessons, news, music, video and social nets. Only 7,1% were using for games.

In terms of internet usage, 88% were using internet intermittently in a day, and 11% were spending the whole time in once. 24% of the participants were making cervical exercises, 22,6% were making hand-arm-shoulder exercises, 20% were walking sometimes, 5,4% were doing both exercises, and 44% were doing none of the exercises during internet usage.

Two stage clustering analysis was done according to the scores obtained from internet addiction scale. In this way students were grouped as; addicted, possible addicted or non-addicted. Nine (5,4%) students were addicted and 159 (94,6%) students were not addicted.

Correlation between internet addiction, cervical-lumbar measurements and exercises:

Internet addiction scores were compared according to internet usage habit, exercises done, and cervical/lumbar graphics. Internet usage habit was described as; daily intermittent or totally usage, and data of addiction scores compared according to the groups (Table 1). In one-way ANOVA test a significant difference was found ($F(2, 164) = 6,386$, $p = .002$) (Table 2). There was a significant difference in daily internet usage habit of students and internet addiction scores of students, but Tukey test was done to determine in which groups the difference was occurred (Table 3).

There was a significant difference between internet usage habits and internet addiction scores, but the highest difference was found between “intermittent + long time usage” and “total usage in once”. Beside this, as we evaluate the scores, we found that the scores of “intermittent + long time usage” were higher than the other groups (Table 4).

We found that when internet usage time increases, intermittent internet usage rate decrease, and intermittent + long time usage increase, and internet addiction scores were higher if the students use internet for long time or once in daily.

Twenty nine of the 168 participants gave permission for cervical and lumbar X-rays (Table 5). In the X-rays cervical Cobb angle, cervical vertical axis, and lumbar Cobb angle were measured (Table 6). In the SPSS program, correlation between measurement values, internet addiction scores, and the device used for internet access were evaluated.

The correlation between internet addiction scores, cervical Cobb angle, cervical vertical axis, lumbar Cobb angle were evaluated with Pearson correlation analysis (Table 7).

According to the data, there was only a negative ($r = -.341$) and significant relation ($p= .021$) between internet addiction and lumbar Cobb angle. As the score of internet usage increases, value of lumbar Cobb angle decreases (Table 7).

The measurements of cervical and lumbar region were related with the devices used for internet access, so the relation between these variables were evaluated (Table 8). According to the devices used for internet access, cervical Cobb angle, cervical vertical axis, lumbar Cobb angle measurements were analyzed with non-parametric Mann-Whitney U test (Table 9).

Only lumbar Cobb angle values were significantly different (p= .030) for devices used for internet access. According to the Rank values, students' lumbar Cobb angle using laptop as internet access device (13,07) were lower than the students' using cell phone or pads (21,07) (Table 8,9).

Table 1 Addiction levels according to the internet addiction scores

	N	Total %	Mean	sd
Addicted	9	5,4%	126,889	14,426
Mean addicted	66	39,3%	86,833	9,250
Non-addicted	93	55,4%	56,720	10,682
Total	168	100,0%	72,310	22,031

Table 2 Comparison of internet addiction scores according to the habituation of internet usage, one way ANOVA data

	Sum of Squares	df	Mean Square	F	p
Between groups	5816,812	2	2908,406	6,386	.002
In the groups	74692,506	164	455,442		
Total	80509,317	166			

Table 3 Tukey test data to determine the source of the difference

Usage habit		Difference of mean	p
Both intermittent and in once usage	Intermittent	9,355	.024
	Total usage in once	17,564	.005

Table 4 Crossing of daily internet usage time and daily internet usage habituations

Daily usage time (hour)		Intermittent	Total usage in once	İntermittent and long time usage	Total
< 1	f	21	9	5	35
	%	60,0	25,7	14,3	100,0
1-2	f	46	9	28	83
	%	55,4	10,8	33,7	100,0
3-4	f	12	1	20	33
	%	36,4	3,0	60,6	100,0
5-6	f	2	0	11	13
	%	15,4	,0	84,6	100,0
7-8	f	0	0	3	3
	%	,0	,0	100,0	100,0

In table 10, the difference between doing exercises or not, during internet usage of participants was compared with Independent Samples t-test.

According to table 10, doing exercises for certain regions of body or not, during internet usage, makes a significant difference only for sagittal balance (p=.006; p<.05). In this respect, as we investigate the mean values of sagittal balance, we found the mean scores were higher in the participants doing exercises during internet usage.

Table 5 Frequency Distributions According to Cobb angle measurements (C:cervical, L:lumbar)

	Kyphosis		Straight		Hypolordosis		Normal		Hyperlordosis		Total	
Gender	C	L	C	L	C	L	C	L	C	L	C	L
Male	0	0	14	2	4	5	0	8	0	3	18	18
Female	1	0	8	1	2	2	0	3	0	5	11	11
Total	1	0	22	3	6	7	0	11	0	8	29	29

Table 6 Descriptive statistics concerning to the cervical and lumbar measurements

	Mean	sd	Distortion	Flatness
Cervical Cobb	10,612	6,887	.839	.016
Cervical SVA	26,138	6,911	1,008	2,135
Sagittal balance	18,679	7,344	.969	1,817
Lumbar Cobb	38,840	14,506	-.151	-.876

Table 7 Correlation values between internet addiction and cervical and lumbar measurements

		CerCobb	SVA	Sagittal balance	LumCobb
Addiction score	Pearson Correlation	-.026	.027	-.057	-.341
	p	.892	.888	.773	.021

Table 8 Cervical and lumbar mean Rank values according to the device used for internet access

	Device for internet usage	N	Mean Rank
CerCobb	Laptop	22	15,68
	Celluler phone, tablet	7	12,86
SVA	Laptop	22	16,52
	Celluler phone, tablet	7	10,21
Sagittal balance	Laptop	21	15,81
	Celluler phone, tablet	7	10,57
LumCobb	Laptop	22	13,07
	Celluler phone, tablet	7	21,07

Table 9 Comparison of cervical and lumbar measurements according to the devices for internet access, Mann-Whitney U analysis

	CerCobb	SVA	Sagittal balance	LumCobb
Mann-Whitney U	62,000	43,500	46,000	34,500
Z	-.764	-1,710	-1,465	-2,166
p	.445	.087	.143	.030

Table 10 Independent Samples t-Test parameters, according to the comparison of active (doing exercises), and inactive (not doing exercises) participants

Dependent Variable	Exercises	N	Mean	sd	t	df	p
CerCobb	cervical, hand, arm exercises, walking	15	10,5594	7,231	-.045	27	.964
	inactive	14	10,6777	6,731			
SVA	cervical, hand, arm exercises, walking	15	22,0667	7,353	2,981	27	.006
	inactive	14	14,7692	5,231			
LumCobb	cervical, hand, arm exercises, walking	15	40,01	14,181	.889	27	.382
	inactive	14	35,18	15,021			

Discussion

Associated with technological development, internet usage became widespread. Especially for the medical students quick access to the knowledge is important. As we evaluated the internet usage interval of medical students, we found that intense study of these students, because of the essential lessons in the first three years, causes less time for internet usage, so the addiction scores are low. Also it is confirmed that the internet addiction scores are related to these usage habituations. Participants using internet for long time and once in a day, spend more time with internet so the addiction scores are higher in these individuals. Correlation between internet addiction and amounts of time was studied in many studies but there are not many studies investigating the association between internet usage habit or internet usage period (intermittent or in once) with internet addiction (9-16). Therefore the parameters achieved from this study may significantly contribute to the literature.

As we study the rate of the students for addiction we found the mean addiction score as 72.310, an important signed for non-addiction profile. This can be the result of only a few of the participants were using internet for gamble or games, and daily internet usage time was long that can cause addiction. Also this can be explained by the participants were medical students, and they were spending most of their times for studying, and less time for technology usage for entertainment.

In many studies, for internet addiction a period of usage of about 18hours/week was reported. In our study, this period was daily 2 hours or less, so this can be one of the reasons clarify the reason why only 5,4 % of students were addicted. In university student population, internet addiction prevalence was, 0,8 % in Italy, 5,6 % in China, 2,8 % in Iran, 15,1 % in Taiwan, 16,2 % in Poland, 12,3 % in Turkey and 9,8 % in the USA (17-23). Many factors like culture, access to technology, economy, difference between measurement tools and techniques, research year and sampling may achieve to this difference.

We found a significant correlation between internet addiction and lumbar Cobb angle in a negative way, so as the internet addiction scores increase, lumbar Cobb angle measurements decrease. This decrease in lumbar Cobb angle measurement means hypolordosis, straight or kyphosis of the spine that shows the

disruption of the sagittal balance. The only handicap for this point is that medical students need to sit for long time to study which can be the reason for sagittal disruption, independent from internet addiction.

We know that loadings and stresses on spinal structures influence the spinal morphology and cause the occurrence of spinal degeneration. Alterations in sagittal alignment also affects mobility. In literature an association between the loss of lordosis, an anterior shift in the sagittal vertical axis and degenerative changes in the spine and symptomatic back pain was suggested(1). Vertebral bodies and intervertebral discs composes the physiological curvatures of the spine. Sagittal curves measurement values of spine present great variability in normal individuals (24).

Jackson and McManus described the lumbosacral curvature values ranging between -31^0 and -88^0 and Guigui et al. described between -13,6^0 and -69^0 (25,26). Damasceno et al. evaluated 350 asymptomatic individuals for lumbar lordosis and reported a significant difference between males and females for lumbar curvature measurements that females present higher values (24). In our study, males mostly (44%) had normal (31-45^0), and females mostly (45%) had hyperlordosis (>45^0), compatible with literature. We also found that flatten of cervical spine was rather more in both gender.

Another remarkable point is that there is a significant difference between lumbar Cobb angle and devices used for internet access. The mean lumbar Cobb angle measurements of the students using laptop for internet access was lower than the students using cellular phone or tablet, which can be identified with variations of sitting positions.

Imagama et al. had studied the association between quality of life (QOL) and spinal sagittal balance and physical ability (daily exercise) in 304 middle-aged and elderly people, and showed that exercise in elderly people is important to maintain spinal balance (27). In our study, we also found a significant relation between exercises and cervical sagittal balance. As cervical exercises are not time-consuming and feasible exercises, they are more effective than lumbar exercises.

Limitations of the study include the number of the students (n = 29) that gave permission for X-rays. This also complicated to make interpretation of analysis and data. In another way, this is also an important fact that shows the conscious and sensibility of the medical students for radiation. Simpson et al. had reported that anteroposterior images resulted in significantly greater radiation exposure than lateral views, due to the calculated effective dose values, that represents the radiation exposure of the patient and offers an estimate for the risk of radiation-induced carcinogenesis, for cervical AP as 0.12 mSv, cervical lateral as 0.02 mSv, lumbar AP as 2.20 mSV, lumbar lateral as 1.50 mSv (28).

Beside health impairment, cervical spondylosis, one of the most common indications for cervical spine surgery in United States, hospital charges exceed about $2billion per year (29).

Further studies need to be done with larger number of participants, and more data about the positions of the participants while using devices for internet should be collected. Besides this, samples of participants thought to be more addicted should be chosen.

Conclusion

Variabilities in sagittal alignment can determine kinematic changes in cervical and lumbar spine. According to these changes load distribution can be affected and disc degeneration may occur. As technology come into our life further more day after day, taking precautions earlier both reduces medical problems and hospital-based economic expenses that may occur in declining years.

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