Student Points of View – Pedagogical, Psychological, Social and Technical Issues

A STUDY OF THE IMPACT OF THE DISTANCE FORM OF EDUCATION ON THE LOCOMOTIVE ACTIVITY OF THE STUDENTS

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Abstract. The study of the influence of the computer technologies on the physical health and locomotive activity represents a priority problem for a number of institutions and organizations such as public health, education, IT companies, etc. With the introduction of the distance form of education the number of people situated in conditions affecting their physical health has continuously been on the rise. It is of major importance therefore to establish the factors determining the influence of the used computer technologies on the degree of locomotive activity of the students during the process of the distance form of education. In the state of pandemic, the empirical investigation is one of the most suitable methods for obtaining information on the studied problem. On the basis of the mathematical statistical method results have been obtained about the risk factors for the physical health of the students as well as about the accompanying changes and harm. The results show a physical activity of a low degree during the time and after the work on the computer. Almost 40,9% of the studied ones confirm that they do not do exercises for expansion and stretching and in any of the three special groups the respondents inform about pains in the different parts of the body the most affected ones being those in the different parts of the zone "back".

Keywords: health; students; learning form; harmful effects

Introduction

The challenges of the modern conditions and way of life of the students provoke an incessant development of the educational form which is aimed at the creation of consistent knowledge and skills as well as at the formation of particular competence in the given profession. One of the prevalent forms of education in the last years is the distanced one. It represents such an organization of the teaching process in which the student and the instructor are separated in location but not necessarily in time. The distance thus created is overcome by the implementation of technological means such as: audio, video, computer and communication technologies.

Today, the use of the new technologies ensures a much better distanced education which employs in most cases the instruments of e-learning. (George et

al., 2014) The presentation of the study materials and the conducting of lessons can be *synchronous*, i.e. the participants (teachers and students) communicate at the same time or *asynchronous* when the communication is at times differing for them. (Belanger & Jordan, 2000) There is a large number of e-instruments and models used in both types of distanced teaching. Its introduction allows for the educational system to be flexible, adaptive and sustainable in its development on condition that definite actions for the solution of the accompanying challenges and problems are undertaken, analyzed and rationalized.

In the modern aspect the main factor for the implementation of the distanced education is the use of electronic devices such as a desktop computer, portable computer (laptop), tablet, smartphone, etc. (Pei & Wu, 2019) In their use a greater expense of time is required for the occupation of a definite posture of the body which in itself affects the degree of locomotive activity of the students. The influence of the use of the computer technologies on the posture, the locomotive activity and psychological overloading gives rise to problems of ever-growing studies in the IT-technologies and the companies depending on their use. (Zhiyong et al, 2004) That is the reason for these places to be ensured with ergonomic furnishing and equipment created especially for this activity – desk, chair, monitor, light, etc. (Rasoulzadeh & Gholamnia, 2012) In the distanced form of education, the better part of the students counts on what is available in domestic conditions. In this way an equally based ergonomic medium for studying cannot be ensured. Another important issue is the level of locomotive activity depending on the locomotor habits and culture of the students. In the conditions of a pandemic the chance for locomotive activity are drastically limited. The restrictions for visiting sports halls, gyms, playgrounds and tourism only make the mass deprivation of motion deeper[1)].

Aim

One of the basic purposes of the present study is to determine the factors exerting impact on the physical health condition of the students engaged in a continuous work with a computer at the time of the distanced form of teaching.

To specify three groups with a different degree of risk (low, medium and high) of damage to the various parts of the body due to the prolonged use of electronic devices.

The persons in the survey can be classified into the three groups depending on the degree of risk of damage.

Methodology

Documentary method

Investigation of literature and official electronic sources on the problem. A study on the forms of education and models of application. A study on the impact of computer techniques on locomotor activity.

Sociological method

An empirical survey has been performed for the purpose of the study by means of a direct questionnaire carried out among students specializing in the "Rehabilitator" and "Medical aesthetic care" courses. The volunteer participation was the main criterion in the selection of the persons under study.

Statistical methods

The following statistical methods were used in processing the data: frequency analysis – one and two measure ones; variation analysis; cluster analysis.

Results and analysis

In the conditions of an emergency epidemic state the education of the students from the Medical College at the Sofia Medical University has been carried out by distance forms of learning. In view of the conditions created for the course of the educational process the Event-Oriented Design Model of Web-based education has been applied. This model has been described for the first time by T. Welsh in 1997 and is characterized by three basic elements: *Full synchronous*, *Limited synchronous*, *Asynchronous*.

These circumstances for the implementation of distance learning have required the use of electronic devices of longer duration than in the ones in the attendance form. The impact of computer technologies on the body posture; the locomotor activity and physical health presents problems that are the subject of unceasing investigation. As a result, ergonomic furnishing and equipment are being developed in response to the requirements for ensuring healthy work/educational environment.

In the distance form of learning the better part of the students count on the available furniture and equipment of which they dispose at home. In contrast to the real educational environment in this case it is not possible to supply an equally posed ergonomic environment for studying.

On the other hand an important issue for the healthy learning is manifested by the level of culture which the educated ones display and it includes the keeping of the right time for studying and rest, time duration of use of the electronic devices, locomotor habits, regular intake of food and liquids, use of various sources of learning (paper and electronic means).

Questionnaire study

Aiming at tracing the impact of the distance form of learning on the locomotive activity and habits of the students we carried out a questionnaire study in the specialties "Rehabilitator" and "Medical aesthetic care". The questionnaire contains 10 questions of the closed type. 132 students from the courses between the 1st and 3rd ones have taken part in the survey. The percentage of students in the specialties "Rehabilitator" 54,5% and "Medical aesthetic care" – 45,5% is approximately equal while after the "Sex" feature women constitute 90,2% of the participants and the rest of 9,8% are males.

With respect to the feature of "Age" the results show that 72% of them are at an age till 25 years and 17,4% are the ones between 26 and 35 years of age. 6,1% of the surveyed are the ones aged between 36 to 44 years of age. The percentage of respondents over 44 years of age is the lowest – 4,5%.

The group of the surveyed persons after the "Age" feature is not homogeneous (coefficient of variation V= 32,90%). This fact renders the opportunity to study persons of different age groups which adds an additional value to the conclusions and results of the analysis.

In view of the purpose of the survey it was of importance to state exactly what the diurnal duration of using the computer technologies is during the distance learning (Table 1).

Table 1. Percent distribution of the persons using computer without interference in the limits of the day and night

Time range	Percent distribution
up to 4 hours	37,10%
from 4 to 6 hours	34,80%
from 6 to 8 hours	19,70%
from 8 to 12 hours	4,50%
More than 12 hours	3,80%

From the results obtained it is clear that roughly 2/3 rds of the surveyed ones spend up to 6 hours in incessant work in the day and night range. 2/3 rds of the persons under study have stated their preferences for the portable computer as opposed to the desktop.

In order to determine the habits of the students related to the position of the body during the time of using the computer we asked them to give their answers to the following options: occipital lying; lateral lying; relaxed seating; lying on the knees. Out of the total of 132 studied students an answer to this question was given by 127 (96,2% of the total number). Since the surveyed ones had the right to more than one answer, the number of all answers received is 160. The percent distribution of the usual position of the body at the time of work with a computer is summarized in Table 2.

Table 2. Percent distribution of the usual position of the body at the time of work with computer

Usual posture in front of the computer	Percent distribution
Occipital lying position	26.30%
Lateral lying position	15.60%

Relaxed seating	35.60%
Lying position	12.50%
On the knees	3.10%
Another one	6.90%

The percent distribution of the habitual position of the body when using a computer shows a preference of the surveyed students for the following poses: relaxed seating – 35,60 per cent, occipital lying – 26,30% and lateral lying – 15,60% which accounts for about 80% of the choice of all respondents. Summing up the results pertaining to the habitual pose and typical position of the body when working with a computer we can conclude that the students under study most often use a portable computer in the position of being seated or lying, which in their turn affects different parts of the body such as: cervical area, thoracic area, lumbar area, etc. The protracted occupation of such poses gives rise also for a predisposing of recording pains in the different parts of the body.

M. Kiran, (2012) has confirmed that such pains present an often-encountered problem in the systematic work with a computer.

From the point of view of vision, the optimum levels at which the upper end of the computer screen should be located are the nose, eyes and chin. A high number of the students have confirmed these levels – 84%. The chances for furnishing the place of study, an adjustable chair for example renders the possibility for the screen of the computer to be of an optimum location. The problem of how well the students under study use the maximum functionality of the workplace in view of the location of the computer screen is also of interest. The results of the analysis are summed up in Table 3.

Table 3. Level of the upper end of the computer screen according to the furnishing of the workplace

Furnishing	**Level of the upper end of the screen**					
	eyes	*nose*	*chin*	*shoulders*	*breast*	*total*
Adjustable in height desk and chair with a back rest	7 33.3%	7 33.3%	7 33.3%	-	-	21 16.7%
Un-adjustable in height desk and adjustable in height chair with a back rest	5 25.00%	5 25.00%	8 40.00%	2 10.00%		20 15.90%
Table (for example a dining one) and an un-adjustable in height chair with a back rest	13 25.50%	21 41.20%	10 19.60%	3 5.90%	4 7.80%	41 40.5%
High table or a highchair without a back rest		4 57.10%	2 28.60%	1 14.30%		7 5.60%
Short-legged table and an armchair or a stool for sitting	4 14.80%	7 25.90%	6 22.20%	6 22.20%	4 14.80%	27 21.40%

It is clear from the data in the Table that the students who own adjustable in height chairs and desks use them fully to the optimum adjusting their pose so that their computer screen gets into the level of the eyes, nose and chin. 90% of the ones who do not have the option of adjusting the level of the desk, but with the opportunity to change the height of the chair use it to the maximum. Only in 10% of them the level of the computer screen is located at the shoulders level. 13,70% of the students who do not have the chance to use the options of the adjustable chair have located the computer screen at the level of the shoulders and the breast on a dining-room table. 14,30% of the ones using a high table and a tall chair without a back rest have positioned their screens at the shoulder level. The rest of the respondents – 85,70% have confirmed that the positioning of the screen is at level of the nose and chin. The percentage of the students improperly positioning the screen is highest among those using a short-legged table, a sofa or a stool for sitting as part of their workplace – 37,00%. In conclusion we can summarize that the students owning furniture with options for adjusting its height make the optimum use of it with relation to the positioning of the computer screen.

From a healthcare point of view the most suitable distance from the face to the screen of the computer is from 55 to 70 cm. It is noteworthy that 69,00% of the students under study work at a distance from 40 to 55 cm to the computer screen as well as in the range less than 40 cm and more than 70 cm. This fact creates pre-conditions for a risk of eye problems as a consequence of the long-term work with the computer. (Table 4) In his study N. Kozeis (2009) has established that blurred vision, dryness in the eyes, burning sensation, reddening of the eyes and headache are the main symptoms as a result of the improper use of computers.

Table 4. Percent distribution of the distance from the face to the screen

Distance from the face to the screen	Percent distribution
from 55 to 70 cm	28.80%
from 40 to 55 cm	50.80%
Less than 40 or more than 70 cm	18.20%

In order to establish the locomotor habits of the students we have posed the following question: “Do you do exercises for moving about/stretching while using the computer?” The percentage of the ones who have answered that they do not do exercises for moving about or stretching is the highest – 40,90%. 25% of the students start moving about once a day and 16,7% several times a day. 3% of the surveyed ones work out their musculature once a week and more than two times – 11,4% of them. As a whole, the results show a low degree of muscular activity of the students at the time of work with the computer and after that.

At the end of the survey we asked the respondents to point out the degree of discomfort or pain in the different parts of the body-head, cervical area, thoracic area, shoulders, lumber area, elbows, palms, sacral area, knees, shanks. 10 possible answers have been allotted according to the following point-scale (Table 5).

Table 5. Evaluation scale of the degree of discomfort or pain

Degree of pain	Points
Without pain	0
Very weak	1
Weak	2
Bearable	3
Strong	4
Unbearable	5

Discussion

Cluster analysis is a method for classification aiming at the formation of natural groups on the basis of a multitude of criteria. Its implementation for the purposes of the present analysis is to qualify the surveyed students encompassed in the range of the study into three groups determining the different degree of risk depending on the manner and long-term studying with a computer. Under the so defined conditions the K-Means Cluster (cluster analysis of the K-means) is the most suitable method of clusterization. The results from the analysis are presented in Table 6.

Table 6. Groups determining a varying degree of risk depending on the way and time duration of the work with a computer

Question	Group		
	1	2	3
What kind of computer do you use most of the time?	Portable	Portable	Portable
How many hours totally do you diurnally use a computer?	From 4 to 6 hours	From 4 to 6 hours	From 4 to 6 hours
Do you do moving/stretching exercises while using the computer?	Yes, I do. I work out after using the computer (at least 2 times a week)	Yes, I do. I work out after using the computer (at least 2 times a week)	Yes, I do. I work out my muscles once a week
Do you use a specialized program for tracing the duration of the work with a computer?	No	No	No
Evaluate the degree of discomfort or pain in the head	Without pain	Weak	Bearable

Evaluate the degree of discomfort or pain in cervical area	Very weak	Weak	Bearable
Evaluate the degree of discomfort or pain in the thoracic area	Without pain	Weak	Weak
Evaluate the degree of discomfort or pain in the shoulders	Very weak	Without pain	Bearable
Evaluate the degree of discomfort or pain in the lumbar area	Very weak	Very weak	Bearable
Evaluate the degree of discomfort or pain in the elbows	Without pain	Without pain	Very weak
Evaluate the degree of discomfort or pain in the palms	Without pain	Without pain	Weak
Evaluate the degree of discomfort or pain in the sacral area	Very weak	Without pain	Bearable
Evaluate the degree of discomfort or pain in the knees	Very weak	Without pain	Very weak
Evaluate the degree of discomfort or pain in the shanks	Without pain	Without pain	Very weak

Group №1 can be defined as the one with the slightest risk from the results so obtained. In it the degree of pain in the different parts of the body depending on the way and time duration of the work with computer varies from "Without pain" to "Very weak". The ones falling in that group predominantly use a portable computer. They do not use a specialized program for tracing the duration of the work with computer but exercise at least two times a week. The ones classified in group №1 report for the presence of very weak pains in the following areas: cervical, lumbar and sacral ones of the spinal column, the shoulders and knees.

Group №2 can be qualified as such with a medium level of risk. In the degree of pain in the various parts of the body depending on the way and time spent in the work with computer it varies from "Without pain" to "Weak". Those falling into that group tend to use mainly portable computers. They do not use a specialized program for tracing the duration of the work with a computer but do exercises at least two times a weak. The respondents from that group report the presence of weak pains in the following areas: head, cervical and thoracic areas.

Group №3 can be defined as the one with the highest risk. The ones falling into that group use predominantly portable computers. They do not use a specialized program for tracing the duration of the work with computer and do exercise only once a week. The degree of pain in the different parts of the body here varies from "Very weak" to "Bearable". The respondents from that group report bearable pains in the following areas: head, cervical area, shoulders, the lumbar and sacral areas. Very weak pains they feel in the elbows, knees and shanks and weak ones in the thoracic area and the palms.

For the purpose of the analysis the surveyed students can be distributed in the three groups as follows: 69,91% of the respondents fall into the low risk group №1. 21,05% in the group with medium risk №2 and 14,03% in the one with the highest degree of risk №3.

An innovative tool for analyzing this type of process is the neural network. It offers effective solutions for both data description and forecasting tasks (Konchev, 2018).

Conclusion

The computer is an indivisible part of the work and everyday life of the students. The quantitative amassment of the time spent in front of the computer monitor combined with the pose of the body and the back, the position of the screen, lack of locomotor activity and rest do exert a substantial impact on the health condition and locomotive functions of the body. The portable computer is the preferred mobile device among the students under study. Approximately 2/3^{rds} of them use it for work, study and recreation as the time duration in the day and night range reaches up to six hours of work.

Last but not least in importance in the everyday usage of the computer comes the furnishing of the workplace. The per cent distribution according to the type of chair shows that 67,40% of the surveyed students use an un-adjustable chair with or without a back rest at the time of work. Nearly 69% of the students work in an improper distance of the face from the screen thus creating pre-conditions for problems with the eyesight. It should be marked that the students having proper furnishing allowing for the adjustment of its height tend to use it to the optimum positioning the computer screen at the eye-level.

It should be noted that 65,2% of the respondents do not use software for tracing the duration of the work with computer. The individual registration of the time spent in work and rest is extremely ineffective. The lack of specialized software also contributes to the negative effect upon the locomotor activity. The results show a low degree of muscle activity at the time and after the work with computer. About 40,90% of the surveyed students confirm that they do not to do exercises for moving around and stretching.

As a whole the results from the survey study indicate to a troubling tendency. Roughly 50% of all persons under study report the presence of pain and/or discomfort in the head. Every third one (72,7%) of the respondents suffers from a differing in degree pain and discomfort in cervical area. The confirmation of the presence of pain in the thoracic area – 38,60% and the shoulders shows a tendency for a rise as well. The part of those feeling a pain in a different scale displays a peak in the ones in the lumbar area – 58,30% of the surveyed. The ones suffering from a pain varying from weak one to a bearable one account for the percentage of 37,10. This percentage is close to that one found in the knees, shoulders and the lumbar,

thoracic and cervical areas. Similar to the complaints expressed for the lumbar area 8,30% of the respondents testify to a pain varying from strong to an unbearable one.

The results from the analysis show that the palms, elbows and shanks are the least affected areas. 75% of the respondents do not feel pain in the palms and in the rest of 25% it is either very weak or bearable. The part of those confirming a pain varying in strength in the elbows is low – 16,70%. 78,8% do not report a pain in the shanks while in the rest of 21,20% it is very weak to bearable.

Similar data have been published by A. Pavlenko (2019). According to him "the motionless posture under pressure of the person working in front of the computer for a long time and being still in front of the computer monitor gives rise to an over-tiredness and pains in the spinal column, the neck, shoulder joints and the intensive work with the keyboard provokes a stronger pain in the elbow joints, wrists and thumbs of the hand" The muscle and skeletal disorders are assumed as a priority of the member states of the EU and the European social partners. (A report of EU, 2020)

The problem with the chronic lumbar disc disease, which are caused by changes in the posture from under pressure sitting, as well as the possibilities for the application of therapeutic methods are also analyzed by Dimitrova et al. (2018). They recommend combination of physiotherapy and balneotherapy procedures which will have a positive effect on the muscle strength and lumbar flexibility. (Dimitrova et al.,2018)

For the purposes of the present analysis three groups have been specified depending on the way and time duration of the use of computer. The following conclusions from the obtained results can be made. As factors exerting a most crucial impact on the health condition of those working with computer the following ones can be outlined: unceasing work with a computer and the accumulation of the effect from it in time. The improper posture of the body and the lack of locomotive activity at the time of work and after it. While in the first two groups the respondents report a low degree of pain and even lack of it, in the third group with the highest risk they confirm for pains in the whole body. This requires the application of different measures for improvement of the locomotor activity and better information about the risks of the long-term use of a computer.

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NOTES

1. A report of the EU "State of healthcare in EU: more protection and prevention for a better life in a better health", 2020.01.09.

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