



The Awareness of Using Laptops on Spinal Vertebrae Posture Among College Students

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Abstract

This research helped to draw attention to the effect of laptop use on the spinal cord vertebrae among college students who usually tend to spend long hours sitting in front of a computer screen to do their academic work. The main aim of this project was to investigate the awareness of using laptops on spinal vertebrae posture among college students in Dublin. It has evolved in response to the need to reach a better understanding of how proper sitting posture is important for college students, because most students are required to use a laptop without considering the impact of computer-related musculoskeletal symptoms. In this research, I used a qualitative research technique to fulfill its aim. Ten students were interviewed. They were chosen from Dorset College Dublin and Dublin International Foundation College. Their ages ranged from 24 to 30 years old and they study postgraduate diploma courses. The results of this project showed that only one of the participants reported musculoskeletal discomfort. However, the participants agreed that they felt uncomfortable when they used a laptop for more than five hours per day as well as regarding laptop stations. This study has been able to demonstrate that the participant who uses a laptop station has no cervical discomforts. In conclusion, the findings contribute additional evidence to suggest students should adjust the height of a laptop to the preferable level to prevent computer-related musculoskeletal discomfort.

Keywords: Laptop; Posture; College; Students; Health; Laptop Station; Spinal Vertebrae; Discomfort

Abbreviations

UEMDs: Upper Extremities Musculoskeletal Disorders; DCD: Dorset College Dublin; DIFC: Dublin International Financial Centre

Introduction

There is a greater constriction of shoulder muscle movements when people use laptops on the desk whereas on their laps, there is a greater stress on the wrist and head-neck muscles [1]. These problems often appear because there is a significant relationship between the viewing angle of computer display and muscle activity, if the computer display is displaced from the preferable position [2]. Similarly, according to Shin and Hedge the 'position of a computer display has been known to influence users' body discomfort' [3]. A

significant analysis and discussion on the subject were presented by Gold., *et al.* [4] who mentioned that the participants in the study complained of pain in their back and neck when they use their laptops in a prone position. The pain was because the prone position is a non-neutral position that demonstrates neck and trunk extension [4]. Furthermore, using a keyboard computer on average four hours or more per day is associated with neck and upper limb extremity pains [5]. According to this same study, the participants reported numbness and tingling pain in their neck and upper limb areas [5].

College students usually tend to spend long hours sitting in front of a computer screen to study in libraries or at home. Hence,

according to Dockrell, *et al.* [6], 'the neck and upper back were the most frequently reported sites of discomfort caused by computer use'. There seems to be general agreement on computer-related musculoskeletal discomfort, Cooper, *et al.* [7] found that the amount of time that students spend using their computers and the awkward body postures are more likely to increase the risk of musculoskeletal symptoms. In addition, it is important to note that forward head neck posture and the duration of sitting are more likely to effect on cervical angle, thus it causes neck pain [8].

The topic of using adjustable tools to reduce the load on neck vertebrae is necessary to discuss, especially with the prevalence of laptops among college students. It has discussed how it is important to use adjustable tools to meet every student need and to reduce cervical discomfort [9]. 'Students, even those in an allied health science university, are often unaware of the negative consequences that can result from lack of ergonomic knowledge' [10].

The purpose of this literature was to discuss a variety of studies that have supported the relationship between using a laptop and health risks especially body posture. It is clear from the review that improper sitting posture, wrong habits and not using adjustable equipment among students will risk their health. The studies found that cervical, shoulder and lower back pain were because of doing one or more of these things. This research is important to draw attention to computer-related musculoskeletal discomfort among students, especially college students who spend long hours using laptops to do their academic duties. It will allow them to develop awareness of the correct body posture and laptop use without putting a lot of pressure on spinal vertebrae muscles. Also, this research will increase the awareness of using adjustable equipment among college students if they know that it is important to use adjustable equipment to reduce the effect of improper posture on their neck, shoulder and lower back. Furthermore, the research will improve physical therapists' academic knowledge because it will allow them to advise patients who suffer from musculoskeletal problems in their neck, shoulder and lower back if they know that these patients use their laptops for long hours.

Materials and Methods

In this research, I used a qualitative research technique in order to collect in-depth and detailed information, such as students' opinions, beliefs and attitudes, based on their individual

experiences, about the correct body position, in dealing with computer devices. Ten participants from Dorset College Dublin and Dublin International Financial Centre were interviewed. They were international students, four males from Saudi Arabia who study in DCD, four males from Saudi Arabia who study in DIFC and two females from Nigeria who study in DIFC. Their ages ranged from 24 to 30 years old and they study postgraduate diploma courses. All the participants had to meet the inclusion criteria, which are as follows: all participants have had no medical operations on their spinal vertebrae and have experience using laptops. I decided to use non-random sampling and convenience sampling. In fact, the reasons that made to choose this method to achieve the aim and objectives were convenience non-random sampling was more likely to detect sampling errors than the other types of non-random sampling.

I had some difficulties with my participants, such as a language barrier. However, I prepared an interview schedule in advance and tried to explain the purpose of my research using simple words. I used an individual interview to achieve my aim and objectives. The individual interview provided me with deep and rich information about the research topic. I asked the participants to feel free to ask me for clarification or supplementary information about the purpose of the research. I used structured, open-ended questions to let the participants talk about their opinions and beliefs in detail. The interview schedule was conducted and I asked two students from DIFC to pilot it in order to make sure these questions covered every objective. I made some changes afterwards such as the interviewing time and clarifying some questions as well as adapting some question's structure. I took notes during the interview as well as I used a recording device. In case there was a problem with the recording device, I used my phone as a backup.

I sent a Consent Form and Participant Information Leaflet to the participants with an explanation about the purpose of my study. In addition, I gave the participants introductory questions to fill in and hand back to me on the day of the interview. However, to analyze the data that I got from interviewing the participants, I did the following; firstly, I took notes from the interviewees during the interview. At this stage, I wrote down their opinions and beliefs regarding every question. Also, I recorded their voices using a recording device. Secondly, I wrote a transcript about each

participant as soon as I got home. I listened to every participant audio record and in the transcript I wrote words only, no paralinguistic words were included. The notes, which I took during the interview, were written in the transcript. Writing paralinguistic words could obscure the main theme. Thirdly, I did the content analysis. At this stage, I looked for common themes in the transcripts and gave each theme a specific code (word or phrase) to make it easier to identify. Fourthly, I identified specific patterns by looking

for similarities and differences. I used Excel software to organize and display the results. Fifthly, I used the participants' words as well as appropriate quotations to display the results. These made it easier to explain some important findings. Finally, I interpreted the results. This interpretation was based on the data that I collected from interviewing the participants.

Results

Participant	Gender	Nationality	Age	Job	Height	Weight
P.1	Female	Nigeria	27	Student	170	80
P.2	Female	Nigeria	24	Student	167	54
P.3	Male	Saudi	25	Student	172	105
P.4	Male	Saudi	25	Student	166	59
P.5	Male	Saudi	26	Student	168	102
P.6	Male	Saudi	27	Student	168	57
P.7	Male	Saudi	27	Student	174	76
P.8	Male	Saudi	28	Student	173	55
P.9	Male	Saudi	27	Student	180	63
P.10	Male	Saudi	28	Student	177	88

Table 1: Introductory information about the participants (n = 10).

The table indicates all introductory information about ten students who selected to participate in this study.

Laptop habits among students

The participants at DCD and DIFC were asked questions regarding their laptop habits. Two third of the participants answered that they prefer to use their laptops at home. The participants mentioned that when they use their laptops at home, they use them in the position that they prefer. However, participant 2 said that she prefers to use her laptop at school because 'in a sitting position, she will achieve more. Also, it is more convenient'.

When the participants were asked about their feeling if their laptops displaced from the preferable position their answers were in the words of participant 7, 'he has to move it to another place or just maybe shut down his laptop'. In addition, participant 10 described his feeling as 'he will feel uncomfortable and a little bit angry'. However, participant 4 said that there is no impact of displacing the laptop on his feeling 'he thinks it is same for him, in another words he will be not as comfortable as when he uses it on his bed' (see figure 1).

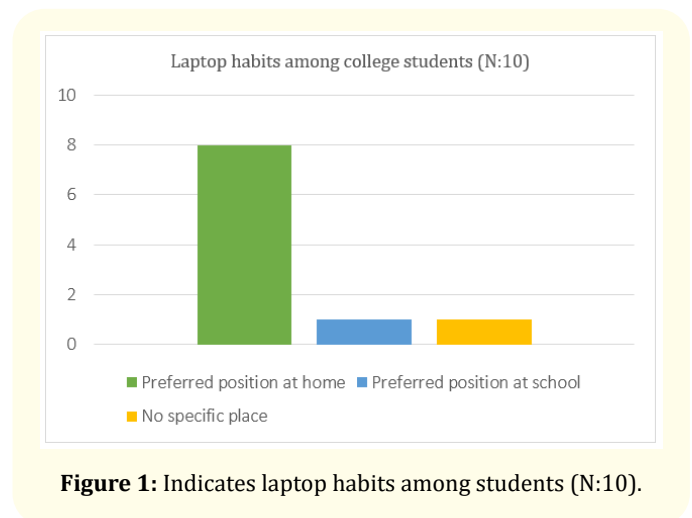


Figure 1: Indicates laptop habits among students (N:10).

Postural problems associated with the use of laptops

The majority of students answered that they had no musculoskeletal problems. However, participant 6 declared that ‘he felt pain in his knees and back’ as well as ‘he thinks that it was because he sits on the floor and put the laptop on the floor’. Furthermore, the participants were asked about the time that students spend as well as their general feelings about using their laptops. Most of the students agreed that they feel comfortable when they use a laptop for less than five hours per day. However, participant 6 mentioned that ‘he would use it three hours at least every day’ and his general feeling was ‘actually, no I do not like to use laptop, but prefer to do paperwork’. Likewise, participant 7 acknowledged that ‘he spends a long time 5 hours per day’ and his feeling was ‘he might feel some pain in his neck or upper limb extremity or even he feels s headache or sore eyes’. Regarding the students who answered that they used their laptops for more than five hours per day, participant 5 mentioned that ‘he uses it more than eight hours per day’ and ‘when he uses his laptop, he does not feel comfortable as he feels some pain in his neck or uncomfortable, so he needs to change his position’. Furthermore, participant 4 spends as the same time on a laptop as participant 5, but his feeling about using his laptop was ‘sometimes he feels a problem in his eyes or a headache’. Whereas participant 1 mentioned that ‘I spend a lot of time, let’s say roughly 12 to 14 hours per day’ and ‘yes, she feels comfortable’ and the same participant mentioned that ‘she tries to take breaks’ (see figure 2).

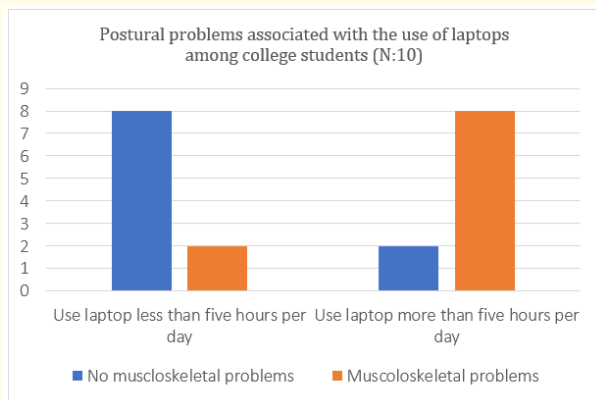


Figure 2: Indicates postural laptop habits among college students (N:10).

The awareness of the effect of using a laptop station compared to a standard laptop on neck posture

All the participants were asked if they have any information about the correct body posture when using a laptop. The response was that only five of them know it (see figure 3).

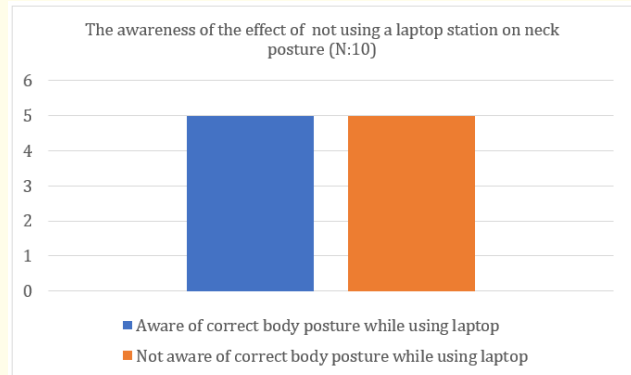


Figure 3: Indicates the awareness of the effect of not using a laptop station on neck posture (N:10).

According to participant 1, ‘she watched couple times on the internet, they say sit upright and put a laptop on the desk or on the table then sit upright while having work on the laptop’. However, all the participants agreed that laptop companies have a responsibility to give advice to consumers about using a laptop station. Participant 9 mentioned that ‘he believes that it is from their reasonability to let people know how to use it’. The participants were asked about the preferable type of laptop stations. The response was that the majority of students preferred to use an adjustable laptop station. Participant 8 stated ‘standard laptop stations are not popular because people prefer to buy adjustable laptop stations to be used by everyone in the family’. However, participant 6 reported ‘he prefers standard laptop station because he thinks adjustable laptop station could break after a while but standard it will stay for long time’. Regarding the participants thoughts about using an adjustable tool. Their responses were positive as participant 9 said ‘it is really easier and more comfortable because you can adjust it in the level or on the position you want exactly’ (see figure 4).

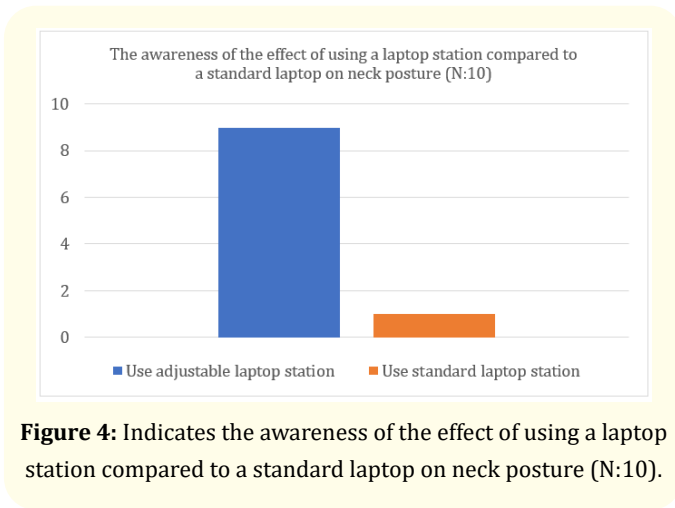


Figure 4: Indicates the awareness of the effect of using a laptop station compared to a standard laptop on neck posture (N:10).

Discussion

Laptop habits among students

Using a keyboard computer on average four hours or more per day is associated with neck and upper limb extremity pains [5]. The results of this study indicate that most students agreed that they feel uncomfortable when they use a laptop for more than five hours per day. These results are likely to be related to height and weight of the participants. This is because they might have changed their sitting habits to match their laptop position. Four out of five of the participants were asked whether height and weight correlation were above the normal average of body mass index (BMI) or slightly under the normal average (see Table 1). The height and weight correlation of the second participant was within the normal average which is why she did not report any level of discomfort. She was also the only one of them who had no problems with tables and chairs of the college. A possible explanation for this might be that the height and width of the chairs and tables of her college suit her height and weight.

It is also worth noting that the physical problems on muscle activity are significantly more frequent in the research of Sommerich, *et al.* [2]. They found that there was a relationship between the viewing angle of a computer screen and muscle activity. However, the findings of the current study do not support the previous research. It found that 70% of the participants reported psychological discomforts such as anger and mental concentration. In general, therefore, it seems that in the previous

study, the main focus was monitoring muscle activity in relation to the viewing angle of a computer screen. The position of a computer screen could put a lot of pressure on neck muscles if it was a bit higher or lower from the preferable position.

Postural problems associated with the use of laptops

Neck and upper back were the most affected areas according to the participants in Dockrell, *et al.* research [6]. On the other hand, in this current study, it is surprising that only one of the participants reported pain in the lower back and knees. A possible explanation for this difference could be because of the type of data collecting that the researchers used. They used a questionnaire to fulfill their aim and objectives. Using a questionnaire could not give the participants more options to choose from or even let the participants express their opinions about computer related musculoskeletal discomfort whereas in my research, I used an interview to allow the participants to express their feeling in more words. This allowed me to find more musculoskeletal problems related to using a laptop. Another explanation could be national customs. One of the participants is from Saudi Arabia and he mentioned that he prefers to use his laptop while he is sitting on the floor. This awkward body posture could affect lower back and knee muscles whereas in the previous literature review, the participants were from Dublin and usually sit on a chair while they use their laptops.

The awareness of the effect of using a laptop station compared to a standard laptop on neck posture

The present objective was designed to determine the awareness of the effect of using a laptop station compared to a standard laptop on neck posture. A little information been found in the literature review regarding how a laptop station could be used as an indication to assess neck discomfort. However, this study has been able to demonstrate that the participant who uses a laptop station feels no neck discomforts. A possible explanation could be that the participant is able to choose the preferable type of a laptop station that suits their needs. The only participant who reported neck pain was using his laptop at school which has no relation to the laptop station, but it might have a relation to ergonomics of the institution such as the height of chairs and tables.

Conclusion

Everyone in society has the right to be advised to use a laptop in a proper way. Students are one of age groups most exposed to computer related to musculoskeletal discomfort. Many suggestions are being considered by organizations in order to reach a better understanding of the relation between using a laptop and musculoskeletal discomfort of colleges students. Students should be encouraged to buy tools to use with their laptops. Doing this could help students to achieve more and reduce the impact of using their laptops on spinal vertebrae posture. Likewise, governments and universities have a responsibility to design special places with special features for students to feel more comfortable when they use their laptops. The special designs could be adjustable tables and chairs to be used at libraries. Other tools that could be used at libraries are detachable keyboards and mice. All of these facilities together will allow students to use libraries' computers in a way that not affect students' spinal vertebrae posture.

Four major limitations were reported in this research and are as follows: firstly, I would be better off using both qualitative and quantitative research techniques. The reason that makes me state this is when I was conducting the interview, I realized that I needed to provide the participants with numerical data and figures to draw their attention to this problem as well as using the qualitative approach to collect in-depth information regards their opinions and beliefs. Secondly, the small sample size did not allow me to collect enough data and 80% of the participants were from Saudi Arabia. As a result, most of the answers were similar to each other. It would be better if I had a bigger sample from different nationalities. In addition, using non-random sampling limited me from choosing different nationalities because I had to choose the participants that I had easy access to. However, this research would probably benefit the researcher who wants to do research on a specific nationality, such as Saudi. Thirdly, not all the questions were suitable to be used as an interview questions. Some of these questions were suitable to be used as questionnaire questions specially Likert scale and present them in bar charts. That gives concrete information to the reader about the importance of the research. Fourthly, the main focus of this research was on postural problems associated with laptop use and thus this did not allow me to discuss other health problems, such as eyes problems and

headaches in relation to laptop use. It was not possible to assess these problems because they required advanced equipment not available in my college.

It would be interesting to assess the effects of using standard laptop stations or adjustable laptop stations on musculoskeletal discomfort. The reason that makes me recommend this is because there is not much research done on this topic. All the previous research focused on the effect of both these types on neck posture but using these stations do not affect the neck posture only. There is a relationship between neck posture and lower back discomfort. If there is a problem in neck muscles, it would probably affect lower back muscles.

The findings of this research could be used to help students to draw attention to their body posture when using a laptop. The present study confirms previous findings and contributes additional evidence that suggests students should adjust the height of a laptop to the preferable level. Everyone prefers to use his laptop for a long time without feeling any musculoskeletal discomforts. That is why using an adjustable tool could possibly deter this problem. Using adjustable tools such as chairs, tables and laptop stations could be one of the best steps that educational institutes provide for students.

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Conflict of Interest

The author declares no conflict of interest exists.

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