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Research Article

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Effects of COVID -19 Pandemic Lock Down on Posture in Physiotherapy Students: A Cross-Sectional Study

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Abstract

Highlights

The current lifestyle, with its increased use of modern technologies, has determined modifications in people's behavior, making individuals more and more sedentary and with inappropriate body habits. Posture is one of the most important factors affecting the physical and mental status of an individual. Purpose of this study was to analyze the effects of COVID-19 pandemic lockdown on relative changes in postural habits, patterns and associated problems among Physiotherapy students, correlating it with the increased technology use and a reduction in levels of physical activity.

It was a cross-sectional online survey conducted during COVID-19 lockdown period (June to July 2020). Participants were 223 college students (mean age 20.65 ± 2.86) years recruited from undergraduate (I–IV year), internship, and postgraduate programs under Maharashtra University of Health Sciences. This was a qualitative study in which perspectives of students were obtained through a self-reported questionnaire. The results of this study revealed that the majority of the students have inefficient posture patterns and inadequate postural habits. Dominant inappropriate postural patterns were those of established low back pain, followed by neck pain, upper back pain, and shoulder pain (these being most prominent). This was majorly seen in participants who assumed awkward postures, owing to postural habits, increased use of digital devices, inappropriate ergonomics and also emotional stress. However, a significant number have also attempted to correct the same. The levels of physical activity before and during lockdown was either 'considerably' or 'minimally reduced' with the majority engaging in only light to moderate physical activity. The acquisition of adequate body behaviors and postural habits must be shaped during early adult age, minimizing postural disorders in later adult life and their consequences. Thus, early detection of postural changes and musculoskeletal risks is essential for the application of a preventive and educational protocol.

Keywords: posture, physiotherapy students, technology use, screen time, media use, COVID-19 pandemic lockdown, musculoskeletal disorders, postural habits

Introduction

Posture is one of the most important factors affecting physical and mental status of the individuals through their lives. Posture in humans is affected by different factors including familial factors, anatomical structural impairments, postural habits, and occupation [1]. In addition, there are a number of factors that may affect the posture like hereditary, age, gender, environmental condition, emotional, physical activity, and ergonomics, etc. [2-9].

According to the definition of Posture Committee of American Academy of Orthopedics in 1947, posture is the regular and balanced arrangement of skeletal components so as to preserve supportive structures of the body from injury and progressive deformation [1]. Posture is defined as the attitude assumed by the body either with support during the course of muscular activity, or as a result of the coordinated action performed by a group of muscles working to maintain the stability [10].

The key to good posture is the position of the spine. The spine has three natural curves - at the neck, mid/upper back, and lower back. Correct posture should maintain these curves, but not increase them. Cailliet stated that "posture may be in question if static spinal configuration does not lead to fatigue, pain in a certain period and is within acceptable ranges aesthetically" [1].

A good posture is the one which fulfills the purpose for which it is used with maximum efficiency and minimum effort. Having proper posture is very important for many reasons. When you lack the ability to maintain good posture in your daily routine, then your spine is out of balance, putting unhealthy pressure upon all other structures of the body including the nervous system and breathing patterns. The spine has a powerful relationship with the brain, spinal cord, and overall organ function. This intimate connection means that poor posture and spinal health has a far more reaching effect throughout the entire body. A bad posture has detrimental effects on mental, physical, cardiovascular health of an individual. Correction of bad posture is thus the need of the hour.

Postural habits may be good or bad. The latter are likely to result in change of muscle tone distribution, impair symmetry of body alignment and lead to the establishment of poor posture patterns. Established (habitual) posture patterns are related to the predominant type of daily activity, considering not only professional work but all activities performed during a day in different positions [11-15]. The predominance of static or dynamic overload in these constantly repeated patterns of body alignment results in disturbances of muscle tension equilibrium called muscle imbalance. In muscle imbalance, muscles, working according to the repeated patterns, fix them, thus creating specific posture patterns (for example cervical dyslordosis/ hyperlordosis, lumbar dyslordosis/ hyperlordosis) and causing pain of various intensity and location [16]. There is an association between inappropriate postural habits and musculoskeletal disorders in any age group and many factors can corroborate with these body modifications such as the adjustments and adaptations to individual's own body changes, psychosocial demands, and ergonomic difficulties, etc [17].

The postural deviations associated with the changes in habits of young people have increased over the last decade. Bad posture is a modern-day health epidemic that is much worse than most people naturally assume. The current lifestyle, with its increased use of modern technologies, has determined modifications in people's behavior, making individuals more and more sedentary and with inappropriate body habits, agility in work and leisure activities. On one hand modernization has provided greater comfort and on the other hand it has promoted a privation of body experiences [17].

Context and Relevance

Due to the COVID-19 crisis, many students are locked inside their homes, which must have significantly restricted their level of physical activity. This therefore has led to an increase in a sedentary lifestyle. A sedentary lifestyle is a type of lifestyle involving little or no physical activity. A person living a sedentary lifestyle is often sitting or lying down while engaged in an activity like reading, socializing, watching television, playing video games, or using a mobile phone/computer for much of the day. Also the strong restrictions on out-of-home movements increase the exposure to these dangers, inducing an increase in associated health risks. Hence, it may be difficult for them to stay physically active and maintain good postures along with an increased use of gadgets. Physical impact of digital devices use is a growing concern in health professional students. Studies suggest that there is an emerging need to address the postural problems and the associated musculoskeletal disorders arising from overuse of technology. There is substantial evidence to endorse the need to develop and monitor the quality of postural patterns in young people.

Investigating by way of self-perception questionnaires allows one to understand the level of awareness that the individual has of the positions of the different body parts. With such assessment it is possible to identify postural asymmetry and deviations, although there may be differences between the individual awareness and the image observed by the researcher. Self-perception instruments stimulate and evaluate the awareness of his/her body by the individual and might assist in the planning and evaluation of programs designed for postural/body education and predict positive results. Body perception studies work with awareness and self-reeducation, making it possible for the individual to reflect on his/her way of life, think and feel, reactivating the sensory part of his/her being and allowing for new movements.

The acquisition of adequate body behaviors and postural habits must be shaped during early adult age, minimizing postural disorders in later adult life and their consequences. Early detection of postural changes and musculoskeletal risks is essential for the application of a preventive and educational protocol. This survey will allow us to study the postural pattern among students who are constantly using technology for either study or leisure purposes in lockdown with added effects of sedentary lifestyle. This study also seeks to determine the association of these postural habits with postural problems.

Objectives:

1. To identify postural habits in Physiotherapy students (type of posture adopted, awareness of incorrect posture, any measures taken to modify it)
2. To identify the effects of lock down on the posture
3. To study the effects of posture

Methodology

It was a cross-sectional descriptive study conducted during COVID-19 lockdown period (June to July 2020). Ethical approval was obtained from the institutional review board of K.J. Somaiya college of Physiotherapy, India. Undergraduate (I–IV year) Physiotherapy students, interns, postgraduate students enrolled under MUHS were invited to participate in an online survey. Participation in the study was voluntary and electronic consent was obtained from the participant. Participants were excluded if (a) they refused to participate in the study (b) Any congenital or acquired postural deformity (c) Suffering from any traumatic or pathological conditions affecting physical health based on self-report. The target population was recruited by a non-randomized convenient sampling method and is representative of students available on social media platforms. Sample size was not estimated prior to the study. However, a maximum number of participants were desirable as well as anticipated in view of relevance of this topic to students in the current situation; and the beneficial use of

social media as a method of data collection.

A questionnaire was developed de-novo as a part of this study. The questionnaire includes student's academic profile details and other socio-demographic and behavioral characteristics including age, sex, etc. Students self-reported their use of screen-time and hours of sitting in a day. The objective of this questionnaire was to identify the perception of students concerning their postural habits in home environments during work, leisure activities (such as using the computer or something similar, watching TV) and resting. The questionnaire primarily focused on sitting posture. Physical activity level was assessed using variables like sleep, and use of digital devices (in hours). Effects of lockdown on posture was assessed using variables like pain, respiratory system, mental status, etc. Measures and time taken to correct the posture was also analyzed.

The questionnaire is self-reported and in English language. It is semi-structured with a combination of open and close ended-questions (includes multiple choice and ranking questions). Content validity of the questionnaire was established from two experienced Physiotherapy teachers. The questionnaire was distributed to the participants as Google forms via social media on WhatsApp; and was emailed, if requested by them. Link to the forms was available to them for a period of one week. Reminders were sent to ensure maximum participation. Data thus collected was subjected to analysis.

Data Analysis:

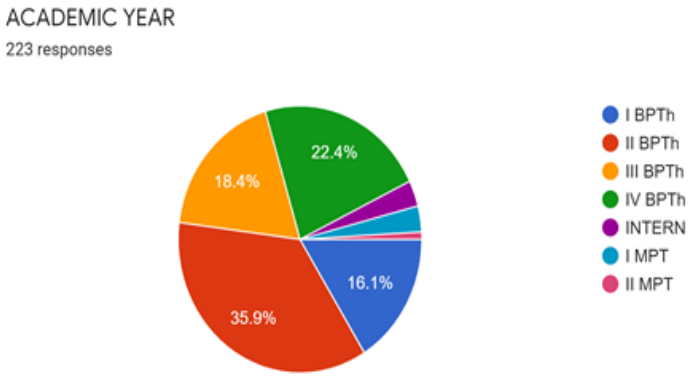
All the Google forms received were screened and inappropriate and incomplete responses were discarded from the analysis. The close-ended data was analyzed automatically using Google spread-sheet and descriptive statistics using percentage and frequency distribution was performed. The open-ended questions were analyzed using categorization and thematic analysis.

Results

The participants in this study were 223 college students, with a mean age of 20.65 ± 2.86 years, and predominantly females (93.3%). Distribution as per academic year of study showed that the majority of the students were from second year undergraduate program.

Technology Use:

All the participants reported using at least one screen based mobile device, smartphone being the commonest device followed by television and other portable digital devices. It can be seen that with the evolution of mobile phones to smartphones and by encompassing all of the internet features and mobile applications, the technological usage discussed above have been shifting gradually to smartphones. Multiple device use in varied combinations is also reported by the participants. Screen time is the amount of time that is spent using a device such as a smartphone, computer, television, tablet, iPhone, laptop, or video game console [18]. The following pie chart depicts the amount of hours spent by the participants actively on their digital devices (Figure 1 & 2):



1: Academic year wise distribution of participants

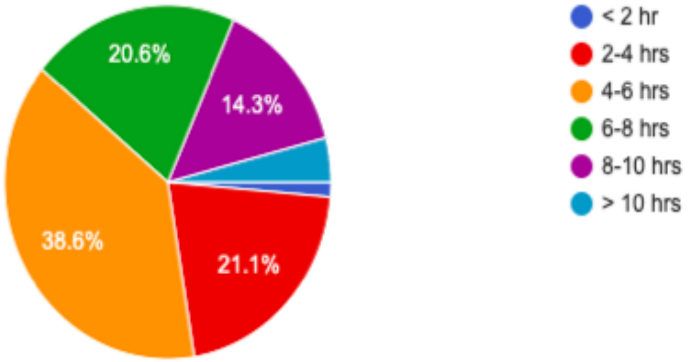


Figure 2: Amount of hours spent by the participants actively on their digital devices during lock down

It can be seen that the majority (77.6%) of the students were spending > 4 hours actively on their digital devices. Our study findings are in accordance with some preliminary reports suggesting that during the COVID-19 pandemic Tech use has increased tremendously among the younger generation and students [19]. Younger people are more likely to be digital technology and social media users. With more people having to stay at home, use of the internet for entertainment and social networking has been accelerated as indicated by preliminary surveys conducted during lock down [19, 20]. According to a few other studies the average time spent on screens now is seven to 10 hours. Online lessons for young adults have of course contributed to an increase in the amount of time they are in front of screens – and this is largely unavoidable. Students at our university regularly use communication technologies to update on the program in which they are enrolled, completing assignments and participating in course activities. These technologies have become essential to student life and may lead to modification of their behavior. Psychological and environmental factors in the lives of college students operating during this unprecedented situation of lockdown may leave them disproportionately vulnerable to excessive and undisciplined use of digital devices. It is clear that excessive reliance on digital devices during lockdown is a distinctively problematic pattern of use emerging as a health concern and need to be addressed. Studies show that screen time directly impacts an individual's mental and physical health [21]. Concerned about its negative health consequences, specialists called for limiting the screen time and for a more active lifestyle. Recommendations for an acceptable amount of screen time include two hours a day for adults [22]. The results of our survey clearly

account for an over expenditure of time in front of screens.

When young people use digital devices, they often do so in awkward positions such as lying on their stomachs or slouched over. Remaining in such positions for extended durations can have significant adverse consequences on the neck, back, and spine. Some doctors opine that many young people do not sit or walk straight and that excessive use of mobile devices exacerbates an already bad situation [23]. Correct ergonomics, while using digital devices is essential.

Laptop computers are not ergonomically designed for prolonged use. Portability and mobility of smartphones and laptops come with its own jeopardy (McKinley Health Center, 2008), as students often use it in a position that results in a poor posture, e.g. at one's lap or in constricted spots on tiny tables. As a response to the question 'where do you usually sit for studies while using digital devices?', the majority of the participants (64.6%), reported that they use a study table, either a traditional one with a chair (37.2%), or a smaller portable one sitting on the bed (27.4%). 23.3% stated that they sit in a comfortable position on the couch while 5.4% stated that they study in a recumbent position and 1.4% reported sitting on the floor. It is observed that students preferred comfort over ergonomics while studying in the chair, bed or on the floor.

Table 1 shows the ergonomic measures adopted by the study participants while using digital devices. The results revealed that the majority of the participants were not using ergonomic measures. These findings are in accordance with previous literature indicating that non-ergonomic postural behaviors are common among young people [24]. A study on Indian Physiotherapy students revealed that the majority of students lack knowledge regarding good posture and are unaware of safety risks regarding computer ergonomics regarding screen, mouse, keyboard, and overall work station [25].

Table 1: Ergonomic measures adopted during use of digital devices

Ergonomic Measures used	Percentage of participants(%)
Chair with armrest	17.5
Chair with backrest	48.4
Ergonomic chair	8.5
Mobile phone holder	7.6
Mobile phone or computer screen at eye level	40.4
None	30.9

Another concern with the digital devices is that the cognitive distraction from using a mobile phone reduces situation awareness. A study by Schwebel et al. found that listening to music and texting are more distracting than talking on the phone, because texting involves reading and typing; an activity which is more cognitively demanding than talking on phone [26]. Yet another similar study revealed that engaging in a cell phone conversation, especially cognitively complex conversations distracted college pedestrians [27]. These studies only analyzed the behavioral effect of using mobile phones that may cause accidents. It can, however, be extrapolated that distracted users are less likely to perceive abnormal posture while using digital devices. Among the effects of using a computer on the musculoskeletal system, keeping a posture of staring at a monitor, located below the height of eyesight leads to a turtle neck posture. This is becoming increasingly common, as it is becoming more common to use Video Display Terminals in the leaning forward posture, particularly with the popularization of smartphones [28]. Severity of head flexion of smartphone users when text messaging while sitting is the most [29].

Postural Habits

According to our survey (69%) of the participants admitted that they were assuming an awkward posture in sitting (69%), standing (21%), recumbent position (52%), while (31.8%) did so while doing functional activities. Poor postural patterns were transferred from one position to another, most frequently from sitting to recumbent position, from standing to functional activities, etc.

Due to the current situation of home confinement, many of us are glued to our chairs or couches, watching television, doing our work or simply just using our phones and majorly adopting sitting positions. The following pie chart shows the amount of time spent in sitting position by the study participants (Figure 3). It is seen that more than half of the surveyed population (50.2%) was spending nearly 4 to 8 hours in a sitting posture. Sitting for a long time leads to many risk factors that cause postural changes [30, 31]. Those risks are exacerbated by computer use, which has already been identified as predisposed to musculoskeletal diseases, mainly in the upper limbs and cervical spine [32]. Various ergonomic studies have reported the musculoskeletal health effects related to prolonged static sitting as low back pain and neck- shoulder complaints. In particular, sitting behavior in an upright and a forward inclined sitting position combined with few breaks and no changing in seated position is believed to be connected to back pain [33]. Sitting time at work and an unfavorable working posture is associated with neck–shoulder pain. Prolonged sitting is also associated with sedentary behavior and thus a spectrum of other health risks, including diminished cardiovascular health, cancer, diabetes, weight gain, metabolic syndromes, higher risk of psychological distress, muscle degeneration, osteoporosis and a higher rate of mortality [34]. Reducing prolonged static sitting, with replacement with standing and increased activity levels is recommended to mitigate these negative health impacts [35].

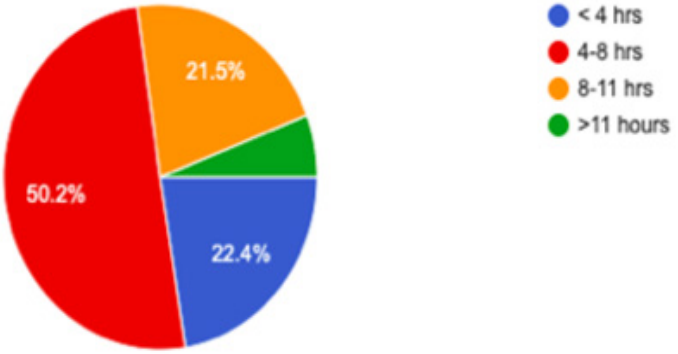


Figure 3: Amount of time spent in sitting position

The position assumed while sitting in general (table 2) was 'well supported back' (45.4%), 'well supported buttock/hips' (60.8%), while some also adopted 'tilted buttocks' (32.6%) or 'twisted position of back' (7%). For the remaining participants the spine was either not supported in the sitting equipment or the supporting device was not used by them. The dominant inappropriate postural patterns among the participants were those of poorly supported spine. Acquisition of such inadequate habits mean the potential for future problems like postural changes and back pain [36-38]. 46.4% of the participants noticed that their body posture is changed during the lockdown. The most commonly observed postural deviations were protracted shoulders (20.3%), forward head (13.5%) followed by increased lumbar lordosis (5.9%), increased thoracic kyphosis (5%); and all of these deviations in combination were reported by most of these participants. Remaining participants reported no change in posture whereas some participants mentioned that they were not aware if their posture had changed.

Table 2: Posture adopted in sitting

Position assumed while sitting in general	Number of participants
Back support	
1.Well supported	100
2.Tilted or Slipping forward	107
3.Twisted position	16
Buttock or hip support	
1.Well supported	135
2.Tilted or Slipping forward	73
3.Twisted position	15
Foot position	
1.Firm on floor	52
2. Unsupported or hanging down	29
3.Legs crossed	142

Sitting has been associated with a substantial decrease in lumbar lordosis and pelvic measures. De Carvalho, et al. (2010) compared lumbar spine and pelvic posture between standing and sitting via radiologic investigation and found that lumbar lordosis and sacral inclination decreased by 43 and 44 degrees, respectively [39]. This shows that with respect to sitting posture, the goal should be to maintain or prevent a reduction of the lumbar lordosis. Neutral sitting postures also provide positive effects to the cervico-thoracic spine. Researchers have looked at the effects of various postures on regional muscle activity. A study by Caneiro, et al. (2010) showed that slumped sitting was associated with greater head / neck flexion, and increased muscle activity of the cervical erector spinae with one study reporting 40-percent higher cervical extensor activity in the slouched posture [40, 41]. More neutral sitting postures reduce the demand on the cervical extensor muscles [42]. Thoracic kyphosis is a complication of the combination of slouched-forward shoulders and rounded upper back [42, 43]. Slouched position also has an impact on the thickness of the transversus abdominis (TrA), which is important in spinal stability. A study by Reeve, et al. (2009) found that the thickness of the TrA was significantly greater in standing and erect sitting than in a slouched or sway-back standing position [44]. The authors concluded that lumbo-pelvic neutral postures have a positive influence on spinal stability compared to equivalent poor postures. For the deep and superficial fibers of lumbar multifidus muscles, the least muscle activity occurred during a flat posture, which was similar to a slump posture. [45]. The most activity occurred in a short lordosis position; there was also more activity in the obliqus internus. Repeated forward flexion at the spine can contribute to impaired reflex activation of the back muscles. Prolonged forward-flexed positions can impair sensorimotor control mechanisms and are mainly due to time-dependent "creep" in soft tissues, rather than muscle fatigue. Proprioception, in the form of lumbar spine reposition sense, is also affected by a slouched posture. A study by Dolan, et al. (2006) provided evidence that a slouched posture of 5 minutes' duration can increase reposition error [46]. Proprioceptive control is known to be valuable in spinal stability. The fact that reposition error can occur within as little as 5 minutes of "slouched" posture suggests the importance of postural education in decreasing proprioceptive loss and injury. Therefore, limiting prolonged forward flexion of the spine is important in helping to maintain proper posture. Education on maintaining a neutral sitting posture can offset the detrimental effects. Studies are showing a trend toward addressing neck postures through thoracolumbar spine postural adjustments. Adjustments to seat angle and lumbar roll can also significantly affect head and neck posture. A study by Horton, et al. (2010) found that the degree of angulation of the backrest support of an office chair, plus the addition of a lumbar roll support, are the two most important seat factors that will benefit head and neck postural alignment [47].

For functional movement to occur in sitting, stability of proximal body parts (pelvis, spine and shoulders) is a prerequisite for distal control [48]. It is important for pressure management in sitting that as much of the individual's body as possible is loaded in their chair, this includes the feet, a commonly overlooked area. In normal upright sitting, weight distribution is such that 75% of our body weight is exerted through the buttocks and thighs and 19% of a person's body weight is taken through their feet [48]. If the individual is not properly loaded or supported in their chair they may be forced into a posterior pelvic tilt and may use their feet/ heels/ankles to stabilize themselves. Many people nowadays get joint pain, wear-out of joints, etc. and the basic reason for this is their sitting posture with legs hanging down. The reason for

this is that, when we sit with our legs hanging down, our blood circulation will be more below our waist and the upper part of our body will not get sufficient blood circulation. It was found that 23.2% of the surveyed population sits with their feet supported on the floor, while 13.4% keep their legs hanging and 63.4 % of the population (majority) keeps them crossed while sitting. With long sitting hours not only do we need to see to it that our backs are well supported but we should even put into light the importance of our lower limbs being supported well. Loading the feet properly on an appropriate footplate makes the individual more stable and secure in their chair and gives a greater level of independence such as during transfers.

During the lockdown participants newly experienced musculoskeletal pain in various body regions as depicted in (table 3). Data revealed that pain occurred in nearly two-thirds of the participants (66.6%), predominantly and almost equally in the lumbar spine (33.3 %) and cervical spine (32%) followed by the thoracic spine (19.4%) and other body parts. 26.1% participants reported headache while 8.6% reported tingling or numbness in extremities. Back pain among this population is already considered a public health problem. It increases over the years and can be associated with other disorders like sleep disturbances, as well as the need for specialized medical care and medication [36, 49, 50]. 55.84 % of the participants having these symptoms prior reported that their symptoms have aggravated during lock down. Few participants (6.8%) also reported that they have been experiencing difficulty in physical activities of daily living, which seemed normal earlier (e.g. grabbing a jar from a shelf placed, overhead activities). This is rather alarming considering the age of the participants (18-23 years). Posture is a major factor in the health of the musculoskeletal system. The pain was probably partly due to inappropriate everyday postural behaviors. Dominant inappropriate postural patterns among the participants were those of established neck pain, followed by low back pain, upper back pain, and shoulder pain (these being most prominent). Considering the high prevalence of back pain among the surveyed population, it would seem appropriate to give special attention to back care in postural educational programs. Raising the awareness about back care and how best to perform daily activities has shown to be effective in averting the development of painful symptoms [37].

Table 3: Musculoskeletal pain

Pain site	Percentage
Jaw	1.4
Neck	32
Shoulder	13.5
Wrist and hand	9.5
Upper back	19.4
Lower back	33.3
Leg	12.2
Calf, wrist, elbow	0.5

When asked to identify the cause of their postural problems, the majority of the participants attributed it to poor postural habits (67.6%) and excessive use of digital devices (60%) followed by inappropriate ergonomics (44.6%) and also emotional stress (25.7%).

According to the participants themselves, changes like forward head, protracted shoulders, increased thoracic kyphosis and lumbar lordosis, etc. corroborated with the symptoms mentioned above (e.g. pain) while it was aggravated in some owing to an increase in faulty postural habits adopted during lockdown. Participants related it most frequently with the use of study tables with incorrect back and buttock support (tilting forward) and use of digital devices without taking appropriate ergonomic measures. Proper ergonomics are key components to creating and maintaining good postural habits while they also increase human efficiency and prevent injuries such as recurrent micro traumas or strain. A study has shown that the introduction of ergonomically correct postural patterns is effective after just a few weeks and results in increased comfort during assuming various positions and performing everyday activities in these positions [24].

Excessive tech device, especially smartphone usage can contribute to several physical ailments that might impact young people [49]. This includes strains and possibly damage to joints, ligaments, and tendons, which might precipitate serious pain and mobility difficulties; headaches; bone spurs, herniated and degenerative disc problems in the back and spine, pain in the neck, shoulder, and thumb, and the severity of the symptoms as the total time spent using the smartphone increases [52]. According to other musculoskeletal studies, in a population using mobile phones, most participants reported pain in at least one body part. Right hand pain was most common at the base of the thumb. Significant associations found included time spent internet browsing and pain in the base of the right thumb and total time spent using a mobile device and pain in the right shoulder and neck [53]. White and his associates reported 54% prevalence of musculoskeletal pain and/or discomfort in intensive users of hand-held electronic devices (meaning five or more hours of use per day) ends with 12 percent among the less intensive group in their study involving 500 Hong Kong University students [54].

Postural Stress is the stress on our bodies as a result of inefficient posture, repetitive movements or prolonged time in the same positions; often as a result of work environments [55]. These stresses may be relieved once the offending posture is corrected or may continue to accumulate, slowly weakening the affected structure. Many of us being aware of our poor posture at times tend to take certain good measures to try to correct or improve it by following certain protocols. According to our survey, 93.7% participants stated that they took active measures to correct their posture when they noticed that it's awkward or incorrect. This shows awareness about one's posture and the need to correct it amongst the physiotherapists. Out of these, 58.7 % of the population follows stretching exercises, 50.2% does general activity, 61% people stated that they change their positions frequently. 15.6% of the participants reported use of good ergonomics and 9% set reminders to correct their posture periodically. Stretching and general body exercises could be considered as a component of postural hygiene. Postural hygiene is a term developed by Andre Noel Potvin, president of Infofit Educators to encourage his clients to perform quick and easy daily exercises that offset the

daily tension that builds in their muscles due to gravity, poor body mechanics, stress and other such factors [54].

Along with these measures, 69.9 % participants targeted modification in their posture; out of which 78.68% mentioned that it helped relieve their body discomfort. On the other side, 3.2% participants reported that such attempts led to more discomfort, 15.8% did not attempt and 12.2% assumed that their posture is not the cause of their pain. When asked about how long they persist in their efforts to correct posture, 52.7 % reported that they discontinued it within 1 month, 21.2% continued for 1-3 months while only 2.3% persisted for 3-6 months. Results of our study are consistent with those of an interventional study which reported that some examinees discontinued behavior modification during the first month after the initial instruction and the majority did so over the next three months [24]. An attempt to modify non-ergonomic postural behaviors usually results in pain, which may act as a demotivating factor. Discomfort associated with the modification of habitual postural behaviors is reduced after 3-4 months of regular training.

When prompted, almost anyone can 'sit up straight' or 'have good posture'. It is maintaining good posture throughout the day that is difficult for the far majority of the population. Maintaining resilient posture for a long period of time is called Postural Fitness [57]. Just as we have to consistently workout to increase our level of physical fitness, it takes commitment and persistence to build our Postural Fitness. Proper postural habits contribute to better body function and are necessary to increase our level of Postural Fitness.

Physical Activity

Recently studies have been directed towards investigating the relationship between postural habits and physical activity levels. Previous studies have reported a relationship between levels of sedentary behavior, physical activity, and back pain [58]. These studies propose that deconditioning and fatigue associated with prolonged sitting is a risk for musculoskeletal injuries. When asked to compare the individual levels of physical activity before and during lockdown, the majority of the participants claimed that their physical activity was "considerably reduced" (44.8%) while a substantial number claimed it as "minimally reduced" (32.1%). 8.6% mentioned that it's nearly the same as before while 14.5% mentioned that it has been increased. The responses largely show that levels of physical activity have reduced during lockdown as against before it. A major chunk of the population (52%) self-rated its physical activity as 'light'; 'moderate' level was reported by (29.9%) and only a fraction of the population (2.7%) reported vigorous physical activity. 15.4% reported sedentary behavior as well, which we cannot afford to ignore. There have been preliminary reports indicating that physical activities have been reduced tremendously and has led to a sedentary lifestyle in lockdown, owing to self-isolation and quarantine requirements. We also took into consideration sleep times in order to study the sedentary behavior. The pattern of sleep times observed in our survey was: 69.7% of the population had sleep hours within the recommended range (7-9 hours), while 13.1% of the population had less sleep time (< 6 hours) and 17.2% of the population had more sleep time (>11 hours) than the recommended hours [59]. Exercising helps our posture by moving the articulations of the body and strengthening the postural muscles that support our spine. We asked the participants about their engagement in any kind of exercise of physical activity and to compare the same before and during lockdown. Regular physical exercise was considered to be done for a minimum 3-5 days per week. 60.08% participants were doing physical exercises during lockdown as opposed to 41.25% prior to lockdown. Thus, overall participants reported reduced physical activity but more participants engaged in physical exercise during lockdown.

Czakwari et al. studied the incidence of postural faults, level of physical activity and their possible relationship in young adults [60]. Most common was lumbar hypolordosis and thoracic hyperkyphosis. It was seen that postural faults were widespread in the group while physical activity in the assessed group was high, with 71% of cases. It is also observed in other studies that sedentary behavior associated with prolonged sitting promotes deconditioning. This study further adds that fatigue negatively affects employees' abilities to meet the demands of increasingly physical workloads and is a risk for musculoskeletal injuries [61]. A study by Fahad Hanna, et al investigated the relationship between levels of sedentary behavior, physical activity, and back pain among university employees. 61.2% reported to have experienced back pain [62]. Sedentary behavior (too much sitting) was significantly associated with those who experienced either low back pain or upper back pain [58]. There is evidence that screen time is associated with sedentary behavior largely due to the nature of most electronic activities. Sitting to watch television, playing computer games or scrolling on your phone takes time away from physical activities. Owing to the limited evidence and mixed results, we recommend future studies to explore the relationship between postural habits and physical activity levels in the context of screen time and its further association with musculoskeletal ailments.

It is worth considering that postural behaviors may reflect the psyche. Another concern is the psychological and psychiatric implications of postural behaviors. There are supporters of the theory (for example M. Alexander) that posture reflects human character or that it is a response to stress [63]. For example, Wickham says, the body can associate closed, or slumped-over posture with stress, which results in the release of cortisol. On the other hand, open or high-power positions — which may release endorphins and even testosterone, the dominance hormone — ward off stress and create feelings of confidence. Four studies were conducted by John H., Riskind, Carolyn C. Gotay in a laboratory setting to examine whether variations in physical posture can have a regulatory or feedback role affecting motivation and emotion [64]. The results of these studies revealed that subjects who had been temporarily placed in a slumped, depressed physical posture later appeared to develop helplessness more readily, as assessed by their lack of persistence in a standard learned helplessness task, than did subjects who had been placed in an expansive, upright posture. Subjects who were placed in a hunched, threatened physical posture verbally reported self-perceptions of greater stress than subjects who were placed in a relaxed position. The findings of these studies are interpreted in terms of self-perception theory. It is suggested that physical postures of the body are one of several types of cues that can affect emotional experience and behavior [65]. Shwetha Nair, et al. investigate whether an upright seated

posture could influence responses to a psychological stress task [66]. Adopting an upright seated posture in the face of stress can maintain self-esteem, reduce negative mood, and increase positive mood compared to a slumped posture. Furthermore, sitting upright increases the rate of speech and reduces self-focus. This research is consistent with embodied cognition theories that muscular and autonomic states influence emotional responding. The emotions of happiness, success, confidence, and optimism are associated with an open expansive posture.

These research studies highlight the direct correlation of posture and emotions stating that posture can affect emotions and emotions can affect postural presentation [67]. In our survey, more than half of the population reported lack of motivation (56.8%), lack of concentration (59%); anxiety and low self-esteem was reported by 30.7% and 23.4% of the participants respectively. A study conducted by Samikshya Acharya indicated that most of the students are experiencing increased stress sometime due to lock down and are threatened with coronavirus outbreak. Some factor associated with increases stress are increasing days in confinement, worries about studies, online classes, and lack of access to a mobile device or Wi-Fi at home for digital learning, lengthening of academic year due to uncertainty related to corona virus [68]. There is also evidence that high screen time is associated with deleterious effects on irritability, low mood and cognitive and socio-emotional development, leading to poor educational performance [69]. In a systematic review there was a positive association between screen time and poorer psychological well-being or perceived quality of life in 11/15 studies [69]. As reported ---Since February 2020, there has been a 300 per cent increase in people searching "how to get your brain to focus", a 110 per cent increase in "how to focus better", and 60 per cent rise in "how to increase focus" in February 2020, there has been a 300 per cent increase in people searching [70]. Considering the emotional dimension of posture, sitting upright may be a simple behavioral strategy to help build resilience to stress and such negative emotions and improve overall emotional performance.

Posture influences almost every physiologic function of the body; it can have a positive or negative influence on strength, function, performance and overall energy levels. When our bones and joints are in correct alignment, it allows the muscles to be used as they are intended, so we will have less fatigue and more energy. In other words, the muscles don't have to work so hard to do what they are supposed to do. In the present study, 32.4% participants reported physical exhaustion or increased tiredness in lockdown. There are indications in the literature that inappropriate postural patterns may also influence the function of internal organs [71]. Around 30.6% participants reported an increase in weight since lockdown. When asked specifically about presence of some symptoms, 6.3% participants reported shortness of breath, 11.7% reported constipation and indigestion, 2.7% participants reported urinary incontinence and 0.5% participants reported varicose veins. It is known that slouched posture after a meal can trigger heartburn caused by acid reflux, heartburn and slowed digestion. Forward head posture may result in a decrease of up to 30% of lung capacity, mostly through inhibiting some of the anterior muscles of the neck (hyoids and anterior scalenes) [71]. Kyung Woo Kang, et al, investigated respiratory function in different sitting postures while using a smartphone. The posture assumed while using a smartphone leads to reduced respiratory function as measured by forced vital capacity and forced expiratory volume in 1 second [70].

Discussion

Human postural habits have anatomical and physiological limitations, but there are a great many choices, the determinants for which appear to be mostly habitual. This study aims to deal in a systematic fashion with the postural habits related in particular to digital device use in Physiotherapy students. Purpose of the study was to identify the postural awareness of the young people with respect to sitting position and the home dimension. Awareness of correct posture was inferred from the analysis of postural habits self-reported by the students.

Through this cross sectional survey we intended to analyze the effects of COVID-19 pandemic lockdown on relative changes in postural habits of individuals, correlating it with the increased technology use and a reduction in levels of physical activity. Results of the study revealed that during home confinement majority of the university students adopted a sit-down culture with awkward, non-ergonomic positions and experienced various musculoskeletal and other health problems. The following study contributes to our knowledge in knowing the association of incorrect or awkward posture and physical pain, and highlighting the effects of physical activity on the same. As an asset of this design, we were able to infer that a change in the lifestyles of young people during the lockdown may be linked to poor postural habits. Additionally, we were able to explore different exposure-response relationships to draw inferences from technology or screen use and physical inactivity to postural problems and general health. An important highlight of this study is its comprehensive nature of enquiry as along with postural changes it also asks about certain aspects of mental health like anxiety, lack of motivation and low self -esteem. The blending of physicality and emotionality dimensions of posture may actually cause and reinforce problematic patterns of poor posture.

Majority of the studies conducted on the student population have been done in a school environment. Only a few epidemiological studies have evaluated university students with regard to their postural behavior and knowledge of body posture. Some studies in Physiotherapy discipline have addressed the posture in work settings and in relation to patient care. Moreover, there is a lack of scientific information on postural behavior of university students during activities of daily living. Corona pandemic was an experimental time to explore the effect of postural habits in the home environment. To the best of our knowledge, this is the only study which has explored the postural changes that have come our way due to long sitting hours during the corona pandemic and its effects on our bodies.

During the physical therapy undergraduate education, a student gets introduced to the concept of body posture; and basic lessons, such as exercise physiology and exercise education, are taught intensely. It is expected that Physiotherapy students have in depth knowledge about body movements, biomechanics and body physiology. Under this assumption, we hypothesized that Physiotherapy students would demonstrate good postural habits in daily life. On the contrary, the results of this study indicate

that the majority of the students have inefficient posture patterns and inadequate postural habits. While authors of similar studies have also observed that knowing the consequences of unhealthy habits does not ensure a correct behavior. Inappropriate (non-ergonomic) behaviors are prevalent among young people. The high frequency of poor postural habits in young people may be linked to a lack of education or insufficient education about ergonomics. In the current context of using digital devices at home, proper ergonomic infrastructure may not be available to students. However, lack of awareness regarding the importance of ergonomic support cannot be ignored. It can also be said that long periods without monitoring or additional learning experiences lead to progressive abandonment of learned postural patterns. During lockdown without regular practice of sitting with proper ergonomics for studying in a classroom setting; and a comfortable home environment with limited choice of ergonomic support could explain the lack of association between postural knowledge and adoption of appropriate postural behaviors by the students.

The findings from previous studies support the hypothesis that programs involving practice and motivating strategies impart health knowledge and habits more efficiently than those restricted to the mere transmission of information [73-75]. Nevertheless, it is important that educators use strategies that emphasize repetition and memorization of concepts as well as other strategies that enable students to associate theory into practice. It supports the need for institutional programs offering increased opportunities for implementing reinforcement strategies to improve theoretical knowledge and the ability to make practical use of this knowledge. Improved mentoring by educators may result in better postural hygiene amongst the students and ensure proper adoption of proper postural habits in adult life. It is essential that the content of the postural education programs meet the reality of student environments and address situations related to their daily lives. Focus should be on the etiquette of sitting postures and postural behaviors that can be assimilated, practiced, and corrected on a daily basis. Such an approach may lead to higher probability that students will incorporate these lessons in daily life.

Teaching postural behavior through educational and preventive programs are widely implemented in school and have also been applied to the workplace or other community settings to the adult population [76-82]. These programs have demonstrated the effectiveness in terms of improved level of awareness about posture with changes in postural habits and posture.

The effectiveness of remedial action aiming to correct inappropriate behaviors (in the case of our study, it was the modification of poor postural habits) depends, above all, such factors as the awareness of the person involved in the remedial program, their commitment and systematic work. The implemented postural programs mentioned in some studies were based on the 'Health Belief Model' which links an individuals' perception on their health or illness [83-86]. Sensitization of students and by increasing their perception of improper postural habits could be viewed as the initial step in this process. Habits are deeply rooted in everyday behaviors and their modification is a long-lasting process requiring self-discipline, which was apparently lacking in the young people. An attempt to modify incorrect postural behaviors may lead to pain, which may be a demotivating factor that often results in the withdrawal from further work on changing one's habits. The discomfort connected with modifying habitual behaviors is reduced after a long time (3-4 months) of systematic work [24]. Even the effectiveness of postural education programs is evident immediately whereas follow-up evaluations reveal that long term or carryover effect is lacking. Good postural hygiene requires maintenance evaluations. Simple strategies such as posture photos, taken periodically, could give a visual timeline of the posture and demonstrate level of postural fitness. If the individual sees his/her posture beginning to weaken, an action can be taken immediately to correct the posture. Avoiding the problem will lead to avoiding the health consequences that are harder to correct later in life.

Though there is robust evidence of postural evaluation using direct clinical observation and objective methods, there are some advantages of using self-report measures of postural assessment. Awareness is essential to good posture. Investigating the subject by way of a self-perception questionnaire allows one to understand the level of awareness the individual has concerning his/her postural habits [1]. It is believed that when the young person replies to the questionnaire, he/she will become aware of his/her own postural habits, and involve himself/herself in a sensory experience that might serve as a contribution to a change in postural habits. The PROSPER questionnaire, created by Ritter and Souza, was also developed based on the idea that body awareness could serve as a support for a change in postural habits [17]. We believe that the investigation of postural habits in a subjective way (self-perception) demonstrates the knowledge and self-care the individual has with his/her own body.

This study only presents an outlook of the variables and does not present a relationship between analyzed variables. However, some points emerged from the study's context and the data suggest causation and contributes to the growing literature highlighting the negative effects of inappropriate postural habits. In spite of the tentative nature of information provided by the self-reports we think there is good reason to believe that many postural patterns adopted by these students were adding to the abnormal strain on the musculoskeletal system. The biggest problem is not the symptoms but the daily behaviors. We need to address the posture, time spent on digital devices and the mechanics and bad habits that are causing the problem. Students should be sensitized with the extent and vigor of postural etiquette. Effective translation of knowledge would reduce the risk of various musculoskeletal disorders in the future. By being mindful of how much time we are spending staring at a screen, we can make sure that the technology is not affecting our health.

We however acknowledge several limitations of this study. By far the most important being students' self-reported information on screen use, posture and physical inactivity variables might generally be biased by recall and subjectivity of the reporter. Lack of physical evaluative measurements of posture of participants especially, in case of deviations from ideal posture as well as levels of physical activity can be a drawback. Owing to the cross sectional nature of this study, casual relationships cannot be established and future longitudinal studies are recommended to further explore this dynamic relationship. Also, owing to the complex interaction of the multiple factors viz. postural changes, body pains and aches, physical activity, etc. we cannot separate the

individual contribution of each factor.

Conclusion

The study revealed that the screen time spent on digital devices, smartphone being the commonest, had increased. This is indicative of excessive reliance on the same, especially during the lockdown period. Majority of the participants (i.e. 77.6%) were spending > 4 hours in a day on their devices, which is approximately more than double the recommended amount.

In addition, this study also highlighted the ignorance of participants towards ergonomics while using digital devices for study, and how they preferred comfort over it. Though maximum (64.6%) participants stated that they used a study table (either fixed or portable), their positions were non-ergonomic. Others were found to assume their own comfortable positions. Therefore, these findings come as a concern keeping in mind the repercussions of over expenditure of time in front of screens and faulty postural habits.

Nearly half of the participants reported to be attaining a sitting posture for nearly 4 to 8 hours in a day, while maximum of them attained an awkward posture. Participants who reported a change in posture, mentioned its effects on the musculoskeletal system, respiratory system, mental health, etc. also reported an aggravation of these symptoms since the lockdown began. When asked about the cause for their postural problems, maximum reported poor postural habits. This is surprising as the study population mainly includes physiotherapy students.

Most of the participants engaged themselves only in forms of light physical activity; and levels of physical activity were reduced considerably during the lockdown. Around 30.6% participants reported an increase in weight since lockdown. However, when asked about performing regular exercise before and during the lockdown, findings showed that the majority managed to do regular exercises (at least 3 days a week) more during the lockdown period. Overall, the results were pointing towards a sedentary behavior of maximum participants, in spite of the study population being closely related to areas of healthcare. By doing this survey we aimed at raising awareness about the deleterious impact of sedentary behaviors and physical inactivity as against the significance of exercise and remaining active and fit.

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