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EVALUATING THE EFFICACY OF BODY MECHANICS IN IMPROVING POSTURE IN STUDENTS

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Abstract - *Abnormal body postures can lead to musculoskeletal disorders over a period of time if not corrected at an early age. Proper alignment of body parts while at work and at rest is very essential especially during this pandemic where online classes has become inevitable. This study focus on making the students understand the difference between good posture and bad posture by creating an awareness on the principles of body mechanics in students in order to improve their quality of life. An interview schedule was used to collect the data. The samples consisted of 50 under graduate students of Mount Carmel College, Bengaluru. The results of the study revealed that majority (80%) of the students were not aware of their bad body posture they adopted from their early years while doing work. Upon statistical analysis the evaluation of the awareness session on proper body alignment, good posture and principles of body mechanics proved great efficacy in improving the body posture of students.*

Key Words: Body Alignment, Body Mechanics, Posture, Quality of life.

1. INTRODUCTION

Body mechanics is the principle of carrying out activities with less energy and exertion. Proper way of coordinating muscles, nerves and bones will help the individual to maintain good posture, right alignment of body parts thereby preventing musculoskeletal disorders and other related injuries. (Perry et al., 2014)

Ergonomics is setting up the work environment according to the needs and capacity of the worker. The principle behind ergonomically designed products is that the workers can adapt the task well. Ergonomic risk factor occurs when the individual uses wrong postures and forceful exertions, and it results in injuries and other disorders. The relation between body mechanics and ergonomics is that proper application of the principles is possible if the work environment is designed in an ergonomic way. (Phillips, 2022).

Musculoskeletal disorders (MSD) are injuries or disorders of the muscles, nerves, tendons, joints, cartilage, and spinal discs. The Bureau of Labor Statistics of the Department of Labor defines MSDs as musculoskeletal system and connective tissue diseases and disorders when the event or exposure leading to the case is bodily reaction (e.g., bending, climbing, crawling, reaching, twisting), overexertion, or repetitive motion. (Centre for Disease Control and Prevention, 2020). Poor way of doing activities, unhealthy lifestyle, poor rest, lack of proper sleep, sedentary lifestyle, poor hydration, bad body posture while at doing activities and while at rest are factors which lead to MSD over time.

Body alignment is obtained by placing body parts like joints, ligaments and muscles in line with one another while sitting, standing, lifting, pulling, lying down etc. According to body mechanics, the center of weight of an object or person is the center of gravity. So only if the center of gravity is stable individual can position his body in alignment in vertical and horizontal line thereby reducing the risk of injuries. (WorkSafeBC, 2013). Proper body alignment of body parts by following the principles of body mechanics will lead to good posture which would help the individual in maintaining balance, reduce fatigue, and avoid muscle pain and injuries.

In the prevailing pandemic situation, online classes and self-study have disturbed the student community physically, emotionally and psychologically. During these days of lock down and covid situations, they experienced tremendous change in their lifestyle in terms of eating habits, sleeping pattern, activity pattern, social and mental health. (Kunal.et. al, 2021). Similar results were suggested by a study done among college students in China that negative effects on student health was noticed due to perceived stress caused as a result of academic workload, separation from school, and fears of contagion.(Yang, 2021).

There are several studies to prove that our students have adapted bad posture while sitting, standing and while doing other activities. The prevalence of incorrect posture was noted in students aged 10–15 years and >15 years. (Yang, 2020). The study also found out that bad posture in adulthood is which formed during their childhood. It was reported in an article in Times of India (Hussain, 2020), that in Bengaluru, online classes cause pain in the neck for students due to bad posture and lack of physical activity. A study on 'Posture Analysis of Students doing Online Class at Home during COVID-19 Pandemic' also proved that the highest score of students were 7 in RULA and 5 in REBA where there was medium risk in their posture. The study also highlights the need for students and parents/guardians' to become aware about applying the principle of ergonomics

at home to tackle the postural risk and body discomfort in children which may lead to risk factors and injuries. (Vallespin et. al. 2020).

After understanding the issues faced by the students community due to online classes and prolonged use of gadgets, this study focus on posture analysis of undergraduate students and guide them differentiate between good posture and bad posture. The study also intends to give awareness on the principles of body mechanics in improving their posture in order to lead a better quality life.

1.1 Objectives

- To analyze the posture and related risk factors in students
- To create awareness on good posture and body mechanics in students.
- To evaluate the efficiency of body mechanics in posture of students.

2. LITERATURE SURVEY

In a study done on "Association between the sitting posture and back pain in college students (Sebastian, 2016), it was found that majority of the respondents had neck pain which was mainly because of their sitting posture with rounded back, feet supported on another chair, crossed legs and screen time at the computer.

According to the Hazard Identification Risk Assessment and Risk Control study (Nurul, 2009), two of the variables that had an impact on musculoskeletal pain in children were poor furniture design and incorrect sitting posture. Awkward body position while sitting or lifting will have an impact on the musculoskeletal system. (Bygrave, 2004). When the awareness of good working posture and computer ergonomics was evaluated among medical students of Isra University, Hyderabad, it was seen that 55% students never had their posture assessed. (Hussain, 2015).

It was also noted in a research article that older women experienced forward head, pronated foot and thoracic kyphosis which were associated with prolonged sitting and reduced flexibility. (Kiruthika et. al, 2018). Life today has adverse effect on human motor behavior due to sedentary lifestyle. (Minoo, 2013). Higher prevalence of postural problems were noted among female college students. Therefore they need to be educated on postural defects and risk factors associated with poor body posture. (Kiruthika et. al, 2018).

Kaur in his article on 'How to Sit While Studying for Long Hours in College' (2021), stated that lower back pain is the major problems students face these days. Both students and professors are not able to maintain good posture. According to him, hunched back posture and rounded shoulders seen in students these days are a result of the slouched posture they adapted in their childhood days.

People develop poor postural habits during their childhood years itself. Just because these habits were left unnoticed and untreated, the symptoms of injuries and musculoskeletal disorders become striking during early adulthood itself. Therefore it is essential that individuals be made aware of the principles of body mechanics and implement good postural habits at their early age itself. (Kratěnová, ŽEjglicová, Malý & Filipová, 2007; Murphy, Buckle & Stubbs, 2004; Boyle, Milne & Singer, 2002; Milne & Williamson, 1983).

A. Concept of Body Mechanics

Good body mechanics are based on good posture. Good posture means the spine is in a "neutral" position - not too rounded forward and not arched back too far. (Spine Institute, 2016). The study of body mechanics will guide individuals to move their body in such a way that their bones, muscles and nervous system be in coordination with their structure so as to maintain balance, posture and alignment. It is not only advisable to avoid forceful stress or pressure into the body and but also to maintain control of the body.

B. Principles of body mechanics

- Maintain Centre of Gravity and line of gravity vertically and horizontally.
  - Keep low center of gravity to improve balance.
  - Keep spine straight.
  - Keep the object close to the body while lifting objects
  - Bend knees.
- Maintain an open base of support for stability while lifting.
  - Keep feet apart.
  - Place one foot slightly ahead of the other.
  - Bend knees slightly to absorb jolts.
- Maintain Proper Body Alignment.
  - Tuck in abdomen and buttocks.
  - Keep back straight, head up, chin in and shoulder parallel to ears.

- Use largest and strongest muscle of hands and legs while pushing, pulling, lifting objects.
- Imagine vertical line passing through center of body while at work
- (Nursing Fundamentals, 2015; Body Mechanics, Kent State University)

C. Good Posture and Bad Posture

Good Posture is holding the body in a right way for long term health, to prevent injuries and other related disorders. Poor Posture can become a habit which would lead to chronic back pain, neck pain, spine injuries and other nervous issues. Therefore it is essential that one should be able to self – control to not get into the habit of poor posture and also self-assess to correct being in good posture.

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. Posture is classified as Dynamic Posture (positioning of body when in movement) e.g. pushing, pulling, lifting, walking etc. and Static Posture (positioning of body when not in movement) e.g. sleeping, standing, sitting etc. (Gardiner, 1957; Levangie et. al; Howorth 1956).

D. Awareness of postures while Sitting, Standing, Lifting, Pulling, Pushing, Getting into bed, Getting off bed and Sleeping.

- Do not Slouch while sitting and standing. Keep body straight.
- Head and neck should be tucked in and not forward, backward or sideways. Body follows head so there is a tendency for body to lean forward if head and neck is held forward (Tech Neck and poked chin posture).
- Maintain natural S curve of spine (lordosis) by sitting erect. Pillow or back support can be used to support the curve. Avoid exaggerated outward curve of lower back (hyper lordosis) or inward curve of lower back (Donald Duck posture).
- Stretch to relax muscles or walk often to avoid longer sitting hours
- Shoulders should be pulled back and relaxed and not be rounded.
- Shoulders should be parallel to ears.
- Hands and elbow to be kept closer to the body while sitting and hung down at sides of body while standing.
- Tuck in abdomen.
- Feet should be wide apart, comfortably touching the floor, ankles to be in front of knees.
- Avoid sitting crossed legged to prevent misalignment of spine and hips.
- Distribute weight of body equally on to both feet and Invest on good quality foot wear
- Shoulder width and Feet with should be same.
- Maintain ideal body weight and stay active
- When lifting and setting down get the load close to body, feet wide apart, bend knees, head up, stomach in and body in alignment.
- When pushing and pulling, bend knee keeping in line ears, shoulders and hips, lean near to the object, and use body weight to push or pull object. Preferable to walk backward while pulling.
- While sleeping, keep a pillow in between thighs for hips, pelvis and spine to be in alignment.
- In between sleep, switch to sides time to time to balance.
- Use pillows as support to maintain natural curve of the spine.
- While getting out of bed turn on to side, sit up by pushing oneself with hands, and bring down both legs.
- While getting into bed, roll to sides, raise upper body first followed by swinging legs to floor. Move the whole body and avoid unnecessary twists and turns.
- (Medline, 2021; Brace ability, 2021; NHS, 2019; Health Encyclopedia, 2022; Health line, 2020; Cleveland Clinic, 2019).

In the challenge to reduce MSD prevalence research has focused on how pushing and pulling task intensity is related to these internal strain factors at injury-prone body locations such as the knees, the shoulders, and the lower back. (Malchaire er. al, 1996)

Students who received the ergonomic intervention reported significant improvements in their sitting posture in a classroom environment and reduction of schoolbag weight as compared with the controls. According to our results, the EHPP intervention program was able to reduce musculoskeletal pain significantly in students in the experimental group. (Syazwan et. al, 2011)

This study is an attempt to shed light on students, parents and teachers about incorrect postures and how to practice the right way of doing activities by proper alignment of their body parts. They study also intends to find

out the problems the students face due to bad posture and guide them to overcome the stress in order to prevent them from injuries, musculoskeletal disorders and anxiety. This study would definitely help them to realise the importance of good posture by which they can enhance their quality of life in a healthy manner.

3. METHODOLGY

The study aims to analyze the posture and related risk factors in students, create awareness on good posture and body mechanics in students and evaluate the efficiency of body mechanics in posture of students.

50 under graduate students of Mount Carmel College, Bengaluru of age group 18 to 22 years were selected for the study. Classes were happening in hybrid mode where mostly it was online classes. An interview schedule was formulated with data regarding the uses of gadgets, hours of use, type of device used, and way of using etc. The interview schedule also contained information about the posture they maintain while sitting, standing, pulling and pushing, lifting, getting into and getting out of bed, and sleeping. Data on the risk factors- physical, emotional and psychological problems, they faced were also collected to understand if they faced any stress and strain due to postural issues.

Later after analysis, awareness sessions for a period of one month were conducted to make the students realize the harmful effects of long term usage of bad posture. They were taught the right way of keeping the body in alignment when at work and at rest.

After one month, an assessment was made to check for any improvements in the problems they faced earlier and also if there was improvement in their quality of life. For this assessment, a rating scale was used.

All data were consolidated, tabulated and interpreted which is discussed below. Few statistical analysis was done using SPSS software, version 21, to know the effectiveness of the awareness program and its impact in improving their quality of life.

4. RESULTS AND DISCUSSION

A. Use of gadgets

Of the 50 student respondents, only 22% of them spend less than five hours with gadgets. Rest of them fall under the major category of using gadgets for more than 8 to 15 hours a day. Apart from the classes, they use for surfing, listening to music, videos, chatting, calls and playing games etc. Among these 50 respondents, 87% of them also use their mobile phone 30 minutes to one hour prior to bed time.

Table I. Description on use of gadgets

Duration of class Hours	
Hours	%
>5	10
5 to 8	72
<8	26
Device used	
Device	%
Mobile	50
Laptop	36
Tab	18
Device placed while class	
Placing devices while in use	%
Lap	42
Bed	46
Table	38

The duration of online classes for majority of them (72%) was five to eight hours per day. 50% of them used mobile phone to attend classes, 36% used laptop and 18% used tab for attending classes. A key point to note here was that 88% of the students placed laptop on their lap or on bed, or holding mobile in their hand while in class. Only 38% used proper table to place their device and chair to sit and attend classes. This itself proves that the most of the students are already in the habit of poor posture which they aren't aware of and need proper guidance to change to proper body postures. They chose to lie down slouch or use improper postures to while using mobiles and laptops.

When enquired about their peak time in terms of their energy level in studies or other activities, 52% of the students said they were fully energetic and focused in mornings from 8 .00 to 11.00 AM and for 56% the peak time was 7.00 to 12.00 PM. It was clear from the study that the energy levels were at the peak to take up the work load, both academic and non-academic during mornings and late evenings.

An important finding to be noted in the study was 60% of the students faced fatigue both physically and psychologically particularly during mid-mornings and after noon. This was mainly because of the poor posture, sedentary lifestyle and online classes pertaining to the Covid pandemic situation. They reported tiredness due to prolonged sitting, staying indoors and less socializing considering the pandemic situation.

In a study conducted on effect of excessive usage of electronic gadgets during COVID-19 lockdown n health of

college students, it was noted that the average time spent on gadgets increased from 4.75hrs/day before lockdown to 11.36hrs/day during lockdown among participants. It was also clear from the study that health issues like headaches, insomnia, eye complaints, tiredness and restlessness were associated with excessive use of gadgets. The study also recommended to create awareness and interventions to control and manage the excessive use of gadgets among college students in order to improve their quality of life. (Pachiyappan, et.al, 2021)

The results of the resent study suggested that the average time spent on gadgets increased from 4.75 hrs/day before lockdown to 11.36 hours/day during lockdown among participants. Most health complaints like headaches, insomnia, eye complaints, tiredness and restlessness were associated with gadget use during the lockdown. The percentage of participants experiencing these complaints during lockdown was also significantly higher than before lockdown. By understanding the effects of gadget use, it would be possible to create interventions and suggest ways to manage the excessive use of gadgets. It is of prime importance to handle the issue considering the quality of life and wellbeing of students.

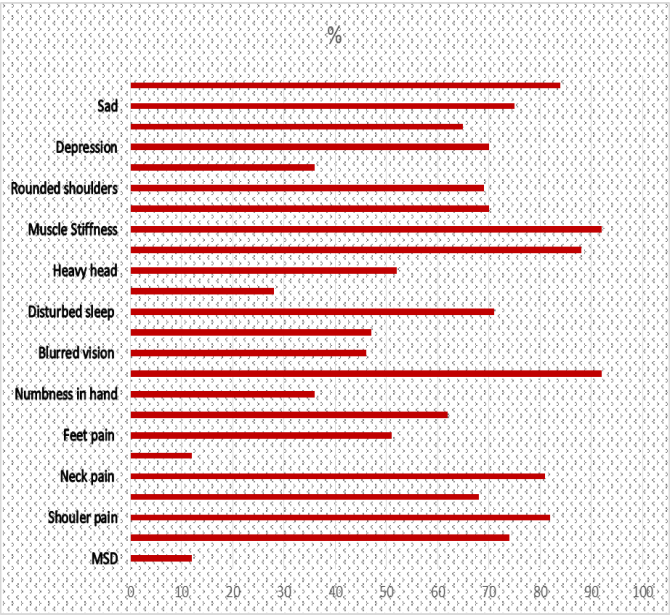

Fig -1:

Percentage of respondents with risk factors

B. Risk factors due to poor posture

With regard to their physical ailments, more than 80% of the students in the study suffered from headache, muscle stiffness, neck and shoulder pain. It was very evident that they developed the habit of slouching over a period of time being unaware of ailments associated with it. Lower back pain, shoulder stiffness, hand pain and numbness, feet pain, disrupted bowel and disturbed/abnormal sleep were other physical problems mentioned by 50% to 75% students. Also, they underwent emotional problems like frequent mood swings, sadness, depression and anxiety. Few of them also complained of issues like watery eyes, blurred vision, puffy eyes, pot belly and inflammation in feet.

Other potential risks for the adolescents may include cyberbullying, trolling, isolation, posting of inappropriate materials, and getting into inappropriate relationships with other people.

In an educational study conducted on gadget addiction and mental health amongst the younger generation in Malaysia, it was seen that their gadget addiction had fair significance with their levels of depression, anxiety, stress and sleep quality. The study concluded that the gadget addiction in the users will definitely interfere with their psychological status and mental health and hence need to be controlled. (Surat, et. al, 2021)

C. Effectiveness of awareness program on Body Mechanics

A general assessment of the students with regard to their lifestyle was observed and was explored that Covid 19 had immensely affected life, health and academics of the students. It was evident from the present study as well as from previous researches that overuse of digital media, anxiety, musculoskeletal disorders associated with bad body posture are the major outcome of the pandemic in a student's life.

Understanding the problematic situation and lack of knowledge among the students about good posture while using gadgets, sitting, standing, walking, sleeping, an awareness session was conducted among the respondents in the form a short term course. The information made clear that the students were aware of the good posture but did not have the knowledge on the principles of body mechanics and its application to maintain good posture.

The awareness program was found to be effective to the students in the study in understanding the significance of good posture while doing activities. The results of the evaluation is shown below in table 2.

Table II. Distribution of percentage on the effectiveness of the awareness program

Effectiveness of the awareness program	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Acquired knowledge on good posture	92	8	0	0	0
Able to apply the knowledge learned	84	12	4	0	0
Difference between good posture and bad posture were identified	100	0	0	0	0
Content was organized and easy to follow	90	8	2	0	0
Class participation, activities, interaction were incorporated	96	4	0	0	0
Good posture while sitting, standing, getting out of bed, getting into bed, sleeping, walking were well explained	86	14	0	0	0

On completion of the awareness program, the impact of it on the problems faced earlier by the respondents was also analyzed. The results are depicted in figure 2.

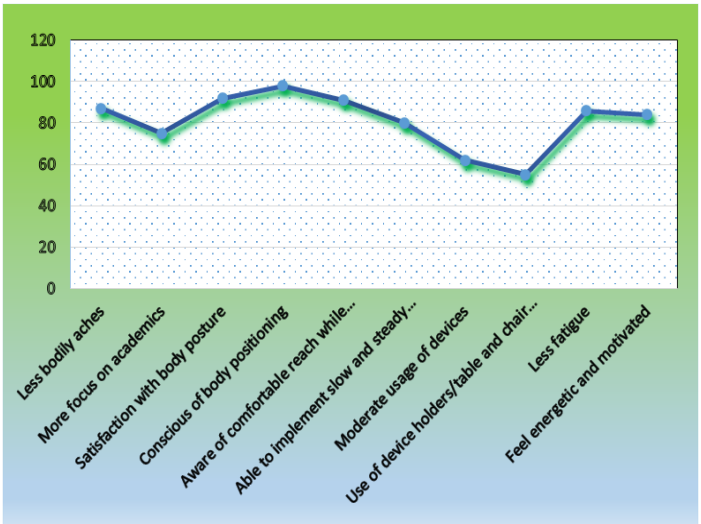

Fig -2:

Impact of awareness program on the respondents

5. CONCLUSIONS

Poor posture can put stress and strain on specific body parts such as the spine, which can lead to pain. It can also cause your body to feel more fatigued. It's especially important for children to be aware of good posture because the habits they develop can go on for a lifetime. Online education and homeschool programs that require a significant amount of time in front of a computer or on a tablet can cause notable damage to our students' posture and thus hinder their education. An incorrect seated posture can quickly lead to fatigue, neck and back strains and consequently a decline in focus and comfort. Further research need to focus on the students to minimize the use of gadgets to improve their health and also train them on body posture and fitness at a regular basis from the school level itself.

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