International Journal of Health Sciences and Research
Vol.12; Issue: 8; August 2022
Website: www.ijhsr.org
Original Research Article
ISSN: 2249-9571

An Observational Study on Musculoskeletal Impairments Among Architecture Students

Anila Paul[1], Yasir Zahid[2], Heena Rupalwala[3]

[1]Professor & HOD, Medical Trust Institute of Medical Sciences, College of Physiotherapy, Irumpanam, Kochi, Kerala, India 682309
[2]Clinical in charge & Head Physiotherapist, HEAL Institute, Mumbai, Maharashtra, India 400052
[3]Home care Physiotherapist, Mumbai, Maharashtra, India

Corresponding Author: Yasir Zahid

DOI: https://doi.org/10.52403/ijhsr.20220827

ABSTRACT

Introduction: Architecture students work in challenging static and dynamic awkward posture for a long period of time working on sheets for their designated projects. These constant postural adaptations may have an impact on posture, postural balance and flexibility. Considering the scarcity in literature, this study was designed to explore the musculoskeletal impairments among architecture students.
Methodology: This study was conducted on thirty architecture students and thirty age and gender matched subjects between the age group of 18 to 25 years. All subjects were assessed for posture by photographic method, postural control by unipedal stance test and flexibility by sit and reach test and shoulder neck mobility test.
Results: Results expressed statistically no significant changes in different variables of postural deviations. The mean unipedal stance test in architecture students was 0.58 (±0.49) and in control group was 1.17 (±0.62) with p value ≤0.05, which indicated statistically significant change in balance. The mean value for sit and reach test in architecture students was 5.7 (±7.06) and in control group was 2.0 (±8.33) with p ≥ 0.0, revealing no significant changes in lower extremity flexibility.
Conclusion: This study suggested no statistically significant difference in posture and flexibility. Whereas, static balance was found significantly decreased in architecture students.

Key words: Posture, balance, flexibility, unipedal stance test, sit and reach test

BACKGROUND

Repeated movements and prolonged awkward or forced postures can lead to the presence of discomfort, disability or persistent pain in the joints, muscles, tendons and other soft parts. Various work patterns which include fixed or constrained body position and prolonged repetition of movements may lead to musculoskeletal disorders. [1,2] Prolonged static postures lead to micro trauma, muscle ischemia affecting the blood circulation in the muscle which can lead to muscular pain and fatigue. These impairments can adversely affect the activity level and productivity of individuals and can increase absenteeism at work due to clinical pathologies affecting different parts of body.[2]

The scientific literature provides enormous information on musculoskeletal impairments among different professionals who maintain forced or awkward postures for prolonged time as part of the profession such as dentists, physical therapists, nurses, computer professionals. [3,4,5,6] Students of architecture course have a five year graduation program, where in they have to do sketching, drafting, tracing, designing, and conceptualizing of structures and their ideas. During the course they maintain static and dynamic awkward position for a long period of time throughout their day, working on sheets or their designated projects. They work in challenging positions of continuous standing, sitting, bending, stooping and more. Considering the vulnerability to develop musculoskeletal impairments among architecture students, this study was designed to evaluate posture, postural control & balance and flexibility among architecture students.

MATERIALS & METHODS

This observational study was approved by the institutional ethics committee and informed consent was acquired from all participants. Thirty architecture course male students within age group of 18 to 25 years were recruited from one academy at Mumbai with permission from authority using purposive sampling technique. Thirty age and gender matched subjects who do not require prolonged work posture were recruited as control. Students with trauma, musculoskeletal impairments in past six months, neurological impairments and medical pathologies like obstructive pulmonary diseases, tuberculosis, polio which could affect posture were excluded from the study.

The materials used for the study were MATLAB software installed in computer, digital canon camera, tripod camera stand, colour markers, cardboard with footprints, sit and reach box, weighing machine and measurement tapes. The posture was assessed with photographic method, postural control assessed with unipedal stance test, flexibility of lower extremity assessed with sit & reach box, flexibility of upper extremity assessed with shoulder neck mobility test.

For posture evaluation, subjects were asked to stand on the footprint drawn over the cardboard and they were instructed to stand with full weight bearing on both the feet and to look forward. Digital Canon camera A3300 of 16MP and 5x zoom was used. Camera was aligned vertically for full view of the body which was placed at 45 inches above the ground on the Croma camera stand. The stand was positioned 70 inches away from the cardboard. [7]

Markers were placed at corner of eye, tragus of ear, acromion process, greater tubercle, midline of articulation knee and lateral malleoli. Orange plastic balls having 8mm diameter were placed on the bony prominences of sternal notch, C7, L4, anterior superior iliac spine and posterior superior iliac spine with the help of double sided adhesive tape.[8]

Subjects were then asked to stand on footprint drawn over cardboard and the photographs were taken in the lateral view both the sides. Each photograph was transferred to the computer and coding was done and analyzed with the help of software for various angles. Spinal curves, pelvic tilt, trunk lean angle and neck angle were measured using posture evaluation software by MATLAB 7.11.0 (R2010b). The angles measured were pelvic tilt, lumbar lordosis, thoracic kyphosis, trunk lean angle and neck angle.[8]

Unipedal stance test was employed to assess postural control and balance which is a valid and reliable tool. Subjects were instructed to stand barefoot on the limb of their choice, with the other limb raised so that the raised foot was near but not touching the ankle of their stance limb. Each subject was asked to focus on a spot on the wall at eye level in front of him. Prior to raising the limb, the subject was instructed to cross his arms over the chest. Stopwatch was used to measure the amount of time the subject was able to stand on one limb. Time was recorded from when the subject raised the foot off the floor. Timer was stopped when the subject either, uncrossed his arms, moved the raised foot toward or away from the standing limb or touched the floor, moved the weight-bearing foot to maintain his balance. The procedure was repeated 3 times and best performance was recorded for data analysis.[9]

The sit and reach test are a valid and reliable test to evaluate flexibility of hamstrings and lower back muscles. The subjects were instructed to sit on the floor with legs stretched out straight ahead, with the soles of the feet placed flat against the box. The inner edges of the soles of the feet must be 6inches apart and both knees should be kept straight. The subject was instructed to reach forward along the measuring line as far as possible with the palms facing downward and the hands on top of each other without jerky movements. The subject reached out and held that position for at least two seconds while the distance is recorded. Three trials were conducted and the maximum score was recorded.[10]

Shoulder neck mobility test was administered to evaluate flexibility of upper extremity at shoulder neck region. Subjects were instructed to stand one and a half feet away from wall with back supported. Then instructed to raise arms from front with elbows straight trying to touch the dorsal aspect of hand to the wall behind. This activity was scored based on the grading system, grade 5 is the whole dorsal side of hand is in contact with wall, grade 3 is only fingers reach the wall and grade 1 is no finger contact with the wall.[11]

Statistical analysis was performed with SPSS 16.0 version. Independent t test was applied to analyze the scores of postures from MatLab 7.11.0(R2010b), unipedal stance test score and sit and reach test score. Mode was computed for shoulder neck mobility test scores.

RESULTS

The mean age of architecture students was 21.33(±1.71) and control group was 21.28(±1.66) and the body mass index (BMI) of architecture students was 21.98(±3.55) and control group was 21.72(±3.57).

The posture variables were assessed in MATLAB software and the mean and standard deviation of lumbar lordosis in architecture students was -9.56 (7.7) and in control group was -6.5 (7.4) respectively and the p value was 0.125 which suggested no statistically significant increase in lumbar lordosis among architecture students compared to control group. The mean and standard deviation of thoracic kyphosis in architecture students was 47.66 (8.2) and in control group was 46.233 (6.8) respectively and the p value was 0.466 which suggested no statistically significant increase in thoracic kyphosis among architecture students compared to control group.

The mean and standard deviation of pelvic tilt in architecture students was 15.26(9.5) and in control group was 12.51(5.1) respectively and the p value was 0.105 which suggested no statistically significant change in pelvic tilt among architecture students compared to control group. The mean and standard deviation of trunk lean angle in architecture students was 0.7 (3.01) and in control group was 0.5(2.16) respectively and the p value was 0.773 which suggested no statistically significant change in trunk lean angle among architecture students compared to control group.

The mean and standard deviation of neck angle vertical in architecture students was 38.2 (6.2) and in control group was 39.33(5.3) respectively and the p value was 0.455 which suggested no statistically significant change in neck angle vertical among architecture students compared to control group. The mean and standard deviation of neck angle trunk in architecture students was 37.56(5.5) and in control group was 38.96(5.7) respectively and the p value was 0.347 which suggested no statistically significant change in neck angle trunk among architecture students compared to control group.

The mean and standard deviation of unipedal stance test score in architecture students was 0.58 (0.49) and in control group was 1.17 (0.62) respectively and the p value was 0.0001 which suggested statistically significant change in postural control and balance among architecture students compared to control group. The mean and standard deviation of sit and reach test score in architecture students was 5.7(7.06) and in control group was 2.0(8.33) respectively and the p value was 0.07 which suggested no statistically significant change in lower extremity flexibility among architecture students compared to control group. Mode was computed for both architecture students and control and was found to be the same as grade 5 which suggested no statistically significant change in upper extremity flexibility among architecture students compared to control group.

DISCUSSION

This study did not reveal any statistically significant deviations in posture. But we found that mean angle of lordosis, kyphosis, pelvic tilt, trunk lean angle is increased, and neck angle vertical and neck angle trunk is found to be decreased when compared with mean of control group. The students need to be in prolonged static posture during academic activities such as drawing, under poorly equipped work site which may lead to poor posture alignment. McGill and brown reported that twenty minutes in a position of sustained loading can induce creep in soft tissues with a recovery taking longer than 40 min.[12] Sustained forces produce time dependent deformation and adaptation in soft tissues. Studies have reported that static load on neck muscles induce biomechanical strain leading to development of neck pain which may lead to forward head posture and decreased balancing ability.[6]

The maintenance and control of posture depends on integrity of musculoskeletal system. In addition, postural control depends on information received from receptors located in and around the joints.[13] Studies have also reported that pain and inflammation reduce sense in joints and leads to abnormal proprioception and postural imbalance.[6]

This study did not reveal any significant changes in flexibility. But the changes in mean values points towards the possibility of decrease in flexibility. Students have to maintain prolonged awkward postures which may affect the musculoskeletal structures and thereby flexibility. Therefore, it is suggested to implement posture awareness and correction programs as a preventive measure.

CONCLUSION

This study revealed statistically no significant change in posture and flexibility among architecture students. The postural control & balance was found to be statistically reduced in architecture students compared to control group. Awareness about posture correction exercises and preventive exercises for musculoskeletal impairments need to be implemented for architecture students.

Acknowledgement: We thank the participants for the cooperation in data collection. We acknowledge MGM School of Physiotherapy for providing the research tools used for data collection of this study.

Conflict of Interest: None

Source of Funding: None

Ethical Approval: Approved

REFERENCES

1. Laura Punnet, David H. Wegman. Work related musculoskeletal disorders the epidemiological evidence and debate. Journal of Electromyography and Kinesiology. 2004. 14:13-23
2. Waqar Naqwi. Physiotherapy in community health and rehabilitation. New Delhi: Jaypee Brothers Medical Publisher (p) Ltd. 2011
3. Karmen Harutunian, Jordi Gargallo-Albiol, Rui Figueiredo, Cosme Gay-Escoda. Ergonomics And Musculoskeletal pain among post graduate Students and faculty members of school of dentistry of the University of Barcelona, Spain. Med Oral Patol Oral Cir Bucal. 2011. 16(3) (1698-6946), 425-429
4. Einas Al-Eisa, Syamala Buragadda, Afaf A.M. Shaheen, Amal Ibrahim and Ganeswara Rao Melam. Work related musculoskeletal disorders: Causes,

Prevalence and Response among Egyptian and Saudi Physical Therapists. Middle-East Journal of Scientific Research. 2012. 12(4) (1990-9233), 523-529
5. Anila Paul, A pilot study on awareness of ergonomics and prevalence of musculoskeletal injuries among nursing professionals. International Journal of Nursing Education. 2012. 4(1)
6. Jung-Ho Kang, Rae Young Park, Su-Jin Lee, Ja-Young Kim, Seo-Ra Yoon, Kwang-Ik Jung. The effect of the forward head posture on postural balance in long time computer based worker. Annals of Rehabilitation Medicine. 2012. 36. 98-104
7. A.C.H. Geurts, T.A. Boonstra, N.C. Voermans, M.G. Diender, V. Weerdesteyn, B.R. Bloem. Assessment of postural asymmetry in mild to moderate Parkinson's disease. Gait Posture 2011; 33: 143–145
8. Ferreira EA, Duarte M, Maldonado EP, Bersanetti AA, Marques AP. Quantitative assessment of postural alignment in young adults based on photographs of anterior, posterior, and lateral views. J Manipulative Physiol Ther 2011 July Aug;34(6):371–80
9. Barbara A. Springer, Raul Marin,Tamara Cyhan, Holly Roberts, Norman W. Gil. Normative Values for the Unipedal Stance Test. Journal of Geriatric Physical Therapy. 2011. 30; 1
10. Heyward, V. advanced fitness assessment and exercise prescription.5th ed. university of New Mexico: Human Kinetics. 2006
11. Suni, J. et al. Fitness for Health: The ALPHA-FIT Test Battery
12. Won-Gyu YOO, Duk-Hyun AN. The Relationship between the Active Cervical Range of Motion and Changes in Head and Neck Posture after Continuous VDT Work. Industrial Health 2009; 47: 183–188
13. Carolyn Kisner Lynn Allen Colby. Therapeutic exercise. 5th edition. Philadelphia: Jaypee publication; 2007

How to cite this article: Anila Paul, Yasir Zahid, Heena Rupalwala. An observational study on musculoskeletal impairments among architecture students. *Int J Health Sci Res.* 2022; 12(8):202-206.
DOI: *https://doi.org/10.52403/ijhsr.20220827*

******