



## **Preventive Recommendations to Reduce the Impact of Poor Ergonomics on Children during Online Learning**

**Khushbu Meshram<sup>a\*</sup>, Vaishali Tembhare<sup>b</sup>, Archana Taksande<sup>a</sup>,  
Savita Pohekar<sup>b</sup>, Pooja Kasturkar<sup>b</sup>, Sheetal Sakharkar<sup>a</sup>,  
Darshanakumari Wankhede<sup>a</sup> and Prerana Sakharwade<sup>a</sup>**

<sup>a</sup> Child Health Nursing Department, Smt. Radhikabai Meghe Memorial College of Nursing, Datta Meghe Institute of Medical Sciences (Deemed to be University) Sawangi (Meghe) Wardha, India.

<sup>b</sup> Medical Surgical Nursing Department, Smt. Radhikabai Meghe Memorial College of Nursing, Datta Meghe Institute of Medical Sciences (Deemed to be University) Sawangi (Meghe) Wardha, India.

### **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

### **Article Information**

DOI: 10.9734/JPRI/2021/v33i57B34053

### **Open Peer Review History:**

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/76555>

**Short Communication**

**Received 20 September 2021**

**Accepted 27 November 2021**

**Published 14 December 2021**

## **ABSTRACT**

The term 'ergonomics' and 'human factors' are interchangeable, 'ergonomics' is generally used in regard to physical features of the workplace, such as workstations and control panels, whilst 'human factors' is generally used in regard to the larger system in which people co-operate. This COVID 19 pandemic impact make the children to stay at home only and government of India has been supported the online education for the children and because of that change the whole learning system in India. While attending the classes at home mostly the parents don't have that much knowledge regarding ergonomics to prevent the lot of physical as well as mental health problems, impact of poor ergonomics kids faced lot of problems like headache, back pain, knee pain, eye irritation etc as we called as repetitive strain injuries and musculoskeletal health has been deteriorated.

**Conclusion:** Parents and teachers do not appear to involve schoolchildren in conversations about safe computing behaviors, which might be due to their own lack of understanding of computer

<sup>#</sup>Assistant Professor;

<sup>\*</sup>Corresponding author: E-mail: khushbupande86@gmail.com;

ergonomics and also the impact of COVID 19 Pandemic drastically affect the children's schooling and have to learn at home through the online education system. Ergonomic education should also include into the school curriculum as future necessity.

*Keywords: Ergonomic; human factor; gadgets; cognitive capacity; musculoskeletal disorders; cumulative trauma disorder; posture.*

## 1. INTRODUCTION

Due to COVID-19, 55 million students are homeschooling, with projections that this will continue for a long period. Children are using the Internet for longer periods of time, mobile devices and tabs to do their work. Setting up comfortable and ergonomically sound work place for children is essential for them to be able to focus one's thoughts, be efficient in the present and in the future to avoid aches and pains [1]. Ergonomics' multidisciplinary character allows it to be applied to a wide range of topics involving human performance. Education is one area where ergonomics may make a huge difference, but its implementation in education has gotten little attention. The branch of ergonomics/human factors dealing with the relationship between educational performance and educational design is known as educational ergonomics [2]. The majority of furniture is outdated and does not meet minimal orthopedic and physiological standards leads to poor concentration, improper posture and positioning. [3] Humans spent much of their time either moving or resting; sitting came later. The human physique does not favor sitting posture. The consequences of stress on the spine and appendages are significant. Sitting has a greater metabolic rate than laying or walking. Animals do not have as much back and neck discomfort as humans. As a result of their horizontal spinal column as compared to human spine in vertical position [4]. People have been compelled to stay indoors due to the COVID-19 epidemic. Schools, universities, and other educational institutions were forced to close their doors. As a result, online lectures, training, and gatherings have become increasingly important.

Children spent more time on androids, laptops, desktops, and other gadgets as a result. However, neither the youngsters nor their parents or instructors were aware of the issues connected with improper postures that they had picked up. Repetitive Strain Injury (RSI), Cumulative Trauma Diseases (CTDs), and MSDs (musculoskeletal disorders) are all examples of repetitive strain injury. MSDs cover a wide variety of inflammatory conditions [5].

Children are sat for lengthy periods of time in school from an early age, it is necessary to change the distance between the chair and the work surface, particularly in the classroom. Welcoming classrooms for children and adolescents throughout adolescence this difference is important because crucial in terms of comfort at these times the youngster to sit [6].

Poor posture is a defective interaction between the various parts of the body that causes more strain on the supporting structures and a less effective balancing of the body on its support base.

Scoliosis, which is defined as a lateral deviation of the spine in respect to the main axis of the same, kyphosis correction, and physiological curves of the spine are among the several diseases [7].

Outside of the classroom, parents have a crucial role in shaping their children's conduct. The level of worry they have about computers' possible harmful influence on their children's health, as well as how they convey this to their children, are key factors in influencing children's computing habits [8].

Parents and teachers do not appear to involve schoolchildren in conversations about safe computing behaviors, which might be due to their own lack of understanding of computer ergonomics. Future interventions should focus on macro ergonomics to not only instil knowledge about safe computing habits, but also develop strategies to design classrooms that promote positive attitudes toward healthy computing behaviors and empower school children to self-manage their physical health [9].

### 1.1 Impact of Poor Ergonomics in Children

#### 1.1.1 Pain and posture

Children have unique features in terms of body size, height, and stage of growth and development, all of which may be relevant to the function of ergonomics in the daily routine of

online classes and the use of electronic devices. The peak of bone growth, calcification, and density occurs in late adolescence, and how much bad ergonomics contributes to children's back discomfort later in life. Children were unable to reach their feet on the floor while working, leading them to slump with a forward head position. The ergonomics of children using smart phones were the poorest. Musculoskeletal discomfort is more likely to occur when unconventional chair and table configurations are used [10].

### **1.1.2 Headache, eye strain and Irritation**

Children have a propensity to not blink their eyes frequently while watching intriguing things on screen, resulting in decreased lacrimation of the eyeball, which causes dryness and redness. Eye strain and headache are caused by direct or indirect illumination, as well as poor eye monitor ergonomics, which can lead to nearsightedness early in life. Long-term exposure to radiation from devices, as well as boredom from lockdown, may cause headache, discomfort, and sleeplessness [11]. It is essential to take frequent pauses from screens, both for the sake of the eyes and the body. We should ideally follow the 20-20-20 rule, which indicates that we should glance away from the screen for 20 seconds every 20 minutes and at an item 20 feet away. These brief intervals allow our eyes to adjust their focus to a distant object while also allowing our neck muscles to relax.

### **1.1.3 Flexibility**

Educators and designers believe that today's classrooms have evolved into active learning environments. This necessitates portable (in weight and design) seats that students of all ages can move, arrange, stack, and store quickly and effortlessly [5].

### **1.1.4 Make it a perfect fit furniture**

Ergonomics is concerned with 'fit': the fit between individuals, their activities, the products they use, and the environments in which they function. During classes, sitting on a comfy seat increases the user's comfort, health, well-being, and safety. Poor ergonomic classroom furniture is frequently cited as one of the primary causes of adult severe postural issues.

### **1.1.5 Create a focused setting**

Children must need calm and quiet space as adult need so child should provide designated

place that is comfortable and comfortable, as divertissement free space as possible, and ideal for studying and concentration.

### **1.1.6 Encourage healthy postures**

The two most important things you can do for your child are to get them a comfortable chair with adequate spinal support and feet on the floor or on a footrest, and to set up their screens so they don't look down, up, or to the side [6].

## **1.2 Advice for Children and Parents about Proper use of Ergonomics at Home**

### **1.2.1 Create a committed work-study area**

It's critical to set aside an area for child to attend online classes, complete home assignments and research surfing. This is particularly difficult over the course of COVID-19, when our entire family is at home and we are unable to locate a place to get a space [7].

### **1.2.2 Height and dimensions of the desk**

If kid is small, should get them a desk that is the right size for their age and height. According to socio-economic condition parents should purchase a height-adjustable desk as well as changing the height as our children grow. This is especially helpful if our children share a workstation with other members of the household.

### **1.2.3 Space for sitting arrangement**

Good posture is critical in the ergo equation. Getting a chair that is the right height for our children is ideal. This includes a chair that keeps their feet on the ground while still offering back support. Cushions can be used for back support and to make the chair smaller. When the kids sat in the parents chair and their feet are dangling, simply offer support by placing a box, books, or a stepstool beneath their feet [8].

### **1.2.4 Electronic gadgets**

Due to the inability to adjust the screen height on laptops, they face problems with ergonomics in general. Using a laptop on the desktop, the screen should be wide and not too far below eye level, depending on our child's age and height; the best solution is to use a laptop riser (or books, boxes, etc.) or link the laptop to an external monitor. An extra keyboard and mouse

are necessary if the laptop is raised or an external monitor is utilized. Finally, whether your child uses their laptop or tablet on the couch or in bed, a lap desk.

### 1.2.5 Keyboard and mouse

Make sure the keyboard is directly in front of the kids, at or slightly below elbow height. Their upper arm should be able to hang vertically, with their elbows close to their sides and securely underneath their shoulders, with the keyboard, the mouse should be at eye level and immediately accessible. Assist children in bringing their keyboard and mouse closer to them if their arms are trying to extend out for typing on the keyboard or they are unable to reach the mouse. Our kids will perform well if their keyboard and mouse are the proper size for their hands. Elbow supports in the chair, what is crucial to have cervical muscles relaxed during PC work (elbows are not in the air while working).

### 1.2.6 Display monitors

If child is using a laptop, tablet, or external monitor, make sure the monitor is raised and aligned in front of them, about an arm's length away and just below eye level, parents may do this by raising the screen height with a monitor or laptop risers, or by placing the screen atop books, a box, a small crate, or anything else that is level and stable [9]. Work-related musculoskeletal problems encompass a broad spectrum of inflammatory and degenerative diseases and disorders. These diseases cause discomfort and functional impairment and can

affect the neck, shoulders, elbows, forearms, wrists, and hands, among other places. [12] The horrible scenario of pandemic generates new situations in people's lives in a different way, which will be life lessons for them. Such lessons should be remembered for the sake of the safety of living creatures, among other things. [13, 14, 15, 16]

### 1.2.7 Headphones or earphones

It is better to use over-the-ear headphones or earphones when kids use headphones or earphones to conduct online classes, watch videos, or listen to music help safeguard their developing ears with acoustic features. Teach them how to keep track of their volume levels and to strive for a volume of 60% or less. Set the child's work location near a window if that's even feasible for natural light, but make sure it's parallel to the window to eliminate reflections on their displays. They can utilize a focus lamp to augment their workstation if there isn't enough light. If a child complains of eye strain, we should lower the contrast on their displays and ensure that they are clean. Encouraging students to take regular breaks during the school day can help them stay in top physical and mental shape [10]. It is essential to take frequent pauses from screens, both for the sake of the eyes and the body. We should ideally follow the 20-20-20 rule, which indicates that we should glance away from the screen for 20 seconds every 20 minutes and at an item 20 feet away. These brief intervals allow our eyes to adjust their focus to a distant object while also allowing our neck muscles to relax.

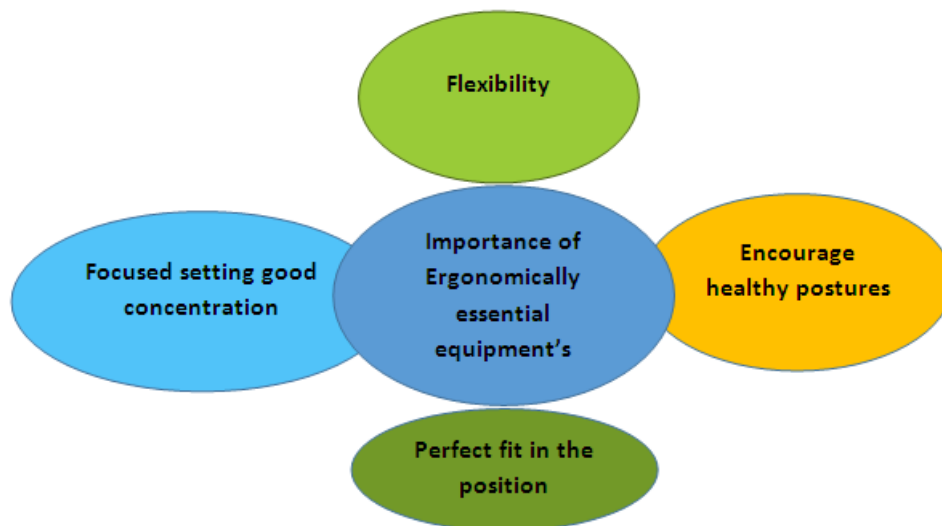


Fig. 1. Importance of ergonomically essential equipment's

## 2. CONCLUSION

COVID 19 impact on children and their education system has been drastically changed over the year. So importance of ergonomics might help to reduce the strain injuries and musculoskeletal health of the children. Teachers, parents and student must be trained in fundamentals of workstations it should be incorporated in school syllabus. Children need mini-intervals from sitting postures, which parents as well as teachers should be aware of; they should also be taught how to build healthy living patterns and how to use the appropriate ergonomic components or equipment. Ergonomic education should also include into the school curriculum as future necessity. New National Curricular Frameworks for School Education, Early Childhood Care and Education, Teacher Education, and Adult Education will be established in the spirit of the NEP, paving the way for curriculum reform. A safe, secure, inclusive, and accommodating learning environment is critical for both students and teachers. Improvements to infrastructure, such as barrier-free access and resource sharing across schools. A transparent and accessible online public disclosure mechanism for public and private schools. Access to ICT and high-quality e-content in classrooms, as well as technology integration in educational planning and governance.

## CONSENT

It is not applicable.

## ETHICAL APPROVAL

It is not applicable.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

1. Gligorović B, Desnica E, Palinkaš I. The importance of ergonomics in schools – secondary technical school students' opinion on the comfort of furniture in the classroom for computer aided design. IOP Conf Ser Mater Sci Eng. 2018;393:012111.
2. Cardon G, De Clercq D, De Bourdeaudhuij I, Breithecker D. Sitting habits in elementary schoolchildren: A traditional versus a "Moving school". Patient Education and Counseling. 2004; 54(2):133–142. DOI: 10.1016/S0738-3991(03)00215-5
3. Bakhtiar Choudhary MS, Choudary AB, Jamal S, Kumar R, Jamal S. The Impact of Ergonomics on Children Studying Online During COVID-19 Lockdown. J Adv Sports Phys Educ. 2020;3(8):117–20.
4. Dockrell S, Earle D, Galvin R. 'Computer-related posture and discomfort in primary school children: The effects of a school-based ergonomic intervention. Computers & Education. 2010;55(1):276–284. DOI:10.1016/j.compedu.2010.01.013
5. Rajan P, Koti A. Ergonomic Assessment and Musculoskeletal Health of the Underprivileged School Children in Pune, India. Health Promot Perspect. 2013; 3(1):36–44.
6. Zapater AR, et al. Postura sentada: A eficácia de um programa de educação para escolares. Ciênc. sa úde coletiva, Rio de Janeiro. 2004;9(1).
7. Kapandji IA. Fisiologia Articular-Esquemas comentados de Mecânica Humana Volume 3 Ed. Manole, 2000 Kendall, H. O. Músculos- Pr ovas e Funções. São Paulo, Manole, 1995.
8. Brink Y, Louw Q, Grimmer K, Jordaan E. The relationship between sitting posture and seated-related upper quadrant musculoskeletal pain in computing South African adolescents: A prospective study. Manual Therapy 2015;20(6):820–826. DOI:10.1016/j.math.2015.03.0159.
9. Heyman E, Dekel H. Ergonomics for children: An educational program for elementary school. Work Read Mass. 2009;32:261–5.
10. Ismail SA, Tamrin SBM, Baharudin MR, Noor MAM, Juni MH, Jalaludin J, et al. 'Evaluation of two ergonomics intervention programs in reducing ergonomic risk factors of musculoskeletal disorder among school children. Research Journal of Medical Sciences. 2010;4(1):1–10. DOI: 10.3923/rjmsci.2010.1.10
11. Caring for your child's eyes during online classes and screen time? [Internet]. Dr. Digvijay Singh. 2020 [cited 2021 Nov 24]. Available:<http://drdigvijaysingh.com/uncategorized/caring-for-your-childs-eyes-during-online-classes-and-screen-time/>
12. Buckle PW, Devereux JJ. The nature of work-related neck and upper limb

- musculoskeletal disorders. *Appl Ergon.* 2002;33(3):207–17.
13. Bakshi S, Toshniwal V, Agrawal A, Acharya S, Shukla S. Awareness and psychosocial effects of covid-19 pandemic on health care professionals and medical students across the state of Maharashtra. *International Journal of Current Research and Review.* 2020;12:S-122-S-125. Available:<https://doi.org/10.31782/IJCRR.2020.SP74>
14. Chaudhari BV, Chawle PP. Life lessons of the pandemic "COVID-19". *International Journal of Research in Pharmaceutical Sciences.* 2020;11:469–471. Available:<https://doi.org/10.26452/ijrps.v11iSPL1.2814>
15. Chhapare S, Bhutada RS. COVID-19: A pandemic situation — review article. *International Journal of Research in Pharmaceutical Sciences.* 2020;11:1110–1115. Available:<https://doi.org/10.26452/ijrps.v11iSPL1.3545>
16. Dhakite S, Wajpeyi SM. Role of rasayana in prevention of COVID-19-a review. *International Journal of Research in Pharmaceutical Sciences.* 2020;11:716–722. Available:<https://doi.org/10.26452/ijrps.v11iSPL1.3072>

© 2021 Meshram et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

*Peer-review history:*  
*The peer review history for this paper can be accessed here:*  
<https://www.sdiarticle5.com/review-history/76555>