



## Postural Problems in School Children and Physiotherapy Role

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### Introduction

A good posture is one which requires a minimum expenditure of energy for the maintenance of good alignment, whereas utilization of excess energy and effort indicate poor posture. Good posture permits mechanically efficient functioning of joints wherein friction in the joints is minimized, tensions of opposing ligaments are balanced, and pressures within the joints are equalized, requiring minimum wear and tear of the joints. A posture can be said to be good if it fulfills the purpose with maximum efficiency and minimum efforts.

To conclude, in good posture, body will be at ease involving less effort weight equally distributed, all the axis being parallel to a vertical line, the curves of the spine are not twisted, abdomen held inside, chest held high in such a way that the shoulders are in an erect position.

**CAUSES OF POOR POSTURE:** The causes of poor posture can broadly be classified into two categories:- (i) Acquired- due to some accident or disease. (ii) Congenital- present at birth or hereditary. The deformities caused due to poor posture can be of two types: (i) Functional divergency, and (ii) Structural divergency.

The main causes of poor posture in school children are listed below.

1) Heavy bags can cause back pains, slouching back, head, neck and shoulder pain. In the long run, the abnormal weight on a growing spine can lead to the spine losing its natural curve. Anything more than 10% of the body weight on their shoulders can lead to not just back and posture problems, but also a host of other health conditions in children, warn experts.

2) Injury: when a bone, ligament, or muscle is injured, it is likely to weaken the support at that point and throw the framework out of balance. When such condition exists, it is not possible to have a perfect posture. Even after the injury has fully healed, the habit developed during the injury may still persist, and faulty posture may continue for a long time.

3) Disease: posture is greatly affected by the disease that weakens the bones or the muscles or causes the joints to lose their strength or mobility. The examples of this kind of disease are, rickets caused due to faulty nutrition of bone, and tubercular disease of joints or vertebrae. Poliomyelitis may cause weakening or distorting of motor nerve cells in the spinal cord, and thereby causing partial or complete loss of function in certain muscle groups. This type of loss of power in muscle groups upsets the body

control and balance and also causes other kind of defects.

4) Habit: habits of posture, whether good or bad, are acquired in the same way as the habits of walking, speaking or sitting, i.e. by practicing a certain type of coordination so many times that the act becomes unconscious and habitual. In case of school and college students, though the bones, joints, ligaments and muscles are in normal condition, but due to faulty and wrong habits, their coordination is disturbed, causing poor posture. Environment and occupation can also cause poor posture

5) Weakness: it is not possible to assume and maintain erect posture without expenditure of some energy. Such efforts, therefore, require some strength and endurance. Experiments have shown that slumped or slouched position of body can be maintained with quite less metabolic energy as compared to the erect position. The muscular weakness and lack of viability is thus responsible for such faulty postures.

6) Heredity: heredity is another factor which is responsible for poor or defective posture. Hereditary defects like kyphosis and other genetic defects may cause poor posture.

7) Improper Clothing: The type of dress one wears also has impact on individual's posture. For example wearing tight fitted dress, tight shoes, high heel shoes etc. will result in adopting poor posture. Such improper clothing makes one uncomfortable and may lead to faulty posture.

8) Improper Diet or Malnourishment: improper diet or malnourishment may result in various diseases due to deficiencies of vitamins and minerals e.g. rickets etc. which result in adopting faulty and poor posture.

9) Chronic Fatigue: Due to continuous school working hours, lack of rest and sound sleep, body tends to develop fatigue, and such condition becomes chronic with persistence of such conditions. Without proper relaxation, rest and sleep, the body and the mind becomes over worked and inefficient. Such conditions put undue

stress upon muscles thereby causing postural deviations.

10) Over Load: one may develop round shoulders and deformities of spine like kyphosis and scoliosis by continuously lifting and carrying heavy weight on shoulders and the upper back. Everyday example of overloading can be observed as we find school children carrying heavy school bags on their back.

11) Imitation: due to over exposure of the children to popular media like TV, network etc., there is general tendency among children to imitate their favorite heroes, models, stars, teacher, friends etc, such imitation may distort their natural posture and may cause postural deviations.

12) Unhygienic Conditions: it is very common to find crowded class rooms with improper sitting arrangement, improper furniture, improper and insufficient lighting arrangements etc. in our country. Such unhygienic conditions result in postural deviations.

13) Improper Time Table: improperly planned school curriculum puts extra stress upon the children. E.g. during long practical hours they have to maintain a static and most of the time bent posture which may be a factor causing postural defects.

14) Lack of Exercise: exercises tone up the spinal nerves and abdominal organs, improve appetite and digestion, promotes flexibility and co-ordination, reduces mental strain, and provides energy, improves the physical ability and efficiency. Lack of exercises in school and continuous study schedule has several adverse effects which may lead to postural deformities and defects.

15) Lack of Awareness: many are unaware regarding the concept of proper posture and continue to follow wrong or faulty postures. This becomes their permanent habit and a life style which leads to postural defects deformities.

16) Childhood Obesity: obesity or undue body overweight puts extra stress and strain on the muscular as well as skeletal structure of the body which may result in postural deviations.

17) Poverty: lack of essential and basic facilities due to poverty is another important factor which may lead an individual to adopt bad or faulty posture.



### Biomechanics

When the backpack load is positioned posterior to the body, the center of gravity shifts posteriorly, over the base of the support; the area covered by the feet<sup>(5)</sup>. This shift is accomplished by either leaning forward at the ankle or hip or inclining the head and the rigidity of postural muscles controlling these adjustments

The excess weight puts undue stress on the muscles, ligaments and disk and damage them. The alignment of the column is also disturbed causing it to bend, mostly forward or sideways, Rao explained. The survey was conducted in ten cities including Delhi, Kolkata, Chennai, Bangalore, Mumbai, Hyderabad, Pune, Ahmedabad, Lucknow, Jaipur and Dehradun in which over 2500 students and 1,000 parents were interviewed.



### Pathology

The peak rate of growth occurs during childhood, puberty and the growth of the appendicular skeletal system ceases around 16 years of age for females and 18 years for males.<sup>(3)</sup> However secondary ossification of vertebrae is not complete until the mid twenties. In these years skeletal tissue transforms from cartilage to bone through the process of ossification occurring in several stages and they are most vulnerable at this time<sup>[3,4]</sup>. Therefore, the spine may be susceptible to injury for a greater length of time and establishing standard backpack load should be emphasized during these years

Children have relatively larger heads and also have higher centre of mass at about T12, compared to L5-S1 in adults resulting in difficulty in maintaining static balance. Carrying posterior loads by young people has been linked with spinal pain, and the amount of postural change produced by load carriage has been used as a measure of the potential to cause tissue damage.

Back pain in children appears to be more common than was previously thought. An Indian studies had reported that 10%-30% of healthy children experience back pain, especially low back pain, by their teenage years<sup>[6,7]</sup>. Up to now, the effect of carrying heavy bags on children natural growth pattern has not been proven. Studies have reported relationship between heavy school bags and educational failure, lack of motivation, lack of learning, and absenteeism; however no definite results have been obtained<sup>[8]</sup>. The health effects of carrying heavy backpack loads necessitated the attention given to the determination of the load limit of backpack in the literature. Students sometimes carry as much as 30% to 40% of their bodyweight at least once a week<sup>[9]</sup>. Many studies present evidence to support backpack load limits for children, but the suggested limits have been based on percentage of the body weight with discrepancies. While some researchers proposed 10 % of body mass<sup>[10,11]</sup>, another research works proposed 15 % of body mass<sup>[12]</sup>. Considering the fact that in spite of many studies being carried out



on influence of school bag carrying in India, there exist a huge regional differences in data based on regional educational system and type of schools.



### Physical Therapy Role

The appropriate remedial action should be started as soon as possible. Immediate attention is required as bad posture exerts unusual and atypical stress on the soft tissues, muscles and ligaments of the body segment.

Time to time screening of body posture will go a long way in preventing postural defects. It must be remembered that the means of correcting postural deviations must be based upon medical diagnosis and recommendations. As ignorance regarding the basic concept of posture is one of the major causes for postural divergences, proper knowledge regarding the importance of posture in children and appropriate guidance for correcting the same is necessary so as to develop a "postural sense" regarding body mechanics in the mind of an individual. Class room benches should have proper back rest and adequate height for children to sit straight because children spent 6 to 7 hours in school. In the school, benches and chairs should be age appropriate that is not too big or not too small.

As the child starts to school, heavy backs on the posterior spine should be avoided. This will

prevent postural kyphosis and other spinal problems like scoliosis where spine is bent to one side which causes breathing problems and gradually developing knee and ankle problems. Light weight bags by reducing the number of books will definitely reduce the weight of the school bag. Brackley and Stevenson recommended that backpacks weight should be between 10–15% of a child's body mass<sup>[14, 15]</sup>.

An in-house survey by a city school revealed that poor seating and sleeping habits, and lack of physical fitness were responsible for growing number of children with a poor posture.

Specially designed chairs and desks are used in some schools to maintain normal posture. In home watching multimedia like Tvs, laptops and mobile phones in the slouched posture of the neck should be avoided. Sitting and doing homework with back adequately supported with pillows will definitely help children avoid postural problems.

### Exercises

First of all forward head posture should be avoided by pectoral stretching exercises, isometric neck exercises. Neck bending, extension, rotation, side bending stretching should be encouraged.

Neck extension exercises, balancing book on head will improve balance and proprioception of neck muscles. Playing outdoors or taking up sport is one of the best ways for students to strengthen their back muscles. If already abnormal posture develops in children, then braces like milwawkee, taylors brace should be given.

**Modalities:** Back pain in children can be reduced by modalities such as heat and cold if children can perceive. TENS, IFT can be given to larger pain areas

### Conclusion

Prevention is better than cure. So proper posture in school, home and avoiding heavy bags along with exercise such as participation in sports definitely will help children avoid musculoskeletal problems in children.



4. Lanes T, Gauron E, Spratt K, Wernimont T, Found E, Weinstein J. Long term follow up of patients with low back pain treated in a multidisciplinary rehabilitation program. *Spine* 1995; 20: 801-806.
5. Ramprasad, et al. Backpack weight and postural angles in children, *Indian Paediatrics* 576 Volume 47\_\_July17, 2010
6. Shumway CA. Control of normal mobility. In: Shumway CA, Woollacott MH, Eds. *Motor Control: Theory and Practical Applications*.
7. Mayank M, Upendar S, Nishat Q. Effect of backpack loading on cervical and shoulder posture in Indian school children. *Indian J Physiotherapy Occupational Therapy* 2006; 1: 3-12.
8. Grimmer K, Dansie B, Milanese S, Pirunsan U, Trott P. Adolescent standing postural response to backpack loads: a randomized controlled experimental study. *BMC Musculoskelet Disord.* 2002; 3: 10.
9. Ko, J and M.Kim, 2013. Reliability and responsiveness of the gross motor function measure-88 in children with cerebral palsy. *Phys. Ther.*, 93; 393-400.
10. Mackenzie, W. G., Sampath, J. S., Kruse, R. W., Sheir-Neiss, G. J., *Backpacks in Children, Clinical Orthopaedics and Related Research*, vol. 409, pp. 78–84, 2003.
11. Bauer, D. H., Freivalds, A., *Backpack load limit recommendation for middle school students based on physiological and psychophysical measurements, Work*, vol. 32, pp. 339–350, 2009.
12. Chow, D .H. K., Kwok, M. L. Y., Au-Yang, A. C. K., Holmes, A. D., Cheng, J. C. Y., Yao, F. Y. D., Wong, M. S., *The effect of backpack load on the gait of normal adolescent girls, Ergonomics*, vol. 48, no. 6, pp. 642– 656, 2005.
13. Hong, Y., Cheung, C., *Gait and posture responses to backpack load during level*

## References

1. Syazwan A, Azhar MM, Anita A, Azizan H, Shaharuddin M, Hanafiah JM, et al. Poor sitting posture and a heavy schoolbag as contributors to musculoskeletal pain in children: an ergonomic school education intervention program. *JPainRes* 2011;4:287-296.
2. Grimmer K, Dansie B, Milanese S, Pirunsan U, Trott P. Adolescent standing postural response to backpack loads: a randomized controlled experimental study. *BMC Musculoskelet Disord.* 2002; 3: 10.
3. Cite as: School Bags And Musculoskeletal Pain Among Elementary School Children In Chennai City; Vol 1|Issue 06|Pg:302-309 2014 303

- walking in children, *Gait & Posture*, vol. 17, pp. 28–33, 2003.
14. Brackley, H. M., Stevenson, J. M., Stevenson, Selinger J. C., Effect of backpack load placement on posture and spinal curvature in prepubescent children, *Work*, vol. 32, pp. 351-360, 2009. Cite as: School Bags And Musculoskeletal Pain Among Elementary School Children In Chennai City; Vol 1|Issue 06|Pg:302-309 2014 309
  15. Brackley, H. M., Stevenson, J. M., Are Children's Backpack Weight Limits Enough? A critical review of relevant literature, *Spine*, vol. 29, pp. 2184–2190, 2004.
  16. Orloff HA, Rapp CM. The effects of load carriage on spinal curvature and posture. *Spine* 2004; 29(12):1325-1329.
  17. Hong Y, Li JX, Wong AS, Robinson PD. Effects of load carriage on heart rate, blood pressure and energy expenditure in children. *Ergonomics* 2000; 43(6):717-727.
  18. Deere KC, Clinch J, Holliday K, McBeth J, Crawley EM, Sayers A, et al. Obesity is a risk factor for musculoskeletal pain in adolescents: findings from a populationbased cohort. *Pain* 2012; 153:1932-1938.
  19. Mwaka et al.: Musculoskeletal pain and school bag use: a cross-sectional study among Ugandan pupils. *BMC Research Notes* 2014 7:222.
  20. Grimmer KA, Williams MT, Gill TK: The associations between adolescent head-on neck posture, backpack weight, and anthropometric features. *Spine (Phila Pa 1976)* 1999, 24:2262–2267.
  21. Hong Y, Brueggemann GP: Changes in gait patterns in 10-year-old boys with increasing loads when walking on a treadmill. *Gait Posture* 2000, 11:254–259.
  22. Pereira DSL, Castro SS, Bertencello D, Damião R, Walsh IAP. Relationship of musculoskeletal pain with physical and functional variables and with postural changes in school children from 6 to 12 years of age. *Braz J Phys Ther.* 2013 JulyAug; 17(4):392-400.
  23. Santos MM, Silva MPC, Sanada LS, Alves CRJ. Análise postural fotogramétrica de crianças saudáveis de 7 a 10 anos: confiabilidade inter examinadores. *Rev Bras Fisioter.* 2009; 13(4):350-5. <http://dx.doi.org/10.1590/S1413-35552009005000047>.
  24. Javadivala, Z., Allahverdipour, H., Dianat, I. and Bazargan, M. Awareness of parents about Characteristics of a healthy school backpack. *Health Promot Perspect* 2012;2: 166.