



ASSESSMENT OF BODY MECHANICS AMONG SCHOOL GOING STUDENTS IN NAGPUR CITY

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Abstract

Children undergo rapid musculoskeletal development; the external force of a heavy school bag may cause musculoskeletal disorders. Children use school bags to carry their study material. Along with it play kits, tiffin baskets and much other stuff are carried in the bags, making it heavier. These loads on child's back arises risk of developing backpack syndrome. Bag weight therefore should be reduced, it is said that a school bag should not weight more than 10 – 15 % of child's body weight. The current study was to determine musculoskeletal pain among school going girls, to check the anthropometric measurements and to examine their physical fitness. A survey cum experiment method was used to collect data. According to the findings, 38% respondents carried a bag weighing 5 kg and only 1% of the respondents carried a bag weighing 2 kg to 3kg each day. Respondent's minimum weight (kg) was 25kg and maximum weight was 63kg. Guidelines and recommendations were provided to reduce load of heavy bag on back. The use of heavy school bags are predictors for musculoskeletal problems and disorders, therefore, there is a need to investigate further.

Keywords: Backpack, Musculoskeletal problems, Posture, Anthropometry.

Introduction

Ergonomics is the science of fitting the job to the worker and adapting the work environment to the needs of humans. An overall goal of ergonomics is to promote health and safety and to optimize productivity. Attention to ergonomics principles help to reduce injuries and illnesses. Many disorders and injuries are preventable when people recognize the hazards and safety of problems as well as how to control their own behavior for maximum comfort and health. Posture ranks right at the top of the list when one talks about good health. It is as important as eating balanced and nutritive diet, exercising, getting a good night's sleep and avoiding potentially harmful substances. Good posture enables to do things with more energy, less stress and fatigue. Good posture means the bones are properly aligned and muscles, joints and ligaments work naturally. It means organs are in the right position and can function at peak efficiency. Furthermore, good posture is an important contributing factor in the normal functioning of nervous system. The long-term effects of poor posture can affect bodily systems (such as digestion, elimination, breathing, muscles, joints and ligaments), a person who has poor posture is often tired, unable to work efficiently or move properly. People spend an average of 2 to 4 hours each day with their neck bent at unnatural angle while sending emails or texts. That is 700 to 1,400 hours a year. The average adult head weighs 10 to 12 pounds when it is in the upright or neutral position. However because of gravitational pull, the

cranium becomes heavier (the further forward the head is). Studies have found that bending the head forward at a 60 degree angle places 60 pounds worth of pressure on the cervical spine, the region of your spine above the shoulders. That is more than the weight of the average 7 year old.

Loss of the natural curve of the cervical spine leads to early wear, tear, spinal degeneration and possibly future surgeries. According to the Physical Therapy Dictionary, good posture is defined as “the state of muscular and skeletal balance which protects the supporting structures of the body against injury or progressive deformity irrespective of the attitude (erect, lying, squatting, and stooping) in which the structures are working or resting. Under such conditions the muscles will function most efficiently and the optimum positions are afforded the thoracic and abdominal organs.”

The spine is made up of 33 individual vertebrae. Nine of these vertebrae fuse together through a process known as ossification by the time a person reaches adulthood – 5 in the Sacrum, and 4 (sometimes 3-5) in the Coccyx or tailbone. That leaves 24 moveable vertebrae: 5 – cervical, 12 – thoracic, and 5 –lumbar. The spine has what is known as primary and secondary curves. Primary curves are the curves in the spine that we’re born with; namely the thoracic and sacral curves. These curves are formed in the developing fetus and are structural in nature. Secondary curves on the other hand are formed in response to muscle strengthening and develop a little bit later. The cervical curve for example takes shape as the newborn learns to lift his/her head. The lumbar curve develops after this as the child begins to sit up. Because of the nature of secondary curves, they are more susceptible to being over and underdeveloped, and as a result can lead to faulty postures.

Tight, contracted muscles have a way of restricting oxygen and nutrient rich blood flow to our cells. As a result, metabolic waste can accumulate in the tissue creating pain and imbalance. Chronically contracted muscles also burn up more energy and place an undue strain on the joints of the body. Over time these conditions can lead to illness, fatigue, and arthritis.

Children usually used school bags to carry their school materials. Carrying heavy school bags can cause several problems such as musculoskeletal problems among school children. A school going child spends 6 to 7 hours per day either at the school desk or in front of the computer or lifting a heavy school bag. School children are more at risk than ever before as they develop back pain because they carry overweight school bags.

Much has changed in the schools for the betterment of students. Ways of teaching and learning has changed. School environment have also transformed to absorb the changes in teaching and learning. Despite these changes one thing has remained unchanged that is excessive weight of school bags that student carry to their school. Students carry school bags from home to school, during moment from one class to another; sometimes they also attend activities in school with their bags on the shoulder. This can take a long time period undefined as to how long a child carries his school bag on his shoulders.

Along with books and stationery products like compass box they can't leave behind there's swimming suits, football kit, badminton kit and similar things. They also carry tiffin and water bottles; then there is all little stuff that is buried at the bottom (just in case).

The spine is a set of bones called the vertebral column with the bones separated by a cartilage called intervertebral disc and held up right by the muscles and ligaments around it. The excess weight put undue stress on the muscles ligaments and disc that damaging them. The alignment of the column is also disturbed causing it

to bend mostly forward or sideward; in other words a heavy school bag puts the child's health and physical development at risk which can hamper their overall growth this has immediate as well as long term ill effects. The immediate ill effects are back, neck and shoulder pain along with tingling, numbness, weakness in the hands, fatigue and an early development of poor posture is also an immediate ill effect.

Currently there is a need to examine the causes and effects of musculoskeletal symptoms among school children and identify risk factors associated with such symptoms.

A school bag as such is a bag that is used to transport different material for school like textbooks, exercise books and pencil cases - on the back.

There are several consequences of overburdening the tiny shoulders, back and neck at a young age. Carrying heavy backpacks can lead to muscular and skeletal problems, especially if the child carries the bag on one shoulder, or maintains bad posture while carrying the bag. This could also lead to stunted growth of bones among children. The pain and physical discomfort resulting from carrying a heavy school bag can also result in stress and lack of attentiveness in a child, affecting their learning in the precious formative years.

Growing numbers of children are developing irreversible back deformities because of the weight of the bags they carry to school; a heavy bag puts the child health and physical development at risk which can hamper their overall growth. This has immediate as well as long term ill effects.

A school bag should always be light and apt.

The purpose of this study is to highlight the following ways to maintain good body posture for better development of school going children.

1. Carry only what is essential.
2. Leave some books at School.
3. Make sure to pick up good quality lightweight accessories.
4. Choose an Ergonomic Bag.
5. Check out the posture while carrying the bag.
6. Pack smartly

Health experts say that children risk long-term and ultimately permanent damage if they regularly carry more than 15 per cent of their body weight over their shoulders; Using Ergonomic Schoolbags Can Reduce the Risk of injuries; therefore this study is to know the association between school bags and postural effects in school going children.

OBJECTIVES:

1. To determine the changes in various postural angles with different back pack weight in school going girls.
2. To find out the musculoskeletal pain among school going girls.

LIMITATION:

- This study was conducted in state board schools only.
- Sample population was hundred (100).
- Gender was also determined i.e., only girls were chosen for the study.
- Body posture of girls was examined.

- Age factor was also be considered i.e., all sample range in 11 – 16 year of age.
- This study was conducted in the area of Nagpur city only.

Methodology

The research design is the specification of method and procedure used to acquire the information needed. Research design is needed because it facilitates the smooth sailing of various research operations thereby making the research as efficient as possible, yielding maximum information with minimum expenditure of efforts, time and money. A descriptive cum experimental research was used to study the postural analysis among school going students with respect to school bag weight in Nagpur city. Self administrated Interview schedule was used to gather the information by preparing questionnaire.

- Anthropometric kit and a questionnaire were used for the study. The questionnaire was divided into three sections:

Section 1: This section in the questionnaire comprised of the questions regarding the personal background of the respondents, such as – age, class (standard), mode of transport, bag weight, body weight etc.

Section 2: This section in the questionnaire comprised of the questions regarding the anthropometric dimensions, change in postural angles while lifting heavy bag weight etc.

Section 3: This section in the questionnaire comprised of the questions regarding the musculoskeletal pain, measures to maintain good body postures etc.

The present study was carried out in state board school in front of Kasturchand park i.e., SJC Nagpur Maharashtra. A purposive random sampling was done to select the sample for the study i.e. (6th, 7th, 8th and 9th). The samples were in age group of 11 to 16 years. Data was collected from the sample by using the pre-coded interview schedule. Observation method was also used for analysis.

Result and Discussion

BAG LOAD CAUSING BODY PAIN IN RESPONDENTS:

Overloaded bags develop irreversible back deformities. The first symptom of ill posture is body pain. This might take form permanent ill effects on body and its system. The obtained data reveals that 52% of the respondents feel body pain due to load of bag. The remaining 48% didn't felt body pain due to load of bags.

BAG WEIGHT:

Weight of the school bags affects the musculoskeletal system, especially in children. Early pains in head, neck and spine are some of the causes of carrying heavy school bags. Weight of a school bag should not be more than 10 – 15% of child's body weight.

NEED TO MODIFY WAYS OF CARRYING BAG:

Too heavy school bag causes pressure on spine, pulling a trolley bag is associated with rotation of spine; hence, bag weight plays a crucial role along with maintaining correct body posture.

In this study, 74% of the respondents believed that there is a need to modify the way of carrying school bags, whereas, 26% of the respondents were unworried with the way of carrying school bags.

To overcome or restrict musculoskeletal problems it is necessary to reduce school bag weight. This can be done

by inculcating habits like maintaining good body posture, arranging bag according to time table.

In the current study, 91% of the respondents felt the need to reduce school bag weight. Only 9% of the respondents were satisfied with the bag weight.

Causes and analysis of musculoskeletal pain in the respondents.

Musculoskeletal pain or disorders are injuries to joints, muscles, ligaments, nerves, tendons and structure that support limbs, back and neck. It can arise from a sudden exertion, e.g. lifting a heavy object. This information is necessary as it provides data about changes in muscles and skeletal structure caused by regular use of heavy bags, lifting techniques etc. the data also helps in the interpretation of the result.

SENSE OF 'BACKPACK SYNDROME'

The pain associated with carrying a backpack is referred to as backpack syndrome. This pain might form into a permanent one if, one continues to use or opt a bag body posture while lifting or carrying heavy school bag. In the present study, 40% of the respondents sensed backpack syndrome and 60% did not felt any pain associated with back.

MUSCULAR PAIN DUE TO BAG LOAD:

Tight, contracted muscles restrict oxygen and nutrient rich blood flow to the cells. This results in waste accumulation in tissues causing muscle pain. 46% of the respondents suffer muscular pain due to bag load and 54% of the respondents don't experience muscular pain in carrying bag load.

MUSCULAR PAIN DUE TO BAG LOAD:

One reason for back pain is wearing tight cloths, as they compress muscles. Thigh clothing also causes indigestion and stomachache. Regular use of such apparels restricts comfortable and maximum reaches. In the current study only 3% of the respondents felt problem in dressing themselves, whereas 97% of the respondents could dress themselves completely without any problem.

BODY PAIN WHILE ATTENDING CLASSES:

If one does not opt good posture for sitting, standing or performing any task or is hindered by any obstacle e.g. heavy bags, it will not only lead to discomfort and body pain but also distracts attention, further causing learning or grasping disability. The study reveals that 30% of the respondents experienced pain due to heavy bag weight while attending classes. Remaining 70% felt comfort while attending classes.

MUSCLE IRRITATION DUE TO BAG WEIGHT:

Damage to muscles and skeleton is the frequent consequence of carrying heavy bag. It contributes to lack of range of motion. Weakness in muscle is the starting of every muscle problem. Medication and exercise helps in reduction of muscle related problems. The current study indicates that only 24% of the respondents suffered muscle irritation due to carrying heavy school bag. Bag weight doesn't matter 76% of the respondents.

STIFFNESS IN MUSCLES, JOINTS OR BACK:

Every muscle problem start with weakness in muscles. Rashes, muscle fatigue, thickening of skin, difficulty in breathing are some of the causes of muscle weakness. Therapies treatments and medications are available for muscle and joint problems. In the present study, 39% of the respondents experienced stiffness in their muscles, joints or back, 61% of the respondents were not affected by such syndromes.

FREQUENT PAIN AREA – DUE TO CARRYING SCHOOL BAG:

It is very necessary to understand the importance of posture as it reduces risk of musculoskeletal problems. In the current study 52% respondents were not suffering from any pain while carrying school bags. 48% of the respondents experienced pain in some or the other spine area. 24% of the respondents suffered pain in cervical spine, 19% of the respondents suffered pain in thoracic spine, 4% of the respondents suffered pain in other part of the body. Only 1% of the respondents suffered pain in lumbar spine. Only 8% of the respondents consulted doctor for related pain. 92% of the respondents didn't consulted the doctor for related pain.

CARRYING SCHOOL BAGS IN EXTREME CLIMATES CAUSE MUSCLE PAIN:

Climate directly pays an impact on human health. Extreme climates affect appetite, water requirement, and demand of oxygen, which directly increases or reduces muscular power to work. This may reflect as various muscle weakness syndromes. In the present study, 32% of the respondents experienced pain while carrying school bags in extreme climate, whereas 68% of the respondents did not experienced any muscle pain while carrying school bag in extreme climatic conditions.

LOAD LIFTING ADVERSELY AFFECTED BODY ANGLES:

The imbalance of weight causes over stretching and makes the head rotate or tilt at an unnatural angle. This results in neck pain followed by pain in spine. When a bag is carried on one shoulder, the other shoulder is affected and might cause pain. Therefore, proper lifting and carrying techniques should be followed to reduce pain and disorders of body angles. The study reveals that

PALPITATION OR SUFFOCATION WHILE CARRYING SCHOOL BAG:

Palpitation is fluttering in chest. It is a result of stress, whereas lack of oxygen and disability of body to fulfill oxygen requirement leads to suffocation. These problems may occur because of heavy exercise, activity or physical illness or due to carrying of heavy load. In the current study 84% of the respondents do not feel palpitation or suffocation while or after carrying school bag. 16% of the respondents felt either palpitation or suffocation while carrying school bag.

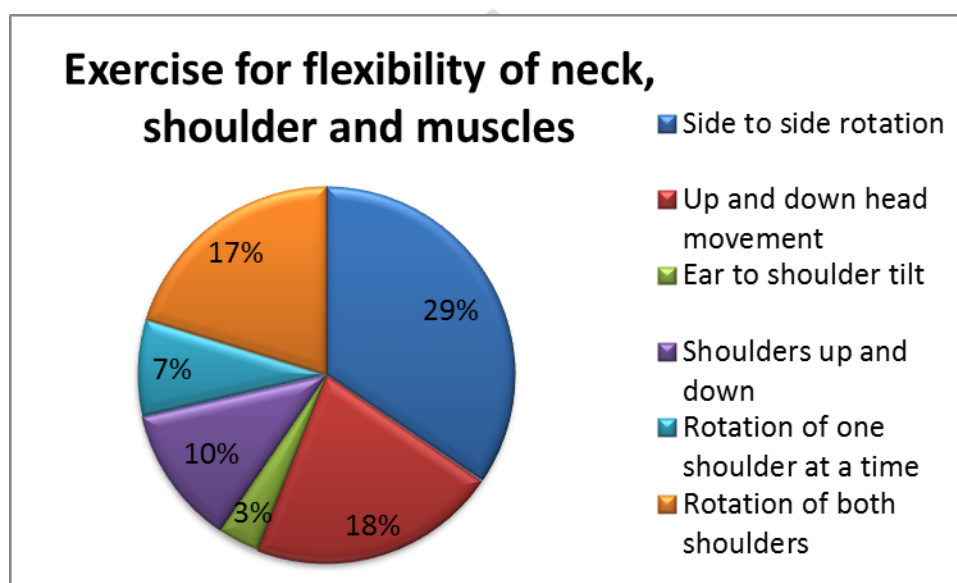
WALKING IN SPEED WITH BAG CAUSES STRAIN AND PAIN IN SHOULDER:

Walking is a cardiovascular exercise, but, when it is done at a high speed along with some load, it may weaken joints and muscle. Incorrect carrying of load may even lead to further musculoskeletal disorder. In the present study, 62% of the respondents suffered strain and pain in shoulder due to walking in speed with bag load and 38% felt no pain or strain in shoulder due to walking in speed with bag load.

EXERCISE TO INCREASE FLEXIBILITY OF NECK, SHOULDER AND MUSCLES:

Shoulders help in everyday tasks hence; it should be free and flexible. They increase overall body strength. The neck supports head and cervical spine and therefore it is important to relax and give rest periods to body parts. This can be done with the help of exercises. The current study reveals that 29% of the respondents perform side to side rotation of neck, 18% of the respondents perform up and down head movement, 17% of the respondents perform rotation of both shoulders, 10% of the respondents perform shoulders up and down exercise, and 7% of the respondents perform rotation of one shoulder at a time. Only 3% of the respondents perform ear to shoulder tilt for flexion and relaxation of neck, shoulder and muscles.

Figure: Graphical representation of the respondents on the bases of exercise performed to increase flexibility of neck, shoulder and muscles (N=100)

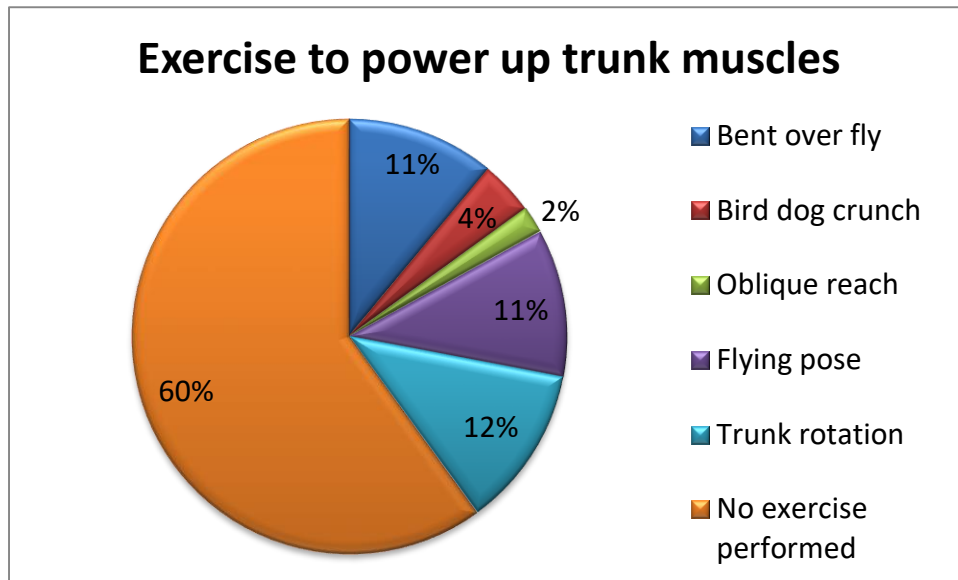


EXERCISE TO POWER UP TRUNK MUSCLES:

Trunk muscles balance the body and helps in task performance. These muscles help in maintaining body balance and stability. Current study reveals that bird dog crunch and oblique reach was performed only by 4% and 2% of the respondents respectively.

11% of the respondents performed flying pose and other 11% of the respondents performed bent over fly to power up trunk muscles. 12% of the respondents perform trunk rotation exercise and 60% of the respondents perform no exercise for trunk muscles

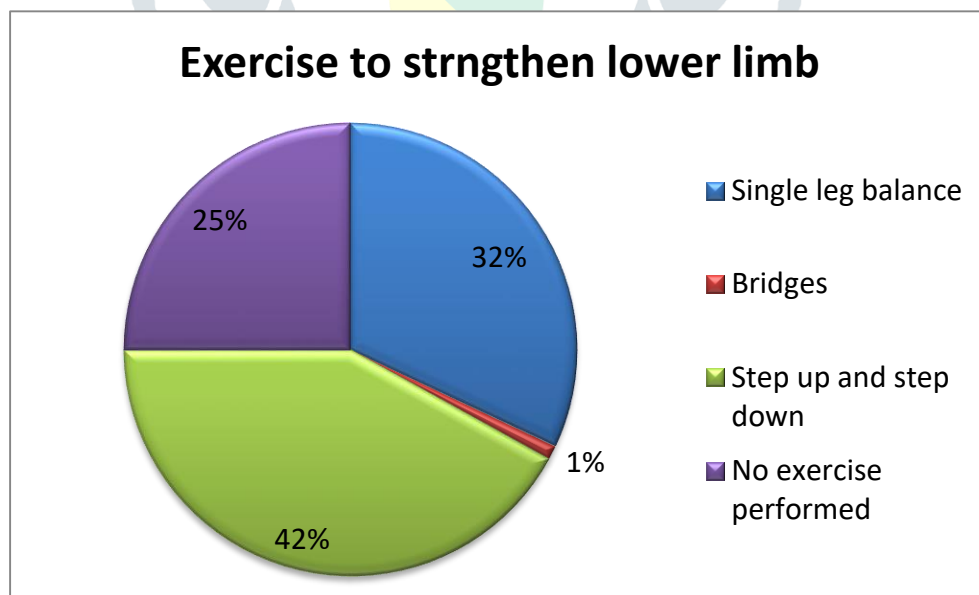
Figure : Graphical representation of the respondents on the bases of exercise performed to power up trunk muscles (N=100)



EXERCISE TO STRENGTHEN LOWER LIMB:

The legs are the wheels of the humans. Lower limb holds up whole body weight and therefore it is important to keep it exercised. The study reveals that 25% of the respondents do not perform exercise for lower, whereas 42% of the respondents perform step up and step down exercise. 32% of the respondents perform single leg balance and only one respondent perform bridges.

Figure : Graphical representation of the respondents on the bases of exercise performed to strengthen lower limb (N=100)



CONCLUSION:

On the basis of the findings of the study, it revealed that respondents suffered some kind of problems related to muscles because of carrying heavy load of bag and there was also a positive association of pain and bag weight.

There were changes in postural angles because of carrying heavy school bags. Majority of the subjects fall under the range of 110 – 115 i.e. majority of the respondents have a physical fitness at a high average level (According to the score table) at the same time they also felt the need to reduce school bag weight.

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