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EFFECT OF BACKPACK OF 10% OF THE BODY WEIGHT ON CERVICAL AND SHOULDER POSTURE FOR SCHOOL GOING CHILDRENS

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ABSTRACT

The backpack is one of the several forms of manual load carriage that provides versatility and is often used by bikers, backpackers and soldiers, as well as school students. However, musculoskeletal problems associated with backpack use have become an increasing concern with school children. The combined effects of heavy load, position of the load on the body, size and shape of the load, load distribution, time spent carrying, physical characteristics and physical condition of the individual were hypothesized as factors which were associated with these problems experimental study, same subject design was used for the study. Two experimental load conditions (static and dynamic loading with 10% body weight) were tested. The subject unloaded posture is compared with posture under two different experimental loading conditions. Result: No significant difference was found between unloaded state and static loading posture p value is greater than 0.05.

KEYWORDS: **Posture, backpack and body weight, shoulder posture, cervical posture**

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INTRODUCTION

Pressures often come from outside sources such as family, friends, or school, but they can also come from within. The pressure we place on ourselves can be most significant because there is often a discrepancy between what we think we ought to be doing and what we are actually doing in our lives. Stress can affect anyone who feels overwhelmed — even school children's. For children studying in schools, there's no escape from the huge burden on their back as only a few schools have responded to the plea of education officials to relieve the children of the stress. Some schools have begun reducing the 'burden' of the children by keeping some of their text books and note books in cupboards in the school. But schools have not really been able to do away with bags altogether. They say that they give very little homework for childrens. Except for the books they require, they can keep the rest of the books in the school. Children regularly carry overweight bags, despite campaigns warning teachers and students of the damage that can be done when the load exceeds 15 % of their body weight. You see them at almost every bus stop on their way to and from school - heroic pupils battling with huge overloaded backpacks.The backpack is one of the several forms of manual load carriage that provides versatility and is often used by bikers, backpackers and soldiers, as well as school student.[1] The backpack is an appropriate way to load the spine closely and symmetrically, whilst maintaining stabilityHowever, musculoskeletal problems associated with backpack use have become an increasing concern with school children.[1,2,3]The combined effects of heavy load, position of the load on the body, size and shape of the load, load distribution, time spent carrying, physical characteristics and physical condition of the individual were hypothesized as factors which were associated with these problem.[1,4] As growth of the spinal structure extends over a longer period of time than the other skeletal tissues, incongruities in rate of tissues development can pose a threat to postural integrity.[5] Moreover, external forces such as load carrying may also influence the growth, development and maintenance of the alignment of the human body.[6] Recent studies confirmed high prevalence rate (10% to 40% depending on back pain definition and age) of back pain among adolescent in many countries like New Zealand, United Kingdom, India, Italy, America, Finland, and Switzerland. There are also few reports of other problems associated with backpack i.e., functional scoliosis, rucksack and reduced lung function palsy.[12,13] [14,15] When load is positioned posterior to the body in the form of backpack it changes posture because of changes to the center of gravity. The body tries to keep the center of gravity between feet, so with a backpack, the trunk is in a more forward position, placing abnormal forces on the spine. Recent study by Wunpen chansirinukor reveals that carrying a backpack with 15% of their body weight is too heavy to maintain the head and shoulder posture for adolescents.[20] Hence this study is to find out whether the impact of carrying a backpack with 10% of the body weight on cervical and shoulder posture. Limitation of the study: study is done within the Chennai city school. Study concentrates only on cervical and shoulder posture. Study examines the effect of the double strap bag not the single strap bag. Study is done with the healthy male school children of age between 10-15.Sagittal shoulder posture (SSP): The angle formed by intersection of a horizontal line through C7 and the line between the midpoint of the greater tuberosity of the humerus and the posterior aspect of acromian process. This provides measurement of the forward shoulder position.

Sagittal shoulder posture (SSP)

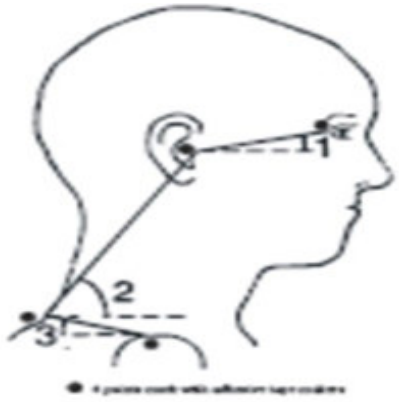


Figure 1
1.The craniohorizontal angle 2.The craniovertebral angle 3.Sagittal shoulder posture.

MATERIALS AND METHODS

An experimental, same subject design was used for the study. Two experimental load conditions (static and dynamic loading with 10% body weight) were tested. The subject unloaded posture is compared with posture under two different experimental loading conditions. The study was conducted in St. Joseph's matriculation higher secondary school; Chennai-56.56 healthy male school students between age group of 10-15 years were included in the study.

INCLUSION AND EXCLUSION CRITERIA

Inclusion Criteria

Healthy male school students, Age group of 10-15 years, No recent injuries to neck and shoulder, No deformities.

Exclusion Criteria

Recent injuries, Fever, Systemic illness, Congenital deformity.

PROCEDURE

The investigator personally met the school principal and obtained a written consent after explaining the program, objective and the significance of the study. All the subjects are selected based on inclusion and exclusion criteria.64 male school students were assessed initially based on the evaluation form (Appendix II) after explaining the program, objective and obtaining informed consent.Study was approved by of Saveetha university, scientific review board and ethical committee for doing study on human. Informed consent was obtained from all participants. 56 students volunteers were selected for the study after the initial screening and since the study was for short duration small samples were selected .All the selected students were weighed with and without their school bags to find out the weight they normally carry. Clothing were rearranged so that shoulder was exposed. With the subject in standing posture markings were placed on four areas**.** To evaluate the cervical and shoulder posture the following four anatomical regions were proposed by Harrison et al 1996, raine et al in 1994, chansirinukor et al in 2001. Tools for data collection 1. Weight machine,2.School bag with two shoulder strap,3.Weights,4.One Sony 12.5 mega pixel digital camera5.Image tool UTHSCA (3.0 version).

- External canthus of the right eye
- Right tragus
- Spinous process of 7^{th} cervical vertebrae
- Midpoint of greater tuberosity of humerus and the posterior aspect of acromion of scapula.

Subjects were asked to stand comfortably with their arms by their side in normal standing posture. They were asked to place their weight evenly on both feet. The lateral malleoli were placed between parallel lines, which are perpendicular to the frontal planes. The subjects looked directly ahead. Camera was placed two meters from the subject's right side. Photograph was taken within 5 second of assuming the position. The photographs of the subjects were taken in specific order. The length of the straps of the school bag was adjusted prior to loading, to place the center of bag approximately at mid back level. Subjects were photographed in specific order first without the school bag (unloaded) then with static loading with 10% of body weight followed by after dynamic activities with the same weight (dynamic activities : 3 minutes walking & 2 min – stair climbing with 10% of the body weight). Subjects were encouraged to relax and move about after each photograph. The photograph was taken in the morning to minimize the effect of muscle fatigue.Photographs were analyzed by digital software Image Tool UTHCSA version 3.0, University of Texas Service Center, San Antonio.

Table 1

The mean height and mean weight of the subjects

VARIABLE	MEAN	MAX	MIN
Age (yrs)	12.8	15	10
Height (cms)	151.75	169	128
Body weight (kg)	39.82	72	22
Weight of school bag (kg)	7.2	10	3

Comparison were made of postural angles with no school bag, and postural angles produced by carrying school bag over two shoulder equivalent to 10% of body weight with static loading and after dynamic activities. Comparison of postural angles after dynamic activities is done with static loading with 10% body weight and with 0% of body weight. The significance of changes in data was estimated using repeated measures analysis of variance on each angle with which planned contrast were made of the unloaded condition with each of two other loaded condition. Statistical test were considered significant if p = 0.05.

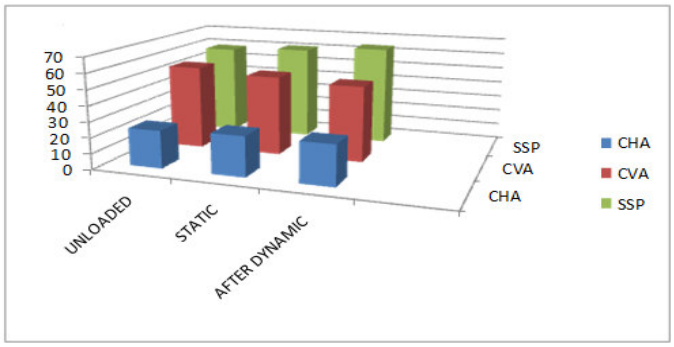
Table 2

Mean values from postural assessment (in degrees)

CONDITIONS	CHA	CVA	SSP
UNLOADED	24.09	53.98	58.52
STATIC	25.66	51.10	60.75
AFTER DYNAMIC	25.82	48.68	63.99

Table 2 showing the result mean values of the groups i.e., at the three levels of back pack in unloaded,static and after dynamic at CHA,CVA,SSP. In unloaded the mean value was 24.09(CHA), 53.98(CVA) and 58.52(SSP), static the mean value was 25.66(CHA), 51.10 (CVA) and 60.75(SSP) and after dynamic position the mean value was 25.82(CHA), 48.68 (CVA) and 63.99 (SSP).

Graph 1
Pattern of postural changes under different conditions



Graph 1 showing the result mean values of the groups i.e., at the three levels of back pack in unloaded,static and after dynamic at CHA,CVA,SSP.

RESULTS

From the mean value of the postural assessment ie., unloaded,static and dynamic postural test it was clear that there is a direct impact of back pack over cervical and shoulder posture. Mean values of craniovertebral angle was reduced in all two experimental loaded conditions when comparison with unloaded condition (Table 2). Significant difference is founded by repeated measure of variance in the craniovertebral angle between unloaded state(53.98°), static loading(51.10°) and after dynamic activities(48.68°) with p value 0.018 which is less than 0.05. The mean values of craniohorizontal angle increased in all two experimental load conditions when compared with unloaded state (Table 2). There was no significant difference was found in craniohorizontal angle between the unloaded condition(24.09°) and carrying school bags weighing 10% body weight while static loading(25.66°) and after dynamic activities posture(25.82°). Mean value of sagittal shoulder posture increases in all the two experimental loads conditions in comparison with unloaded state (Table 2). There was a significant difference between unloaded state (58.52°) and after dynamic activities posture (63.99°) with 10% body weight with p value. 000.

DISCUSSION

In this study the result revealed that most of the school children in the age group of 11-15 years carried school bag weighing between 10%-18% of their body weight. In this study it reveals the experimental hypothesis i.e., carrying the backpack of 10% of the body weight has an direct impact on the cervical and shoulder posture. Thus implying that school bag weighing 10% of body weight would be too heavy for the Indian school children aged 10-15 years to maintain their normal cervical and shoulder posture.Shruti. R. Iyer states that Indian school children carry school bags weighing 18.5% of their body weight, studies done by Whittfield JK et al claims that the average weight of school bag is above 15% of their BW in various countries.[7,10,16] Carrying heavy school bags is clearly a risk factor for back pain and pain around the neck and shoulder (Troussior B et al in 1994). Also repeated micro traumatic of carrying backpack may lead to postural anomaly of forward head posture in children.[16] Therefore it is important to limit postural changes with backpack loading less then 10% of body weight.

FUTURE PROSPECT

Study can be done in large samples and district wise schools be selected. Modifications of backpack can be advised.

LIMITATIONS OF THE STUDY

Study was done with small sample size.

CONCLUSION

The study reveals the experimental hypothesis i.e., carrying the backpack of 10% of the body weight has an impact on the cervical and shoulder posture. Thus implying that school bag weighing 10% of body weight would be too heavy for the Indian school children aged 10-15 years to maintain their normal cervical and shoulder posture. Recommendation: The study can be done nation wide with large sample size, The study can be done with 5% of the body weight, The study can be done on the effect of loading single strap bag, The study examines the only the cervical and shoulder, whereas the study observing changes in spinal curvature and trunk forward lean are recommended.

CONFLICT OF INTEREST

Conflict of interest declared none.

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