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ORIGINAL ARTICLE

Efficacy OF HEAVY BAGS WITH 15% OF BODY WEIGHT IN TEENAGERS ON CERVICAL AND SHOULDER POSTURE ALIGNMENT

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ABSTRACT

Background of the study: This examination clarifies about the normal weight an understudy needs to convey to school. The pinnacle development happens during pubescence and the development of the affixed skeletal framework stops around 16 - 18 years for guys. The greater part of the investigations on the impact of burden carriage has been centered around patches and climbers fully intent on working on the strategies of burden carriage. **Methodology:** This is an observational investigation with 50 male subjects included. With static and dynamic stacking with 15% body weight and changes in stride design in the two circumstances were caught. Subjects were on their own control where gauge or dumped pose is contrasted and act under two distinctive trial stacking conditions. Subjects were weighed with and without their school packs on the one set off aligned electronic scale. **Result:** The mean upsides of Craniovertebral Angle (CV), Craniohorizontal (CH) point and Sagittal Shoulder act expanded in all trial load conditions in examination with dumped state. The mean upsides of Step Length (SL) decreased in unique stacking when contrasted with dumped condition while it was not appropriate if there should arise an occurrence of static stacking. No huge contrasts were found in CH Variance between the dumped condition and conveying school sacks weighting 15% body weight while in static stacking the CH Variance was expanded to practically twofold when contrasted with no heap and dynamic burden condition. **Conclusion:** This experimental study supports that dynamic loading of the student with 15% of body weight, leads to significant change in cervical and shoulder posture compared to static loading with 15% of body weight and unloaded condition.

Keywords: Cranio-Horizontal Angle; Cranio-Vertebral angle; Sagittal Shoulder posture; Strength

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INTRODUCTION

The word rucksack was begat in the U.S. in 1910's. Rucksack is a proper method of conveying load of spine, intently and evenly while keeping up with dependability. The Backpack is one of the few from of manual burden carriage that gives flexibility and is frequently utilized by climbers, hikers and troopers, just as school kids. However, there is developing public worry that over-burden youngsters and juvenile's knapsacks might prompt the improvement of back torment and other musculoskeletal wounds. Data got from these investigations may duplicate to school kids. Stance in juvenile can be influenced by both inward and outer impacts, which might make young adult more vulnerable to injury. Contemplating postural reactions to burdens will help us to understanding the effect of conveying school packs on kids. At the point when burden is situated back to the body as knapsack it changes pose on account of changes to focus of gravity[1, 2].

The body attempts to keep the focal point of gravity between feet, so with a bag, the storage compartment is in a more forward position, putting unusual power on the spine, load conveyed in a backpack shift the focal point of gravity behind the body to equalize, the focal point of the gravity of the body in addition to the load is moved back over base of the feet. The specialists demonstrated that conveying backpack lead protrusion of head to the forward direction. These progressions in arrangement of the neck can produces strain of cervical joints [3, 4].

Conveying back loads by youngsters has been connected with spinal agony, and the measure of postural change created by load carriage has been utilized as a proportion of the possibility to cause tissue harm. Back torment in kids gives off an impression of being more normal than was recently suspected. Studies have shown that 10% to 30% of sound youngsters experience back torment by their teen. Consequently examination to postural reactions to stack conveying will assist us with understanding the effect of school knapsack on youngsters[5-7].

To decrease the event of musculoskeletal agony a proactive, preventive methodology utilizing ergonomics mediation has been proposed by certain scientists. For instance, school packs plan, school spot, furniture, and apparatuses. Managerial controls are choices made by school staff, medical care experts and others (specialists, school overseers, and guardians or parental figures) to lessen the term, recurrence and seriousness openness to existing risks. They additionally pass on the dangers set up however endeavors to decrease the impacts on the young (for example ensuring the heaviness of the rucksack doesn't surpass 15% of the body weight, checking the adolescent stance when wearing the knapsack). Work practice controls are self-guided, self-started systems utilized by understudies to guarantee protected and legitimate methods while doing exercises (for example utilizing the two ties, affixing the lashes yet not very firmly). This load of methodologies or controls target decreasing the weight on musculoskeletal framework[8, 9].

The limitation of the most extreme load to 15% of the body weight is one of the fundamental controls. Anyway some different creators have suggested that sack weight ought not to surpass 15% of the body weight. In this investigation we are attempting to decide if the heaviness of the rucksack (15% of body weight), its situation on the spine or time

conveyed influenced youths cervical and shoulder act. None of the scientists till date have examined reactions of cervical and shoulder act after static stacking and after unique exercises with 15% of body weight. In addition, attributable to anthropometrical contrasts among western and Indian offspring of comparable examination done there are not straightforwardly appropriate to Indian kids [10].

Purpose of the Study: There is need of this investigation so it can give us data about the normal weight a kid needs to convey to school. Subsequently if preventive measures can be acquaint now with the respect with safe burden carriage in undergrads, it won't just serve to item youngsters while they are as yet growing, yet will likewise guarantee, that the standards they adapt now are brought through to work place as grown-ups and to address the very example deviations which happen in the youngsters because of weighty burden.

Aim & Objectives : Objectives of the study were to examine the changes in Cervical Lumber & Shoulder posture in college children with Dynamic Loading (15% of body wt.); also, to examine the changes in cervical Lumber & Shoulder posture in college children with static Loading (15% body wt.). And to analyses the gait pattern after back loading in college children.

Growth: Growth applies powers to the spine, the extent of which differs with the pace of development. Since the development speed is most elevated in newborn child and youths, it is normal that the subsequent powers applied to the spine are most noteworthy at these ages. Despite the fact that they are not more noteworthy, the powers that outcome from development might change spinal design since they are applied throughout extensive stretches of time. In ordinary spinal development, foremost and back development and side to side development are adjusted. The outcome is stretching of the spinal segment with moderately little change in its gross forms. Assuming, nonetheless, a pathology condition causes deviated development, the power vectors change and cause deformation.

Adaptability The pediatric spine can adjust to applied anxieties substantially more promptly than can the grown-up spine. "This is identified with development potential, the lower modulus of flexibility, and unmistakable rebuilding capacity.

Malleability: as well as being versatile, which suggests in dynamic interaction, the pediatric spine likewise is generously pliable. Pliability, a uninvolved interaction, suggests that the spine might be disfigured with the use of powers outside to the spinal segment.

Hypermobility: The physiologic scope of movement of the pediatric spine is extensively more noteworthy than that of the grown-up spines. This is the consequence of contrasts in ligamentous limitations and direction of the feature joint.

Weak Growth Plate: The development plate is the most fragile connection in the hub skeleton when it is exposed to tractable powers. This has significant ramifications for the sorts of injury probably going to happen in the pediatric spine. Odontoid wounds typically happen through the actual plate, situated close to the foundation of the odontoid cycle.

METHODOLOGY

Total 50 students aged between 17-20 years of BPT First Year was participated in the study. Participants with fever, systemic illness,

cervical injuries, scoliosis or Kyphosis or congenital deformity were excluded from this study. Participants with complaint of pain were stopped for testing procedure.

Inclusion Criteria: Students should be aged between 17-20 yrs. Height, Body Weight should almost be similar, weight of the bag should be equal, lifestyle variation.

Exclusion Criteria: Scoliosis or Kyphosis, Injury, Fever, Systemic illness, any congenital deformity.

Study Procedure: Participants were weighed with and without their school packs on the one set off adjusted electronic scale (Beurer scale, precise to be inside 0.1 kg to 120 kg). Standing stature was estimated against an estimating tape got to divider. One school pack was utilized for every one of the exploratory conditions. The school sack had two movable cushioned shoulder ties, two compartments and no midriff or chest pressure lashes. Scopes of loads of 2 kg, 1 kg, 500 gm, 100gm, and 50 gm were utilized for the exploratory burden conditions.

The element of loads repeated regular instruction material. One Cannon 7.1 Mega pixels advanced camera was utilized to take actually photos of subject's sagittal stance. Stand remain with a soul meter level was utilized for mounting the camera. Proportions of cervical and shoulder act were determined structure advanced photos utilizing the digitizing programming (Image Tool UTHCSA variant 3.0 University of Texas Health Service Center, San Antonio, TX).

Design of the study: This was an observational study to compare 2 test load conditions in static and dynamic stage with 15% body weight and were tried noticing the progressions in step design in the two conditions. Subjects were their own control where benchmark or dumped act is contrasted and act under two distinctive exploratory stacking conditions.

Techniques: Clothing was reworked so that shoulders were uncovered. With the subjects in standing stance cement markers were put on four physical tourist spots.

Spinous process of the seventh cervical vertebrae, Midpoint between greater tuberosity of humerus bone, back part of acromion of the scapula, Outer canthus of right eye and right tragus, were noted and were approached to stand serenely with their arms close by in ordinary standing stance.

They were approached to put their weight equitably on the two feet. The horizontal malleoli were put between equal lines, which are opposite to the front facing planes. The subjects gazed straight ahead. Camera was put two meters from the subject's right side. Photo was taken inside 5 second of taking on the position.

The photos of the subjects were taken without school bag; it was 0% body weight, 15% body weight applied for Static loading and for dynamic activities. Information was examined by advanced programming Image Tool UTHCS version 3.0, University of Texas Service Center, San Antonio.

Figure 1. Digital camera

Figure 2. Unloaded Condition (15% Body Weight)

Figure 3. Static Loading (15% Body Weight)

Data Analysis: Examination of postural points after powerful exercises is finished with static loading with 15% body weight and with 0% body weight. The meaning of changes in information was assessed utilizing rehashed measure examination of difference on each point with which arranged differentiation were made of the dumped condition with every one of two other stacked condition. The study was considered as significant with if $p<0.05$. The Gait was observed at carrying school bag more than two shoulders comparable to 15% body weight with static and dynamic exercises.

Descriptive data analysis

Variables		N	Mean	Std. Deviation	Std. Error	95% Confidence interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
CH	**1**	50	16.61	2.725	0.3854	16.292	17.803	13.1	23.1
	2	50	23.18	3.656	0.5171	22.653	24.680	17.8	30.5
	3	50	20.4	2.432	0.344	20.087	21.436	14.9	28.2
	Total	150	39.93	4.020	0.3283	40.209	41.496	13.1	30.5
CV	**1**	50	40.71	4.941	0.6988	40.383	43.122	35.4	52
	2	50	43.99	3.827	0.5413	43.748	45.870	39.2	52.8
	3	50	40.54	2.881	0.4075	40.654	42.251	33.8	48.5
	Total	150	84.98	4.278	0.3494	86.154	87.523	33.8	52.8
SS	**1**	50	19.06	3.402	0.4812	18.104	19.990	13	23
	2	50	NA	NA	NA	NA	NA	NA	NA
	3	50	16.84	3.646	0.5156	15.037	17.058	10	22
	Total	150	19.22	3.696	0.3697	18.483	19.932	10	23

Table 1: Descriptive data analysis of the samples collected

Variable	Mean (SD)	Max.	Min
Age(yrs)	18.40 (1.43)	21	16
Height (cms.)	157.5 (4.156)	168	151
Body weight (kg)	54.03 (5.008)	63	45
Weight of College bag (kg)	8.062 (0.751)	9.45	6.75

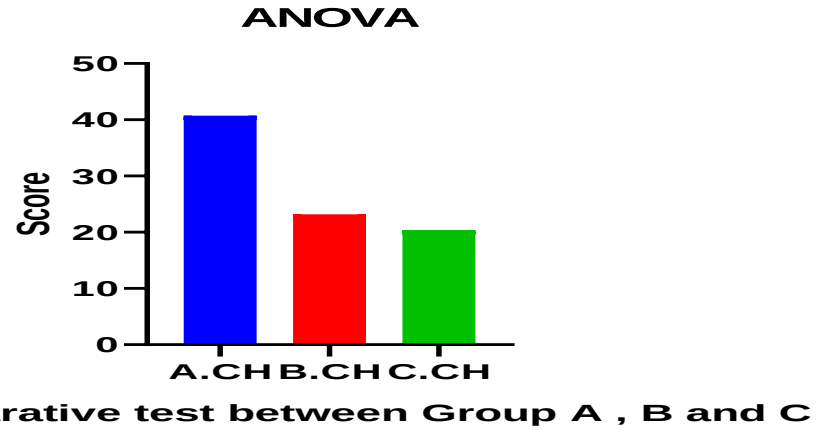
Table 2: Characteristics of Subjects

Conditions	Cranio Vertebral Angle (CVA) Mean (SD)	Cranio Horizontal Angle (CHA) Mean (SD)	Sagittal Shoulder Posture (SSP) Mean (SD)	Step Length (SL) Mean (SD)
Unloaded condition (0% of body weight)	41.35 (4.991)	16.816 (2.752)	39.366 (6.323)	18.5 (3.436)
Static loading (15% of the body weight	43.375 (3.866)	22.991 (3.693)	35.308 (5.977)	NA (NA)
Dynamic loading (15% of the body weight)	40.491 (2.9103)	21.041 (2.456)	39.233 (8.850)	16.75 (3.683)

Table 3: Mean (SD) degrees values from postural Assessment

Difference between Group A, B and C	SS	DF	MS	F (DFn, DFd)	P value
Cranio Horizontal Angle	12133	2	6066	F (2, 147) = 408.1	P<0.0001

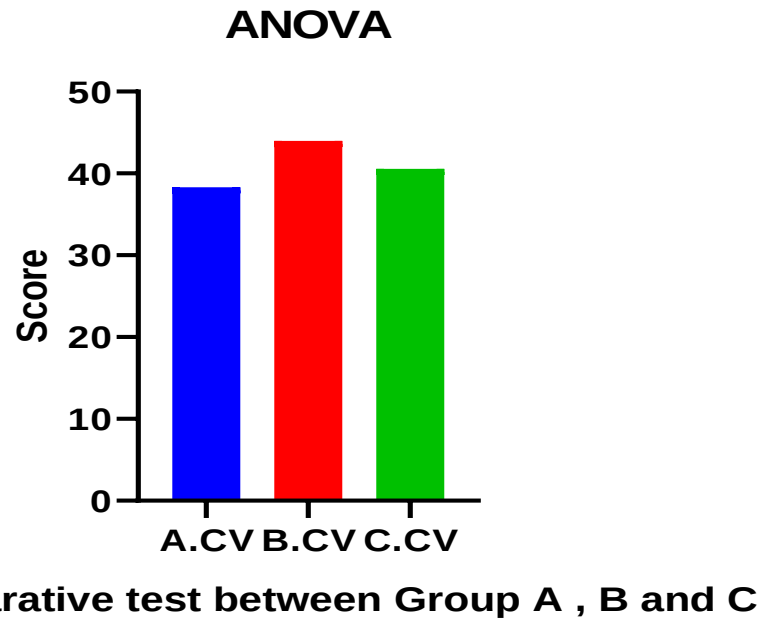
Table 4: ANOVA of difference between Groups A, B and C on Cranio Horizontal Angle



Graph 1: The Cranio-horizontal angle increases in the Group A i.e. Without static loading and it reduces gradually once it is loaded and further more it reduces in the dynamic loading subjects when they start walking.

Difference between Group A, B and C	SS	DF	MS	F (DFn, DFd)	P value
Cranio vertebral Angle	816.4	2	408.2	F (2, 147) = 19.31	P<0.0001

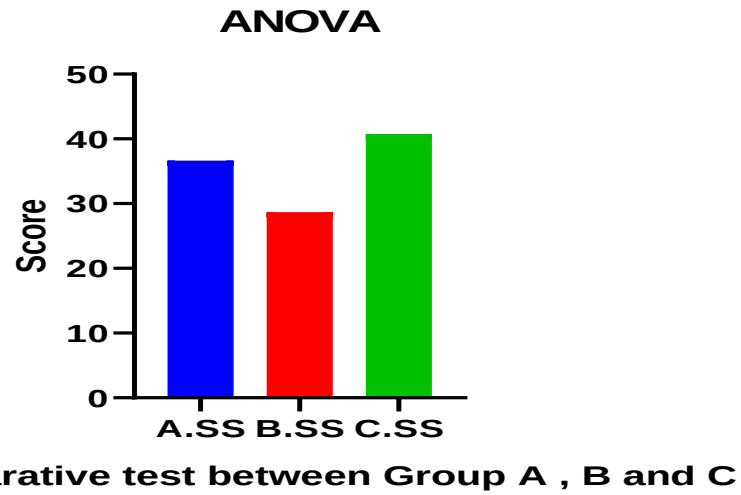
Table 5: ANOVA of difference between Groups A, B and C on Cranio vertebral Angle



Graph 2: Cranio vertebral angle increases in static loading comparatively more than unloaded group and dynamic loading.

Difference between Group A, B and C	SS	DF	MS	F (DFn, DFd)	P value
Shoulder Sagittal Angle	3757	2	1879	F (2, 147) = 26.37	P<0.0001

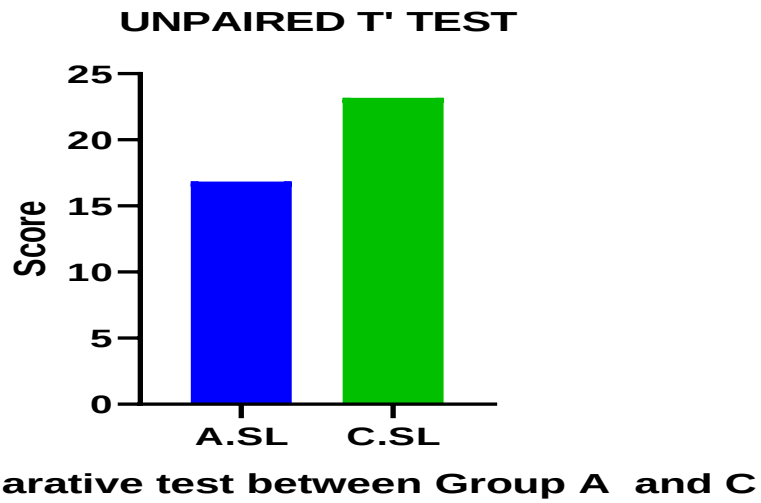
Table 6: ANOVA of difference between Groups A, B and C on Shoulder Sagittal Angle



Graph 3: Shoulder sagittal angle increases in static loading comparatively more than unloaded group and dynamic loading

Independent t test	Mean		df	t	P value	Significant
	Group A	Group C				
Step Length	16.84	23.19	98	8.603	P<0.0001	****

Table 7: Unpaired T test to find the difference between Group A and C on Step length



Graph 4: The step length (SL) changes in group C than group A, which is unloaded static group.

RESULT

The mean stature and mean load of the subjects enlisted were 157.5cms, 54.34 kg separately. The mean load of the bag which kid conveyed to school was observed as 8.151 kg which was 15% of their body weight. Benchmark esteems were got ten by estimating Craniovertebral Angle, Craniohorizontal Angle, Sagittal Shoulder stance and step length on the dumped condition with 0% of their body weight.

The mean upsides of craniovertebral point diminished in a trial loaded condition in examination with dumped condition. The mean worth of CVA in the dumped state was 40.718 = 4.991, though the mean upsides of CVA while static stacking with 15% of body weight and after unique exercises with 15% of body weight were 43.994= 3.866 and 40.542=2.910 individually. Huge contrasts were found by rehashed proportion of difference (ANOVA) in the CVA between dumped state, static stacking and after powerful exercises with p esteem 0.018 which is more than 0.0001.

Pair insightful correlation was between loaded state and static loading with 15% body weight shows that there is contrast with p esteem 0.0001 and furthermore critical distinction between dumped state and after powerful exercises act with p esteem 0.034. There was no critical contrast was found between static stacking states and after unique stacking exercises pose with 15% body weight load for CVA as p esteem is more noteworthy than 0.0001.

The mean upsides of Craniohorizontal point expanded in every one of the two trial load conditions in examination with dumped state. The mean worth of CHA in the dumped state was 16.61 = 2.75, though the mean upsides of CHA while static stacking and after unique exercises with 15% body weight were 23.186 = 3.693 and 20.4 = 2.456 individually. No huge contrasts was found in CHA between the dumped condition and conveying school sacks weighting 15% body weight while static stacking and after powerful exercises act.

The mean worth of sagittal shoulder act increments in every one of the two trial loads conditions in correlation with dumped state. The mean worth of sagittal shoulder act in the dumped state was 38.324 = 6.323, though the mean upsides of sagittal shoulder pose while static stacking and after unique exercises with 15% body weight were 34.68 = 5.977 and 40.75 = 8.850 separately.

The mean worth of step length diminishes in all trial loads conditions in examination with dumped state. The mean worth of step length in the dumped state was 19.06 = 3.436, though the mean upsides of step length while static stacking isn't pertinent and after powerful exercises with 15% body weight was 16.84 = 3.683.

DISCUSSION

Shruti. R. Iyer in their examination tracked down that Indian youngsters convey school bags gauging 18.5% of their body weight. Pascoe et al7 in their examination done in America tracked down that mean load of school bag conveyed by school kids in the age gathering of 11-13 years was 17% of their body weight[11].

Likewise Negrini et al in their examination done in Italy tracked down that normal burden conveyed by school kids matured 11.29=0.33 was 9.3 kg, which was determined to 22% of their body weight. Conversely, the heaviness of

school pack communicated in level of body weight in this examination was observed to be heavier than detailed by Forjuoh SN et al in their investigation done in Texas (6.2% among kindergarteners and 12% among fifth graders)[12].

The consequence of this examination uncovered that the greater part of the Indian kids in the age gathering of 17-20 years conveyed school pack weighing between 15% - 18% of their body weight. The mean worth of weight of the school pack conveyed by youngsters was observed to be 8.151 kg which is observed to be 15% of their body weight. The heaviness of the school pack communicated in level of body weight was observed to be reliable with studies done by Shruti. R. Iyer5 and Pascoe et al[13].

Likewise J.K Whitefield et al in their examination done in New Zealand College detailed 13.2% of body weight for 3rd grade and 10.2% for 6th grade. Craniovertebral point gives an assessment of head on upper back. A little point shows more forward head position. It has been tracked down that more modest the CVA point is related with migraines in females51. Additionally change in arrangement of neck can deliver strain of cervical joints and delicate tissues just as imbalanced muscle execution. Head act immediately affects the situation of mandible and can prompt temporo-mandibular joint brokenness, and gulping difficulties[14].

Ethical clearance: There was no risk of conducting this study. Ethical clearance was obtained from the ethical committee of Institute of Applied Medicine and Research, under the Chaudhary Charan Singh University, Meerut with approval letter dated 15thApril 2011.

Conflicts of Interest: There is no conflict of interest to conduct this study.

Fund for the study: This is self-funded study.

CONCLUSION

The consequence of the investigation upholds the exploratory theory that powerful stacking the understudy with 15% of body weight prompts huge change in cervical and shoulder pose when contrasted with static stacking with 15% of body weight and dumped condition, Significant change in cervical and shoulder showed by decline in craniovertebral point and expansion in sagittal shoulder act was found in unique stacking and static stacking when contrasted with dumped act.

We have likewise tracked down that 5 minutes of dynamic exercises with 15% of body weight produce huge change in craniovertebral and sagittal shoulder pose when contrasted with dumped act. Consequently, suggesting that school sack gauging 15% of body weight would be excessively weighty for the Indian school youngsters matured 17-20 to have the option to keep up with their ordinary cervical and shoulder pose arrangement.

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