INFLUENCE OF SCHOOL BAG CARRIAGE ON GAIT AND POSTURE

By

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بسم الله الرحمن الرحيم

رَبِّ هَبْ لِى حُكْمًا وَأَلْحِقْنِى بِٱلصَّالِحِينَ * وَٱجْعَل لِّى لِسَانَ صِدْقٍ فِى ٱلْآخِرِينَ * وَٱجْعَلْنِى مِن وَرَثَةِ جَنَّةِ ٱلنَّعِيمِ.

صدق الله العظيم

سورة الشعراء

(85- 83)

DEDICATION

To ***My parents,*** who gave every thing to me. To ***My husband,*** for his sacrifices and continuous help. To *My lovely girl, **Raneem,** and my sweat boy, **Mohammed,*** the best gift of **Allah.** For every one of my family and my friends who gave me support.

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Abstract

Background The carriage of backpacks has been shown to constitute a considerable daily "occupational" load on the spines of school children. **The purpose** of this study was to assess the neck posture angles and vertical and antero-posterior ground reaction forces in children while they were carrying two types of schoolbag (ordinary backpack and modified double-sided bag) and compare each with carrying no pack. **Subjects:** Thirty subjects, mean age was (10.06±1.31). They were assigned in one group. **Materials and methods:** They passed through two tests. First, static test with child stand (without bag, with ordinary backpack, and with the modified double side bag) then take a capture of the neck posture angles for each. Second, the dynamic test, to take Ground Reaction Forces (vertical and anteroposterior forces) in the same three situations while the child walked in his normal gait passing over the Force plate. The recording includes, neck angles captured by Infrared cameras and force plate for GRF data. **Results:** There was a statistically significant increase in the cranio-horizontal angle (upper cervical) when carrying ordinary bag compared with no load and modified bag carriage .There was also significant decrease in the cranio-vertabral angle when using the ordinary bag compared with no load and modified bag. Shoulder sagittal angle showed significant decrease in ordinary bag carriage compared both to the modified bag and no load. There was significant increase in the examined GRF vertical and anteroposterior forces when carrying the ordinary bag in relation to no load. While only F2, F3 and F5 were significantly increased when using the modified bag in relation to no load. F1 was the only force had significant difference between the ordinary and modified condition. **Discussion and conclusion:** Modified double side bag significantly decreased the forward head posture compared with the ordinary backpack style, and led to less but not significant decrease in vertical and antero-posterior GRF in using the modified bag compared with ordinary style.

Keywords: Backpack, Children, Neck posture, Ground reaction force.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

Abbreviation	*Name*
AIS	Adolescent idiopathic scoliosis
AP	Antero-Posterior
BW	Body Weight
CHA	Cranio Horizontal Angle
COM	Center of Mass
CPSC	Consumer Product Safety Commission
CVA	Craniovertabral Angle
FHP	Forward head posture
F1	First peak of the vertical ground reaction force
F2	The valley of the vertical ground reaction force
F3	Second peak of the vertical ground reaction force
F4	Anterior force of ground reaction force
F5	Posterior force of ground reaction force
GRF	Ground reaction force
GRFV	Ground Reaction Force Vector
HPSCI	Head Posture Spinal Curvature Instrument
LEMD	Linear Excursion measurement Device
LBP	low back pain
ML	Medial-Lateral
N	Newton
SSP	Sagittal Shoulder Posture

CHAPTER I

INTRODUCTION

The carriage of backpacks has been shown to constitute a considerable daily "occupational" load on the spines of school children. It is widely believed that the repeated carriage of heavy school backpacks places additional stress on the rapidly growing spine of school children, making them more prone to postural changes, and ultimately leading to lower back problems [1,2].

It is alarming that almost half of the school children reported complaints of muscle soreness of neck, shoulder and back. It was reported that gender-related factors including physical fitness (cardiovascular fitness, muscle performance, motor competence), activity patterns (information technology use, moderate and vigorous physical activity), psychological factors (depression/anxiety, life stresses) and the perceived weight of the bag were the main factors associated with these complaints, which lead to alternation in the posture and gait of the students [1,3,4] .

Neck and back pain are among the major problems associated with school bag carriage. When the backpack weighs more than 10 to 15 percent of the student's bodyweight (BW), postural changes, particularly, the forward leaning of the head and trunk is a major problem that may result in spinal deformities. Studies have shown that reports of back pain occur early