REVIEW OF RELATED LITERATURE/BACKGROUND OF THE STUDY

INTRODUCTION

Over the past years, the prevalence of the shoulder-supported bags has raised concerns about the posture of users. Statistically, students from all over the world primarily use shoulder-supported bags such as backpacks and messenger bags to carry their school materials beginning their secondary level of education (Dockrel, 2006). This trend often falls into the age group which spans from 15 to 18 years of age, years which are critical to posture development.

Studies have shown that any form of carrying heavy loads which exceed a person's load-bearing capacity leads to fatigue and postural problems (Haselgrove et al, 2008). It has also been identified that a person's average load-bearing capacity is 10% of his total body mass (Illinois State Board of Education, 2006). Furthermore, studies have shown that individuals carrying loads greater than their load-bearing capacities develop musculoskeletal problems which develop for their entire lives (Luttman et al 2003). While there have been many studies conducted concerning the amount of discomfort caused and musculoskeletal problems developed (Dockrell, 2006 and Shamsoddin, 2010), few studies have been conducted regarding postural analysis related to the usage of messenger bags. Therefore, this study will aim to identify the effects of different bag weight loads on the posture of students from sixteen to eighteen years old.

The review of related literature will focus on the identification of the average load-bearing capacities of individuals, ideal posture, health problems which arise from

excessive weight loads and the relationship between posture and muscular injury. The review will not include the differences between males and females and musculoskeletal problems which are not developed due to carrying heavy loads.

Anatomical Effects of Shoulder-supported Loads

The carrying of shoulder-supported bags leads to various levels of discomfort in different muscle regions. According to a report done by Shamsoddin (2010), 9.3% of students report discomfort in their lower back, while 27.6% report discomfort in their neck and 38.1% report discomfort in their shoulders. Overall, 42.2% of students reported discomfort in their upper body. Discomfort in various parts of the body is due to the distribution of the weight. Majority of the weight is supported by the shoulders, which then causes the neck to extend. The lower back is then required to support the total weight (Mohan et al, 2010).

Ideal Load-bearing Capacities

Given the additional weight, the body must compensate. According to the Illinois State Board of Education (2006), a shoulder-supported bag begins to have negative effects on an adolescent's body posture once it reaches between 10-15% of his totally body mass. However, Ramrasad (2009) stated that a bag weighing even 5% of the user's total body mass significantly changes trunk and lower limb angles. Subsequently, a bag weighing at least 15% of the user's total body mass changes all angles pertaining to the

neck, shoulders, trunk and lower limbs. On average a student carries a backpack weighing 12% of his body weight (Dockrell et al, year unknown).

Skeletal Problems Resulting from Prolonged Strain and Poor Posture

Firstly, heavy loads result in discomfort among users. 48% of backpack users report pain while 13% report moderate to sever pain (Amro and al Faqeeh, 2009). Secondly, the carrying of heavy loads also leads to large muscle imbalances in the neck, shoulders and spine. (Mohan et al, 2010) Although primary formation of the spine is completed by 16 in females and 18 in males, secondary ossification is not completed until the mid-twenties (Ramrasad, 2009).

Furthermore, prolonged discomfort can also lead to more long-term effects such as thoracic kyphosis or the abnormal increase in the posterior curvature of the upper spine (Pashman, year unknown), problematic secondary bone ossification or the continual layering of osteoblasts for bone tissue formation (Ramrasad, 2009) and other musculoskeletal problems (Luttman et al 2003).

Methodologies in Postural Assessment

The maximum load-bearing capacity of an adolescent in terms of their total body mass is between 5% (Ramrasad, 2009) and 15% (Illinois State Board of Education, 2006) when placed on two shoulders. Exceeding this load-bearing capacity can cause

discomfort in the neck, shoulders and lower back (Shamsoddin, 2010) which spans from mild to severe pain (Amro and al Faqeeh, 2009).

In the study of Aaras (1988), electromyography was used a means of measuring muscle strain since body posture is not the only factor which affects muscle fatigue. Other variables include variation of movements and speed of movements. On the other hand, the study of Chansirinukor (2001) was limited only to shoulder and neck posture. Given their scopes, the latter is more appropriate for the experiment. In Chansirinukor's experiment, markers and measurements were made using four points of the head, one point of the upper spine and two points on the shoulders. The points of the head and spine can be used to measure neck posture while measurements of the shoulders can be used to measure back posture. Postural grids will be used as basis for ideal body posture and markings for the comparison of postural changes (Gillespie, year unknown).

Given these studies, we think that their contribution in information will be applicable to our experiment. Since we are simply measuring the change in posture of the individuals in our research, this background information demonstrates the greater implications of poor posture. Also, these studies provide us with a general idea of how much weight should be placed in the bag to test for maximum changes.

CONCLUSION

Through the review of literature, the researchers have found the approximate load-bearing capacity of an adolescent, the harms of overloading and the means of

measuring these harms. There is a consistent relationship between the overloading of backpacks and musculoskeletal problems. These problems range from simple discomfort to spinal deformities and determent of bone growth. Using existing research on alternative measurement of postural angles, the researchers have found a procedure of measuring shoulder angles using markers and postural grids.

However, there are inconsistencies in terms of the actual load-bearing capacities of adolescents. In terms of body mass, the found capacities range from 5% to 15%. Also, there were no found studies regarding the use of messenger bags. There is also a gap of research regarding the justification of the weight percentage of the ideal load-bearing capacity of students. Although there are multiple studies regarding postural deformities due to the usage of heavy backpacks, very few have been conducted on those of messenger bags. Through our research, we hope to expand this field of study through the use of a messenger bag. Also, we hope to show the extents of the possible harms of overloading an adolescent since pressure exerted by a messenger bag will be even greater than that exerted by a backpack, since there is only one strap supporting the weight. Since this study may be one of the first studies on the effect of overloaded messenger bags on posture, it also hopes to contribute to the existing literature on the effects of overloaded bags on the posture of adolescents. It can be used as contributory literature to future studies regarding postural assessment and the harms of poor posture. Alternatively, this review may also provide an alternative method for researchers limited by technological and specialization restraints.

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