INTRODUCTION

People regularly use a variety of bags to transport their belongings from one place to the next. Whether it is a handbag, backpack, athletic bag, golf clubs, or shoulder packs, carrying a bag can have an influence on a person’s kinematics. People grow accustomed to utilizing bags and potentially neglect the consequences that carrying a load can have on the human body. Improper carrying methods and carrying heavy loads can result in alterations in walking patterns, abnormal posture, muscle strain, and chronic spinal issues.

The purpose of this study is to investigate how carrying a load unilaterally (over one shoulder) affects a person’s step width. The effect of mass and load position in relation to the body must be considered. Walking is a synergistic and complex set of movements that can be described in terms of biomechanical principals. When the spine, torso, head and lower extremities are aligned, the body is able to efficiently ambulate in an orthograde posture. I predict that walking while carrying a heavy load over one shoulder will produce an increase stride width when compared to normal ambulation.

METHOD

The subjects recruited for this study were a convenience sample of seven abled-bodied individuals. Subjects needed to be capable of carrying up to 40 pounds while walking up to 100 meters. There was no exclusion based on gender, age or activity level. Verbal consent was obtained by all participants prior to testing.

The equipment used for this experiment consisted of a Zeno GAITRite mat that is 230 5/16” long by 27.5” wide. In order to analyze the results, Proto Kinetics movement analysis software (PKMAS) was utilized. The GAITRite mat paired with PKMAS has been proven to be valid and reliable (McDonough et al. 2001). The backpack that subjects carried over one shoulder was a Jansport “big student back pack” (dimensions: 17.5” x 13” x 10” / 43 x 33 x 25 cm). The back pack had standard weights inside of it, adding to a total weight of 36.1 lbs.

Initially participants were asked to walk barefoot at a self-selected walking speed (SSWS) across the Zeno matt 6 times (down and back 3 times). This test was used to get a baseline of participants gait walking patterns. All trails were then averaged together to give a better representation of walking patterns. The variable that was recorded was the subjects average step width (cm). On a future date, the same participant were asked to follow the same protocol as the initial recording (barefoot, SSWS, 6 passes) this time while carrying a 36.1 lbs. back pack suspended unilaterally over the shoulder. Each participant was asked to carry the bag over their dominant side, conveniently all participants were right handed so all subjects wore their backpacks on the right side. Each backpacks height was adjusted to be level with his or her iliac crest. The same temporal spatial variable was recorded and later compared.

RESULTS

<table>
<thead>
<tr>
<th>GROUP:</th>
<th>BASE</th>
<th>BACKPACK (36 LBS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEAN:</td>
<td>9.59</td>
<td>8.52</td>
</tr>
<tr>
<td>SD:</td>
<td>3.67</td>
<td>3.59</td>
</tr>
<tr>
<td>SEM:</td>
<td>1.39</td>
<td>1.36</td>
</tr>
<tr>
<td>N:</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>

P VALUE- 0.2717

DISCUSSION

Based on the results average step width decreased while walking with a backpack, however a paired t-test showed the two variables to be not significant. This could be because the subjects had observable lateral trunk lean towards the shoulder suspending the backpack, therefore further compensation for step width wasn’t needed. It has been reported that an increase in the load asymmetry applied to the foot during stance phase decreases step width (Kim et al.). An asymmetry between weight on each side of the subjects shoulders results in instability and relocation of the COP. In response, a mechanism for posture adaption activates to maintain physical balance by postural changes in the trunk and extremities (Son. 2013).

CONCLUSION

In conclusion, this study reports that when carrying a heavy bag over one shoulder, the subjects resulted in a decreased average step width that was proven to be not significant.

CLINICAL APPLICATIONS

By understanding the biomechanical effects of carrying heavy objects, we can decrease the likelihood of developing postural problems and increase ambulation efficiency.

REFERENCES