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Lifft Slings - Independent Biomechanical Assessment

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Summary

This report shows that the Lifft Sling® keeps the spine straighter and improves posture by reducing sideways lean both during walking and standing. The amount of sideways lean without the Lifft Sling® is comparable to previous research that has found potentially damaging forces to the base of the spine, the change in posture provided by the Lifft Sling® reduces these damaging forces.

Introduction

Many parents are keen to carry their young children as it is believed that close proximity aids the bonding process (Hofer, 2005). One of the most common carrying positions is 'on the hip'. The carrier pushes the hip away from the body whilst moving the upper body away to create a shelf for the young child to sit on. In biomechanical terms this is lateral trunk flexion combined with a large movement of pelvic obliquity from neutral. It has been demonstrated that asymmetric load carriage is potentially damaging to the lower spine in both standing (Marras and Granata, 1997) and walking (Fowler et al, 2006).

A new sling, the Lifft Sling®, has been designed and developed to provide a similar position for the young child but with greater support for the parent. The Lifft Sling® is comprised of a single piece of material with a stretchable panel. It is folded as per the manufacturers' instructions to fit.

Aim

To compare the loading and body position when carrying a weighted manikin with and without the Lifft Sling®.

Objectives

- To compare the kinematics of walking with and without the Lifft Sling®
- To compare the kinematics of standing with and without the Lifft Sling®

Method

Three female participants (height 1.6 m; mass 67.5 kg) performed two daily tasks (standing and walking) with and without the Lifft Sling® whilst carrying a weighted manikin (mass 8.2 kg). The manikin was similar in size and mass to a young toddler of 1 years of age. When carrying the manikin without the Lifft Sling® the participants were instructed to carry it 'on the hip'. When carrying the manikin in the Lifft Sling® the manufacturers instructions were followed. The participants were allowed to choose which side they carried the manikin on but they had to keep this side for each experimental condition. The order in which participants performed the conditions was counterbalanced to reduce the effects of fatigue on the results.

The movement of the participants was captured through each activity using a 3D infra-red based motion capture system (Qualisys AB Medical, Sweden) operating at 100 Hz. The forces and centre of pressure paths of the participants on the ground were recorded using four force platforms (Amti, USA). Joint angles and data processing were then undertaken in a further software package (Visual 3D, C-motion, USA).

Results

There was a reduction in the amount of lateral trunk flexion recorded when the participants were carrying with the Lifft Sling® (Table 1), in stance and walking gait. Examples of these differences are shown in Figure 1 and 2.

Table 1 – Mean (SD) Maximum Lateral Trunk Flexion

	Standing	Walking
With Lifft Sling®	2.43 (2.85)	7.79 (2.94)
Without Lifft Sling®	6.25 (3.83)	11.29 (3.04)

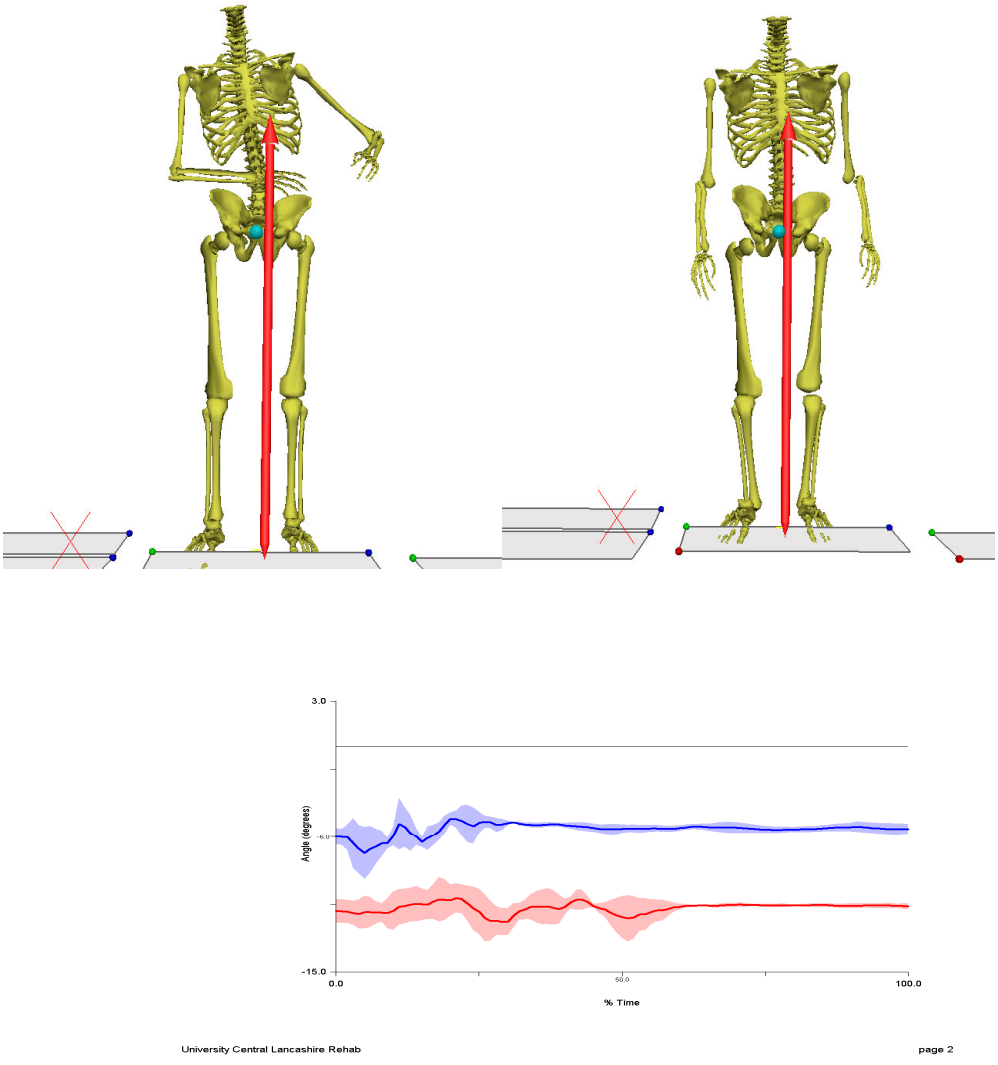

Figure 1 – Lateral trunk flexion in stance (Blue line represents carriage with Lifft Sling®, red line without). The corresponding positions are shown above (with Lifft Sling® on the right)

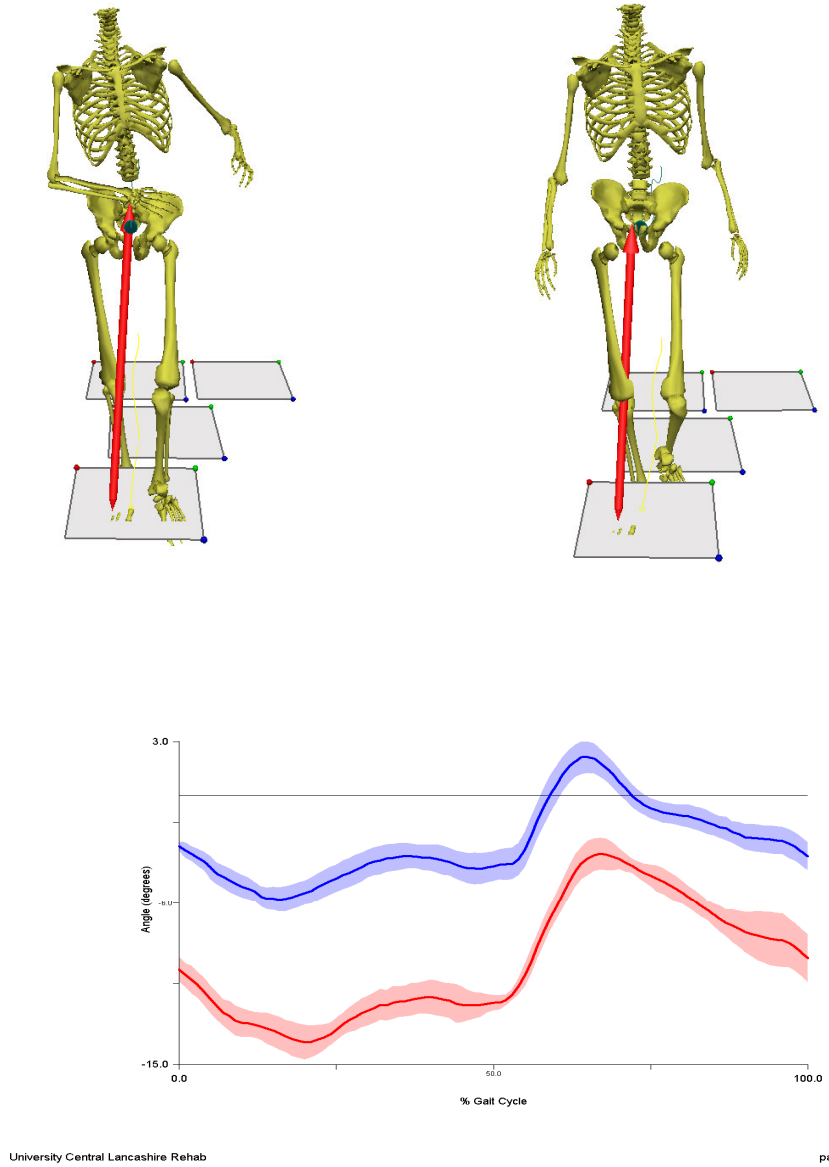

Figure 2 – Lateral trunk flexion in walking (Blue line represents carriage with Lifft Sling®, red line without). The corresponding positions are shown above (Lifft Sling® on the right).

Discussion

The Lifft Sling® reduced the amount of lateral trunk flexion in walking and in stance for all participants (Table 1). The relatively large standard deviations are indicative of the different methods used by each participant to carry the manikin with and without the Lifft Sling®. However, the same trend was observed for all participants.

The largest amount of lateral trunk flexion is shown in Figure 1 and 2. This illustrates the magnitude of trunk lateral flexion that may occur for some parents when carrying a child without a Lifft Sling®. The amount of trunk lateral flexion without the Lifft Sling® is comparable to the results of Fowler et al (2006) and is potentially damaging to the lumbar spine.

The use of the Lifft Sling® clearly shows a reduction in lateral trunk flexion in walking and in stance, with the amounts of lateral trunk flexion observed without the aid of the Lifft Sling® producing a potentially damaging position of the lumbar spine.

References

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