

# The Effect of Cot Height on Trunk Muscle Activity When Lifting a Simulated Baby

Sue Annetts MSc MCSP, Sarah Harris BSc MCSP, Danielle Rickards BSc MCSP  
 School of Healthcare Studies, Cardiff University

## Introduction

It has been reported that between 2% and 65% of post-partum women suffer from low back pain (LBP) within the first 18 months following delivery (Larsen et al, 1999). A common activity for post-partum mothers is lifting a baby from a cot, which may well contribute to the accumulative stress on the spine that can cause LBP. The task of lifting a baby from a cot involves the risk factors of holding a load away from the handler's body and moving the load through a vertical height whilst the handler's spine is rotating. The skeletal muscles of the trunk need to provide major support during such a manual handling task in order to help prevent injury, but also initiate movement to allow the task to occur. Therefore the trunk skeletal muscles can broadly be classified as mobilisers or stabilisers of the back or abdominal wall.

Investigating trunk muscle activity is thought to be an indirect measure of spinal loading. Therefore investigating trunk muscle activity when lifting a simulated baby from a cot can inform the risk assessment involved in the manual handling task of lifting a baby from a cot. This has potential implications for healthcare workers who handle babies and educate ante-natal and post natal women.

## Aim

This study aimed to determine if there was a statistically significant difference ( $p \leq 0.05$ ) in muscle activity of the following muscles when lifting a simulated baby from two different cot heights:

Muscle	Role
Iliocostalis Lumborum (IL)	Back Mobiliser
Multifidus (MF)	Back Stabiliser
External oblique (EO)	Abdominal Mobiliser and Stabiliser
Internal Oblique (IO)	Abdominal Stabiliser

Figure 1: Finishing position



Figure 2: Finishing position



## Method

- N = 20 healthy subjects
- Experimental cross over design
- Simulated baby weighed 3.6kg
- A standard cot was used to compare heights: the highest level was 77cm (from floor to upper surface of mattress) and the lowest height was 59cm
- Readings were taken using surface EMG (SEMG)

Figure 3: SEMG of Back Muscles



Figure 4: SEMG of abdominal muscles



- Maximum voluntary contractions were used to normalise data
- A signed rank Wilcoxon test was used to analyse the data within SPSS

## Results

Table 1: A summary of the Signed Rank Wilcoxon Test Comparing the Two Cot Heights

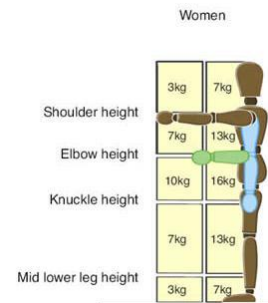
Muscle	P value
IL	.232
MF	.001*
EO	.007*
IO	.001*

Key: \* = statistically significant ( $p \leq 0.05$ )

## Conclusion

- **Anatomical**
  - The muscles whose primary role is stabilising (IO and MF) or have a secondary stabilising role (EO) showed a statistically significant increase in activity at the lower cot height. This could suggest a greater load is placed on the lumbar spine at the lower height.
  - The statistically insignificant difference for IL is consistent with its role as a mobiliser and being thought to carry a lesser load than stabilisers in lifting activities (Joseph and Richardson, 1994)
- **Clinical Relevance**
  - This study supports the use of vertical height moved being a key component of risk assessment for manual handling (HSE, 2009a) as illustrated in the diagram below.

Figure 5: Lifting Guidelines for Women (HSE, 2009b)



- Healthcare workers need to ensure they always consider cot height when handling babies themselves and also when teaching others how to handle babies e.g. post-partum mothers.
- **Suggestions for Further Study**
  - Repeat the study on post partum women.
  - Investigate if manual handling training in the ante-natal phase has an influence on the incidence of back pain.

## References

HSE (2009a) Manual Handling Assessment Chart (MAC) Tool (Online). Available at: <http://www.hse.gov.uk/Msd/mac/guidance01a.htm> (Accessed 13/10/09)

HSE (2009b) Getting to Grips With Manual Handling (Online). Available at <http://www.hse.gov.uk/pubns/indg143.pdf> (Accessed 13/10/09)

Joseph K-F. and Richardson C (1996). Reliability of Electromyographic Power Spectral Analysis of Back Muscle Endurance in Healthy Subjects. *Archives of Physical Medicine and Rehabilitation* 77: 259-264

Larsen E., Wiken-Jensen C., Hansen A. et al (1999) Symptom-giving Pelvic Girdle Relaxation in Pregnancy. Prevalence and risk factors. *Acta Obstetrica et Gynecologica Scandinavica* 78: 105-110