

## **CORRELATES OF OCCUPATIONAL LOW BACK TROUBLES: CLUES FOR BETTER PREVENTION AND REHABILITATION**

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### **Abstract**

Seventy-two workers were recruited from two heavy industries, 26 of who had lost time at work due to low back troubles. These workers were tested using measures of spine three-dimensional range of motion, strength, endurance, spine kinematics during lifting, the ability to maintain spine stability during static steady state tasks, surprise loading tasks, anticipatory tasks and challenged breathing. Having a history of low back troubles is not related to reduced strength, but is related to a non-typical flexion to extension strength ratio. Having a history of low back troubles appears to be associated with a different flexion to extension endurance ratio, with the extensors being particularly less endurable. The "imbalance" in endurance also appears between the right and left side as evidenced by the asymmetry in right and left endurance holding times.

**Keywords:** endurance, strength, flexion to extension ratio

## **CORRÉLATS DES MAUX DE DOS AU TRAVAIL : INDICES POUR UNE MEILLEURE PRÉVENTION ET RÉADAPTATION**

### **Résumé**

Soixante – douze travailleurs ont été recruté dans deux industries de main d'oeuvre lourde. Vingt-six d'entre-eux avaient perdu du temps de travail à cause de maux de dos. Des données de mesures cinématiques de la colonne vertébrale en trois dimensions, la force musculaire du tronc, l'endurance musculaire du tronc, l'habileté de maintenir la stabilité lombaire pendant des tâches d'activités constante, de charges soudaines, d'anticipation, et un défi ventilatoire furent enregistrées. Il semble que l'histoire antérieure de maux de dos soient reliée à un déséquilibre flexion vs extension dans la force musculaire et non pas à une diminution de la force. Il semble aussi exister un déséquilibre flexion versus extension dans l'endurance musculaire. Ceci étant du à une diminution de l'endurance des extenseurs lombaires. Ce déséquilibre est aussi remarqué sur le plan frontal, c'est-à-dire d'un côté par rapport à l'autre.

**Mots clés:** endurance musculaire, force musculaire, ratio flexion/extension

## Introduction

To elucidate cause and effect, longitudinal studies together with investigations into mechanisms are usually required. This study examined the links between those who have a history of disabling low back troubles and those who don't. The way in which they move, use their muscles, and maintain stability, together with a wide variety of spine health and performance markers were compared. These parameters were documented with quite detailed and advanced tests. This study of the correlates of a history of low back troubles will be useful for both secondary prevention efforts and better rehabilitation approaches.

## Methods

Seventy-two workers were recruited from two heavy industries, 26 of who had lost time at work due to low back troubles. All were working at the time of testing so that any differences could be considered to be residuals of their troubles. Over the years we have developed a number of sophisticated tests that we feel provide detailed and comprehensive insight into spine performance - much beyond the typical clinically used measures of strength and range of motion. Specifically these tests focus on the measurement of endurance (4), stability (2) and motor control fitness (3), (5). They include measures of spine three-dimensional range of motion, strength, endurance, spine kinematics during lifting, the ability to maintain spine stability during static steady state tasks, surprise loading tasks, anticipatory tasks and during challenged breathing, etc. Traditional fitness testing and a questionnaire based psychosocial inventory were also administered. Instrumentation consisted of electromagnetic devices to monitor spine 3-D motion, electromyography of 14 torso muscles to document motor control responses, various spine force/moment measuring jigs, video system, Co2 lung ventilation apparatus etc.

## Results

When subjects were categorized into those with a previous history of LBD with no work loss, those with a history of LBD with work loss, and those with no history of LBD, ANOVA results suggest that while having a history of low back troubles is not related to reduced strength, a history is related to a non-typical flexion to extension strength ratio. Furthermore, having a history of low back troubles appears to be associated with a different flexion to extension endurance ratio, with the extensors being particularly less endurable. This imbalance in endurance also appears between the right and left side as evidenced by the asymmetry in right and left endurance holding times (for example RSB/LSB ratio of .93 for those with a LBD history vs. 1.0 for these without). Furthermore, those with a history of low back troubles also appear to have greater difficulty maintaining sufficient spine stability during tasks that have multiple demands - such as supporting a load while having elevated breathing, or a need to maintain whole body balance, for example. It also appears that those with a history of troubles are less likely to squat when picking objects off the floor. Weight, waist girth and age were also different between those who had a history of LBD with work loss and those without.

## Discussion

While several studies have suggested that torso muscle endurance is a more important link with low back troubles than with torso strength parameters e.g. (1), this study suggests that the balance of endurance may further refine the relationship. Specifically, the balance between flexion and extension and right and left sides, and between flexion and either lateral

side, may be as, if not more, important in the link to back troubles. Furthermore, motor deficits are linked with a history of troubles. This cross sectional study cannot infer cause and effect. We still do not know if these differences exist prior to the first episode of back troubles. Nevertheless, the implication is that perhaps improving symmetry of strength and endurance could also improve low back health.

## References

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