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ORIGINAL ARTICLE

# Occupational low back pain and the sitting position: effects of labor kinesiotherapy*

## *Lombalgia ocupacional e a postura sentada: efeitos da cinesioterapia laboral*

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## SUMMARY

**BACKGROUND AND OBJECTIVES**: Low back pain is the most frequent spinal disease causing from movement limitation to temporary disability. Studies show its multifactorial etiology, stressing biomechanical causes, individual characteristics and occupational factors. This study aimed at assessing the effects of kinesiotherapy in occupational low back pain patients.

**METHOD**: This study has evaluated 38 employees of a university of the city of Recife with occupational low back pain, who worked in the sitting position. Employees were evaluated by Self-Perceived Pain Scale, Oswestry and Roland-Morris functional questionnaires and Screening physical evaluation test before and after labor kinesiotherapy sessions.

**RESULTS**: There has been statistically significant pain intensity improvement by the Self-Perceived Pain Scale ($p < 0.001$) and by Screening physical evaluation test ($p = 0.001$). However, there has been no significant improvement by Oswestry and Roland-Morris questionnaires analysis.

**CONCLUSION**: Results allow us to infer that labor kinesiotherapy has improved lumbar pain, decreasing its intensity, improving functional capacity of trunk stabilizing muscles and joint movement amplitude.


**Keywords**: Ergonomics, Low back pain, Occupational health, Spine.


## RESUMO

**JUSTIFICATIVA E OBJETIVOS**: A lombalgia é apresentada como a mais frequente afecção da coluna vertebral, provocando desde limitação de movimento até invalidez temporária. Estudos revelam etiologia multifatorial, destacando-se as causas biomecânicas, as características individuais e os fatores ocupacionais. O presente estudo teve como objetivo verificar os efeitos da cinesioterapia em pacientes portadores de lombalgia ocupacional.

**MÉTODO**: Trinta e oito funcionários de uma instituição de ensino superior da cidade de Recife portadores de lombalgia ocupacional, que trabalhavam sentados, foram avaliados por meio da Escala de Dor Auto-Percebida, dos questionários funcionais de Oswestry e Roland-Morris e do teste de avaliação física *Screening* antes e após sessões de cinesioterapia laboral.

**RESULTADOS**: Houve melhora estatisticamente significante na intensidade da dor avaliada pela Escala de Dor Auto-Percebida ($p < 0,001$) e no teste de avaliação física *Screening* ($p = 0,001$). Entretanto, não houve melhora significativa pela análise dos questionários de Oswestry e Roland-Morris.

**CONCLUSÃO**: Os resultados permitem inferir que a cinesioterapia laboral melhorou a dor lombar, diminuindo a sua intensidade, melhorando a capacidade funcional dos músculos estabilizadores do tronco e a amplitude de movimento articular.


**Descritores**: Coluna vertebral, Ergonomia, Lombalgia, Saúde ocupacional.

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## INTRODUCTION

Spinal diseases are responsible for most pain complaints being a major cause of medical leave. Among spinal disorders, low back pain is the most frequent and may cause from movement limitation to temporary disability[1,2].

Lumbar region is critical to accommodate loads arising from body weight, muscle action and external forces and it has to be strong and stiff to maintain anatomical intervertebral relationships and to protect neural elements; on the other hand, it has to be flexible enough to allow joint mobility. The ability to perform both functions is provided by mechanisms which ensure the maintenance of vertebral alignment[3].

Studies have shown that low back pain etiology is multifactorial, with biomechanical causes, individual characteristics and occupational factors, since the musculoskeletal system is subject to unbalance when submitted to inadequate conditions which directly affect body posture, such as after long periods in anti-ergonomic sitting position[4,5].

In this position, body weight support rests on ischial tuberosities and adjacent soft tissues and the trunk is maintained straight by the constant activity of abdominal and dorsal muscles. The sitting position, added to the lack of physical activity, is a conditioning factor to decrease miofascial flexibility. The lack of joint mobility and spinal extensor muscles fatigue are factors which may impair spinal alignment and stability, contributing to the appearance of lumbar discomfort. The shortening of hamstring and iliopsoas muscles is also considered a pain triggering factor because it worsens lordosis and increases spinal and intervertebral disks load[4,6].

Breaks during work to exercise may bring positive results in fighting and preventing occupational disorders. Exercises promote muscles flexibility and increase joint amplitude, in addition to favoring symptoms relief[7,8].

This study aimed at assessing kinesiotherapy effects on occupational low back pain employees.

## METHOD

After the Institution's Ethics Committee approval under CAAE 0026.0.096.000-08, this analytical, transversal study was developed in a university of the city of Recife. Participated in this study 38 individuals of both genders with low back pain and working in the sitting position, identified by survey carried out by Barros, Ângelo and Uchôa.

All volunteers authorized their participation through a free and informed consent term and were invited to participate in a program with 10 sessions of labor kinesiotherapy. Sessions lasted 10 minutes and were held twice a week for five weeks.

A fast and easy therapeutic exercises protocol was applied, adapted to the working environment, directed to promote flexibility of lumbar extensor muscles and posterior chain muscles of lower limbs, in addition to activating abdominal and pelvic floor muscles responsible for lumbar stabilization. Materials were 4 extra-strong elastic bands measuring 14 cm x 1.5 cm, 4 ball studs with 7 cm, 2 foam spaghetti-type floaters for swimming pools and one rubber mat measuring 100 cm x 60 cm x 2.5 cm.

Exercises proposed were breathing awareness and abdominal and pelvic floor muscles activation, plantar fascia massage, stretching of knee flexors and dorsiflexors, stretching and strengthening of hip extensors, anteroposterior gravity center displacement in unstable plane, in addition to pelvic anteroversion and retroversion exercises. All exercises where coordinated with breathing through verbal commands.

Volunteers were treated alone or in groups of no more than four people, in their workplace. Tools to evaluate subjects in the preliminary study were also used after the intervention period: interview card, Self-Perceived Pain Scale, Oswestry and Roland-Morris Functional Evaluation Questionnaires and Screening physical evaluation test proposed by Polestar Education®.

Interviews and evaluations were carried out individually in each workplace, during working hours, and a single researcher was in charge of all stages, thus avoiding changes in execution and response. Collected information were filed before the researcher in charge, and submitted to statistical analysis.

Chi-square test was used for qualitative variables analysis, in addition to Fisher's Exact test, when needed. Student's *t* test was used to compare quantitative variables. Softwares were Excel 2000 and SPSS v 8.0 and all conclusions adopted significance level of 5%.

## RESULTS

Sample distribution values have shown predominance of females (63.2%) and age above 41 years (81.6%). Approximately 40% of employees work for the same sector between 10 and 25 years.

With regard to low back pain, 31.6% of subjects had no longer the symptom after the intervention period, showing the effectiveness of exercises to improve low back pain (Table 1).

Low back pain intensity evaluation by the Self-Perceived Pain Scale has shown a decrease of 2.9 points between

Table 1 – Distribution of subjects as to physical activities, breaks during working hours and low back pain perception before and after labor kinesiotherapy sessions.

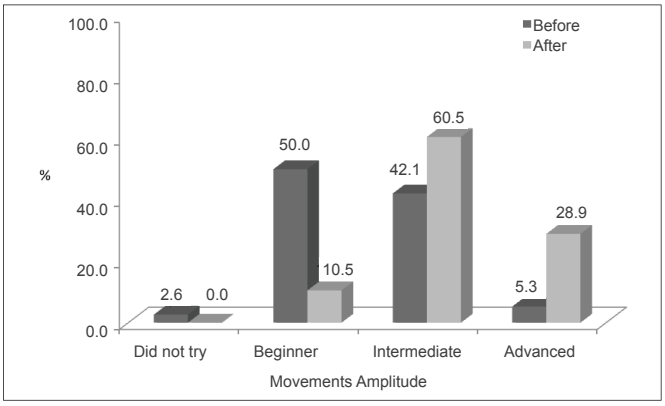
| General Characteristics | Before | | After | | p value |
|---|---|---|---|---|---|
| | N | % | N | % | |
| Physical activity | | | | | |
| Yes | 6 | 15.8 | 10 | 26.3 | |
| No | 32 | 84.2 | 28 | 73.7 | 0.399 |
| Pauses during working hours | | | | | |
| Yes | 8 | 21.1 | 7 | 18.4 | |
| No | 30 | 78.9 | 31 | 81.6 | 1.000 |
| Pause time during working hours | | | | | |
| Up to 15 minutes | 1 | 2.6 | 1 | 2.6 | |
| 20 minutes | 2 | 5.2 | 0 | 0.0 | |
| > 20 minutes | 1 | 2.6 | 2 | 5.2 | |
| No information | 34 | 89.6 | 35 | 92.2 | 0.243 |
| Low back pain | | | | | |
| Yes | 38 | 100.0 | 26 | 68.4 | |
| No | 0 | 0.0 | 12 | 31.6 | < 0.001 |

values referred before and after labor kinesiotherapy ($p < 0.0001$), reinforcing the importance of breaks during working hours to perform physical exercises to minimize low back pain.

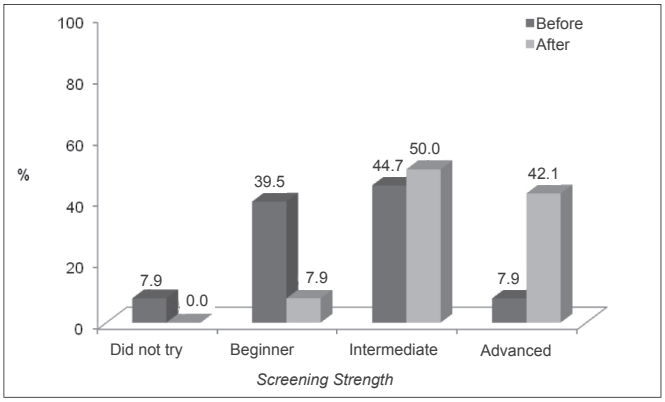
The analysis of Oswestry and Roland-Morris scores has shown better ability to perform labor and daily life-related activities, however without significant difference. This result is explained by the difficulty of the volunteers to find among questionnaires alternatives, especially Oswestry's, the items corresponding to pain and limitation status, having to check items inconsistent with reality.

Screening physical evaluation test has shown significant increase in movement amplitude and functional capacity of spine stabilizing muscles ($p = 0.001$). As to amplitude gain, the highest percentage (50%) of subjects were beginners before kinesiotherapy session. At the end of the intervention period, most (60.5%) were in the intermediate level (Graph 1). No subject failed to try to perform the test after labor kinesiotherapy sessions. These data show improved flexibility and confidence in the ability to perform proposed exercises.

Functional capacity of trunk stabilizing muscles was maintained in the intermediate level for most subjects, both before kinesiotherapy sessions (44.7%) and after intervention (50%), however, there has been significant increase of percentage values after labor kinesiotherapy sessions (Graph 2). All subjects tried to perform the tests, showing that they were sure that they could perform them.




Graph 1 – Distribution of subjects as to spinal movement amplitude (Screening physical evaluation test) before and after labor kinesiotherapy sessions ($p = 0.001$).




Graph 2 – Distribution of subjects as to trunk stabilizing muscles functional capacity (Screening physical evaluation test) before and after labor kinesiotherapy sessions ($p = 0.001$).

## DISCUSSION

Our study findings are in line with other studies carried out to identify the prevalence of chronic low back pain in Brazil, where researches have observed that most volunteers belonged to the female gender, with ages between 40 and 59 years[1,2], suggesting that gender and age may be risk factors for low back pain.

Studies show that female vulnerability may be associated to a cultural issue. Women have the mission of reconciling domestic tasks and professional activities, increasing biomechanical requirements, which makes them more susceptible to ergonomic aggressions, especially repetitiveness, vicious positions and prolonged work[2,9], probably contributing to a higher female prevalence among patients with low back pain in our study.

Several studies report age as risk factor for low back pain[2,5]. With aging, the intervertebral disk looses its hygroscopic feature, suffering progressive dehydration and consequent degeneration, and the spine starts to present progressive instability and pain in the affected region. These problems occur in any spinal region, however they are more common between the fourth and fifth lumbar vertebrae and between the fifth lumbar and first sacral vertebrae[5,10].

The relation between years working in the same sector and the prevalence of low back pain is justified as a function of daily body requirements to perform professional activities. Such requests probably bring cumulative injuries to locomotor system mechanics and contribute to the appearance of pain complaints[11].

Our study has shown a large percentage of employees with low back pain and who do not practice physical activities. Similar data were found by studies investigating factors related to low back pain[1,2,12]. Sedentary life seems to be related to lumbar discomfort. Investigators state that low back pain is a common symptom in sedentary people. Physical inactivity favors paravertebral and abdominal muscles weakness, decreases posterior muscle chain of lower limbs flexibility and joint mobility[12]. So, it may be considered a risk factor for low back pain genesis.

Most participants of this research had no breaks during working hours. Similarly, an epidemiological study with 650 bank employees with musculoskeletal disorders, has shown that 53.2% had no breaks during working hours, except for lunch break. Almost 70% of employees had pain at least once a year[8].

Breaks and postural changes during working activities are necessary to maintain a good intervertebral disk hydration. Periodic disk load variations are responsible for the good functioning of the mechanism promoting tissue nutrition[10]. So, it may be inferred that breaks during working hours for physical activities are a protective factor against the symptom.

A research with 163 textile industry employees has shown that approximately 75% of them reported no breaks during working hours and approximately 60% have reported pain in more than one body site, being the spine among the most referred regions[13]. Similarly to bank employees with musculoskeletal complaints, the employees of this industry worked in the sitting position. These studies ratify the relationships between breaks during working hours, working in the sitting position and the presence of low back pain.

Break duration greatly influences lumbar disorders genesis. Preventive breaks, based on ergonomic studies, should happen every 50 minutes and last for 10 minutes[8]. In our study, 92.2% of individuals did not inform about duration or frequency of breaks. This suggests that working pace is intense and that the company has no breaks policy, thus contributing to the appearance of lumbar discomfort.

Results suggest that labor kinesiotherapy has benefited volunteers in terms of referred pain intensity decrease and spinal movement amplitude increase during the intervention period. These data allow inferring that proposed exercises had a positive impact on low back pain perception.

Similarly, a study with 25 low back pain patients has applied a kinesiotherapy protocol similar to ours, consisting of paravertebral and ischiotibial muscles flexibility, lumbar-pelvic mobility exercises, and abdominal and trunk extensor muscles strengthening. Confirming our study, results have shown significant improvement in Self-Perceived Pain Scale as compared to values referred before intervention[13].

Notwithstanding Oswestry and Roland-Morris questionnaires be widely described as tools able to reproduce volunteers' clinical status as from subjective pain perception and labor and daily life activity limitations[4,13], scores obtained in our study point to meaningless improvement of functional status and pain perception, as opposed to Screening physical evaluation test and Self-Perceived Pain Scale, respectively. Questions subjectivity may have contributed to interpretation biases and, as a consequence, to

confusion and mistakes when choosing the answers. However, there has been no difficulty in understanding such tools.

Spinal movement amplitude increase, observed by the Screening physical evaluation test, reproduces the effectiveness of stretching exercises performed during kinesiotherapy sessions. Stretching allow muscles to recover the necessary length to maintain correct postural alignment and joint stability. This way, it may be applied both to maintain movement amplitude and to improve body mechanics, in addition to providing the awareness of adequate body movements, especially ensuring muscle integrity and function, helping the execution of labor and daily life activities[14].

As to functional capacity of spinal stabilizing muscles, the significant improvement after labor kinesiotherapy sessions may be the influence of transverse abdominal muscle activation. Authors indicate the transverse abdominal muscle as the most active lumbar stabilization muscle[6,15]. Its activation contributes to the maintenance of postural balance, decreases lumbar spine rotation, inclination and shear stress, protects neural elements and provides low back pain relief[15]. For this reason, its activation was included in our kinesiotherapy protocol.

Our results, within our experimental conditions, allow to suggest that labor kinesiotherapy, especially by muscle flexibility and activation, has a positive impact on low back pain, decreasing its intensity, improving trunk stabilizing muscles functional capacity and joint movement amplitude.

Further studies are needed to address the influence of labor kinesiotherapy on low back pain, with pre and post-intervention evaluations to better understand the problem and provide a better intervention to allow better quality of life to employees.

## CONCLUSION

Results allow inferring that labor kinesiotherapy has improved low back pain, decreasing its intensity and improving trunk stabilizing muscles functional capacity and joint movement amplitude.

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