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## Repetitive motion testing of lumbar spine

The National Library of Medicine (NLM) provides access to scientific literature, but it does not endorse or agree with the contents. A study examined the lumbar movement pattern during clinical tests and functional activity tests in people with and without low back pain (LBP). The results showed that there was a significant association between the two movement tests for both groups, indicating that individuals with LBP had reduced lumbar motion in certain time intervals. The study's findings suggest that the lumbar movement patterns observed during clinical tests may not accurately predict functional limitations. People with low back pain (LBP) often struggle to perform regular daily activities due to their chronic condition. However, assessing how they move their lumbar spine during these activities is not a common practice. Most functional activities only require a small amount of lumbar movement, typically between 3% and 60% of the available range. Research has shown that there may be an association between a person's LBP-related functional limitation and their lumbar movement pattern. However, previous studies have focused on examining maximal or end-range lumbar excursion, which is not representative of most daily activities. This study aimed to investigate the relationship between lumbar movement patterns during standardized clinical tests and functional activity tests, as well as examine the association with LBP-related functional limitation. Thirty-two people with chronic LBP and 16 back-healthy (BH) individuals participated in the study, which included a range of inclusion and exclusion criteria. The results suggest that there is a significant association between lumbar excursion during the early part of movement in both clinical tests and functional activity tests, as well as with functional limitation. The findings provide insight into how people with LBP move their lumbar spine during daily activities and shed light on the relationship between lumbar movement patterns and functional limitations. The study focused on individuals with low back pain (LBP) who had specific medical conditions, such as tumors, infections, or previous lumbar surgery. Participants were also excluded if they had neurological diseases requiring hospitalization, certain spinal conditions like kyphosis or scoliosis, or other health issues like cancer, kidney or bladder infections, or rheumatoid arthritis. Additionally, those who were pregnant, undergoing treatment for cancer, or receiving disability benefits related to LBP were not included. To collect kinematic data, participants completed self-report measures, including a demographic form, numeric pain rating scale (NRS), and questionnaires assessing their low back pain disability and fear-avoidance beliefs. The study used an 8-camera motion capture system with a sampling rate of 120Hz to track the movement of retroreflective markers placed on predetermined landmarks of the trunk, pelvis, and lower extremities. The kinematic data was processed using Visual 3D software and custom programs in MATLAB. A specific protocol for filtering marker position data involved applying a 4th-order Butterworth filter with a cut-off frequency of 3 Hz. The study identified several anatomical locations to place the retroreflective markers, including the acromion, manubrium, C7 spinous process, and various vertebrae. These markers were placed at specific distances from each other to define different segments of the body, such as the thoracic, lumbar, pelvis, thigh, shank, knee, and ankle. The study used these definitions to analyze the movement patterns of participants with LBP. Given article text here Participants performed three trials each of the clinical test of Forward Bending (FWB) and the functional activity test of Pick Up an Object (PUO), presented in random order. The average movement time for each test was examined, with the start of motion defined as a 1° change in sagittal excursion of the trunk from the initial standing position. Movement time was calculated as the time between the start and stop of motion. Angular displacements were calculated across time, with thoracic, lumbar, and pelvis segments expressed relative to each other. Maximal excursion and excursion at various percentages of movement time were also calculated for each segment. Statistical analyses were performed using SPSS, with results showing acceptable ICC values for both FWB and PUO tests. The sample size was determined based on desired power and effect size, with no differences in participant characteristics between the groups. Descriptive statistics showed that BH participants had significantly shorter movement times compared to LBP participants, with correlations calculated between lumbar excursion and MLBPDQ for those with LBP. Researchers compared back-healthy individuals with those suffering from low back pain to assess differences in their movement abilities. The two groups showed no significant differences in terms of maximum excursion or movement time during forward bending and pick-up object tests. However, when controlling for movement time, there was still no difference between the two groups in lumbar excursion during these tasks. The researchers did find that lumbar excursion from 0-50% of movement time during a forward bending test was significantly associated with similar excursion during a pick-up object test for both back-healthy and low back pain participants. Additionally, there were significant associations between lumbar excursion from 0-50% of movement time and the McGill Back Pain Disability Questionnaire scores for both tests. This suggests that the degree of mobility in these movements may be related to an individual's level of disability due to low back pain. Our study aimed to investigate the connection between the lumbar movement pattern during clinical tests and functional activities, as well as its relationship with low back pain (LBP)-related disability. We found a significant association between the lumbar movement pattern and LBP-related disability in both individuals with LBP and healthy individuals (BH). Specifically, our results showed that the lumbar excursion early in the test movement was associated with functional limitation in people with LBP. Our findings suggest that the lumbar movement pattern used during clinical tests reflects the way individuals move their spine during functional activities. Moreover, we found that individuals who use more lumbar excursion early in the movement tend to have greater functional limitation, particularly when performing a functional activity test. Previous studies have primarily focused on comparing movement patterns between BH individuals and those with LBP or examining differences in movement patterns at various speeds and object locations. Our study is unique in its examination of the relationship between the lumbar movement pattern during clinical tests and functional activities in both individuals with LBP and BH individuals. Our results suggest that the lumbar movement pattern used during a clinical test may reflect the lumbar movement pattern used during similar functional activities in both individuals with LBP and BH individuals. Future studies could investigate associations between additional clinical tests and more typical functional activities to better understand the relationship between the two. In our recent study, we reported consistent significant associations between LBP-related disability and lumbar excursion early in the movement under various conditions of a functional activity test. Our interest lies in understanding that limitations in performing functional activities are common among individuals with LBP and may be related to the way they move their spine during these activities. People with chronic lower back pain (LBP) often seek repeated treatment due to functional limitations. Research suggests that individuals with LBP tend to perform daily activities within a specific range of lumbar motion, particularly in the early stages of movement. This study built upon previous findings by investigating the relationship between lumbar excursion and functional limitation during two tests: the Progressive Upper Limb Tension Test (PUO) and the Freiburg Schiattest with a forward bend (FWB). The results showed significant associations between lumbar excursion and functional limitation in both tests, with the PUO test explaining more variance than the FWB test. Interestingly, the amount of lumbar motion during the early part of movement was found to be more closely related to functional limitation than the late part of movement. This suggests that individuals with LBP exhibit a specific lumbar movement pattern, which is associated with increased functional limitation as the amount of lumbar excursion increases. Further research is needed to examine whether interventions aimed at reducing lumbar excursion early in movement can improve functional limitation. Additionally, exploring the relationship between lumbar excursion and self-report measures of pain and fear avoidance behavior may provide valuable insights into the mechanisms underlying LBP-related functional limitation. The participants were given standardized instructions on how to pick up the object with both hands and keep their feet still. However, it is unclear whether these procedures accurately represent how people usually perform everyday activities. This research was partially funded by grants from various organizations, including the National Institute of Health, the Foundation for Physical Therapy, and the Dr. Hans and Clara Davis Zimmerman Foundation. We would like to thank Sara C Putnam for her help with planning the project and acknowledge the contributions of the Musculoskeletal Analysis Laboratory members who assisted with recruitment, data processing, and more. References: 1. Frymoyer JW. Back pain and sciatica. *New England Journal of Medicine*. 1988;318(5):291-300. 2. Wahlgren DR, Atkinson JH, EppingJordan JE, et al. One-year follow-up of first onset low back pain. *Pain*. 1997;73(2):213-221. 3. Croft PR, Macfarlane GJ, Papageorgiou AC, Thomas E, Silman AJ. 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McPhillips-Tangum CA, Cherkin DC, Rhodes LA, Markham C The following references are related to low back pain and physical therapy: \* A study found that a single session of motor skill training can improve lumbar movement patterns during functional activities in individuals with low back pain. \* Another study explored the use of pain rating scales, including the 11-point numerical pain rating scale, which is commonly used to measure chronic pain intensity. \* Researchers compared two low back pain disability questionnaires and found that a modified Oswestry questionnaire was more effective at assessing disability than the Quebec Back Pain Disability Scale. \* A fear-avoidance beliefs questionnaire was developed to assess fear-avoidance beliefs in individuals with chronic low back pain and disability. \* The MOS 36-item short-form health survey (SF-36) is a commonly used tool for measuring health-related quality of life. The text also includes references related to lumbar spine and hip motion, including: \* A study analyzed lumbar spine and hip motion during forward bending in individuals with and without low back pain. \* Researchers compared lumbopelvic rhythm and flexion-relaxation response between two different low back pain subtypes. Additional references include: \* A statistical power analysis text for behavioral sciences \* Studies on kinematic and kinetic constraints on arm, trunk, and leg segments during target-reaching movements \* Research on coordination and timing of spine and hip joints during full-body reaching tasks \* A study correlating lumbar-hip kinematics between trunk flexion and other functional tasks \* Research on active cervical and lumbar range of motion during performance of activities of daily living in healthy young adults. Please note that this is just a paraphrased summary of the text, and the original references should be consulted for detailed information. 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