**Rune Mygind Mieritz** **PhD defence on 31 May 2013**

**Measuring regional movement in the lumbar spine: Reliability and change in chronic low back pain patients**

There are many theories concerning the etiology of low back pain (LBP) but in spite of considerable scientific effort, the definitive pathoanatomical and psychosocial pathways to LBP remain largely unknown. One way to investigate underlying biology and possibly sub-grouping of patients with LBP is by assessing regional motion and how this may vary between patients and possibly change over time as symptoms vary.

The overall aim of this work is to obtain a deeper understanding of the reliability of measurements for regional lumbar motion, to examine motion changes over time and their relationships with changes in pain and back-related function.

We conducted a systematic review of the literature dealing with reliability and/or measurement error of 3D regional lumbar motion measurement systems. Subsequently regional lumbar motion data from a subset of participants from a randomized clinical trial were used for reliability and longitudinal cohort analyses. Participants were 18-65 years of age with a primary complaint of LBP of at least 6 weeks' duration with or without radiating pain to the lower extremity that had no specific identifiable etiology but could be reproduced by back movements or provocation tests.

The systematic literature review (Manuscript I) broadly showed that the level of reporting was incomplete in several domains, i.e. study population, test circumstances, and data analysis and presentation, downgrading the quality of reporting in general and resulting in the reliability and measurement error estimates being difficult to interpret. However, acceptable Intraclass Correlation Coefficients (ICC) were found indicating that such instruments may be used for research purposes.

In Manuscript II, dealing with reliability of the regional lumbar motion measurements in our own data, we found generally lower ICCs and higher measurement errors than reported in the literature. We investigated variation in reliability between subgroups of patients and found that both reliability and measurement error varied between subgroups.

In Manuscript III, we investigated if treatments actually change regional lumbar motion by modulating regional lumbar motion, and whether specific treatment modalities affect regional lumbar motion differently. The group receiving spinal manipulation changed significantly in all, and the exercise groups in half, of the motion parameters included in the analysis. The spinal manipulation group changed to a smoother motion pattern (reduced Jerk Index) while the exercise groups did not.

In Manuscript IV, we found that the relationship between change scores in regional lumbar motion and patient-rated outcomes (pain-related disability measured with the Roland Morris Disability Questionnaire and pain measured with ordinal 11-box scale) were generally weak. However, associations between regional lumbar motion versus patient-rated pain and back-related function were different relative to subgroups. Thus stronger correlation coefficients and significant differences between clinically relevant improved versus no clinical relevant change were found in some motion parameters in the subgroup with back pain only and the treatment group receiving spinal manipulation.