

## Introduction:

The role of musculoskeletal factors in non-specific chronic low back pain (NSCLBP) remains unclear. Regularly considered as pain consequences, these factors could be voluntary or involuntary compensations deployed to reduce pain, leading to long-term nociceptive consequences. Numerous studies have already reported biomarkers related to movement and/or muscular activity impairments to discriminate NSCLBP patients from an asymptomatic population. In particular, a recent systematic review identified 121 movement and 150 muscular activity biomarkers. However, these biomarkers were mostly reported in only one study (90%) and only 8% of them were assessed in terms of reliability, validity and interpretability. Purpose of the study: This study aimed to assess the reliability, validity, and interpretability of a set of 73 movement biomarkers. Materials and

## Methods:

Thirty asymptomatic participants and 30 NSCLBP patients were evaluated twice using the same protocol at one-week interval. Participants were equipped with 64 cutaneous reflective markers adapted from the full body Conventional Gait Model 1.0. A 12-camera optoelectronic system sampled at 100 Hz (OQUS7+, Qualisys, Sweden) was used to track the 3D marker trajectories. Participants were asked to execute a set of 8 motor tasks: two-legged standing, barefoot walking, trunk forward bending, bilateral trunk lateral bending, bilateral trunk rotation, weight lifting, sitting and sit-to-stand. Seventy-three movement biomarkers were computed under Matlab (R2019b, The MathWorks, USA). For each biomarker, the psychometric properties were assessed according to the COSMIN checklist. Test-retest and intra-rater reliabilities were assessed using an intra-class correlation. Construct validity was assessed by testing the hypothesis that a biomarker produced a statistically significant value between groups (Student's t-test or Wilcoxon test, and ROC curve analysis). Interpretability was assessed by computing the smallest detectable change (SDC).

## Results:

Seven biomarkers had good (ICCs>0.75, n=3) or excellent (ICCs>0.9, n=4) test-retest and intra-rater reliabilities. They were all related to the trunk forward bending task. Five of these biomarkers had a moderate (p<0.05, n=1) or good (p<0.01, n=4) construct validity. Altogether, the biomarker related to maximum upper lumbar sagittal angle during trunk sagittal bending demonstrated the best psychometric properties.

## Conclusion:

Six of the 7 highlighted biomarkers have been previously extensively assessed in the literature, with at least good reliability and validity levels. This study points out the fact that trunk forward bending task could be, from a musculoskeletal factors point of view, a valuable test to discriminate NSCLBP patients from an asymptomatic population. More importantly, only 5 of the 73 parameters proposed in the literature could be used as biomarkers. A similar study is ongoing concerning muscular activity biomarkers.