

Mindsets are related to reductions in pain after a gait modification intervention for people with osteoarthritis

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Introduction

Psychological factors and the context of an intervention (e.g., personal interactions, beliefs about the outcomes, intervention presentation) can affect outcomes above the direct effects of the intervention alone [1]. For example, telling individuals they have a high-endurance genotype increases their cardiorespiratory capacity during running, regardless of their actual genotype [2]. Mindsets, which are core assumptions about the nature of things and processes in the world, are psychological factors that orient people to a particular set of expectations, explanations, and goals. Patients with more adaptive mindsets about chronic illness (e.g., “my illness may be challenging, but it can be managed”) report improved physical and mental health compared to patients with less adaptive illness mindsets (e.g., “my illness negatively impacts all parts of my life”) [3].

The relationship between mindsets and biomechanical interventions is unknown, yet likely influences intervention efficacy and patient outcomes. As a first step towards understanding this relationship, we evaluated the association between mindsets about chronic illness and changes in pain after introducing a gait modification for people with knee osteoarthritis, a chronic disease. We hypothesized that a more adaptive mindset about chronic illness would be associated with larger reductions in pain. By studying mindsets and interventions together, we can understand how they influence each other, and how they both influence health.

Methods

Twenty-six individuals with radiographic knee osteoarthritis completed one year of gait retraining aimed at reducing the loading in the medial compartment of their knee (via reducing the knee adduction moment). During 13 visits to the gait lab, participants were trained to adopt their modified gait pattern. Medial knee pain was assessed with the 11-point numerical rating scale (NRS) from no pain (0) to the worst imaginable pain (10). Reduction in pain was defined as the difference in NRS pain score between the beginning and end of the study (where a positive value indicates less pain at the end of the study). At the end of the study, participants’ mindsets about illness were assessed with the Illness Mindset Inventory (IMI) [3]. The participants’ illness mindsets were calculated as a composite variable (from 1-6) using the catastrophe and manageable subscales of the IMI, with higher scores reflecting the mindset that chronic illness is manageable. We calculated Pearson’s correlation coefficient (R) to evaluate the association between illness mindsets and reduction in pain.

Results and Discussion

Illness mindset was positively correlated with pain reduction ($R=0.433$, $p=0.027$), meaning a more adaptive mindset was related to a larger reduction in pain (Figure 1). On average, participants experienced significant reductions in their pain ($p<0.001$) and knee adduction moment ($p<0.001$) with their personalized gait modification. These results suggest that the

illness mindset may influence pain outcomes in addition to the reduction in medial knee loading.

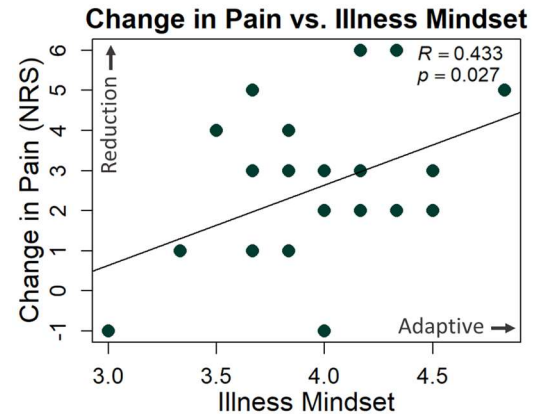


Figure 1: Change in pain vs. illness mindset. A reduction in pain is associated with a more adaptive illness mindset.

Due to the cross-sectional nature of this study, we cannot determine causality. Mindsets at the end of the intervention are likely shaped by the participant’s experiences and expectations both before and during the intervention. If biomechanical interventions affect mindsets, we can leverage the influence on mindsets for optimal intervention compliance, design, and outcomes. For example, even if a biomechanical intervention, such as a gait modification, reduces knee loading, patients that do not have the mindset that they can manage their disease may not receive the maximum benefit from the intervention. In addition to psychological improvements, these benefits can include physical improvements as mindsets can influence physiological processes, such as inflammation. On the other hand, mindsets may influence the efficacy of interventions by mediating outcomes, such as changes in pain. This research motivates future work to understand the mechanisms by which biomechanical interventions affect mindsets and vice versa.

Significance

We found that an individual’s mindset about chronic illness is related to changes in pain after a biomechanical intervention. By bridging the gap between psychology and biomechanics, we can design traditional biomechanical interventions more effectively. Integrating subtle nudges towards more adaptive mindsets, such as presenting an intervention as an opportunity to manage pain or chronic illness, may improve intervention compliance and health outcomes.

Acknowledgments

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References

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