Using Accelerometer Data to Identify Physical Activity Profiles in the Osteoarthritis Initiative

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Abstract

Introduction: Osteoarthritis is a chronic joint disease with no current cure, affecting around 500 million people worldwide. Evidence suggests that physical activity (PA) has beneficial effects, but the ideal “prescription” of exercise remains unknown. The Osteoarthritis Initiative (OAI) is a longitudinal, prospective, observational study with over 10 years of follow-up with accelerometer data from 2712 subjects. Accelerometers are wearable devices that accurately and objectively record PA by quantifying body movements in terms of acceleration; specifically, they provide measurements of the frequency, intensity, and duration of PA. Varying patterns of PA exist in the OAI that can be used to identify overarching profiles. In this project, we used a data-driven approach to identify these profiles and utilized them to determine if there exists an association between such profiles, known correlates of osteoarthritis, and symptomatic outcomes of osteoarthritis such as pain.

Methods: A subgroup of OAI participants wore an ActiGraph GT1M accelerometer for a minimum of 10 hours between 4-7 days which provided activity counts per minute for all observation minutes. Curve registration was used to reduce variability in the timing of PA between participants and then clustered via a K-medoid algorithm. The outcome of pain was measured by the total Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) score. To test the association between the identified profiles and pain, a linear regression model was used to determine if an association exists between the defined profiles and the total WOMAC score.

Results: It was difficult to identify PA-based patterns as subjects were similarly inactive; subjects on average reached 43.84 activity counts per minute, with activity ranging from (0 to 8879 activity counts per minute). No association was determined between the identified profiles and pain (p-value>0.05).

Discussion: The developed profiles are not associated with the total WOMAC score. While the created profiles are not associated with symptomatic outcomes, it is of interest to explore if they provide prediction abilities for structural outcomes such as joint space width and radiographic classification of osteoarthritis such as the Kellgren-Lawrence score.