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Original article

Reliability and validity of two multidimensional self-reported physical activity questionnaires in people with chronic low back pain

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ABSTRACT

Background: Although there is some evidence for reliability and validity of self-report physical activity (PA) questionnaires in the general adult population, it is unclear whether we can assume similar measurement properties in people with chronic low back pain (LBP).
Objective: To determine the test-retest reliability of the International Physical Activity Questionnaire (IPAQ) long-version and the Baecke Physical Activity Questionnaire (BPAQ) and their criterion-related validity against data derived from accelerometers in patients with chronic LBP.
Design: Cross-sectional study.
Methods: Patients with non-specific chronic LBP were recruited. Each participant attended the clinic twice (one week interval) and completed self-report PA. Accelerometer measures >7 days included time spent in moderate-and-vigorous physical activity, steps/day, counts/minute, and vector magnitude counts/minute. Intraclass Correlation Coefficients (ICC) and Bland and Altman method were used to determine reliability and spearman rho correlation were used for criterion-related validity.
Results: A total of 73 patients were included in our analyses. The reliability analyses revealed that the BPAQ and its subscales have moderate to excellent reliability ($ICC_{2,1}$: 0.61 to 0.81), whereas IPAQ and most IPAQ domains (except walking) showed poor reliability ($ICC_{2,1}$: 0.20 to 0.40). The Bland and Altman method revealed larger discrepancies for the IPAQ. For the validity analysis, questionnaire and accelerometer measures showed at best fair correlation (rho < 0.37).
Conclusions: Although the BPAQ showed better reliability than the IPAQ long-version, both questionnaires did not demonstrate acceptable validity against accelerometer data. These findings suggest that questionnaire and accelerometer PA measures should not be used interchangeably in this population.

1. Introduction

Measuring physical activity (PA) levels in chronic low back pain (LBP) is thought to have important clinical implications. Regarding clinical presentation, patients with chronic symptoms and high disability are more likely to present with low PA levels (Lin et al., 2011). From a prognosis perspective, patients considered to be physically active are more likely to have less pain and disability 1 year later (Pinto et al., 2014). Although it is still debatable whether patients with chronic LBP decrease their PA level (Smeets et al., 2006), physical activity-based interventions are effective in managing this condition (van Middelkoop et al., 2010). More recently, in light of the evidence suggesting coexistence of chronic LBP and non-communicable diseases such as cardiovascular disease (Ha et al., 2014), diabetes (Eivazi and Abadi, 2012) and obesity (Shiri et al., 2010), clinicians are facing the challenge to concentrate efforts on interventions that not only decrease pain and disability but also improve patients' PA levels. This aligns with the Exercise is Medicine initiative, an initiative coordinated by the American College of Sports Medicine aiming to advance the implementation of evidence-based strategies to elevate the PA status in primary care settings (Sallis, 2009).

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Most evidence regarding PA in this area has been generated from self-reported assessment methods, such as the International Physical Activity Questionnaire (IPAQ) (Craig et al., 2003) and Baecke Habitual Physical Activity Questionnaire (BPAQ) (Baecke et al., 1982). While self-reported methods rely upon recall of physical activities, objective methods utilize technology to measure PA in real time. As technology advances, objective PA assessment, such as accelerometers, have become one of the most commonly used methods to assess PA in free-living activities, due to their small size, low participant burden and relatively low cost (Trost and O'Neil, 2014).

Although the IPAQ and BPAQ have some evidence for reliability (Baecke et al., 1982; Craig et al., 2003) and validity (Craig et al., 2003; Philippaerts et al., 2001) in the general adult population, it is unclear whether we can assume similar measurement properties in people with chronic LBP. This is important, particularly in the LBP field, in which evidence generated by self-reported and objective PA measures are often combined indiscriminately (Hendrick et al., 2011; Lin et al., 2011). Therefore, our primary aim was to determine the test-retest reliability of two multidimensional self-reported PA measures, the IPAQ (long-version) and BPAQ, and to assess the criterion-related validity of these two self-reported measures against objective PA measures derived from accelerometers in patients with chronic LBP. As a secondary aim we investigated the correlation between self-reported and objective PA measures with measures of pain and disability.

2. Materials and methods

2.1. Study design

This is a cross-sectional study conducted at an outpatient physical therapy university clinic.

2.2. Study population

Consecutive patients with LBP seeking physical therapy were recruited through advertisements in the community, local press and social media. This study was approved by the university ethics research committee (CAAE36332514.0.0000.5402) and all included patients gave informed consent. Patients were included if aged between 18 and 60 years old and presenting with chronic non-specific LBP, defined as pain localised below the costal margin and above the inferior gluteal folds, with or without leg pain of at least 3 months' duration. To be eligible to enter the study patients had to report moderate intensity low back pain and interference with function as measured by items 7 or 8 of the SF36 questionnaire (Ciconelli et al., 1999). Those patients presenting with known or suspected serious pathology such as nerve root compromise (at least 2 of the following signs: weakness, reflex change, or sensation loss, associated with the same spinal nerve); history of spinal surgery; or any contraindication to physical exercise were excluded.

Based on an expected ICC of 0.7, two measures per participant on two separate days and anticipating at least moderate reliability coefficient (ICC = 0.5), the sample size required was 63 participants. Nevertheless, given the high rates of noncompliance with accelerometer wearing protocol, the sample size was adjusted to allow for up to 35% dropout. Hence, the final sample size was set at 85 patients.

2.3. Procedures

Each participant attended the physical therapy clinic twice, approximately one week apart. At the first session information about demographic and anthropometric data; duration and severity of LBP; disability; fear of movement; depression; and self-report PA measures were collected. Participants were also asked to wear an accelerometer during waking hours (except when showering or swimming) for the 7 days following the first session, while maintaining their typical weekly schedule. At a pre-determined time each morning participants received daily short message service (SMS) reminders to wear the accelerometer. At the second session participants returned the accelerometer and completed the self-reported PA measures for the second time.

2.4. Data collection

Patients completed a set of questionnaires to measure the following clinical constructs:

Demographic and social variables investigated were age, body mass index, highest education level, work status and duration of symptoms.

Disability was measured using The Quebec Back Pain Disability Scale (Kopec et al., 1995). The questionnaire consists of 20 items scored in a 0–5 scale. The total score ranges from 0 (no disability) to 100 (maximum disability).

Average pain intensity in the last 24 h was measured with a 0–10 numerical pain rating scale (Ross, 1997).

Fear of movement was measured using the 17-item version of The Tampa Scale for Kinesiophobia (Vlaeyen et al., 1995). Total score ranges from 17 to 68 with higher scores indicating greater fear of movement.

Depression was measured with The Beck Depression Inventory (BDI). The BDI is a 21-item, self-report rating inventory that measures characteristic attitudes and symptoms of depression (Beck et al., 1961). BDI scores ranges from 0 (low depression) to 63 (maximum depression).

Self-reported PA behaviour was measured with two questionnaires. The IPAQ long-version covers four PA domains: work-related, transportation, housework, and leisure activity (Craig et al., 2003). IPAQ asks in detail about walking, moderate-intensity and vigorous-intensity in each domain over the past seven days. Specific activity scores for each PA domain and intensity can be calculated by multiplying the number of minutes per week of the performed activities with the accompanying mean metabolic equivalent (MET) value of these activities. In this study, IPAQ measures calculated were: (i) IPAQ-Total PA *(MET-minutes/week)*; (ii) PA for each domain: i.e. occupational, transportation, household, and leisure activity *(MET-minutes/week)*; (iii) total time spent with walking (*minutes/week*); and (iv) total time spent in moderate-to-vigorous physical activity (MVPA) intensity (*minutes/week*) (i.e. computed by summing the *minutes/week* of reported MVPA across all domains). The BPAQ collects information on PA levels within a typical or usual week (Baecke et al., 1982). This questionnaire The BPAQ consists of 16 items and allows four indices to be calculated: work, sports, leisure time (excluding sports) and total PA (i.e. sum of all indices). The total score varies between 3 and 15 with higher score indicating a higher PA level.

Objective PA behaviour was evaluated by a triaxial accelerometer. The Actigraph wGT3X-BT (ActiGraph, LLC, Pensacola, FL, USA) is a non-invasive, small, lightweight device (4.6 × 3.3 × 1.5 cm, 19 g) that is worn during waking hours for 7 consecutive days on the right hip. For the purpose of this study, acceleration data were sampled at 30 Hz and analysed at 60 s epochs. Accelerometer data were analysed and computed with ActiLife 6 software (ActiGraph, LLC, Pensacola, FL, USA). For each patient, a complete data set was defined to have at least 10 h per day of monitored wear during at least 5 days (Troiano et al., 2008). Non-wear periods were defined as time intervals of at least 60 consecutive minutes of zero counts, with an activity interruption allowance of 0–100 counts min^{-1}