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ABILHAND-HS: a linear scale for outcome measurement in hand surgery

Dear Editor,

The ABILHAND questionnaire is a Rasch model [Rasch, 1980] built measure of manual ability [Penta et al., 1998]. It provides an invariant linear scale allowing quantitative comparisons of manual ability between patients and over time. Manual ability is defined as the capacity to manage daily activities with the upper limbs whatever the strategies involved. The adaptation of ABILHAND to hand surgery (HS) was recently reported [El Khoury et al., 2020]. Patients were asked to indicate their perceived level of difficulty associated with completing manual activities without technical or human assistance, regardless of the hand used, on a three-level scale: impossible, difficult or easy. Successive Rasch model-based analyses led to the selection of 23 items that constitute a unidimensional manual ability scale.

We illustrate the use of the ABILHAND-HS scale in clinical practice. A 55-year-old patient, right-dominant, with a displaced distal radial fracture underwent an osteosynthesis with an anterior plate. Figure 1 shows her manual ability evolution. The panels show her responses at 2 (T1), 3 (T2) and 12 months (T3) postoperatively. A website (www.rehab-scales.org) developed by Université catholique de Louvain and Arsalis, a spin-off of the ABILHAND authors' laboratory, can be used to determine the patient's manual ability at each time point. The website implements a Rasch analysis routine that has been validated against one of the most popular Rasch analysis software packages [RUMM2010,

RUMM Laboratory Pty Ltd, Perth, Australia]. The web service is free to use for daily practice in clinical and research applications, although a licence is required for commercial applications and clinical trials. For each assessment, the patient's manual ability is reported in logits and in centiles along with the associated 95% confidence interval (CI). Patient's improvement [0 logits (50%) at T1, 2.2 logits (68%) at T2 and 3.2 logits (77%) at T3] can be quantified on a linear scale. The CI, which reflects the precision of the instrument, is larger at the extremes of the scale (T3) compared with the centre (T1), and it increases with missing responses (T1 compared with T2). Using the web service, the clinician can verify the response-pattern coherence by comparing the observed responses with the expected ones, given the patient's manual ability. Unexpected responses are those that lie outside the CI. For instance, the patient overestimated the difficulty of 'spreading butter on a slice of bread' at T1 and T2, and 'shuffling and dealing cards' at T2. The clinician can try to make sense of the unexpected responses. A small number of the unexpected responses can be found as part of a normal response pattern, but they can also be due to random answers, not following test instructions or the presence of additional comorbidities.

One might wonder about the advantages of this new scale, given the plethora of well-established questionnaires [El Khoury et al., 2020]. One major asset is the conversion of the ordinal raw scores into a true interval and linear unit. Raw scores represent discontinuous levels, whereas the logit is continuous and presents a fixed unit along the measurement scale. This allows for quantitative comparisons between different treatments and over time. The ability to tolerate missing responses enables the ABILHAND-HS to remain valid when some of the queried activities are rarely performed or not permitted during the recovery period. This is most manifest at T1 (nine missing responses). The ability to analyse response patterns can single out patients' answers that are unexpected given their manual ability level. For example, a patient who answers 'easy' on difficult items and 'impossible' on easy items should be further queried. Items are ordered by their difficulty, thus item hierarchy can be used for goal setting during the rehabilitation process.

The ABILHAND-HS is oriented towards real daily-life behaviours and is intended to be independent of the limb(s) or strategy used and unbiased by activities that are never performed with the affected hand or avoided during recovery. It can be used equally to measure patients with various types of impairments, as item difficulties have been shown to be stable across the tested pathologies [El Khoury et al.,