



University of Southern Denmark

**Danish version of the Patient-Rated Wrist/Hand Evaluation questionnaire  
Translation, cross-cultural adaptation, test–retest reliability and construct validity**  
Hansen, Alice Ørts ; Knygsand-Roehoej, Karin; Ardensø, Kecia

*Published in:*  
Hand Therapy

*DOI:*  
10.1177/1758998318807238

*Publication date:*  
2019

*Document version:*  
Accepted manuscript

*Citation for published version (APA):*  
Hansen, A. Ø., Knygsand-Roehoej, K., & Ardensø, K. (2019). Danish version of the Patient-Rated Wrist/Hand Evaluation questionnaire: Translation, cross-cultural adaptation, test–retest reliability and construct validity. *Hand Therapy, 24*(1), 22-30. <https://doi.org/10.1177/1758998318807238>

Go to publication entry in University of Southern Denmark's Research Portal

**Terms of use**

This work is brought to you by the University of Southern Denmark.  
Unless otherwise specified it has been shared according to the terms for self-archiving.  
If no other license is stated, these terms apply:

- You may download this work for personal use only.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying this open access version

If you believe that this document breaches copyright please contact us providing details and we will investigate your claim.  
Please direct all enquiries to [puresupport@bib.sdu.dk](mailto:puresupport@bib.sdu.dk)

## **Danish version of the Patient-Rated Wrist/Hand Evaluation questionnaire (PRWHE): Translation, cross-cultural adaptation, test-retest reliability and construct validity**

**Introduction:** In Denmark, there is a growing need for valid, reliable and standardized patient-rated outcome measures for use in clinical practice and research. The PRWHE is a self-reported assessment of hand-related disorders that measures pain and functional difficulties in activities of daily living. The purpose of this study was to: 1) translate and cross-culturally adapt the PRWHE into Danish and, 2) assess the reliability and construct validity of the Danish version in patients with hand-related disorders.

**Methods:** The PRWHE has been translated and cross-culturally adapted into Danish using the dual-panel approach. A total of 97 patients with diverse hand-related disorders and a mean age of 52.6 (*sd* 15.2) participated in the psychometric testing. They were assessed on two occasions. Reliability was assessed using the intraclass correlation coefficient (ICC<sub>2.1</sub>) to assess test-retest, Cronbach's alpha (CA) assessing internal consistency and a Bland-Altman plot assessing measurement error. Construct validity was investigated by evaluating the relationship between the Danish PRWHE (PRWHE-DK) and the Danish validated version of the Disabilities of the Arm, Shoulder and Hand questionnaire (DASH).

**Results:** Psychometric testing demonstrated an excellent test-retest reliability (ICC<sub>2.1</sub> = 0.94) and internal consistency (CA = 0.96). A systematic error of 1.49 and a measurement error of  $\pm 16.1$  were found. Furthermore, a strong correlation was found between PRWHE-DK and DASH ( $r = 0.71$ ).

**Conclusions:** The PRWHE-DK is a reliable, valid instrument for patients with different kinds of hand-related disorders, and can be used in clinical practice and multi-cultural research studies to measure pain and functional disability.

## **Introduction**

In recent decades, the demand for valid and reliable patient-rated outcome (PRO) measures has increased in healthcare.<sup>1, 2</sup> PRO measures provide patient-perceived information which is useful in client-centred rehabilitation, and results often differ from objective observations.<sup>3</sup> In Denmark, the government advocates the systematic use of PRO measures in clinical practice for quality improvement.<sup>4</sup>

The Patient-Rated Wrist Evaluation (PRWE)<sup>5, 6</sup> is a region-specific, self-reported questionnaire designed to measure perceived pain and functional difficulties in activities of daily living in patients with wrist disorders.<sup>6</sup> PRWE has been used in several recent studies to describe the patient's perspective, and is reported to be valid, reliable and responsive.<sup>6-9</sup> The PRWE questionnaire consists of 15 items in two

subscales: pain and function.<sup>10</sup> The pain subscale contains five items rated on a scale from zero to 10. The pain score is the sum of the five pain items, ranging from zero – indicating no pain – to the worst pain score of 50. The functional subscale contains 10 items: six concerning specific activities and four related to usual activities, also rated from zero to 10. Zero signifies no difficulty in performing the activity, and 10 inability to perform the activity. The function score corresponds to half the sum of the 10 function items. The total PRWE score is the sum of the pain and the function scores, ranging from 0 to 100. The higher the score, the worse the level of pain and/or dysfunction, as perceived by the patient.<sup>5</sup> All items refer to the situation during the past week and several specifically address the affected hand.<sup>7</sup> If the activity has not been performed in the past week, but is usually performed, patients are asked to estimate the score. If the activity has never been performed, the item should be left blank. According to the user manual, missing items are replaced with the mean score of the subscale.<sup>7</sup>

In 2004, the PRWE was modified to the Patient-Rated Wrist/Hand Evaluation (PRWHE) questionnaire, including hand conditions.<sup>7, 10</sup> PRWHE consists of the same items as PRWE, given that all items are also relevant for patients with hand-related disorders; however, a new subscale, appearance, has been added.<sup>10</sup> The appearance score is optional and it is rated separately from the total score.<sup>10</sup> It consists of two items: one

about the importance of appearance, and one about dissatisfaction with appearance. When calculating the PRWHE sum score, only items from PRWE are used. PRWHE thus has the same psychometric qualities as PRWE.<sup>7</sup> However, PRWHE's psychometric properties have been further assessed by RASCH analysis, which supports internal consistency and reliability.<sup>11</sup> PRWHE has been translated into several languages.<sup>12-15</sup> For many decades the Disabilities of the Arm, Shoulder and Hand (DASH) outcome measure<sup>16, 17</sup> has been used internationally as an outcome measure among patients with hand-related disorders to measure patients' perspectives. However, in many recent studies, PRWHE has been used together with, or instead of, DASH.<sup>8</sup> DASH is a region-specific, self-administered questionnaire that measures functioning and symptoms in patients with musculoskeletal disorders in the upper extremity and not only the wrist and hand.<sup>16, 18</sup> Furthermore, it reflects the patient's perspective on their ability to perform certain activities of daily living, regardless of which arm they use and whether or not they use technical aids.<sup>17</sup> DASH consists of 30 items, and is considered valid, reliable and responsive to most disabilities of the upper limb.<sup>18-20</sup> Herup et al.<sup>19</sup> found excellent reliability for the Danish version of DASH. A strong relationship has been reported between DASH and PRWHE ( $r=0.72$ );<sup>10</sup> however, PRWHE has been reported to be more specific and has shown slightly higher responsiveness than DASH, despite having fewer items.<sup>10, 21</sup>

A Danish, modified version of the PRWE was published in 2013.<sup>22</sup> Patients were to be asked about maximum pain and not average pain in the pain subscale, rendering the results invalid for comparative research purposes. Furthermore, some of the items in the subscale function were translated in such a way that they asked for more than one thing and simplified the activity, e.g., the original item: disabilities concerning “Personal care activities (dressing, washing)” was translated to disability regarding “Dressing and/or taking a bath”. These factors are among those that justify the need for a new Danish version of the PRWHE, rather than adding only an appendix to the Danish PRWE with additional appearance items. The new version of PRWHE will allow comparisons to be made with other countries. The purpose of this study was to translate the PRWHE into Danish (PRWHE-DK), to cross-culturally adapt it, and assess its reliability and construct validity.

## **Methods**

### *Study design*

This study is a multicenter study between Aarhus University Hospital, Zealand University Hospital and Odense University Hospital, in Denmark. The study consisted of two phases. In phase I, the study design involved translation and cross-cultural

adaptation of the PRWHE into Danish; phase II comprised a survey with test-retest to test the psychometric properties of PRWHE-DK.

### *Phase I: Translation and cross-cultural adaptation*

In translating self-administered questionnaires, it is important to perform a cross-cultural adaptation. The aim is to produce not just a literal translation but a translation in which the concept of the questionnaire is adapted to the cultural background of the country in question.<sup>23, 24</sup> The original PRWHE<sup>5, 10</sup> was translated into Danish following the guidelines of dual-panel approach,<sup>23-25</sup> which consists of three steps. First, a bilingual panel individually translated the PRWHE into Danish and then met to achieve consensus on a first version of PRWHE-DK. The panel was informed about how the questionnaire was developed and designed and about the target audience. In line with the dual-panel approach guideline, six participants with good English language skills participated in the translation panel; one had English as native language, two had lived in English-speaking countries, one worked as a translator and two taught in English. Panel members were asked to produce a Danish translation in which the content of each item would reflect the original PRWHE. In the second step, a lay panel discussed the first version of PRWHE-DK one item at a time, including the format, the meanings and the wording, and reached a consensus on a second version. The lay panel consisted of six lay people purposefully selected so they varied in age (mean 42 years

(range 17-67 years), gender (women  $n=3$ , men  $n=3$ ) and educational background. As recommended in the guideline for dual-panel translation, none had a long-term higher education. The first author participated in both panels as a coordinator to ensure the content of the original PRWHE was retained.<sup>23</sup> During the translation process, the authors corresponded with the developers of the PRWE/PRWHE to ensure optimal understanding of the items.

The final step of the dual-panel approach was the assessment of the provisional PRWHE-DK by patients in the target population. Seventeen participants were purposefully sampled from the outpatient hand therapy clinics at the three hospitals participating in the study, to give variation in age, gender, educational level and injury severity. They had to have occupational performance problems, so they had to read the items carefully to answer. The participants were used to assessing linguistic content, comprehensibility and feasibility of the PRWHE-DK, by testing linguistic, face and content validity.<sup>23, 26</sup> Participants completed the PRWHE-DK while being asked to think aloud and comment on any issues and things that were difficult to understand. Afterwards, they answered questions about how they understood the items and whether they had difficulty answering any of the items. This was to assess the agreement in item understanding. Any difficulty in understanding an item was



recorded and discussed among the authors, and adjustments were made, as necessary.

## *Phase II: Psychometric testing*

### Reliability

Test-retest reliability, internal consistency and measurement error were used to assess reliability.<sup>27</sup>

### Validity

To assess validity, face, content and construct validity were assessed.<sup>27</sup> Face and content validity were evaluated by the lay panel and during the cognitive interviews. Construct validity was assessed by hypothesis testing, where the strength of the relationship between PRWHE-DK and DASH was investigated.

### Participants

Participants included in the psychometric testing were patients seen at an outpatient hand surgery clinic at two hospitals. At the third hospital in this study, patients were in rehabilitation and did not fulfil the inclusion criteria for the test-retest. Participants were 18 years or older and had occupational performance problems due to a hand-related disorder. Furthermore, to ensure stability at the re-test, they had to report that their symptoms had been stable for the previous eight weeks. Cognitive ability to complete the questionnaires on their own and understand, speak and read Danish

were further criteria. Patients with no occupational performance problems or with shoulder or elbow injuries were excluded at baseline.

Patients were excluded from the retest if they received rehabilitation or treatment between test and retest, or if they reported that their symptoms from the hand condition had not been stable during the test-retest period.

#### Demographic data

The demographic data collected at baseline concerned educational level, hand dominance, injured hand side, whether or not there were occupational performance problems and whether the condition had been stable for the previous eight weeks.

#### Data collection

Patients who fulfilled the inclusion criteria were invited to complete the PRWHE-DK at the hand surgery clinic while they waited for their consultation. In addition, they were asked to fill in the DASH<sup>16</sup> and items about demographics.

The PRWHE-DK and additional questions about stability of the condition were completed a second time after 14 days.<sup>26</sup> The re-test questionnaire was sent to the participants by post with a stamped, addressed envelope.

Demographics data concerning age, gender and injury or symptoms were gathered from medical records.

### Data analysis

Descriptive statistics were used to describe participants, PRWHE-DK, and DASH dispersion. To evaluate the distribution of the scores, as required by the Consensus-based Standards for selection of health Measurement Instruments (COSMIN),<sup>26</sup> the floor/ceiling effects for PRWHE-DK total score and subscales were determined. We accepted floor/ceiling effects of 15%.<sup>26</sup> We considered floor effect as 0-10 in the total score and 0-5 in the subscales, respectively. In the same way, we considered ceiling effect as 90-100 points in the total score and 45-50 in subscales – as in other studies that have translated PRWE.<sup>28, 29</sup> The assumption of normal distribution was assessed with quantile-quantile plots to determine which statistical test should be used.

Intraclass Correlation Coefficient (ICC<sub>2.1</sub> agreement) was used to test the test-retest reliability between the repeated measurements.<sup>26</sup> An ICC greater than 0.75 is categorized as excellent, according to Portney & Watkins.<sup>30</sup> No gender difference was to be expected; however, because of an unequal gender distribution, ICC<sub>2.1</sub> was assessed by gender. Internal consistency was assessed by Cronbach's alpha.<sup>26</sup>

Measurement errors were illustrated using Bland-Altman plots.<sup>26</sup>

To investigate the construct validity, we assessed the relationship between PRWHE-DK and DASH. We hypothesized a strong correlation ( $r_s \geq 0.7$ ), as reported in other studies.<sup>10, 13, 14</sup> The Pearson correlation coefficient ( $r$ ) was used because of normal distribution. The critical values for significance were set at  $p < 0.05$ .

Data were double-entered using EpiData (version 1.4.2) [EpiData Association, Odense, Denmark], including a range check for all variables. All statistical analyses were conducted using STATA14 [StataCorp LP, Texas, USA].

#### Sample size

A sample size of at least 50 is required for test-retest.<sup>26</sup> However, in recruiting patients referred to an outpatient hand surgery clinic, a high degree of exclusion between test and retest was to be expected. For this reason, 100 patients with hand-related disorders were included.

#### Ethics

Participants were informed about the project orally and in writing at the outpatient hand surgery clinic by one of the authors. All participants gave their written consent. The project was accepted by the Danish Data Protection Agency (no. 15/4258). Due to the nature of the study, approval by the Research Ethics Committee was not required, in accordance with Danish legislation on research ethics. PRWHE was translated with the permission of the copyright holder. Part I of the study followed the guidelines for

the dual-panel approach.<sup>23, 24</sup> Part II conformed to the COSMIN checklists for reliability (internal consistency, test-retest reliability and measurement error) and construct validity (hypotheses testing).<sup>26</sup>

## **Results**

### *Translation and cross-cultural adaptation*

Most terms in the PRWHE are simple and universal and thereby easy to translate and understand. However, some items were modified for cultural adaptation of PRWHE-DK. An overview is given in Table 1. This was done following correspondence with the developers. In Denmark, weight is not measured in pounds (lb), and therefore we changed this to kilograms (10lb to 5 kg) (item 10). Furthermore, the term “door knob” (item 6) is not familiar in Denmark, because door handles are generally used. To retain reference to the same joint motion as turning a door knob, this item was changed to turning a key. To clarify that activities about lifting (items 3 and 10) have to be done with the affected arm in both items, we added this point to item 3, as it is stated in item 10, given that it was the developers’ intention. Item 7 “cut meat using a knife in my affected hand” was discussed, given that the authors and translation panel were in some doubt about what it was supposed to measure. The issue concerned the intention to measure either a bimanual activity or solely the use of a knife in the

affected hand. There was also some doubt about whether the intention was to measure strength, in which case the substance being cut would be pertinent. For those who do not cut meat, the option to cut another substance was discussed. The developers recommended that the item be changed to *cut meat or vegetables*, given that it was supposed to be understood as a bimanual task with ulnar deviation in the wrist, whereby the difficulty level of the action was not in question. Therefore, “or vegetables” were added to item 7 and “with your affected hand” removed, before the version went to the lay panel. However, the word “vegetables” was removed again after discussion in the lay panel. They were confused, because they considered that the item related to two different things, and thereby contained two questions.

Cognitive interviews were conducted with 17 patients with hand-related disorders. Eight women and nine men, with a mean age of 53, ranging in age from 22 to 74 participated. They differed in injury severity and educational level. From the cognitive interviews, at which linguistic, face and content validity were assessed, only minor comments about the layout and linguistic content were made. Otherwise, the patients found the PRWHE-DK easy to complete and they understood the items appropriately when asked. None found it difficult to estimate the average amount of pain.

After the statistical analyses, minor linguistic changes were made, to avoid future missing items. The words “*Please answer all items*” were added to the meta-text about

pain, even though it had already been written in the introduction. This was to avoid a situation where patients with no pain would not answer all pain items. To ensure all patients found item 7 about cutting relevant, it was changed to cutting food. Item 14 was stated more clearly – that it included all usual everyday work. Because of these linguistic corrections, cognitive interviews were repeated after the analysis by 10 purposefully sampled patients. No-one had comments.

Insert Table 1 around here

### *Psychometric testing*

#### Participants

A total of 100 patients completed the PRWHE-DK at inclusion between April and November 2015 (Figure 1). However, three patients were included by mistake; they did not fulfil the inclusion criteria. The remaining 97 patients had a mean age of 52.6 (*sd* 15.2) (age range 19-91). Most were women with a medium-term higher education or vocational education. The participants had various types of hand-related disorders, such as fractures, tendon or nerve injuries or arthrosis. Almost half of the patients were injured in their dominant hand (Table 2).

Sixty patients with a mean age of 52.5 (*sd* 14.7) fulfilled the inclusion criteria for the retest and completed the PRWHE-DK a second time after 14 days (Figure 1). The figure of 60 reflects the fact that 11 patients (11%) dropped out after baseline test and 26 patients (27%) were excluded from the retest because their hand condition had not been stable between test and retest.

Insert figure 1 around here.

Insert table 2 around here.

#### PRWHE-DK

At baseline, the PRWHE-DK scores of the 97 participants were mean 51 (*sd* 23.9) (range 2-97) (Table 3). Most (*n*=55) found appearance “somewhat” important and most had no dissatisfaction with the appearance of the hand (median = 2) (range 0-10). PRWHE-DK means (*sd*) for the 60 participants participating in the retest are shown in Table 3.

Insert table 3 around here.



A floor effect for the total score of the PRWHE-DK at baseline (< 11 points) was observed in 4% of the respondents and a ceiling effect (> 89 points) was observed in 5%. This was also the case for the subscales. The pain and the functional subscales had a floor effect of respectively 8% and 10% (<6 points) of the respondents and a ceiling effect of respectively 3% and 1% (>44 points).

At baseline, 75% of the patients answered all items ( $n=73$ ). Fourteen had one missing or unanswered item (14%). The first five items about pain are not intended to include lack of response. However, some of these items had one – and up to three – missing responses. In the functioning part of PRWHE-DK, the items with the most unanswered responses were: item 6, *turning a key*; item 7, *cutting with a knife*; item 11, *use bathroom tissues with my affected hand*; and item 14, *work*.

### Reliability

An excellent level of test-retest reliability for PRWHE-DK was found by an ICC<sub>2.1</sub> (95% CI) of 0.94 (0.91-0.97) ( $n=60$ ) between baseline and 14-days on the total score. For women, an ICC<sub>2.1</sub> (95% CI) of 0.96 (0.91-0.98) ( $n=40$ ) was found and for men an ICC<sub>2.1</sub> (95% CI) of 0.93 (0.83-0.97) ( $n=20$ ) was found. Cronbach's alpha was 0.96 for the total score in the baseline sample ( $n=97$ ), 0.91 for the pain subscale and 0.95 in the function subscale. The test-retest results between baseline and 14-days follow-up revealed a

mean difference or a systematic error of 1.489 and a measurement error of  $\pm 16.1$  (scale range 0-100) (Figure 2).

Insert figure 2 around here

### Construct validity

A strong correlation was found between PRWHE-DK and DASH at baseline  $r=0.71$ ,  $p<0.001$  ( $n=94$ ). Three patients were excluded from the analysis because they had more than three missing items in DASH – as required by the user manual.

## **Discussion**

The PRWHE-DK was cross-culturally adapted and demonstrated excellent psychometric properties in test-retest, internal consistency and construct validity.

The PRWHE was translated into Danish by carefully following the dual-panel approach to obtain a valid translation. To adapt the PRWHE for a Danish context, focus was placed on assessing the same construct as the original Canadian version. As seen in other cross-cultural adaptations item 6 was changed from “turning a door knob” to “turning a key”,<sup>12, 28, 31</sup> and the unit of measurement was changed from “pounds” to “kilograms”.<sup>12, 15, 31</sup>

PRWHE-DK showed excellent test-retest reliability, with an ICC<sub>2.1</sub> of 0.94 and a high level of internal consistency above 0.90. This high internal consistency was expected and accepted, given that other studies' findings were similar.<sup>6, 13, 15, 31</sup> However, an alpha above 0.90 indicated a redundancy of items, and it might be that some items could be advantageously deleted in future development.<sup>26</sup> A statistically significant relationship with DASH baseline  $r=0.71$ ,  $p<0.001$  was found, indicating construct validity. The DASH score is lower than the PRWHE-DK score, which might indicate that PRWHE-DK is more sensitive. This finding is in agreement with other studies.<sup>9, 14, 15, 28, 31</sup> It could be because DASH measures ability to perform an activity in general, while PRWHE measures ability to perform the activity with the affected hand. Our results at psychometric tests are all in line with other studies that report on both the original PRWE and PRWHE<sup>5, 6, 9, 10</sup> and other countries' psychometric tests of national translations.<sup>13-15, 28, 31</sup> This supports the validity of the cross-culturally adapted PRWHE-DK.

In the Danish modified version of the PRWE,<sup>22</sup> maximum pain is assessed instead of average pain; for the stated reason that patients had difficulties estimating average pain<sup>22</sup>. However, no patient in the cognitive interviews in this study made a comment that it was difficult to report average pain.

#### Methodological considerations

The dual-panel approach<sup>23-25</sup> was chosen as translation method, instead of the more often used forward-backward translation.<sup>32, 33</sup> This was because of the linguistic benefits from the lay panel evaluation, where item understanding and language are discussed in a way that might not be attainable in a forward-backward translation, where the quality of the translation is checked a posteriori.<sup>24, 25</sup> No obvious psychometric differences exist between the dual-panel approach and a forward-backward translation.<sup>24</sup> However, it has been reported that the target population prefers questionnaires translated by the dual-panel approach.<sup>24</sup>

It is a limitation that all questionnaires were not assessed by the researcher after fulfilment, as recommended in the user manual.<sup>7</sup> Consequently it was not possible to report whether missing items were due to real lack of response or if the item was left blank on purpose, given the option to leave items blank if the activity in question had never been performed with the affected hand. However, most of the 97 patients had no or only one missing item/unanswered item(s). Those with the most unanswered responses had an injury in their non-dominant hand, which is why they might have left the items blank. In some articles – including one by the developer<sup>15, 31</sup> – it is stated that no more than two missing items should be accepted in the pain subscale and no more than four in the functional subscale.<sup>7</sup> None of the participants in the current study reached that number of missing items. However, for future use, it is important

that questionnaires be assessed by the clinician or researcher after fulfilment. Another alternative could be the addition of a “not applicable” response as in the German version of PRWE.<sup>34</sup> “Using my affected hand” was removed in the translation process to increase the understanding as a bimanual task, because, according to the developer, it will be changed in PRWHE to increase this understanding. The lack of response to item 7 could reflect the fact that some patients were vegetarian. For this reason, and to increase the relevance of the item, it was subsequently changed to “cutting food”, as seen in the Arabic translation of PRWHE.<sup>15</sup> The lack of response to items 11 is probably because the toilet paper is not used with their affected hand. However, this is accepted without changes given that this item – according to the developer – is supposed to measure that specific function and not performance of the bimanual task. The lack of response to item 14 might be because many participants were pensioners who were not involved in paid work. For this reason this item was clarified. Hopefully, these clarifications will minimize future lack of responses. Nevertheless, the minor corrections made after the psychometric testing represent a limitation and might influence reliability. However, since reliability was very good, it is unlikely that these small variations would influence the conclusion. Moreover, the additional cognitive interviews made after the psychometric tests further validated the changes.

There are currently no recommendations about optimal days between test and retest, and the choice of 10-14 days could be discussed. It could be argued that, in this relatively long period, changes could have occurred. However, we consider our time period to be appropriate, in that it is long enough to minimize the likelihood that patients would remember and repeat their responses, and because patients with unstable conditions were excluded.

No material floor or ceiling effects were found. However, a limitation is that patients without occupational performance problems were excluded. Furthermore, the inclusion criterion that the patient's hand condition had to be stable for 8 weeks might limit generalizability. In clinical practice, of course, there will be a wide variation in levels of stability. The inclusion criteria were done to ensure stability between test and re-test. There were several patients who did not consider themselves stable between test and retest. They were excluded from the reliability study, but participated in baseline analyses and test of validity.

Most participants were women, which might affect external generalization. However, an excellent ICC<sub>2,1</sub> was found for both women and men, indicating high test-retest reliability for both genders.

The responsiveness of the PRWHE-DK was not investigated in this study and should be tested in future studies.

## **Conclusions**

The PRWHE-DK is a reliable and construct-valid patient-rated outcome measure.

PRWHE-DK can be used in clinical practice and multi-cultural research studies to

measure pain and functional disability in patients with hand-related disorders.

**List of figures**

**Figure 1: Flowchart**

**Figure 2: Bland-Altman plot test and retest**



## References

1. Bennett S and Bennett JW. The process of evidence-based practice in occupational therapy: Informing clinical decisions. *Australian occupational therapy journal* 2000; 47: 171-180.
2. Law MC and MacDermid J. *Evidence-based rehabilitation: A guide to practice*. Thorofare NJ: Slack, 2002.
3. Nielsen KT and Waehrens EE. Occupational therapy evaluation: use of self-report and/or observation? *Scandinavian journal of occupational therapy* 2015; 22: 13-23.
4. Finansministeriet. *Aftaler om den kommunale og regionale økonomi*. København: Finansministeriet, 2017.
5. MacDermid JC. Development of a scale for patient rating of wrist pain and disability. *Journal of hand therapy* 1996; 9: 178-183.
6. MacDermid JC, Turgeon T, Richards RS, et al. Patient rating of wrist pain and disability: a reliable and valid measurement tool. *Journal of orthopaedic trauma* 1998; 12: 577-586.
7. MacDermid J, Turgeon T, Richards RS, et al. The Patient-Rated Wrist Evaluation (PRWE) User Manual, <https://srs-mcmaster.ca/wp-content/uploads/2015/05/English-PRWE-User-Manual.pdf> (2011, accessed 22.06.17 2017).
8. Dacombe PJ, Amirfeyz R and Davis T. Patient-Reported Outcome Measures for Hand and Wrist Trauma: Is There Sufficient Evidence of Reliability, Validity, and Responsiveness? *Hand* 2016; 11: 11-21.
9. Mehta SP, MacDermid JC, Richardson J, et al. A systematic review of the measurement properties of the patient-rated wrist evaluation. *The Journal of orthopaedic and sports physical therapy* 2015; 45: 289-298.
10. MacDermid JC and Tottenham V. Responsiveness of the disability of the arm, shoulder, and hand (DASH) and patient-rated wrist/hand evaluation (PRWHE) in evaluating change after hand therapy. *Journal of hand therapy* 2004; 17: 18-23.
11. Packham T and MacDermid JC. Measurement properties of the Patient-Rated Wrist and Hand Evaluation: Rasch analysis of responses from a traumatic hand injury population. *Journal of hand therapy* 2013; 26: 216-223.
12. Reigstad O, Vaksvik T, Lütken T, et al. PRWHE-skjemaet på norsk – vurdering av hånd- og håndleddsplager. *Tidsskrift for den Norske Legeforening* 2013; 20: 2125-2126.
13. Fairplay T, Atzei A, Corradi M, et al. Cross-cultural adaptation and validation of the Italian version of the patient-rated wrist/hand evaluation questionnaire. *The Journal of hand surgery* 2012; 37: 863-870.
14. Brink SM, Voskamp EG, Houpt P, et al. Psychometric properties of the Patient Rated Wrist/Hand Evaluation - Dutch Language Version (PRWH/E-DLV). *The Journal of hand surgery* 2009; 34: 556-557.
15. Hasani FN, MacDermid JC, Tang A, et al. Cross-cultural adaptation and psychometric testing of the Arabic version of the Patient-Rated Wrist Hand Evaluation (PRWHE-A) in Saudi Arabia. *Journal of hand therapy* 2015; 28: 412-419.

16. Hudak PL, Amadio PC and Bombardier C. Development of an upper extremity outcome measure: the DASH (disabilities of the arm, shoulder and hand). *American journal of industrial medicine* 1996; 29: 602-608.
17. Solway S, Beaton D, McConnell S, et al. The DASH outcome measure user's manual. *Toronto: Institute for Work & Health* 2002.
18. Beaton DE, Katz JN, Fossel AH, et al. Measuring the whole or the parts? Validity, reliability, and responsiveness of the Disabilities of the Arm, Shoulder and Hand outcome measure in different regions of the upper extremity. *Journal of hand therapy* 2001; 14: 128-146.
19. Herup A, Merser S and Boeckstyns M. Validation of questionnaire for conditions of the upper extremity. *Ugeskrift for laeger* 2010; 172: 3333-3336.
20. Dias JJ, Rajan RA and Thompson JR. Which questionnaire is best? The reliability, validity and ease of use of the Patient Evaluation Measure, the Disabilities of the Arm, Shoulder and Hand and the Michigan Hand Outcome Measure. *The Journal of hand surgery* 2008; 33: 9-17.
21. Hoang-Kim A, Pegreff F, Moroni A, et al. Measuring wrist and hand function: common scales and checklists. *Injury* 2011; 42: 253-258.
22. Schonemann JO, Hansen TB and Soballe K. Translation and validation of the Danish version of the Patient Rated Wrist Evaluation questionnaire. *Journal of plastic surgery and hand surgery* 2013; 47: 489-492.
23. Swaine-Verdier A, Doward LC, Hagell P, et al. Adapting quality of life instruments. *Value in Health* 2004; 7: 27-30.
24. Hagell P, Hedin P-J, Meads DM, et al. Effects of method of translation of patient-reported health outcome questionnaires: a randomized study of the translation of the Rheumatoid Arthritis Quality of Life (RAQoL) Instrument for Sweden. *Value in Health* 2010; 13: 424-430.
25. McKenna SP. Measuring patient-reported outcomes: moving beyond misplaced common sense to hard science. *BMC medicine* 2011; 9: 86.
26. de Vet HCW, Terwee CB, Mokkink LB, et al. *Measurement in Medicine: A Practical Guide*. Cambridge: Cambridge University Press, 2011.
27. Mokkink LB, Terwee CB, Patrick DL, et al. The COSMIN study reached international consensus on taxonomy, terminology, and definitions of measurement properties for health-related patient-reported outcomes. *Journal of clinical epidemiology* 2010; 63: 737-745.
28. da Silva Rodrigues EK, de Cassia Registro Fonseca M and MacDermid JC. Brazilian version of the Patient Rated Wrist Evaluation (PRWE-BR): Cross-cultural adaptation, internal consistency, test-retest reliability and construct validity. *Journal of hand therapy* 2015; 28: 69-75.
29. Mehta SP, Mhatre B, MacDermid JC, et al. Cross-cultural adaptation and psychometric testing of the Hindi version of the patient-rated wrist evaluation. *Journal of hand therapy* 2012; 25: 65-77.
30. Portney LG and Watkins MP. *Foundations of clinical research. Applications to practice*. New Jersey: Pearson Education 2009.
31. Mellstrand Navarro C, Ponzer S, Tornkvist H, et al. Measuring outcome after wrist injury: translation and validation of the Swedish version of the patient-rated wrist evaluation (PRWE-Swe). *BMC musculoskeletal disorders* 2011; 12: 171.

32. Wild D, Grove A, Martin M, et al. Principles of Good Practice for the Translation and Cultural Adaptation Process for Patient-Reported Outcomes (PRO) Measures: report of the ISPOR Task Force for Translation and Cultural Adaptation. *Value in health* 2005; 8: 94-104.
33. Beaton DE, Bombardier C, Guillemin F, et al. Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine* 2000; 25: 3186-3191.
34. John M, Angst F, Awiszus F, et al. The patient-rated wrist evaluation (PRWE): cross-cultural adaptation into German and evaluation of its psychometric properties. *Clinical and experimental rheumatology* 2008; 26: 1047-1058.

Table 1: List of issues and decisions made in the PRWHE-DK

Item number	The original items	Problems	Solutions	The final translated items*
3	When lifting a heavy object	It is not clear that it has to be done with the affected hand	Added affected hand, as recommended by the developer	When lifting a heavy object with my affected hand
6	Turn a door knob using my affected hand	Door knob is uncommon in Denmark	Replaced with turn a key, to retain functional equivalents	Turning a key using my affected hand
7	Cut meat using a knife in my affected hand	Surface cut is subordinate Bimanual task	Revised to cut food to retain functional equivalents	Cutting food**
10	Carry a 10lb object in my affected hand	The unit of weight lb is uncommon in Denmark	Revised to metric equivalents (5 kg)	Carrying a 5 kg object in my affected hand
14	Work (your job or usual everyday work)	Lack of response by retirees without work	It was stated more clearly that it is included all usual everyday work	Work (such as your job, education, voluntary work, or other everyday occupations)***

\*the backward translation of the items into English is merely a literal translation, which has been made solely for the purposes of presenting of this article in English.

\*\*Cutting meat was changed to cutting food after the statistical analyses. \*\*\* The examples were stated more clearly after the statistical analyses.

Table 2: Demographic data

		Baseline		Re-test	
		<i>n</i> =97	%	<i>n</i> =60	%
Gender	Women/men	60/37	62/38	40/20	67/33
Injury in dominant hand	Yes/no	47/50	48/52	27/33	45/55
Education	Elementary school	18	18.6	10	16.7
	High school	7	7.2	4	6.7
	Vocational education	25	25.8	14	23.3
	Short-term higher education (<3 years)	9	9.3	8	13.3
	Medium-term higher education (3-4 years)	27	27.8	18	30.0
	Long-term higher education (>4 years)	10	10.3	5	8.3
	Missing	1	1.0	1	1.7
Diagnosis	Arthrosis/arthritis	20	20.6	11	18.3
	Degeneration in tendons or ligaments incl. ganglion	14	14.4	8	13.3
	Fracture in wrist or carpus	12	12.4	8	13.3
	Dupuytren's contracture	9	9.3	6	10.0
	Mixed pain, incl. chronic pain	9	9.3	5	8.3
	Tendon injuries	7	7.2	5	8.3
	Subluxation	6	6.2	5	8.3
	Nerve injuries	6	6.2	4	6.7
	Fractured finger(s)	5	5.2	4	6.7
	Ligament injuries	5	5.2	2	3.3
	Vulnus (open wound)/contusion/crush injury	2	2.1	1	1.7
	Finger amputation	1	1.0	0	0
	Other	1	1.0	1	1.7
DASH*	mean( <i>sd</i> )	37.29 ±18.93		-	

\**n*=94 because of more than three unanswered items in three DASH questionnaires

Table 3: Descriptive statistics for PRWHE-DK and its subscales at baseline and retest

	<u>Baseline n=97</u>			<u>Baseline n=60*</u>			<u>Retest n=60</u>		
	Mean	SD	Range	Mean	SD	Range	Mean	SD	Range
PRWHE-DK pain score (0-50)	27.8	13.1	0 - 49	27.2	12.7	1 - 49	26.4	12.5	0 - 49
PRWHE-DK functional score (0-50)	22.9	12.4	0.5 - 48	22.0	12.2	0 - 46	21.9	11.6	0 - 45.6
PRWHE-DK total (0-100)	50.7	23.9	2 - 97	50.7	24.3	2 - 97	48.3	23.0	2.5 - 95

\*Patients participating in test-retest analysis