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# Cross-cultural Adaptation and Psychometric Testing of the Hindi Version of the Patient-rated Wrist Evaluation

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# Psychometric Properties of the Hindi version of the Patient-rated Wrist/Hand Evaluation

## INTRODUCTION

A number of patient-reported outcomes (PROs) are available for assessing upper extremity injuries. PROs can be joint-specific<sup>1, 2</sup> condition-specific,<sup>3, 4</sup> or global measures of upper extremity (UE) functions and disability.<sup>5, 6</sup> The selection of an instrument, for clinical practice or a research trial, is dependent on the purpose and context of measurement; as well as the measurement properties of the tool.

Distal radius fracture (DRF) is one of the most common injuries; and is the most common fracture. The rates of DRF are increasing in developed countries.<sup>7-9</sup> Individuals who sustain DRF experience pain and dysfunction of wrist and hand area which can last up to a year in some patients.<sup>10, 11</sup> The relationship between physical impairment and self-reported functional hand problems following DRF is typically poor to moderate in correlation.<sup>12-14</sup> PROs can capture the patient's perspective of outcomes following DRF. Furthermore, this perspective may be more related to resumption of normal activities and return to work.<sup>15</sup>

The Patient-rated Wrist Evaluation (PRWE) was primarily developed to assess the constructs of pain and disability in patients with DRF.<sup>2</sup> Subsequent reviews have reported that the PRWE is a reliable, valid, and responsive tool for assessing self-reported pain and disability in patients with DRF and certain other hand injuries.<sup>16, 17</sup> The reliability of the PRWE has been assessed using intraclass correlation coefficient (ICC) in previous studies and has ranged from 0.78 to 0.94 in patients with different wrist/hand injuries suggesting good reliability.<sup>2, 18-21</sup> In particular, items related specifically to the pain and functions in the wrist/hand area make the

PRWE a more suitable outcome for patients with conditions involving this area compared to the global outcomes of UE. Psychometric studies comparing the PRWE and the DASH have indicated that while the DASH is more appropriate for patients who report pain and disability in multiple areas of the UE, the PRWE has superior validity and responsiveness in patients who only have pain and disablement in the wrist/hand area.<sup>22-24</sup> The reported standardized response means (SRM) were 1.51 for the PRWE and 1.37 for the DASH in patients with different wrist/hand injuries<sup>23</sup> and 2.27 for the PRWE and and 2.01 for the DASH in those with DRF.<sup>22</sup> The PRWE, like many PROs was developed in English. It is recommended that PROs be translated and adapted to the culture prior to using them in patients whose first language is not English.<sup>25</sup> Apart from the English version, the PRWE has been translated and adapted in Swedish,<sup>26</sup> German,<sup>19, 20</sup> Chinese (Hong Kong),<sup>27</sup> Dutch,<sup>28</sup> and Japanese languages.<sup>21</sup>

Hindi is the national language of India and is spoken by over 400 million people in India.<sup>29</sup> Apart from Hindi, there are almost 21 regional languages in India. This and the inherent cultural diversity influence the way people communicate in Hindi with uniformity in dialects across India. There are in fact over 50 dialects of Hindi reported by the Census of India. Nonetheless, there are almost 258 million people in India who speak Hindi with no regional or cultural dialects.<sup>29</sup> They are the largest group compared to those who speak Hindi but with different dialects. There is a large Hindi speaking population in western countries such as the United States, Canada, and the United Kingdom. For example, over 500,000 people were estimated to speak Hindi in the United States in 2007.<sup>30</sup> Although many people in North America and Europe whose primary language is Hindi may also speak English, their ability to communicate may not be sufficient to allow them to convey some of the nuances of their disability experiences to clinicians. Some PROs have been translated and adapted for use in

patients whose primary language is Hindi.<sup>31-33</sup> However, no measure is available for assessing pain and functional disability following hand injuries including DRF in patients whose primary language is Hindi. In situations where therapists do not have access to suitable translations, they may rely solely on physical impairment measures. This may affect the extent to which they are able to be patient centered in their treatment approaches. A Hindi version of the PRWE would provide patients whose primary language is Hindi the opportunity to communicate more effectively with their clinicians and participate in clinical research where this outcome measure was being used. Therefore the purposes of this study were: to perform cross-cultural adaptation and translation of the PRWE into Hindi and to estimate the reliability, internal consistency, construct validity, and responsiveness of the PRWE-Hindi (PRWE-H). Our objective was to translate and adapt the PRWE for use in patients who speak Hindi with no specific dialects. In particular, we aimed to obtain the semantic, conceptual, and cultural equivalence between the original PRWE and the PRWE-H during the adaptation and translation procedure.

## **RESEARCH METHODS**

### **Phase 1 - Cross-cultural Adaptation**

The five step cultural translation guidelines proposed by Guillemin et al<sup>25</sup> were followed in adapting and translating the PRWE into Hindi. Forward translation of the PRWE into Hindi was performed in the first step. Two independent translators whose first language was Hindi produced two separate versions of the PRWE-H (H1 and H2). The translators were retired professors of a university in India - one was professor of physics and the other was professor and head department of English. Neither of these two were professional translators, rather they were language specialists. Neither translator had clinical background nor were familiar with the

PRWE. This enabled them to translate the items on the PRWE using the terminology that would be suitable for lay a person.

The translated versions were synthesized in the second step. A reconciliation meeting was held over telephone between two forward translators and one of the authors of this paper. The purpose of this meeting was to derive the synthesized version. This synthesized version (H12) was used for the subsequent steps.

Back translation of the synthesized version (H12) was performed in the subsequent step. Translators whose primary language was English and the secondary language was Hindi were difficult to locate. Therefore, bilingual language experts who had lived in Canada for over 8 years performed the back translation. Both these translators had completed their doctoral as well as post-doctoral training in Canadian universities in fields unrelated to health sciences. Therefore, their English language skills were considered comparable to those whose first language is English.

These two back translations were compared to the original PRWE by one of the authors of this study who is also fluent in Hindi. The inconsistencies in the words and concepts across both the back translations were analyzed.

A pre-final version of the PRWE-H was created in the following step. Cognitive interviews as well as quantitative analysis were conducted to examine the applicability of the PRWE-H in clinical context. Ten lay individuals and ten physiotherapists whose primary language was Hindi were involved in this process. All of them were based in Canada but had emigrated from India. They were asked to explain the meaning of all the questions and instructions on the PRWE-H. Since most of them spoke English as their second language, they were given the English and Hindi versions of the PRWE and asked to rate their satisfaction with

each translated item on a numeric rating scale (NRS). The response for the NRS ranged from 0 to 10 (0 meaning completely dissatisfied and 10 meaning completely satisfied and no changes were required). They were also asked to suggest an appropriate translation in case if their response to any of the translated items was less than 9.

## **Phase 2 - Psychometric Analysis of the PRWE-H**

The psychometric properties of the PRWE-H were examined in the 2<sup>nd</sup> phase of the study.

### **Patients**

Potential patients who were attending the orthopedic unit of a government hospital in India were referred to the physiotherapy department located within the same hospital. These patients were informed about the study and were asked to participate when they presented at the physiotherapy department. An informed consent was obtained if patients agreed to participate in the study. Patients with DRF were included in the study if they were above 18 years of age at the time of recruitment and were able to understand the study requirements. Patients with concurrent injuries to the upper extremities, those with neurological disorders of the upper extremities, and those with cognitive impairments were excluded from the study. Ethics approval for conducting this study was obtained from the relevant research ethics boards.

### **Outcome Measures**

#### *Patient-rated Wrist Evaluation*

The PRWE was specifically developed to measure the constructs of pain and disability in patients following DRF.<sup>2</sup> The PRWE has two subscales of pain and functions. The pain subscale consists of five items inquiring about characteristics of wrist pain. The function subscale has ten

items and is further divided into “specific activities” and “usual activities”. Each item on both the subscales is rated on a numeric rating scale of 0 (no pain/no difficulty) to 10 (worst ever pain/unable to do the activity). The scores for each individual item are added to derive the raw scores for the subscales. The raw score on the pain subscale can range from 0-50 which is eventually considered as the final score for the subscale. The total raw score on the function subscale ranges from 0-100 given that there are 10 items on the subscale. This raw score is divided into half to derive the final score for the subscale that ranges from 0-50. Therefore, both the subscales have equal weightage in the total score of the PRWE which can range from 0 to 100 with higher score depicting greater pain/disability. The patients were asked to complete the PRWE-H and were encouraged to ask questions if they required assistance. The steps describing the administration of the PRWE and scoring instructions have been described in adequate detail.<sup>34</sup>

#### *Visual Analogue Scale (VAS)*

We used 0-10 cm VAS for assessing self-reported pain and disability (VAS-P and VAS-D). The anchors for the VAS- P were “कोई दर्द नहीं” (no pain) and “सबसे ज़्यादा दर्द” (extreme pain). The anchors for the VAS-D were कोई अक्षमता नहीं (no difficulty) and सबसे ज़्यादा अक्षमता (extreme difficulty). These anchors had same wordings as those on the PRWE-H to facilitate the understanding of the scales. The total score on the VAS can range from 0 to 10 with higher score depicting greater pain or disability. The reliability and validity of the VAS has been well-documented in the literature.<sup>35, 36</sup>

#### *Grip Strength*

Grip strength was assessed using the Jamar® Hydraulic Hand Dynamometer (Model J00105, Lafayette Instruments, Lafayette, IN) in the second handle position. The participant was seated with shoulder adducted and neutrally rotated, elbow flexed at 90° and forearm and wrist in neutral position.<sup>37</sup> The patients were asked to press on the handle of the dynamometer within limits of pain and comfort. Three trials were taken for each patient during each session and an average of three trials was used for analysis. Grip strength was extracted in kilograms. The Jamar dynamometer is extensively used in clinical practice for assessing grip strength. Previous studies have indicated that grip strength testing performed by dynamometers has excellent reliability in healthy adults or those with wrist/hand dysfunction as demonstrated by ICC values of >0.9.<sup>38, 39</sup>

#### *Wrist Joint Range of Motion (ROM)*

An 8 inch 360° Stainless Steel Goniometer (Indian Surgical Instruments Co., Jalandhar, India) was used for measuring the ROM in the flexion, extension, supination, pronation, ulnar deviation, and radial deviation for the affected wrist. Patients sat on a chair with the forearm supported and shoulder in 0° of flexion, abduction, and rotation. They were asked to move the wrist or forearm actively through the range and the angle where patients stopped the movement was recorded. These procedures are described in detail elsewhere.<sup>40</sup> The goniometry technique for assessing wrist ROM has demonstrated high reliability (ICC >0.8) in those with or without wrist pathology.<sup>41, 42</sup>

#### *Global Rating of Change (GRC)*

The global rating of change (GRC) was used asking patients to rate their perception of change in clinical status. They rated change in their overall condition on a scale of 1 to 7 (1 being almost same and 7 being completely better).<sup>43</sup> The GRC in Hindi and its translation in English are shown in Appendix 1.

## **Study Protocol**

The first author and the second author collected the data for this study. Baseline assessment was performed after patients agreed to participate in the study. The PRWE-H, VAS-P, and VAS-D were administered to all the patients. Wrist joint ROM and grip strength were assessed using standardized guidelines as mentioned earlier. Grip strength was assessed on both sides to obtain comparative values. Those who had difficulty in completing the PRWE-H were given appropriate instructions in order to maximize their understanding and response. Patients returned after 2-3 days for the second follow-up and after 4-5 weeks for the last follow-up. The similar assessment protocol was repeated at these occasions. Patients also completed the GRC on their last assessment. All the patients continued receiving physiotherapy for rehabilitation of their DRF during the entire period of the study. However, the therapeutic protocols (frequency, intensity of exercises) were developed and implemented by the physiotherapy staff at the hospital with no involvement from the authors of this study.

## **Data Analysis**

Mean scores for the NRS depicting the satisfaction level of physiotherapists and lay people for translated items and instructions on the PRWE-H were calculated. A mean score of 9 or above on the NRS was considered as acceptable satisfaction with the translation. Since this was achieved on all translations, no further efforts were needed to refine the translated items/instructions.

The floor and ceiling effects were determined for the total score as well as the subscales. The floor and ceiling effects were considered if the total score of the PRWE-H ranged between 0-10 and 90-100 respectively. The floor and ceiling effects for the subscales were considered if

the total score ranged between 0-5 and 45-50 respectively. Percentages of patients scoring in this range were calculated. Descriptive statistics were calculated for all the outcomes.

Test-retest reliability of the PRWE-H, its subscales, VAS scales, and grip strength was assessed by obtaining the ICC<sup>44</sup> values. The Bland and Altman technique was used to inspect and analyze the agreement between the scores on the first two occasions. This technique is useful for determining the extent to which two scores agree with each other. The detailed understanding and interpretation of this technique has been provided elsewhere.<sup>45</sup> The differences between the PRWE-H scores on two occasions were plotted against the mean score across both the occasions. The limits of agreement (LOA) ( mean difference  $\pm$  two standard deviations (SD) of the difference) for the mean difference were established to assess the extent of agreement between the scores.<sup>45</sup> A histogram of a difference scores was plotted to see the distribution of the differences on re-test differences. Cronbach's alpha (CA) was used to examine the internal consistency of the PRWE-H and its subscales.

Construct validity was examined by assessing the relationships between the PRWE-H with the VAS-P, VAS-D, grip strength, and wrist AROM. Our hypothesis was that the PRWE-H should demonstrate similar relationships with the measures of impairment and disability as reported in the literature validating the English versions of the PRWE. The data for the first assessment session was used for assessing construct validity. The longitudinal validity of the PRWE-H was assessed by examining the relationships between the change scores (the difference between the 3<sup>rd</sup> and 1<sup>st</sup> occasion) of the outcomes. Pearson's correlation coefficients were calculated to assess the correlation between the PRWE-H and other measures. The responsiveness of the PRWE-H, its subscales, VAS scales, and grip strength was assessed by estimating the effect size (ES) and SRM.<sup>46, 47</sup>

## **HYPOTHESES**

1. Given that we performed cross-cultural adaptation using standardized guidelines, we expected that the mean scores for the NRS reflecting the satisfaction with the translations of the items/instructions on the PRWE-H would be  $\geq 9/10$ .
2. Since the English version of the PRWE has shown high reliability and internal consistency, we anticipated that the PRWE-H and its subscales would also have high reliability and internal consistency as demonstrated by the ICC and CA of  $> 0.75$  respectively.<sup>44</sup>
3. The PRWE-H would demonstrate moderate concordance (r value between 0.5 to 0.7) with the VAS-P and VAD-D since both the VAS measure similar construct to those of PRWE subscales but though only one question. The PRWE-H and its subscales would demonstrate low concordance (r value of  $< 0.5$ ) with the wrist ROM (average ROM) and grip strength since they measure diverse constructs.

## **RESULTS**

### **Cross-cultural Adaptation**

The steps for the cross-cultural adaptation described earlier were completed but not without some issues that emerged while translating the items of the functional subscale. For example, many people in India where Hindi is widely spoken are vegetarians and therefore the question “Cut meat using a knife in my affected hand” was not appropriate for the cultural context. This question was changed to “Cut vegetables using a knife in my affected hand” given that cutting vegetables is a common function in the cultural context. It would have been difficult for patients to estimate 10lb from the question “Carry a 10lb object in my affected hand” since the metric system of measurement is more common in India. Therefore, we modified 10lb to 5

kg (kilograms) in this question to be in line with the metric system of measurement. It took considerable discussion between the forward translators and the first author of this paper to arrive on the consensus for the item “Use bathroom tissue with my affected hand”. This is because tissue is not the only cleaning strategy while using the bathroom within the cultural context of India and it tends to vary based on the socio-economic status and beliefs. Since no preferable wording could be identified; it was decided eventually to accept the inherent variability in this practice as a potential source of variation and no adaptation was performed. Keeping the consistent wordings also allowed there to be greater uniformity in the form as applied to Hindi speaking people living in countries other than India. The questions in the “Usual activities” section involve personal and household functions which did not pose major concerns during the translation and cultural adaptation process.

The mean NRS score was 10/10 for all items except the item “How often do you have pain”. This item received 9/10 from 7 respondents (2 physiotherapists and 5 lay individuals). Evaluators expressed minor concern that patients may have difficulty in determining the “frequency” of pain. However, since their satisfaction was rated high and none of them offered alternate translation for this question, it was decided that this was the most parsimonious translation. Based on the responses on these NRS scores, no changes were made to the pre-final version of the PRWE-H.

A total of 58 patients were recruited for the study. Of which, 8 patients were not able to return for follow-up assessments due to variety of reasons. Figure 1 outlines flow diagram illustrating the recruitment, data collection, and the reasons for lost to follow-up for those 8 patients. Baseline characteristics for the participants are shown in Table 1. None of the patients had any major concerns in answering questions of the PRWE-H. Some patients required

assistance during the first data collection session to understand the scaling structure of the PRWE-H and the VAS scales. This reflects a general lack of familiarity with PROs since they are not commonly used in physiotherapy practice in India. One of the common verbal descriptions that most patients understood was the analogy of one rupee being 100% and rating their pain/disability in paisa (100 paisa = 1 Rupees). For example, 60 paisa would mean 6/10 on NRS. Patients were also able to respond to VAS scales by interpreting this analogy.

No floor/ceiling effects were observed for the total score as well as the pain subscale of the PRWE-H. The ceiling effect for the function subscale was observed in 8% of patients (scores > 45). Descriptive statistics (mean ± standard deviation) of the PRWE-H, its subscales, VAS scales, grip strength, and wrist movements across all three occasions are shown in Table 2. As observed, all the outcomes showed improvement on the second assessment. The box plots for the PRWE-H and its subscales for all the three occasions are shown in Figure 2.

### **Reliability and Internal Consistency**

Test-retest reliability and internal consistency and were high (> 0.75 ) for the PRWE-H and its subscales as shown in Table 3 and consistent with our hypothesis. The ICC values the VAS scales and the grip strength was in the range of 0.83-0.85 also suggesting good test-retest reliability. The Bland and Altman plot demonstrated a tendency for better performance on the retest occasion (mean difference = 6.5) with a two standard deviation limit of almost 18 points around that difference (Figure 3).

### **Construct validity**

Table 4 demonstrates the correlations between the PRWE-H and the VAS-P, VAS-D, average wrist ROM, and grip strength. The highest correlation was observed between the

functions subscale of the PRWE-H and the VAS-D ( $r = 0.88$ ). The PRWE-H showed high correlations with the VAS-P and VAS-D ( $r > 0.7$ ). The pain subscale of the PRWE-H showed moderate correlation ( $r = 0.59$ ) with the VAS-P and low correlation ( $r = 0.48$ ) with the VAS-D. The PRWE-H and its subscales showed low correlations ( $r < 0.5$ ) with wrist AROM. Table 5 shows the results of longitudinal validity assessment of the PRWE-H with the other outcomes. The PRWE-H showed moderate correlation with the VAS-P and VAS-D ( $r = 0.66$ ). The subscales of the PRWE-H had moderate to low correlations with the VAS-P and VAS-D ( $r < 0.7$ ).

### **Responsiveness**

The PRWE-H scores changed significantly (mean change in total score = 34.1,  $p = 3.8E-24$ ; pain subscale = 13.4;  $p = 9.6E-20$ ; function subscale = 4.1E-22) on the 3<sup>rd</sup> occasion compared to the 1<sup>st</sup> assessment suggesting improvement in the status of patients. The effect size and the SRM for the total score of the PRWE-H were 2.16 and 2.66 respectively. The standard error of measurement (SEM) was 5.4 and the minimal detectable change at 90% confidence level (MDC<sub>90</sub>) was 12.5. Similarly, large effect sizes were observed for the subscales of the PRWE-H, VAS scales, and grip strength on the affected side. Table 6 summarizes the responsiveness statistics for all the outcomes.

### **DISCUSSION**

To our knowledge, the PRWE-H is the first outcome measure in Hindi for hand therapists. This study provides primary evidence regarding the reliability, validity, and responsiveness of the PRWE-H in patients with DRF. Given the large Hindi speaking population in India and worldwide, the PRWE-H will be a useful tool for hand therapists while assessing Hindi speaking patients.

The availability of this tool is particularly important given that PRO is not common in physiotherapy practice in India. This explains why some patients needed greater explanation of the purpose of the self-report and how to use visual analogue scales since this would have been their first exposure to the concept. This observation has important implications for using the PRWE in clinical as well as research purposes in India or other areas where patients have not been previously exposed to the concept of self-report. Whereas it is common practice in North America to have patients complete instruments by mail or while sitting in the waiting room;<sup>26</sup> this strategy might not be appropriate in circumstances where patients do not have a frame of reference for self-report.

The gender distribution in our study was atypical for DRF studies (28 males out of 50 patients). This is in contrast to the established epidemiology data that indicate that females are 4 times more likely to sustain DRF.<sup>8, 9</sup> Previous studies that assessed the psychometric properties of the PRWE in other languages also recruited greater females<sup>19-21, 26</sup> with one exception.<sup>27</sup> The male to female sex ratio is 1000:933 in India indicating greater male population.<sup>48</sup> However, this alone is unlikely to have accounted for our gender distribution. Though little is known regarding the epidemiological data and rate of DRF in Indian population, previous studies that followed patients with DRF in India also had greater number of male participants.<sup>49, 50</sup> The trends of recruitment evident from these studies and from the current study indicate that the rate of DRF may have been greater in male population in India. Variations in injury rate may be related to occupational or cultural differences between India and European/North American epidemiological studies of DRF.

The retest reliability of the PRWE-H and its subscales was high with ICCs ranging from 0.76-0.85 in our study, which was consistent with our pre-defined hypothesis of obtaining high

reliability. The ICC values for the VAS scales and grip strength were also between 0.83-0.85. These values may serve as reference especially for those who use the VAS scales in Hindi. Our ICC values were lower than the reported values in previous studies that examined the reliability of the translated or original versions of the PRWE where ICCs exceeded 0.90.<sup>2, 19-21, 26</sup> We conducted the first assessment on the day patients presented to the physiotherapy department. Since patients with uncomplicated DRF improve rapidly with advice and hand therapy,<sup>51</sup> some of our patients already had improvement in pain and functions by the second assessment conducted 2-3 days later. A number of our analyses confirm that true improvement over the short interval may have been responsible for our somewhat lower reliability coefficients. Our analysis showed that the PRWE-H scores improved significantly from the first to second assessment which occurred 2 to 3 days later ( $55 \pm 15.8$  to  $48.5 \pm 12.7$ ,  $p < 0.001$ ). This trend of improvement was also evident in the other outcomes as shown in the Table 2. Our Bland and Altman plots also demonstrated this systematic improvement with an overall “bias” of scores being a mean of 6.5 points better on the retest occasion. Two to 7 days is a common retest interval when assessing reliability and is generally thought to capture it in time interval where patients could be expected to remain stable. If patients remain stable then variations between scores are likely to indicate measurement error. However, when patients improve this error is composed of measurement error as well as true change. In such cases the ICC may underestimate the true reliability of the measure. One approach that could be used to overcome this limitation would have been to conduct the first assessment after 2-3 weeks of hand therapy to ensure that patients’ clinical status had become stable. However, many of the patients would already have improved significantly by this time<sup>51</sup> and therefore this approach would not have provided a valid indication of the change. Another alternative is to use a shorter retest interval. However it raises

concerns about patients remembering responses and thereby introducing a recall bias that would overestimate reliability. We suggest that future investigations of acute conditions may consider performing repeated assessments on successive days to balance the potential effect of these two experimental concerns.

The CA for the PRWE-H was 0.89 for the total score and 0.86 and 0.92 for the pain and functions subscales respectively. These values for the CA are comparable to previous studies that assessed the internal consistency of the translated versions of the PRWE.<sup>19-21, 26</sup>

The construct validity of a PRO is usually assessed by examining its relationship with other outcomes that are either considered gold standard or at least measure similar construct. Previous psychometric studies conducted using English version of the PRWE had an advantage in that they were able to assess the relationship of the PRWE with a region-specific scale such as the Disabilities of Arm, Shoulder, and Hand (DASH)<sup>20, 21, 26</sup> and global health status measure such as the Short-Form 36.<sup>19-21, 27</sup> Since there is no hand or upper extremity outcome measure in Hindi, we had to assess the construct validity of the PRWE-H and its subscales by examining their relationship with the one item outcomes such as the VAS-P, VAS-D as well as the objective outcomes such as the ROM and grip strength of the affected side. Nonetheless, our results are consistent with the a priori hypothesis and agree with data reported in English version based studies; where outcomes measuring similar constructs (pain subscale of the PRWE-H v/s VAS-P and function subscale of the PRWE-H v/s VAS-D) demonstrate moderate to high concordance ( $r > 0.5$ ). Conversely, those measuring diverse constructs (PRWE-H and its subscales v/s wrist ROM and grip strength) demonstrated low concordance ( $r < 0.5$ ).<sup>19-21, 26, 27</sup> These trends were consistent in the correlation of the change scores.

Our data indicates that the PRWE-H and its subscales were highly responsive in detecting clinical change over 4-5 weeks in patients with DRF (ES = 2.2 and SRM = 2.7). These values are equal or higher compared to previous studies that assessed the responsiveness in the English<sup>22</sup> or translated versions of the PRWE.<sup>21, 26</sup> The magnitude of the effect size is excellent<sup>47</sup> and has important considerations for research studies provided they recruit similar patient group. Given this large ES, a smaller sample can be adequate to examine the effectiveness of therapeutic interventions in patients with acute DRF. However, these values often change within different contexts and therefore future studies can contribute to a robust estimate of the ES for the PRWE-H and its subscales in patients with DRF across different settings. The SEM and the MDC<sub>90</sub> values for the PRWE-H were almost same as those reported by Schmitt et al.<sup>18</sup> for the English version of the PRWE. Also worth noting are the ES and SRM for the VAS scales which had their anchors in Hindi. No previous study has examined the responsiveness of the VAS scales in Hindi and the ES and SRM values calculated in this study will serve as reference for future studies that use VAS in Hindi. The responsiveness indices for the grip strength in patients with DRF was higher in our study (ES = 1.67 and SRM = 1.34) compared to previous study that recruited patients with volar locking plate following DRF.<sup>52</sup> Patient were recruited in an acute phase in our study where they received physiotherapy to improve hand functions, whereas Kotsis et al 2007<sup>52</sup> recruited patients 3 months after the surgery and had completed their therapy protocols. The moderate responsiveness observed in their study could be because the recovery in these patients may have optimized at the recruitment stage.

Despite our promising findings, our study had limitations. We recruited a convenience sample. Although we obtained results that were consistent with our hypotheses, we would have been able to establish more precise estimates had we measured a larger sample. Secondly, our

results were based on an acute DRF and may not be generalizable to other populations. The acute situation favored achieving high responsiveness indices; but compromised our ability to establish reliability in a stable population. Since the reliability and validity estimates vary depending on the clinical context, additional psychometric studies performed across other contexts are needed to provide more comprehensive information on the performance of the PRWE. Lastly, many people in India also speak other languages such as their regional languages or even English. The potential impact of this translation should be considered in this context. The future work should focus on assessing the utility of the PRWE-H in people from different regions of India as well as Hindi speaking people living in western countries such as the United States, Canada, and the United Kingdom. Finally, since the use of PRO is just emerging in India the translation of other instruments and training for clinicians in how to incorporate them into their clinical decision-making will be required before the full impact of this or other PRO instruments can be seen in clinical practice.

## **CONCLUSION**

This study developed and validated the first PRO for the hand therapists involved in the care of patients whose primary language is Hindi. The study used rigorous methods for translating and culturally adapting the PRWE in Hindi as well as assessing the psychometric properties of the translated version. The results of this study offer preliminary support to the reliability, validity, and responsiveness of the PRWE-H. Future work should be aimed at validating the PRWE-H across different hand conditions and testing its utility across different regions of India as well as in Hindi speaking people living in western countries.

## **Figure Legends**

**Figure 1.** This flow diagram illustrates the recruitment and flow of the patients recruited in this study.

**Figure 2.** The box plots for the PRWE-H and its subscales for all the three occasions are shown in this figure.

**Figure 3.** The agreement between the PRWE-H scores on 1<sup>st</sup> and the 2<sup>nd</sup> assessment sessions is shown in this figure. The lines for the limits of agreement and the mean difference are illustrated.

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## Tables

**Table 1. Demographic of the Patients**

<b>Parameter</b>	<b>Statistic</b>
Total number of patients	50
Age (years) (Mean $\pm$ SD)	46.3 $\pm$ 14.3
Male	28
Age (Mean $\pm$ SD)	48 $\pm$ 16.2
Female	22
Age (Mean $\pm$ SD)	44.3 $\pm$ 11.5
Side of DRF (right/left)	35/15
Grip strength (Kg)	
Affected side (Mean $\pm$ SD)	4.4 $\pm$ 4.5
Unaffected side (Mean $\pm$ SD)	24.9 $\pm$ 8.8
Hand dominance (right/left)	43/7

SD, standard deviation; DRF, distal radius fracture; Kg, Kilogram

	Occasion 1		Occasion 2		Occasion 3	
	Mean	SD	Mean	SD	Mean	SD
PRWE-H pain	23	6.7	20.7*	5.6	9.7*†	3.9
PRWE-H functions	32	11.2	27.8*	9.4	11.3*†	7.1
PRWE-H total	55.1	15.8	48.5*	12.7	20.9*†	9.9
VAS pain	5.7	1.7	5*	1.6	2.5*†	1.2
VAS disability	6.6	2.3	5.6*	1.8	2.7*†	1.5
Grip strength affected	4.4	4.5	6*	5.8	12.1*†	7.3
AROM flexion	48.6	19	56.5*	17.5	79.1*†	9
AROM extension	34	20.8	44.6*	22	74.8*†	16.5
AROM supination	39	28.5	48.4*	24.8	74.4*†	14
AROM pronation	77.1	16.7	81.4*	13	86.7*†	5.1
AROM UD	24.7	8.4	29.9*	11.1	37.1*†	5.2
AROM RD	9.7	6.5	14.3*	7.5	22.3*†	7.5

**Table 2. Descriptive Statistics of the Outcomes for all Three Occasions**

SD, standard deviation; PRWE-H, patient-rated wrist evaluation - Hindi; AROM, active range of motion; UD, ulnar deviation, RD, radial deviation

\* Significant at  $p < 0.05$  compared to 1<sup>st</sup> assessment

† Significant at  $p < 0.05$  compared to 2<sup>nd</sup> assessment

**Table 3. Reliability and Internal Consistency**

	<b>ICC (95% CI)</b>	<b>CA</b>
PRWE-H	0.81 (0.69, 0.89)	0.89
PRWE-Pain	0.76 (0.61, 0.86)	0.86
PRWE-Functions	0.85 (0.75, 0.91)	0.92
VAS-P	0.84 (0.73, 0.91)	-
VAS-D	0.83 (0.71, 0.91)	-
Grip strength	0.85 (0.75, 0.91)	-

PRWE-H, patient-rated wrist evaluation; ICC, Intraclass correlation coefficient; CI, confidence interval; CA, Cronbach's alpha; PRWE, patient-rated wrist evaluation; VAS-P, visual analogue scale - pain; VAS-D, visual analogue scale - disability

**Table 4. Correlation between the Measures**

	VAS-Pain	VAS- Disability	AROM-all movements	Grip strength
PRWE-H Total	<b>0.74**</b>	<b>0.83**</b>	0.17	<b>0.6**</b>
PRWE-H Pain	<b>0.59**</b>	0.48**	0.03	0.35*
PRWE-H Functions	<b>0.68**</b>	<b>0.88**</b>	0.25	<b>0.64**</b>

PRWE-H, patient-rated wrist evaluation- Hindi; VAS, Visual analogue scale;

AROM, Active range of motion

\* correlation significant at  $p < 0.05$

\*\* correlation significant at  $p < 0.01$

r values in bold indicate moderate or high correlation

**Table 5. Correlation between the change scores of the Measures**

	VAS-Pain	VAS- Disability	AROM-all movements	Grip strength
PRWE-H Total	<b>0.66**</b>	<b>0.66**</b>	0.36*	0.35*
PRWE-H Pain	<b>0.72**</b>	<b>0.52**</b>	0.26	0.22
PRWE-H Functions	0.32*	<b>0.62**</b>	0.2	0.35*

PRWE-H, patient-rated wrist evaluation- Hindi; VAS, Visual analogue scale;

AROM, Active range of motion

\* correlation significant at  $p < 0.05$

\*\* correlation significant at  $p < 0.01$

r values in bold indicate moderate or high correlation

**Figure 1. Flow Diagram Illustrating Recruitment and Data Collection**

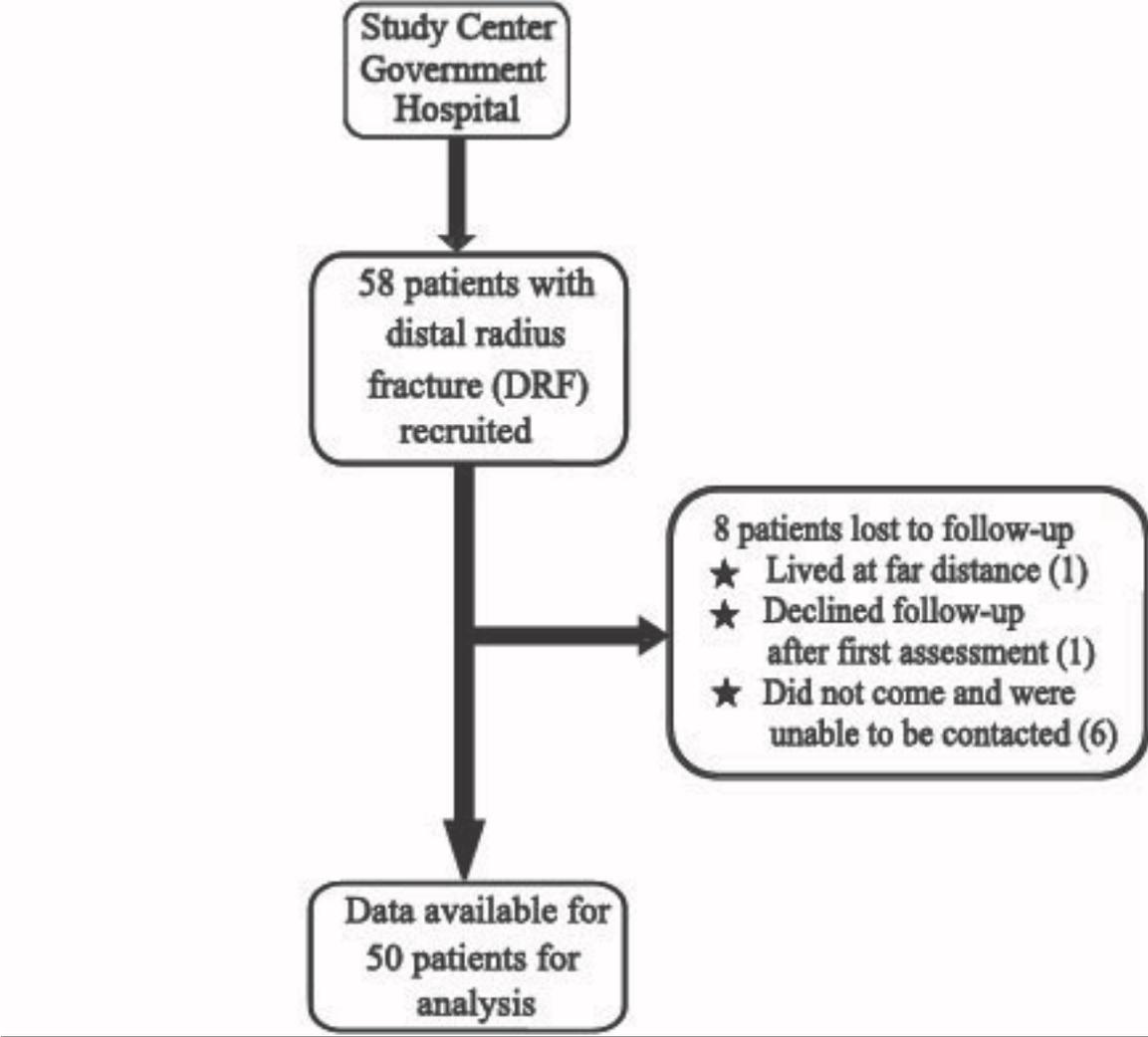


Figure 2. Scores of the PRWE-H and its Subscales on all Three Occasions

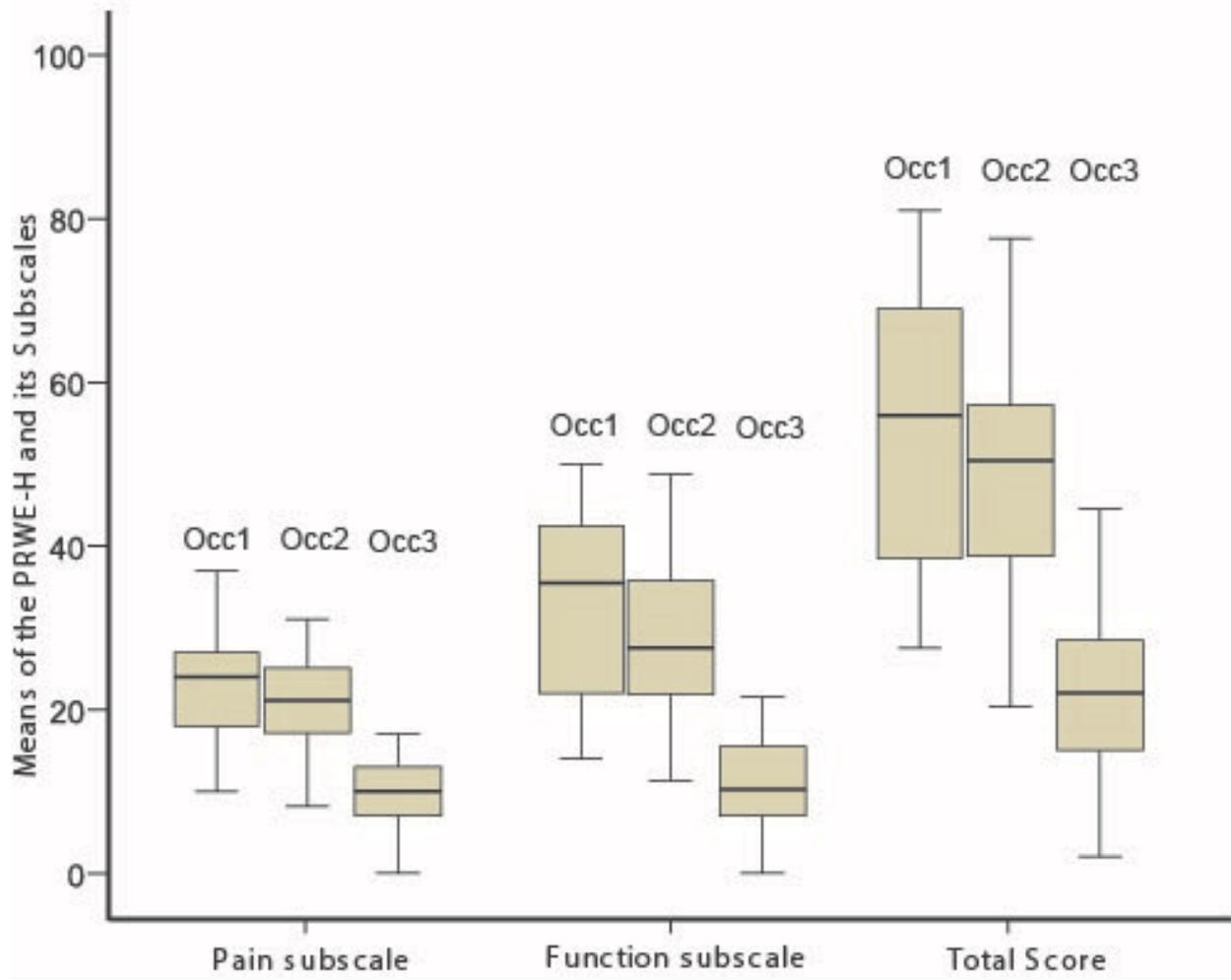
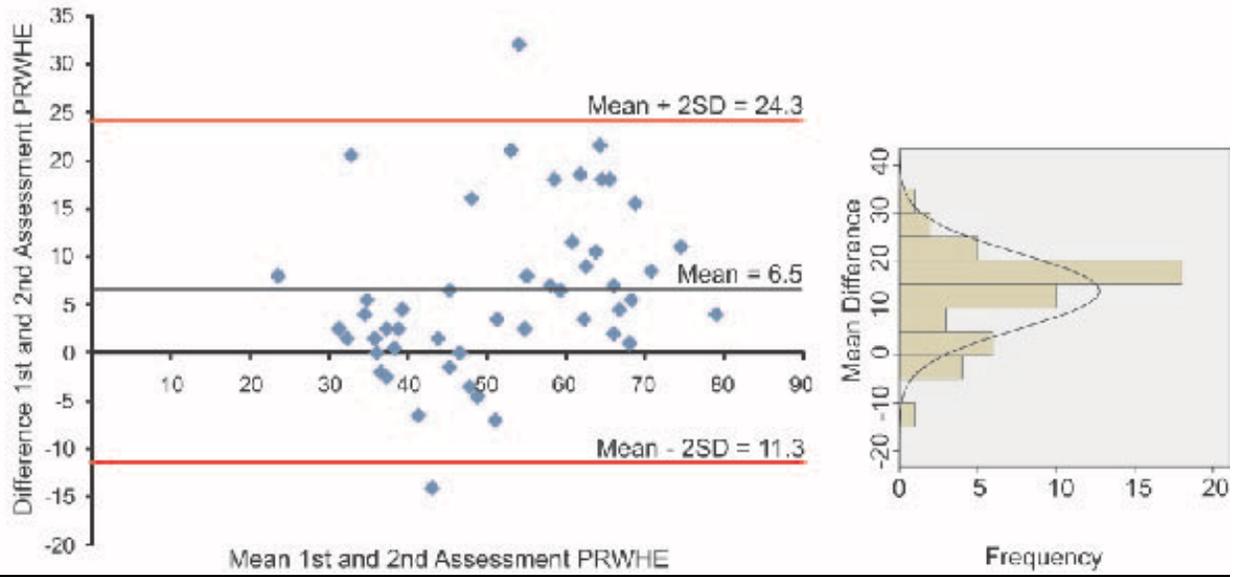


Figure 3. Bland and Altman Plot



## Appendix 1

### आपकी कलाई की परिस्थिति में कुल रूप से परिवर्तन का मूल्यांकन

1. करीब वही, कोई फ़र्क नहीं
2. बहुत थोड़ा सा फ़र्क
3. कुछ फ़र्क
4. मध्यम रूप से फ़र्क
5. अच्छा खासा फ़र्क
6. बहुत ज़्यादा फ़र्क
7. पूरा फ़र्क, अब कोई तकलीफ़ नहीं

### English Translation

#### Assessment of total change in the condition of your wrist

1. Almost same, no difference
2. Very little difference
3. Some difference
4. Moderate difference
5. Quite a bit of difference
6. Extreme difference
7. Complete difference, no difficulty now

## Appendix 2

दर्दी का नाम:

तारीख:

### कलाइ/हाथ की समस्या का मरीजकृत मूल्यांकन

निम्नलिखित सवाल पिछले सप्ताहमें आपकी कलाइमें कितनी समस्या थी वो जानने में हमारी मदद करेंगे। **पिछले सप्ताह** दरम्यान आपकी कलाइकी **एवरेज** तकलीफो को आप 0-10 के स्केल में बताएँगे। कृपया **सभी** सवालो के जवाब दीजिए। अगर आपने पिछले सप्ताह में कोई एक प्रवृत्ति नहीं की हो तो कृपया दर्द का या होनेवाली तकलीफ का **अंदाज़ा** लगाकर जवाब दीजिए। अगर आपने **कभी** वो प्रवृत्ति नहीं की हैं तो जवाब मत दीजिए।

## 2. कामकाज

### A. विशिष्ट प्रवृत्तियाँ

निम्नलिखित हरेक प्रवृत्ति करते समय आपको पिछले सप्ताहमें **जो मात्रामें तकलीफ हुई** उसका मूल्यांकन 0-10 के स्केल मे वो अंक पर वर्तुल लगाकर कीजिए जो सही तरीके से आपकी तकलीफ को दर्शाता है। **0** दर्शाता हैं की आप को ज़रा भी तकलीफ नही हुई और **10** दर्शाता है की आप को इतनी ज़्यादा तकलीफ हुई की आप वो प्रवृत्ति कर ही नही पाए।

स्केल का नमूना



0 1 2 3 4 5 6 7 8 9 10

कोई तकलीफ नही

प्रवृत्ति करने  
में असफल

## कलाई/हाथ की समस्या का मरीजकृत मूल्यांकन

प्रभावित हाथका उपयोग करके दरवाजे की घुंड़ी (door-knob) घुमाना	0	1	2	3	4	5	6	7	8	9	10
प्रभावित हाथमें छुरी पकड़ के सब्जी काटना	0	1	2	3	4	5	6	7	8	9	10
कमीज़ के बटन बँध करना	0	1	2	3	4	5	6	7	8	9	10
कुर्सी से उठने के लिए प्रभावित हाथ का उपयोग करना	0	1	2	3	4	5	6	7	8	9	10
प्रभावित हाथ से 5 किलो की वस्तु उठाना	0	1	2	3	4	5	6	7	8	9	10
प्रभावित हाथ से बाथरूम टिशू का उपयोग करना	0	1	2	3	4	5	6	7	8	9	10

### B. सामान्य प्रवृत्तियाँ

निम्नलिखित सामान्य प्रवृत्तियाँ करते समय आपको पिछले सप्ताहमें जो मात्रामें तकलीफ हुई उसका मूल्यांकन 0-10 के स्केल में वो अंक पर वर्तुल लगाकर कीजिए जो सही तरीके से आपकी तकलीफ को दर्शाता है। "सामान्य प्रवृत्तियाँ" अर्थ वो प्रवृत्तियाँ से हैं जो आप कलाई की समस्या शुरू होने से पहले करते थे। 0 दर्शाता है की आप को ज़रा भी तकलीफ नहीं हुई और 10 दर्शाता है की आप को इतनी ज़्यादा तकलीफ हुई की आप उसमें से कोई भी सामान्य प्रवृत्ति कर ही नहीं पाए।

व्यक्तिगत देखभाल की प्रवृत्तियाँ (कपड़े पहनना, स्नान करना)	0	1	2	3	4	5	6	7	8	9	10
घरेलू प्रवृत्तियाँ (सफाई, घर का मेंटेनंस)	0	1	2	3	4	5	6	7	8	9	10
काम (आपकी नौकरी या हररोज का काम)	0	1	2	3	4	5	6	7	8	9	10
मनोरंजन देनेवाली प्रवृत्तियाँ	0	1	2	3	4	5	6	7	8	9	10

### दिखावट - अनिवार्य नहीं (निम्नलिखित प्रश्नों के जवाब देना अनिवार्य नहीं)

आपके हाथ की दिखावट का आपके लिए कितना महत्व है?  बहुत ज़्यादा  थोड़ा बहुत  बिल्कुल नहीं

पिछले सप्ताहमें आपको अपने हाथ की दिखावट से कितना असंतोष था उसका वर्णन आप सही अंक पर वर्तुल लगाकर कीजिए.

0	1	2	3	4	5	6	7	8	9	10
कोई असंतोष					संपूर्ण					
नहीं					असंतोष					

कोई और टिप्पणियाँ