

Evaluation of the Content Validity Index of the Australian Canadian hand OA Index, the Patient-Rated Wrist/Hand Evaluation and the Thumb Disability Exam in people with hand arthritis

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Keywords: osteoarthritis, rheumatoid arthritis, psoriatic arthritis, content validity, hand arthritis

DOI: <https://doi.org/10.21203/rs.3.rs-32151/v1>

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Abstract

Background

The Australian Canadian hand OA Index (AUSCAN), the Patient-Rated Wrist/Hand Evaluation (PRWHE) and the Thumb Disability Exam (TDX) are patient-reported outcome measures (PROM) used to assess pain and hand function in patients with hand arthritis. This study evaluated the content validity of PRWHE, AUSCAN and TDX.

Methods

This study enrolled participants with hand arthritis to rate the items of all 3 PROM in terms of relevance and clarity. The Content Validity Index (CVI) was computed for each item in each scale (I-CVI) as well as for the overall scale (S-CVI). Kappa was used to determine the inter-rater agreement among the experts.

Results

Overall, 64 individuals with hand arthritis (27% with OA, 67% with rheumatoid arthritis and 6% with psoriatic arthritis) participated in the study. The I-CVI for all items and all scales was very high (I-CVI > 0.76) and the modified Kappa agreement among the raters demonstrated excellent agreement ($k > 0.76$). The S-CVI for all PROMs was found very high for relevance (PRWHE = 0.85, 95% CI 0.82 to 0.88; TDX = 0.87, 95% CI 0.85 to 0.89 and AUSCAN = 0.92, 95% CI 0.90 to 0.94) and for clarity (PRWHE = 0.95, 95% CI 0.93 to 0.97; TDX = 0.91, 95% CI 0.89 to 0.94 and AUSCAN = 0.99, 95% CI 0.98 to 1.00) respectively.

Conclusions

This study demonstrated very high content validity indices for the PRWHE, AUSCAN, and TDX; with strong consensus across reviewers. This augments prior statistical evidence supporting statistical measurement properties, to provide support for the content validity.

Introduction

Hand osteoarthritis (OA) is one of the most common musculoskeletal diseases and a leading cause of disability with an increasing prevalence mainly attributed to increased life expectancy.[1,2] Clinical characteristics of hand OA typically involve pain, reduced hand function, decreased hand grip strength, poor quality of life[3,4] joint degeneration, bony enlargements and joint swelling.[5] Rheumatoid arthritis, although leading to bone tissue abnormalities, loss of joint function and impact on quality of life similarly to OA, is a distinct pathology that mainly targets synovial and soft tissue structures.[6]

Patient-reported outcome measures (PROMs) are often administered to assess any health-related changes that may have occurred as a consequence of health-management interventions.[7,8] Many properties are important[9–12] during an instrument development but a key property is considered to be

content validity.[13] Content validity can be defined as the degree of which the instrument or the questionnaire is an adequate reflection of the construct being measured.[14] Based on the Consensus-based Standards of the selection of health Measurement Instruments (COSMIN) initiative content validity is considered as one of the most important measurement properties.[13] While reliability, responsiveness and other types of validity can be pivotal for an outcome assessment they may be insufficient to establish the validity of a PROM.[15] When PROMs include irrelevant items and lack of clarity they are inefficient, and may have weaker measurement properties.[13] Most importantly, if key aspects are missing or the questions are not relevant responses, they may not reflect patient status or concerns, and may be biased because patients may get frustrated.[16]

The Australian Canadian hand OA Index (AUSCAN)[17], the Patient-Rated Wrist/Hand Evaluation (PRHWE)[17]and the Thumb Disability Exam (TDX)[18] are clinical tools designed to assess pain and hand function in hand arthritis. Their psychometric properties such as reliability, validity and responsiveness have been adequately studied however, the evaluation of relevance and clarity of all the individual items by including patient input as experts has not been quantified. Therefore, we aimed to investigate the quantification of content validity index by asking patients with hand arthritis to rate each of the instruments items in terms of relevance and clarity.

Primary Objective

To evaluate the Content Validity Index (CVI) of Patient-Rated Wrist Evaluation (PRWE), Australian and Canadian Osteoarthritis Index (AUSCAN) and Thumb Disability Exam (TDX) in patients with hand arthritis.

Methods

Study Design

This study was a cross-sectional design that investigated the content validity of patient-reported outcomes (PRWE, AUSCAN and TDX) for hand arthritis. Ethical approval was granted from the Hamilton Integrated Research Ethics Board (HiREB).

Inclusion criteria:

1. The participant is able and willing to provide informed consent
2. Participants between 18 - 85 years old
3. The participant is of any gender
4. The participant has been diagnosed with hand arthritis.
5. The participant can read and write English.

Exclusion criteria

1. If participant has not been diagnosed with hand arthritis
2. If people cannot answer the survey questions and they do not understand English.

Setting and Recruitment

Participants were recruited through poster advertisements at The Roth McFarlane Hand and Upper Limb Centre (HULC) at St. Joseph's Health Care Hospital in London, Ontario and through The Arthritis Society main website. The patients that expressed interest to participate in the study received a letter of information about the survey. separate Both electronic and paper versions of the survey were available for participants. An email with the link of the online survey was sent out to the participants that were interested to complete the electronic version. The electronic version was hosted on Qualtrics which is a secure data collection platform.[19] Participants were asked to provide consent to proceed into the survey questions.

Patient-reported Outcome Measures

The Australian and Canadian Osteoarthritis Index (AUSCAN) is a 15-item self-reported disease specific questionnaire measuring pain (5-items), function (9-items) and stiffness (1-item) in the hand on a scale from 0 – none to 4 – extreme for all items.[17,20] The Patient-Rated Wrist/Hand Evaluation (PRWE) is a self-administered questionnaire which has 2 subscales of pain (5-items) and function (10-items). The PRWE was originally developed and tested for people with distal radius fracture (DRF)[21–23] and later validated as applicable to the wrist/hand for multiple conditions including arthritis as the PRWHE. [17,24] Each item is scored from 0 to 10 scale which 10 indicates the worst possible pain or disability. The Thumb Disability Exam (TDX) is composed of 20 questions divided into 3 sections: hand function (11-items), pain (5-items) and satisfaction (4-items). Each item for hand function is scored from 1 – not difficult to 5 – unable, for level of pain 1 – never to 5 – always and for satisfaction from 1 – very satisfied to 5 – very dissatisfied. [18]

Data Analysis

Descriptive statistics were used to capture the demographics characteristics of the included sample. A Content Validity Index (CVI) value was computed for each item on the AUSCAN, PRWE and TDX (I-CVI) as well as for the overall scale (S-CVI). To calculate an item-level CVI (I-CVI), patients with hand arthritis were asked to rate the relevance of each item, on a 4-point scale. Four ordinal points were used for each scale which was 1=not relevant, 2=somewhat relevant, 3=quite relevant, 4=highly relevant. Then, for each item, the I-CVI was computed as the number of patients giving a rating of either 3 or 4, divided by the number of experts—that is, the proportion in agreement about relevance and clarity which is between 0 and 1. To calculate the modified kappa statistic, the probability of chance agreement (Pc) was first calculated for

each item by the following formula: $P_c = [N! / A! (N - A)!] * 0.5^N$ with N being the number of experts (patients with arthritis) and A is the number of patients that agree that the item was clear or relevant. Then Kappa was calculated of entering the probability of chance agreement (P_c) and content validity index of each item (I-CVI) in the following formula: $K = (I-CVI - P_c) / (1 - P_c)$. Kappa values of 0.74 and above were considered as excellent, 0.60 to 0.74 as good and 0.54 to 0.59 as fair.[25] We performed a Shapiro-Wilk as the omnibus test for assessing univariate normality of each S-CVI distribution, in both relevance and clarity subscales of PROMs. Then, the S-CVI scores were compared with a paired student's t-Test if normality assumption was met or with Wilcoxon paired signed-ranks test, if assumptions of normality were violated. [26] We conducted all the analyses with STATA (StataCorp. 2019. Stata Statistical Software: Release 16. College Station, TX: StataCorp LLC)

Results

Overall, 64 individuals with hand arthritis (27% with hand OA, 67% with rheumatoid arthritis in the hand and 6% with psoriatic arthritis) participated in the study. Four individuals were excluded from the analysis because their arthritis was not affecting their hand. The majority of the participants (66%) were taking pain medication on a daily basis (Table 1).

Content Validity Index and Modified Kappa agreement of the PRWHE

The I-CVI and the S-CVI of the PRWHE for pain subscale and function subscales all supported the content validity of the PRWHE (Table 2). Five items of pain subscale were rated for relevancy and clarity with I-CVI values ranging from 0.79 to 0.89 and from 0.87 to 0.94, respectively. For function subscales, 10 items were rated for relevancy and clarity with I-CVI values ranging from 0.79 to 0.95 and from 0.92 to 1.00 respectively. The S-CVI for PRWHE was 0.85, 95% confidence intervals (CI): 0.82 to 0.88 for relevance and 0.95, 95% CI: 0.93 to 0.97 for clarity. The modified Kappa agreement for every item of PRWHE demonstrated excellent agreement (K ranging from 0.79 to 1.00).

Content Validity Index and Modified Kappa agreement of the TDX

The I-CVI and the S-CVI supported the content validity of the TDX for hand function, pain and satisfaction subscales (Table 3). Eleven items of hand function were rated as relevant and clear with I-CVI values ranging from 0.82 to 0.93 and from 0.94 to 0.98 respectively. For pain subscale, five items were rated as relevant and clarity with I-CVI scores ranging from 0.78 to 0.85 and from 0.77 to 0.86 respectively. For the satisfaction subscale, four items were rated as relevant and clear based on I-CVI demonstrating scores from 0.83 to 0.95 and from 0.88 to 0.91. The S-CVI of TDX was rated as relevant and clear based on scores of 0.87, 95% CI: 0.85 to 0.89 for relevancy and 0.91, 95% CI: 0.89 to 0.94 for clarity. The modified Kappa agreement demonstrated excellent inter-rater agreement on item ratings (K ranging from 0.77 to 0.98).

Content Validity Index and Modified Kappa agreement of the AUSCAN

The I-CVI and the S-CVI supported the content validity of the hand pain, stiffness and function items and subscales of the AUSCANs (Table 4). Five items of pain subscale were rated for relevancy and clarity with I-CVI scores ranging from 0.86 to 0.96 and from 0.92 to 1.00 respectively. For 1-item in stiffness subscale the I-CVI was found 0.93 for relevancy and 1.00 for clarity. For function subscale, 9-items were rated for relevancy and clarity with an I-CVI ranging from 0.88 to 0.97 and from 0.98 to 1.00 respectively. The S-CVI for AUSCAN was found 0.92, 95% CI: 0.90 to 0.94 for relevance and 0.99, 95% CI: 0.98 to 1.00 for clarity. The modified Kappa agreement for every item of the AUSCAN demonstrated excellent agreement (K ranging from 0.86 to 1.00)

Discussion

This study established a high level of content validity for PRWHE, AUSCAN and TDX for patients with hand arthritis. The content validity index was very high for all the individual items for each questionnaire (I-CVI > 0.77) and for the overall score (S-CVI > 0.85) in terms of relevancy and clarity. The Kappa inter-rater agreement was excellent across all the individual items for all PROMs (PRWHE, AUSCAN and TDX) among the raters.

Content validity of PRWHE was established during the development of the PRWE by using semi-structured interviews in patients with distal radius fracture and expert opinion. [27] However, neither were quantified. Thus, this study provides novel information on the content validity of the items of the PRWE/PRWHE, with specific reference to those with hand arthritis. All items of PRWHE were found with very high content validity index in terms of relevance (I-CVI > 0.79) and clarity (I-CVI > 0.87).

For the AUSCAN the content validity was established during development using a formal clinimetric process where patients in a tertiary care centre rated items by importance and frequency to establish relevance.[20] This study provides additional support for the content validity in a community sample of people living with hand arthritis, and by adding new data on the clarity of the items.

It might have been expected that the AUSCAN would have more relevance to our sample, than the PRWHE since it a disease-specific PROM. Both point estimate and CI comparisons indicate that AUSCAN had slightly higher overall scores in terms of relevancy (S-CVI = 0.92, 95% CI: 0.90 to 0.94) and clarity (S-CVI = 0.99, 95% CI: 0.98 to 1.00) than the PRWHE (S-CVI=0.85, 95% CI :0.82 to 0.88 for relevancy and S-CVI=0.95, 95% CI: 0.93 to 0.97 for clarity). Although the CIs of the respective S-CVIs indicate that there was a small statistically significant difference (Table 5) between compared S-CVI values (AUSCAN vs TDX and AUSCAN vs PRWHE), all PROMs met standards of very high content validity. Finally, since 6 to 8 additional raters assessed the PRWHE than the AUSCAN, the small differences may reflect differences in rater pools rather than an actual difference in perceptions.

The TDX is relatively new developed PROM (Noback et al. 2017)[18] that was initially tested in patients with basal joint arthritis. The TDX demonstrated very high content validity index when assessed in terms of relevancy (S-CVI = 0.87, 95% CI: 0.85 to 0.89) and clarity (S-CVI = 0.91, 95% CI: 0.89 to 0.94). All the individual items of the TDX had a very high content validity index (I-CVI >0.77). To the authors knowledge,

no previous studies exist to assess the content validity index of TDX in the current literature. The item generation of TDX included the review of items from relevant scales (Michigan Hand Questionnaire (MHQ), Disabilities of the Arm, Shoulder, and Hand (DASH), AUSCAN, PRWHE and McGill Pain questionnaire). Then, the development process included item reduction and pilot testing and then final item reduction.[18]

Our kappa statistics indicated excellent agreement between patient raters after correcting for chance agreement. ($K > 0.77$). The assessment from a large pool of experts ($n > 60$) generated similar scores between the I-CVI and K scores. This has been previously described in the literature when the number of experts increasing and the probability of chance (P_c) decreases the K agreement and I-CVI values tend to converge.[28]

This study provided novel data on the content validity index in 3 different PROMs in patients with hand arthritis. Since few studies address content validity, this is important to support the conceptual foundations of these measures. While the computation of CVI is relatively easy, its major weakness is the failure to adjust for chance agreement. However, the authors tried to mitigate this problem by calculating a modified kappa agreement. A potential limitation is that the items of the PROMs were not randomized but the items were rated for relevance and clarity in an order (PRWE, AUSCAN, TDX). We deem that it is highly unlikely to have an order effect in the CVI values. First, higher scores were found in AUSCAN and not in PRWE and second, all CVI scores were very high and this indicates that the conclusion is not affected by order.

Conclusions

This study demonstrated evidence of very high content validity index for all the individual items and for the overall scale of PRWHE, AUSCAN and TDX for patients with hand arthritis, with high agreement across raters.

Declarations

Disclosure of Funding

This study is supported by the Canadian Institutes of Health Research (CIHR) with funding reference number (FRN: 201710GSD-402354-282879) and by an operating grant from the Arthritis Society of Canada.

Conflict of Interest

The authors declare that they have no conflict of interest.

Data sharing it not permitted by our institutional research ethics board

Code availability

Code will be made available upon request

Authors' Contribution

PB conceived and designed the study, collected, analyzed and interpreted data, wrote the first draft of the article, and contributed to all revisions. JCM and ECB analyzed and interpreted data and contributed to all revisions. EL, RG and LF contributed to designing the study, collected and interpreted data, and contributed to all revisions. All authors read and approved the final manuscript.

Acknowledgements

Pavlos Bobos was supported by the Canadian Institutes of Health Research (CIHR) Doctoral Award. Joy C MacDermid was supported by a CIHR Chair in Gender, Work and Health and the Dr. James Roth Research Chair in Musculoskeletal Measurement and Knowledge Translation

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Tables

Table 1. Demographics of study participants		
Variable	n	Percentage %
Age, years		
18-24	1	12%
25-34	8	13%
35-44	13	20%
45-54	17	27%
55-64	19	27%
65-74	5	78%
75-84	1	2%
Diagnosis		
Osteoarthritis	17	27%
Rheumatoid arthritis	43	67%
Psoriatic arthritis	4	6%
Frequency of Medication		
Daily	42	66%
Upon pain	10	16%
Other	12	19%
Surgery		
No	49	77%
Yes	15	23%

Table 2. Content Validity Index of item relevancy and clarity and Modified Kappa agreement of Patient Rated Wrist/Hand Evaluation (PRWHE)

Item	Relevance				Clarity				Interpretation
	Agreement	I-CVI*	Pc**	K***	Agreement	I-CVI*	Pc**	K***	
1. Pain subscale									
Rate your pain: At rest	51/64	0.80	< 10 ⁻⁵	0.80	50/53	0.94	< 10 ⁻⁵	0.94	Excellent
Rate your pain: When doing a task with a repeated wrist movement	54/64	0.83	< 10 ⁻⁵	0.83	49/53	0.92	< 10 ⁻⁵	0.92	Excellent
Rate your pain: When lifting a heavy object	54/64	0.83	< 10 ⁻⁵	0.83	50/53	0.94	< 10 ⁻⁵	0.94	Excellent
Rate your pain: When it is at its worst	57/64	0.89	< 10 ⁻⁵	0.89	49/53	0.92	< 10 ⁻⁵	0.92	Excellent
How often do you have pain?	50/63	0.79	< 10 ⁻⁵	0.79	47/54	0.87	< 10 ⁻⁵	0.87	Excellent
2. Function									
A. Specific Activities									
Turn a	53/63	0.84	< 10 ⁻⁵	0.84	52/52	1.00	< 10 ⁻⁵	1.00	Excellent

doorknob using my affected hand									Excellent
Cut meat using a knife in my affected hand	54/63	0.86	< 10 ⁻⁵	0.86	53/53	1.00	< 10 ⁻⁵	1.00	Excellent
Fasten buttons on my shirt	51/63	0.81	< 10 ⁻⁵	0.81	53/53	1.00	< 10 ⁻⁵	1.00	Excellent
Use my affected hand to push up from a chair	50/63	0.79	< 10 ⁻⁵	0.79	51/52	0.98	< 10 ⁻⁵	0.98	Excellent
Carry a 10lb object in my affected hand	58/63	0.92	< 10 ⁻⁵	0.92	52/53	0.98	< 10 ⁻⁵	0.98	Excellent
Use bathroom tissue with my affected hand	50/63	0.79	< 10 ⁻⁵	0.79	51/52	0.98	< 10 ⁻⁵	0.98	Excellent
B. Usual activities									
Personal care activities	53/61	0.87	< 10 ⁻⁵	0.87	50/53	0.94	< 10 ⁻⁵	0.94	Excellent

es (dressi ng, washi ng)									
House hold work (cleani ng, mainte nance)	57/60	0.95	< 10 ⁻⁵	0.95	49/53	0.92	< 10 ⁻⁵	0.92	Excele nt
Work (your job or usual everyd ay work)	52/60	0.87	< 10 ⁻⁵	0.87	49/53	0.92	< 10 ⁻⁵	0.92	Excele nt
Recrea tional activiti es	54/60	0.90	< 10 ⁻⁵	0.90	51/53	0.96	< 10 ⁻⁵	0.96	Excele nt
S – CVI/Av e	0.85 (95% CI: 0.82 to 0.88)				0.95 (95% CI: 0.93 to 0.97)				

Table 3. Content Validity Index of item relevancy and clarity, and Modified Kappa agreement of the Thumb Disability Exam (TDX)

Item	Relevance				Clarity				Interpretation
	Agreement	I-CVI*	Pc**	K***	Agreement	I-CVI*	Pc**	K***	
A. Please indicate your ability to perform these activities with the affected hand									
Turn a Key	54/61	0.89	< 10 ⁻⁵	0.89	51/53	0.96	< 10 ⁻⁵	0.96	Excellent
Pick up a coin	52/61	0.85	< 10 ⁻⁵	0.85	49/51	0.96	< 10 ⁻⁵	0.96	Excellent
Write	56/61	0.92	< 10 ⁻⁵	0.92	51/54	0.94	< 10 ⁻⁵	0.94	Excellent
Squeeze Tooth paste	52/60	0.87	< 10 ⁻⁵	0.87	51/53	0.96	< 10 ⁻⁵	0.96	Excellent
Hold a glass of water	50/61	0.82	< 10 ⁻⁵	0.82	51/54	0.94	< 10 ⁻⁵	0.94	Excellent
Turn a doorknob	52/61	0.85	< 10 ⁻⁵	0.85	51/53	0.96	< 10 ⁻⁵	0.96	
Use a knife to cut food	54/61	0.89	< 10 ⁻⁵	0.89	51/53	0.96	< 10 ⁻⁵	0.96	Excellent
B. Please indicate									

ate your ability to perform the following task while using both your hands										
Open a jar	57/61	0.93	< 10 ⁻⁵	0.93		50/51	0.98	< 10 ⁻⁵	0.98	Excellent
Button a shirt/blouse	53/61	0.87	< 10 ⁻⁵	0.87		49/50	0.98	< 10 ⁻⁵	0.98	Excellent
Tie your shoes	55/61	0.90	< 10 ⁻⁵	0.90		50/51	0.98	< 10 ⁻⁵	0.98	Excellent
Wring a dishcloth/washcloth	53/61	0.87	< 10 ⁻⁵	0.87		49/51	0.96	< 10 ⁻⁵	0.96	Excellent
II. The following questions refer to the level of pain in your thumb										
How often did you have pain in	50/61	0.82	< 10 ⁻⁵	0.82		40/52	0.77	< 10 ⁻⁵	0.77	Excellent

your thumb at rest?										
How often did the pain in your thumb interfere with your daily activities?	49/60	0.82	< 10 ⁻⁵	0.82		44/51	0.86	< 10 ⁻⁵	0.86	Excellent
How often did the pain in your hand interfere with recreational activities?	51/60	0.85	< 10 ⁻⁵	0.85		44/52	0.85	< 10 ⁻⁵	0.85	Excellent
How often did the pain in your thumb interfere with your sleep?	47/60	0.78	< 10 ⁻⁵	0.78		44/52	0.85	< 10 ⁻⁵	0.85	Excellent
How often did the pain	51/60	0.85	< 10 ⁻⁵	0.85		42/52	0.81	< 10 ⁻⁵	0.81	Excellent

in your thumb worse than your mood?

III. The following questions ask about your satisfaction with the indicated hand or thumb over the past week.

Motion in your affected thumb	48/58	0.83	< 10 ⁻⁵	0.83	47/53	0.89	< 10 ⁻⁵	0.89	Excellent
Strength of your affected hand	54/57	0.95	< 10 ⁻⁵	0.95	48/53	0.91	< 10 ⁻⁵	0.91	Excellent
Pain level of your affected hand	52/58	0.90	< 10 ⁻⁵	0.90	48/53	0.91	< 10 ⁻⁵	0.91	Excellent
Overall	53/58	0.91	< 10 ⁻⁵	0.91	46/52	0.88	< 10 ⁻⁵	0.88	Excellent

function of your hand	-5	
S-CVI	0.87 (95% CI: 0.85to 0.89)	0.91 (95% CI: 0.89to 0.94)

NOTE: *I-CVI: item-level content validity index, **pc (probability of a chance occurrence) was computed using the formula: $pc = [N! / A! (N - A)!] \cdot .5^N$ where N= number of experts and A= number of experts who agree that the item is relevant or clear, ***K(Modified Kappa) was computed using the formula: $K = (I-CVI - PC) / (1 - PC)$. Interpretation criteria for Kappa, using guidelines described in Cicchetti and Sparrow (1981): Fair=K of 0.40 to 0.59; Good=K of 0.60 to 0.74; and Excellent=K>0.74. I-CVI, item-level content validity index; scale-level content validity index, average (S-CVI/Ave).

Table 4. Content Validity Index of item relevancy and clarity, and Modified Kappa agreement of the Australian and Canadian Osteoarthritis Index (AUSCAN)

Item	Relevance				Clarity				Interpretation
	Agreement	I-CVI*	Pc**	K***	Agreement	I-CVI*	Pc**	K***	
Rate your pain									
At rest	49/57	0.86	< 10 ⁻⁵	0.86	49/50	0.98	< 10 ⁻⁵	0.98	Excellent
Gripping	55/57	0.96	< 10 ⁻⁵	0.96	49/49	1.00	< 10 ⁻⁵	1.00	Excellent
Lifting	55/57	0.96	< 10 ⁻⁵	0.96	49/50	0.98	< 10 ⁻⁵	0.98	Excellent
Turning	54/57	0.95	< 10 ⁻⁵	0.95	46/50	0.92	< 10 ⁻⁵	0.92	Excellent
Squeezing	55/57	0.96	< 10 ⁻⁵	0.96	50/50	1.00	< 10 ⁻⁵	1.00	Excellent
Rate your stiffness									
After first waking in the morning	52/56	0.93	< 10 ⁻⁵	0.93	48/48	1.00	< 10 ⁻⁵	1.00	Excellent
Rate your difficulty when									
Turning taps/faucets on	51/58	0.88	< 10 ⁻⁵	0.88	51/51	1.00	< 10 ⁻⁵	1.00	Excellent
Turning a round doorknob or handle	54/59	0.92	< 10 ⁻⁵	0.92	53/53	1.00	< 10 ⁻⁵	1.00	Excellent

Doing up buttons	52/59	0.88	$< 10^{-5}$	0.88	52/52	1.00	$< 10^{-5}$	1.00	Excellent
Fastening jewelry	52/59	0.88	$< 10^{-5}$	0.88	53/53	1.00	$< 10^{-5}$	1.00	Excellent
Opening a new jar	57/59	0.97	$< 10^{-5}$	0.97	53/53	1.00	$< 10^{-5}$	1.00	Excellent
Carrying a full pot with one hand	56/59	0.95	$< 10^{-5}$	0.95	52/53	0.98	$< 10^{-5}$	0.98	Excellent
Peeling vegetables/fruits	56/59	0.95	$< 10^{-5}$	0.95	53/53	1.00	$< 10^{-5}$	1.00	Excellent
Picking up large heavy objects	55/59	0.93	$< 10^{-5}$	0.93	51/51	1.00	$< 10^{-5}$	1.00	Excellent
Wringing out wash cloths	52/59	0.88	$< 10^{-5}$	0.88	50/51	0.98	$< 10^{-5}$	0.98	Excellent
S - CVI	0.92				0.99				
	(95% CI: 0.90 to 0.94)				(95% CI: 0.98 to 1.00)				

Table 5: Comparison of content validity index (S-CVI) of Relevance and Clarity							
Relevance				Clarity			
	PRWHE	TDX	AUSCAN		PRWHE	TDX	AUSCAN
PRWE	0.85 (95% CI: 0.82- 0.88)	<i>Paired</i> <i>t-Test</i>	<i>Paired</i> <i>t-Test</i>	PRWE	0.95 (95% CI: 0.93- 0.97)	<i>Wilcoxon</i> <i>Signed</i> <i>ranks</i>	<i>Wilcoxon</i> <i>Signed</i> <i>ranks</i>
TDX	p=0.523	0.87 (95% CI: 0.85- 0.89)	<i>Paired</i> <i>t-Test</i>	TDX	p = 0.153	0.91 (95% CI: 0.89- 0.94)	<i>Wilcoxon</i> <i>Signed</i> <i>ranks</i>
AUSCAN	p <0.001	p = 0.001	0.92 (95% CI: 0.90- 0.94)	AUSCAN	p = 0.001	p = 0.002	0.99 (95% CI: 0.98- 1.00)

Paired t-Test: Student's t-Test for Matched Pairs; Wilcoxon Signed Ranks: Wilcoxon Matched-Pairs Signed-Ranks; Australian and Canadian Osteoarthritis Index (AUSCAN); Thumb Disability Exam (TDX); Patient Rated Wrist/Hand Evaluation (PRWHE)