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Normative values of the Michigan Hand Outcomes Questionnaire for patients with and without hand conditions

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Abstract

Background—The Michigan Hand Outcomes Questionnaire (MHQ) has been widely used for nearly twenty years to assess patients with a variety of hand and upper extremity conditions. However, normative data for this assessment has not previously been collected, limiting interpretation.

Methods—The MHQ was administered to 579 participants recruited from the general population. In addition to the six score domains of the MHQ, participants were asked to identify any problem affecting their hand(s), including trauma, hand disease/condition, systemic illness, or nonspecific symptoms. In addition, we collected comorbidities and demographic data for each respondent.

Results—Total MHQ score for healthy individuals was indicative of generally good hand function (95.2, 95% CI 94.3–96.1). Individuals with unilateral trauma had total MHQ score for their affected hand (90.3, 95% CI 87.9–92.6) that was lower than the score for their healthy hand (mean difference 5.7, 95% CI 3.2–8.3). For individuals with and without hand trauma, total MHQ score decreased with increasing number of comorbidities. Many of the differences in MHQ score between the problem hand and unaffected hand were smaller than the minimal clinically important difference (MCID) of 3.0 to 23.0 for known pathologies of the hand and upper extremity.

Conclusion—These normative data provide appropriate baseline information for individuals with and without underlying hand conditions. Most notably, our findings suggest that individuals with a unilateral problem establish new sub-normative values for both their affected and unaffected hand. This data will encourage an appropriate understanding of the results of future studies containing the MHQ.

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Introduction

The Michigan Hand Outcomes Questionnaire (MHQ) is a tool used to assess patients with hand disorders through the measurement of 6 health domains: overall hand function, activities of daily living (ADLs), pain, work performance, aesthetics, and patient satisfaction.¹ Since its development in 1998, the reliability, validity, and responsiveness of the MHQ have been studied and well-documented.¹⁻⁴ The MHQ has been translated into ten languages and is used worldwide as a standardized instrument to assess outcomes for hand conditions and to evaluate the effectiveness of medical and surgical intervention, including those for trauma, nerve compression syndromes, arthritis, and inflammatory conditions.^{5,6} Over 200 publications have used the MHQ to measure outcomes for disorders affecting the upper extremity from distal radius fractures (DRF)⁷⁻⁹ and carpal tunnel syndrome (CTS)^{10,11} to rheumatoid arthritis (RA)^{12,13} and cerebral palsy¹⁴.

The challenge for clinicians using any outcomes instrument is to determine the meaningfulness of the scoring system. Traditionally, pre- and post-treatment data are compared to determine whether a treatment is associated with a change in an outcomes measure relative to a control or comparison group.¹⁵ There are two basic questions regarding clinical importance: first, is the amount of change large enough to be considered clinically relevant? And second, following treatment, can these individuals be distinguished from normal individuals with respect to the condition of interest?¹⁵ The first question can be addressed via reliable change index, or minimal clinically important difference (MCID). The MCID is of key importance to outcomes measures in that it represents the smallest amount of change in an outcomes instrument that might be considered relevant by the patient. In regards to the MHQ, the MCID has been calculated for RA, carpal tunnel release (CTR), and DRF.¹⁶ The second question requires the use of normative comparison. Although comparison of individual pre-treatment to post-treatment data acts as a valuable control, data from a normal, age and sex-adjusted population can be used to assess whether the findings in individuals before treatment are different from population norms. Furthermore, this method of comparison can also determine whether individuals have returned to normative values following treatment, facilitating better analysis of treatment effectiveness.^{15,17}

Although much data exist regarding MHQ scores for individuals with specific ailments, there are no normative MHQ data.^{4,18,19} The collection of population-based normative data is a necessary step in the continued use of a health outcomes instrument and in the standardization of the MHQ.²⁰ Normative data for similar instruments have helped to advance hand and upper extremity care, and include grip and pinch strength²¹, prosthetic hand function²², and hand function following cerebrovascular event²³, with these 3 studies alone cited by nearly 2,000 publications (1657, 154, and 159, respectively). These studies, however, do not include individuals with underlying hand conditions. Because of the commonality and chronic nature of hand injuries and underlying hand conditions, understanding MHQ scores for individuals in these groups is as critical as assessing a healthy population, as is normally done to create normative values.²⁴⁻²⁶ Given the breadth, applicability, and widespread use of the MHQ, these data will improve the analysis of clinical outcomes and the assessment of treatment effectiveness in hand surgery.

Materials and Methods

Our sampling methodology was designed with the goal to obtain data representative of the general adult US population. Inclusion criteria for subjects included: age of 18 years or older, non-institutionalized, and able to complete the MHQ in English. In addition to the MHQ, demographic factors were collected and information regarding comorbid conditions was collected using the Self-administered Comorbidity Checklist, a validated and frequently used measure.²⁷ Because the goal of the study was to generate a sample representative of the general community population, we recruited all individuals regardless of any pre-existing hand conditions. We collected information regarding hand injuries or conditions and any treatment received. The data were stratified by demographic markers, including sex, age group, and race. Composition data for age, sex, and race were used from the 2010 US Census for appropriate stratification, and to divide the sample into strata proportional to the census data.²⁸

Participants were recruited via four methods: an institution-specific clinical research recruitment website, social networking via e-mail and Facebook, and paper flyers placed in public area of our hospitals and outpatient clinics. An anonymous online version of the English language MHQ was created using Qualtrics, a web-based software company for survey research. Paper copies were available for participants completing the survey in person. Based on past experience with the MHQ, we expected the study to take approximately 10 minutes to complete.³ Participants were not compensated. This project was determined to be exempt from overview by the Institutional Review Board of our institution.

Data Analysis

Five of the six MHQ domains (overall hand function, activities of daily living (ADLs), work performance, aesthetics, and patient satisfaction) are scored from 0 – 100 in which 100 is the best possible ability. The pain domain is scored from 0 – 100, where 0 indicates no pain. Total MHQ score was calculated as the mean of all 6 domains (after converting pain from a “best score of 0” scale to a “best score of 100” scale). For each analysis subgroup mean scores for each of the 6 domains were calculated. Score variations were also analyzed based on patient demographic factors, concurrent hand disorder, type and quantity of comorbidity, and smoking status. Non-parametric statistical methods were used.

MHQ scores for healthy participants and participants reporting bilateral problems were calculated as a mean of left hand and right hand scores, and influence of demographic factors was calculated using Kruskal-Wallis and Wilcoxon-Mann-Whitney tests as appropriate. This was followed by a multiple linear regression model for statistically significant demographic categories. Four problem categories were created for analysis of participants reporting hand/wrist problems: 1) trauma (e.g. fractures, burns), 2) disease or condition of the hand/wrist (e.g. CTS, congenital hand differences), 3) non-specific hand/wrist symptoms (e.g. pain, stiffness, those related to elbow or shoulder problems), and 4) systemic disease or condition affecting the hand/wrist (e.g. RA, gout). Participants who reported problems spanning multiple categories were included in all relevant categories. MHQ scores for participants who reported a unilateral problem were calculated for both the

healthy hand/wrist and the problematic hand/wrist, and the differences between scores were calculated. Statistical analysis was completed using Wilcoxon signed-rank test. Differences in scores were analyzed for the role of demographic factors using the same methods as for healthy scores. Finally, problem hand MHQ scores for participants with unilateral problems and MHQ scores for participants with bilateral problems were analyzed for the role of demographic factors. Statistical significance for all analyses was set at $P=0.05$.

Results

We gathered 579 completed surveys. *Post hoc* power calculations for detecting a difference in total MHQ score among each of the 3 subgroups against the total study cohort found a minimum power of 94% to detect an effect size of 3 points when alpha was set to 0.05. Demographic factors are presented in Table 1. Corresponding with our city's population, respondents were largely young, white, and well-educated. Hand problems were common; 57% of participants reported a current or past injury, disease, and/or condition affecting the hand(s)/wrist(s). At least one comorbidity was reported by 356 participants (60%). Of those participants 176 (49%) reported that their comorbidity limited their activities. The 4 most common comorbidities associated with activity limitations were back pain (16%), depression (13%), obesity (8%), and osteoarthritis (8%).

There were no significant differences in normative values based on the demographic factors of age, sex, and race. We have therefore presented pertinent results that did carry statistical significance.

Healthy Participants

As expected, the mean MHQ scores for individuals reporting no hand or wrist problem were indicative of very good hand function (Table 2). The highest mean score was for the ADLs domain. The aesthetics domain had the lowest mean score, and the widest range of variability. Number of comorbidities was associated with lower total MHQ score, ADL, satisfaction, work, and higher pain score ($P<0.05$ for each). For instance, individuals with no comorbidities reported higher total MHQ scores (96.1 versus 92.5) and less pain (3.8 versus 7.9) than those reporting 3 or more comorbidities ($P<0.05$), whereas those reporting 1 or 2 comorbidities fell between the two. (See Appendix 1, Supplemental Digital Content 1, which shows the MHQ scores (95% confidence interval) by number of comorbidities for patients reporting no hand/wrist problem, INSERT LINK). Level of educational attainment, in the form of completion of a college degree, was directly associated with total MHQ score, function, ADLs, satisfaction, work, and inversely with pain ($P<0.05$ for each). Specifically, individuals lacking a college degree reported lower total MHQ score (92.5 versus 96.7), function (92.3 versus 96.5), and ADLs (95.3 versus 98.1) than those with a college degree (See Appendix 2, Supplemental Digital Content 2, which shows the MHQ scores (95% confidence interval) by level of education for patients reporting no hand/wrist problem, INSERT LINK).

Participants reporting Unilateral Problems

Total MHQ scores for the healthy hand in participants in each unilateral problem category were lower than the total MHQ score and the function, ADLs, and satisfaction domains for patients reporting no problems (Table 2). There was significant variation in score difference between healthy and problem hands for all MHQ domains; difference in scores between healthy and problem hand varied by the problem category (Table 3). Differences in MHQ scores between healthy hand and affected hand for participants with trauma, for example, are shown in Table 4. For the trauma group, as with healthy individuals, the number of reported comorbidities was the participant factor with the most impact. Number of comorbidities was directly associated with the differences in total MHQ score, function score, pain score, and satisfaction score ($P<0.05$ for each). The lack of a college degree was also directly associated with differences in pain scores ($P<0.05$). (See Appendix 3, Supplemental Digital Content 3, shows the Mean difference in score (95% confidence intervals) between healthy and affected hand for individuals reporting unilateral trauma, INSERT LINK).

Results for participants reporting a unilateral hand/wrist disease are shown in Table 5. Number of comorbidities was associated with greater differences in both function score ($P<0.05$) and satisfaction score ($P<0.05$) (See Appendix 4, Supplemental Digital Content 4, which shows the Mean difference in score (95% confidence intervals) between healthy and affected hand for individuals reporting unilateral hand/wrist disease, INSERT LINK). Results for participants with unilateral nonspecific hand symptoms are shown in Table 6. Age was associated with a greater difference in pain score ($P<0.05$). Positive smoking status was also associated with greater difference in function, ADL, pain, and satisfaction scores ($P<0.05$). (See Appendix 5, Supplemental Digital Content 5, which shows the Mean difference in score (95% confidence intervals) between healthy and affected hand for individuals reporting unilateral nonspecific symptoms, INSERT LINK.) Results for participants with systemic disease affecting one hand are shown in Table 7. Female sex was associated with a greater difference in total MHQ, and ADL score ($P<0.05$ for both). Specifically, female participants had a larger difference in score than males (See Appendix 6, Supplemental Digital Content 6, which shows the Mean difference in score (95% confidence intervals) between healthy and affected hand for individuals reporting unilateral effects of systemic disease, INSERT LINK). Lastly, positive smoking status was associated with a greater difference in satisfaction score ($P<0.05$).

Participants with Bilateral Problems

Total MHQ, ADL, pain, and satisfaction scores for participants with bilateral problems varied significantly by problem category (Table 8). For individuals with nonspecific symptoms, increasing age was inversely associated with ADL score ($P<0.05$) (See Appendix 7, Supplemental Digital Content 7, which shows the Mean MHQ score (95% confidence intervals) for individuals reporting bilateral nonspecific symptoms ($n=66$), INSERT LINK). For participants with a systemic illness, those reporting 0 or 1 comorbidity had higher ADL and satisfaction scores than those reporting 2 or more ($P<0.05$ for both) (See Appendix 8, Supplemental Digital Content 8, which shows the Mean MHQ score (95% confidence intervals) for individuals reporting bilateral systematic disease ($n=16$), INSERT LINK).

Comparison to the Minimal Clinically Important Difference

When compared to established MCIDs¹⁶ the mean differences in pain score in this current study for affected hand versus unaffected hand were higher for unilateral hand disease/condition, nonspecific symptoms, and systemic disease when compared to pain score MCID for RA. (Table 9). However, these values were less than the pain MCID for CTS. All other differences in means calculated in this study were less than established MCID values for both CTS and RA.

Discussion

The normative data presented in this study are applicable and pertinent to future research involving the MHQ. One particularly interesting finding was that participants with unilateral problems recorded significantly lower average MHQ scores for their healthy hand/wrist when compared to participants with no problems. A likely explanation is that a multitude of tasks require two hands, and worsening function in one hand may result in increased demand on the healthy hand. Previous studies have shed light on the functional difficulties in switching handedness following injury.^{29,30} Participants may report these difficulties on the MHQ as problems with the “healthy” side. In addition, a disease process that can render one hand or wrist problematic may affect the function of the opposite hand, although to a lesser degree.

Researchers should consider this principle with regards to future study design involving the MHQ. That is, when comparing affected hands and healthy hands, affected scores should be analyzed in the context of scores for the healthy hand. For example, if one were to compare MHQ scores after an intervention for a hand condition to those of a healthy individual with no problems, such an approach may result in an underestimation of the value of that intervention. By utilizing the average scores for the unaffected hand by problem category, hand surgeons and researchers can better quantify the change in outcomes, which may be more meaningful. In addition, with considerable score variation between unilateral and bilateral groups based on type of problem, selecting the appropriate control will aid in providing high quality data.

Consider, for example, an attempt to measure the impact on hand function of open CTR for unilateral CTS. Assume that the average function score of the affected hand for a sample population is 78 before the procedure, and 90 6 months after the procedure. The research team might compare this final result to the function score for all healthy individuals (95.7, 95% CI 94.7–96.7). However, if they were to more appropriately compare their findings to the unique function score for the healthy hand of individuals with a unilateral hand condition (91.0, 95% CI 88.7–93.3), their findings would be more robust and potentially carry increased clinical significance.

An additional important point regarding applicability is that, unlike other problem categories, most trauma affecting respondents occurred in the past. Because we did not explicitly ask about how long ago trauma happened or details regarding treatment received, it is unclear to what extent the initial trauma affected their scores. For instance, many participants over the age of 30 years would submit responses along the lines of: “I broke my

finger when I was 14,” yet still self-identify with the trauma group. Instead of returning to normal, however, MHQ scores were significantly lower than healthy participants for both the bilateral and unilateral trauma groups. This suggests that individuals who experienced prior trauma establish a “new normal” rather than returning to completely healthy values. Given the commonality of trauma in the general population, having an appreciation for this concept in the clinical setting is valuable. For example, when a patient with a remote history of trauma presents with a seemingly unrelated condition of the upper extremity, he/she may report lower baseline MHQ scores than a patient with the same condition but lacking the history of trauma. The idea of a new sub-normal state following trauma will enable physicians to better assess the value of their interventions in such patients.

Our analysis also shed light on important demographic associations. For individuals reporting no hand problems, for example, total MHQ, function, and ADL scores were significantly greater for those with a college degree than those without. Individuals with less educational experience have an increased likelihood to be working in manual labor, in which more severe trauma and arthrosis of the hand and wrist are common, yet not to the extent that a “problem” is reported.^{31,32} Similarly, workers who rely on hand function to a greater extent may be more likely to report decreased satisfaction and function compared to an individual who does not rely on their hands nearly as much. For example, a construction worker may report lower satisfaction with hand strength when compared to an office worker, even though the construction worker is much stronger.

Similarly, the presence of comorbidities was associated with worse total MHQ and pain scores for healthy individuals, with a statistically significant threshold met for individuals with five or more comorbidities. Our findings are consistent with previous studies, which suggest that both physical and psychological comorbidities may contribute to lower reported health outcomes measures.^{33,34} Furthermore, many seemingly-unrelated health conditions have been shown to affect hand and upper extremity function, including systemic lupus erythematosus³¹, chronic obstructive pulmonary disease³⁵, and cerebrovascular accidents³⁶. In a similar fashion, there are health conditions that may influence how a patient *responds* to health-based questionnaires. For example, depression and anxiety³³, psychiatric illness secondary to a medical condition³⁷, and fibromyalgia³⁸, have been shown to increase the rate of symptom reporting, resulting in generally poorer outcome scores.

Limitations

Our sample was skewed towards the demographic groups of the surrounding area; largely white, young, and well-educated. The majority of respondents were also women, which is not unusual.^{39,40} As with any large sample, ideal ratios of demographic groups are often unobtainable. However, similar normative studies of hand function have also been performed under conditions of limited diversity while maintaining reliability.^{21–23} Nonetheless further investigation into the relationship of race and ethnicity to hand outcomes may be warranted. In addition, 39% of our sample reported trauma, but our survey could not account for time elapsed since injury or treatments received. These factors may affect MHQ scores and offer a possible direction for future research.

The Michigan Hand Outcomes Questionnaire is an assessment that has been widely studied in a variety of clinical settings and with a wide range of conditions. Previous efforts to encourage the highest quality use of the MHQ, such as establishing reliability, validity, and responsiveness, have resulted in the fine-tuning of the survey and its use. Similarly, the presented normative data provide appropriate baseline information for numerous segments of the general population, and will increase the utility of the MHQ for future hand research. We found that MHQ scores for participants without hand or wrist problems were uniformly indicative of good function. Furthermore, the majority of the differences realized in this study were smaller than known MCIDs for pathologies studied using the MHQ. This suggests that while these differences are statistically significant, they may not be clinically relevant. Determining the MCIDs for an expanded number of conditions and in varying populations should be pursued to complement the reported normative data. The results of this project can be used to better understand the role which both demographic factors and underlying hand conditions might have on baseline hand functioning and patient-reported outcomes. Most importantly, this study provides data for the purpose of comparing and better understanding the results of future studies using the MHQ. New research regarding the hand and upper extremity may be of greater clinical significance when considered in this context.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Demographic data for all survey respondents (n=579)

Variable	n	%
Age (years)		
18–27	143	25%
28–37	139	24%
38–47	70	12%
48–57	118	20%
58–67	86	15%
68–77	15	3%
78–87	8	1%
88+	0	0%
Sex		
Male	111	19%
Female	468	81%
Race		
White	510	88%
Non-white	69	13%
Employment Status		
Employed Full-Time	344	59%
Employed Part-Time	87	15%
Retired	47	8%
Disability	4	7%
Full-Time Student	68	12%
Unemployed	22	4%
Education		
High School Graduate, or Less	0	0%
High School with Some College	145	25%
College Graduate, or Greater	434	75%
Annual Income (USD) *		
<10,000 – 29,999	110	19%
30,000–59,999	182	31%
60,000+	281	49%
Socioeconomic Status Score		
Very Low	47	8%
Low	115	20%
Medium	174	30%
High	237	41%
Smoking Status		

Variable	n	%
Never	414	72%
Former	130	22%
Current	35	6%
Number of Comorbidities		
0	233	40%
1	127	22%
2	103	18%
3+	126	22%
Current or Past Injury, Disease, Condition Affecting Hand(s) or Wrist(s)		
No	247	43%
Yes	332	57%
Reported injury, disease, or condition ** (n=332)		
Trauma	131	39%
Disease/condition of the hand(s)/wrist(s)	135	41%
Non-specific hand/wrist symptoms	87	26%
Systematic disease/condition affecting the hand(s)/wrist(s)	52	16%

* 6 respondents did not report income

** Respondents can be included in multiple categories.

Mean MHQ scores (95% confidence intervals) for individuals reporting no hand/wrist problems (n=247) and for healthy hands in individuals reporting unilateral injury, disease, or condition affecting the hand/wrist (n=266).

Table 2

Score Domain	All Healthy Individuals	Trauma	Hand/Wrist Disease	Nonspecific Symptoms	Systemic Disease
MHQ Total	95.2 (94.3 – 96.1)	90.3 (87.9 – 92.6)	88.2 (85.8 – 90.6)	87.9 (84.7 – 91.1)	83.1 (79.0 – 87.2)
Function	95.7 (94.7 – 96.7)	94.1 (92.3 – 95.9)	91.0 (88.7 – 93.3)	90.5 (87.5 – 93.5)	91.1 (87.7 – 94.5)
ADLs	97.5 (96.8 – 98.1)	95.3 (94.0 – 96.6)	93.3 (91.6 – 95.0)	94.2 (92.1 – 96.3)	91.0 (87.4 – 94.6)
Pain	4.7 (3.7 – 5.8)	5.7 (3.4 – 7.9)	8.0 (5.3 – 10.8)	7.4 (4.2 – 10.6)	10.3 (6.5 – 14.0)
Aesthetics	91.2 (88.9 – 93.4)	88.3 (84.7 – 91.9)	88.4 (84.8 – 92.0)	89.5 (85.0 – 94.0)	81.4 (74.4 – 88.5)
Satisfaction	95.3 (93.9 – 96.6)	92.7 (90.4 – 95.1)	88.1 (84.8 – 91.3)	87.8 (83.4 – 92.1)	84.0 (78.1 – 90.0)

Table 3

Difference in mean MHQ scores between healthy individuals with no problems and healthy hands in all individuals reporting a unilateral problem (n=266).

Score Domain	No Problem	Unilateral Problem	Difference in Means	<i>P</i> -value
MHQ Total	95.2	89.3	5.8	<0.05
Function	95.7	92.4	3.3	<0.05
ADLs	97.4	94.4	3.0	<0.05
Pain	4.7	6.8	2.1	0.89
Aesthetics	91.2	88.7	2.5	0.14
Satisfaction	95.3	90.4	4.9	<0.05

Table 4

Mean difference in score between healthy hand and affected hand in individuals reporting unilateral trauma (n= 116).

Score Domain	Mean	95% Confidence Interval	
MHQ Total	2.8	1.6	3.9
Function	5.6	3.5	7.6
ADLs	1.9	0.6	3.2
Pain	9.3	6.3	12.3
Aesthetics	3.2	1.0	5.5
Satisfaction	10.9	7.4	14.4

Table 5

Mean difference in score between healthy hand and affected hand in individuals reporting unilateral problems due to a disease or condition of the upper extremity (n= 107).

Score Domain	Mean	95% Confidence Interval	
MHQ Total	6.1	4.3	7.9
Function	5.5	2.9	8.1
ADL's	2.0	0.6	3.3
Pain	18.2	14.4	22.1
Aesthetics	4.2	1.6	6.8
Satisfaction	13.8	9.7	18.0

Table 6

Mean difference in score between healthy hand and affected hand in individuals reporting unilateral unspecified upper extremity symptoms (n= 66).

Score Domain	Mean	95% Confidence Interval	
MHQ Total	4.3	2.3	6.3
Function	6.5	3.3	9.7
ADL's	2.1	0.4	3.8
Pain	17.2	12.8	21.6
Aesthetics	2.7	0.0	5.3
Satisfaction	12.0	6.8	17.2

Table 7

Mean difference in score between healthy hand and affected hand in individuals reporting unilateral effects of systemic disease (n= 36).

Score Domain	Mean	95% Confidence Interval	
MHQ Total	5.7	3.2	8.3
Function	8.2	4.7	11.7
ADL's	2.6	0.6	4.7
Pain	16.4	9.9	22.9
Aesthetics	6.8	2.5	11.0
Satisfaction	20.0	12.6	27.4

Table 8

Mean MHQ scores (95% confidence interval) for individuals reporting bilateral hand problems (n= 66).

Score Domain	Trauma	Hand/Wrist Disease	Nonspecific Symptoms	Systemic Disease
MHQ Total	87.5 (79.8 – 95.2)	77.6 (70.0 – 85.2)	86.7 (80.5 – 92.9)	75.6 (64.5 – 86.7)
Function	86.3 (75.7 – 97.0)	78.9 (70.6 – 87.2)	88.1 (80.8 – 95.4)	77.8 (66.6 – 89.0)
ADLs	95.0 (90.2 – 99.8)	86.5 (79.4 – 93.5)	91.8 (85.7 – 97.8)	81.4 (69.7 – 93.1)
Pain	15.2 (6.0 – 24.3)	24.5 (15.7 – 33.2)	21.5 (13.2 – 29.9)	30.6 (18.1 – 43.1)
Aesthetics	90.0 (82.4 – 97.6)	82.6 (76.3 – 88.9)	91.4 (85.8 – 97.0)	84.2 (74.0 – 94.4)
Satisfaction	81.0 (66.5 – 95.4)	66.5 (54.5 – 78.5)	81.7 (72.8 – 90.7)	64.2 (47.3 – 81.1)
Work	87.7 (79.4 – 96.0)	75.4 (66.4 – 84.3)	88.8 (80.2 – 97.4)	76.9 (62.5 – 91.3)

Table 9

Minimal clinically important differences by MHQ domain for carpal tunnel and rheumatoid arthritis (results adapted from Shauver & Chung, 2009) with differences between affected and healthy hand for individuals with a unilateral problem.

Condition	Function	Pain	ADLs
Carpal Tunnel	13.0	23.0	–
Rheumatoid Arthritis	13.0	3.0	11.0
Unilateral Problem			
Total	3.3	2.1	3.0
Trauma	5.6	9.3	1.9
Hand Disease/Condition	5.5	18.2	2.0
Non-specific Symptoms	6.5	17.2	2.1
Systemic Disease	8.2	16.4	2.6