



## Which hand outcome measurement is best for Turkish speaking patients?

Çiğdem ÖKSÜZ<sup>1</sup>, Burcu Semin AKEL<sup>1</sup>, Gürsel LEBLEBİCİOĞLU<sup>2</sup>, Hülya KAYIHAN<sup>1</sup>

<sup>1</sup>Department of Physical Therapy and Rehabilitation, Faculty of Health Sciences, Hacettepe University, Ankara, Turkey;

<sup>2</sup>Department of Orthopedics and Traumatology, Faculty of Medicine, Hacettepe University, Ankara, Turkey

**Objective:** In determining treatment outcomes of the hand, the Disabilities of the Arm, Shoulder and Hand (DASH), Michigan Hand Outcomes Questionnaire (MHQ) and Milliken Activities of Daily Living Scale (MAS) questionnaires are the most commonly used. The aim of this study was to evaluate the relations, strengths and weaknesses of these questionnaires and determine the most appropriate outcome measure for the Turkish population.

**Methods:** The study included 74 patients with various types of hand injuries. Patients filled out the DASH-Turkish, MHQ and MAS questionnaires. Grip strength and pain intensity were also assessed.

**Results:** MAS parameters were well-correlated with DASH-Turkish and grip strength ( $p < 0.05$ ). MHQ was correlated with all other outcomes except the left hand part.

**Conclusion:** The DASH, MHQ and MAS questionnaires are culturally compatible with the Turkish population and have revealed a good correlation. These results suggest that these outcome instruments can be used in the assessment of hand and wrist surgery outcomes in the Turkish population.

**Key words:** DASH; hand; MAS; MHQ; Turkish.

The objective assessment of a surgical outcome is an essential part of clinical practice. The main areas of assessment for the injured hand include traditional measurements, such as range of motion, pain, strength, sensation or radiographic measurements as well as hand specific functional tests, such as grasping and hand function tests.<sup>[1]</sup> However, none of these measurements can fully reflect the individual's ability to carry out specific tasks and participation in daily-life.<sup>[2]</sup>

In hand surgery, it is important to learn about patients' difficulties, concerns and ambitions in daily life in order to guide diagnosis and decide surgery technique.<sup>[1]</sup> However, defining the patients' real life situa-

tion is a complex issue and must be evidence-based.<sup>[3]</sup> Nowadays, self-report measures are used to evaluate the functional performance of the patient and have become an internal component in describing the outcome of hand therapy. However, each questionnaire has different strengths and weaknesses of which the clinician must be aware when choosing the most appropriate.<sup>[4]</sup>

An important issue in the usage of the questionnaires is cultural adaptation. Generally, a self-administered questionnaire should not only be linguistically well-translated but also adapted culturally to maintain the quality and validity of the content. Sociocultural differences in activity patterns and activities of daily living

**Correspondence:** Çiğdem Öksüz, PT, PhD. Hacettepe Üniversitesi Sağlık Bilimleri Fakültesi, Fizyoterapi ve Rehabilitasyon Bölümü, 06100 Sımanpazarı, Ankara, Turkey.

Tel: +90 312 - 305 15 76 e-mail: coksuz@hacettepe.edu.tr

**Submitted:** December 8, 2010 **Accepted:** November 10, 2011

©2012 Turkish Association of Orthopaedics and Traumatology

Available online at  
www.aott.org.tr  
doi:10.3944/AOTT.2012.2580  
QR (Quick Response) Code:



(ADL) can cause problems for the proper assessment of patient function when using such a questionnaire internationally. Therefore, the process of cross-cultural adaptation is very important and several guidelines for cross-cultural adaptation have been proposed.<sup>[5]</sup>

The Disabilities of the Arm, Shoulder and Hand questionnaire (DASH), Michigan Hand Outcomes Questionnaire (MHQ) and Milliken Activities of Daily Living Scale (MAS) are the most commonly used hand outcome questionnaires. All have been validated and adapted for use in the Turkish population and can be used for all hand injuries.<sup>[6-8]</sup> The aim of this study was to state the relationships, strengths and weaknesses of the questionnaires, reflect our experience in clinical usage of these questionnaires and help clinicians to choose the most appropriate outcome measure for the Turkish population.

## Patients and methods

A sample of 74 patients with different types of hand injuries who were admitted to the outpatient physiotherapy or occupational therapy departments at Faculty of Health Sciences, Hacettepe University between January and September 2010 were included in this study. Diagnoses were confirmed and appropriate diagnostic work-up, including radiological tests were performed by an orthopedist at the Department of Orthopedics and Traumatology at Faculty of Medicine, Hacettepe University.

Patients who were unable to independently complete the questionnaire and those with open wounds or skin lesions were excluded from the study. Patients were included to the study at a minimum of four postoperative weeks. Written informed consent was obtained from all participating patients at their first visit. Hacettepe University Ethical Committee approved the study.

DASH-Turkish, MHQ and MAS questionnaires were administered and grip strength was measured using the J-Tech Tracker Freedom<sup>®</sup> Functional Evaluation System (Jtech Medical, Salt Lake City, UT, USA). Pain intensity was assessed with the 0-10 cm Visual Analogue Scale (VAS).

The DASH is an upper-extremity specific outcome measure introduced by the American Academy of Orthopaedic Surgeons in collaboration with a number of other organizations.<sup>[9]</sup> DASH is a self-administered questionnaire with high validity to measure patients' perception of disabilities and symptoms and symptoms associated with any condition affecting the upper limb. It contains 30 items; 21 evaluate level of difficulty with specific tasks, 5 evaluate symptoms, and 1 evaluates

each social function, work function, sleep and confidence. Response options range from 1 to 5: (1) No difficulty, (2) mild difficulty, (3) moderate difficulty, (4) severe difficulty, and (5) unable. It has three modules; DASH Function/Symptoms (DASH-FS), DASH Work (DASH-W), DASH Sports/Music (DASH-SM). The DASH produces scores between 0 and 100 for each module, in which a high DASH score indicates severe disability. The DASH has been shown to be reliable and valid in patient populations with various upper-extremity disorders and has been translated into different languages.<sup>[9]</sup> A cross-cultural adaptation of the DASH into Turkish (DASH-T) and a validity and reliability study was performed by Düger et al.<sup>[6]</sup> DASH is available in a shortened version (Quick DASH) which consists of 11 questions and has also been adapted into Turkish.<sup>[10]</sup>

The MHQ is a hand-specific outcome questionnaire with 57 items in 6 domains: (1) overall hand function, (2) activities of daily living, (3) pain, (4) work performance, (5) aesthetics, and (6) patient satisfaction. There is an additional demographic section asking questions about patients' gender, ethnic background, etc. Each item is scored on a scale of 1 to 5. Each domain, with the exception of the pain domain, is scored from 0 to 100 with 0 being the worst 100 being the best accepted result. For pain, a higher score indicates more pain. The scoring method is described by the original authors of the MHQ. All domains except work performance and pain assess each hand separately and are scored according to the affected hand. There is no scoring adjustment for hand dominance.<sup>[11]</sup> The Turkish version of the MHQ was studied by Öksüz et al.<sup>[7]</sup>

The MAS is composed of 47 tasks in the areas of meal preparation and eating (8 items), personal hygiene (9 items), dressing (8 items), object manipulation (8 items), housecleaning and laundry (7 items), and other activities (6 item). Patients are asked to complete the questionnaire by rating their current ability level on a Likert scale ranging from 1 (unable to do) to 5 (able to do as before injury). In addition, the level of necessity for each item is considered on a Likert scale ranging from 1 (not necessary) to 3 (necessary). Scores are totaled for each section and a global activity score is attained by combining the scores for all sections. An integrated scoring procedure is also available that uses the product of each ability score multiplied by each necessity score.<sup>[12]</sup> The Turkish version of the MAS was developed by Akel et al.<sup>[8]</sup>

Grip strength was measured using the Grip Track Module of J-Tech Tracker Freedom<sup>®</sup> Functional

Evaluation system. Patients sat on a chair with shoulders and wrist in the neutral position and the elbow in 90° of flexion. They were asked to squeeze the device as hard as possible and were vocally encouraged. According to the recommendations of the American Society of Hand Therapy, three attempts were done and an average score was calculated for the affected hand. If there was a bilateral hand injury, dominant side was accepted as the most affected side.<sup>[13]</sup>

All analyses were performed using SPSS software v17.0 (SPSS Inc., Chicago, IL, USA). Continuous variables were described by mean (x) and standard deviation (SD). Categorical data were given as counts and percentage. Relationship between assessment parameters was determined by Pearson correlation coefficient where DASH, grip strength and pain results were assumed as gold standards. All the tests were two-tailed and conducted at the 5% significance level.

### Results

Of the 74 subjects (mean age: 41 years, 26±10.12 years) included in the study, 44 (60%) were female and 30 (40%) were male. Ninety-two percent of patients were right-side dominant, and 43% of injuries were of the right hand. Patients' diagnoses distribution is presented in Table 1.

**Table 1.** Categories of major diagnoses.

Major diagnoses	n	%
Nerve entrapment	25	33.8
Fracture	20	27
Soft tissue injury	26	35.1
Other	3	4.1

**Table 2.** DASH, grip strength and pain results of participants.

	Mean±SD	Minimum	Maximum
DASH	41.53±23.29	0	90
DASH-W (n=47)	46.06±26.89	0	100
DASH-SM (n=37)	50.32±29.15	0	100
Grip (affected side)	15.1±11.1	1	47
Grip (non-affected side)	24.9±10.2	5	46
Pain (VAS)	4.34±1.96	0	8

Disability level and pain was found to be moderate and there was a grip strength difference of 10 kg between the affected and non-affected hands (Table 2).

Mean MAS and MHQ values are given in Table 3. MAS meal preparation/eating, personal hygiene and dressing areas had similar scores. However, other parameters were lower. Housecleaning and laundry had

**Table 3.** Descriptive statistics of MAS and MHQ.

	Mean ± SD	Minimum	Maximum	
<b>MAS</b>	Total (47-705)	432.5±135.6	122	687
	Meal preparation and eating (8-120)	89.5±24.7	32	120
	Personal hygiene (9-135)	85.6±24.6	20	135
	Dressing (8-120)	85.2±26.3	20	120
	Object manipulation (9-135)	52.8±23.4	9	106
	Housecleaning and laundry (7-105)	39.3±22.6	7	85
	Other activities (6-90)	73.4±21.6	14	90
	<b>MHQ</b>	Overall hand function		
Right		73.85±25.44	0	100
Left		66.78±29.83	0	100
Activities of daily living				
Right		74.00±30.69	0	100
Left		71.87±31.05	0	100
Both		65.76±23.70	0	100
Work performance		43.07±28.40	0	100
Pain		21.07±26.86	0	85
Aesthetics				
Right		77.05±28.36	0	100
Left		70.98±29.37	0	100
Satisfaction				
Right		69.69±27.35	4.16	100
Left		65.94±30.74	0	100
Total				
Right	68.76±19.25	11.64	98.57	
Left	65.10±21.63	15.20	98.03	

**Table 4.** Correlation of MAS and MHQ with other assessment parameters.

	DASH	DASH-W	Grip strength	VAS	
	r	r	r	r	
<b>MAS</b>	Total (47-705)	-0.685*	-0.303 <sup>†</sup>	0.405*	-0.359*
	Meal preparation and eating (8-120)	-0.487*	-0.276	0.345*	-0.353*
	Personal hygiene (9-135)	-0.602*	-0.370*	0.402*	-0.296 <sup>†</sup>
	Dressing (8-120)	-0.603*	-0.281 <sup>†</sup>	0.329*	-0.178
	Object manipulation (9-135)	-0.676*	-0.405*	0.474*	-0.400*
	Housecleaning and laundry (7-105)	-0.498*	-0.078	0.343*	-0.133
	Other activities (6-90)	-0.546*	-0.112	0.505*	-0.393*
<b>MHQ</b>	Overall hand function				
	Right	-0.282 <sup>†</sup>	-0.276	0.396*	-0.331 <sup>†</sup>
	Left	-0.154	-0.017	-0.216	-0.263
	Activities of daily living				
	Right	-0.561*	-0.221	0.595*	-0.420*
	Left	-0.190	-0.010	-0.201	-0.194
	Both	-0.680*	-0.354 <sup>†</sup>	0.438*	-0.517*
	Work performance	-0.563*	-0.177	0.298 <sup>†</sup>	-0.462*
	Pain	-0.287 <sup>†</sup>	-0.383 <sup>†</sup>	-0.444*	0.385*
	Aesthetics				
	Right	-0.374*	-0.205	0.424*	-0.354 <sup>†</sup>
	Left	-0.178	0.052	-0.061	-0.051
	Satisfaction				
Right	-0.458*	-0.366 <sup>†</sup>	0.582*	0.507*	
Left	-0.179	-0.073	-0.291	-0.169	
Total					
Right	-0.630*	-0.431*	0.633*	-0.586*	
Left	-0.376*	-0.088	-0.067	-0.377*	

\*p<0.01; <sup>†</sup>p<0.05

the lowest score, whereas object manipulation and other activities, including shopping, driving, etc. were also found to be difficult for the patients. MHQ reflected worse results than the DASH-T questionnaire, where results varied between an average of 65 to 75, with the exception of work performance and pain which had the best results.

The DASH-T was found to correlate with pain and grip strength results (p<0.05). Correlation of other questionnaires with the DASH-T, grip strength and VAS results are shown in Table 4. All parameters of the MAS were well correlated with DASH-T results and grip strength (p<0.05). Correlations of MAS with VAS were significant with the exception of the house cleaning and dressing parameters. MHQ correlated with all assessment parameters except the left hand part. None of the parameters correlated with the DASH-T sports/music part (p>0.05). MAS and MHQ correlations are shown in Table 5. ADL, work performance, satisfaction and total right score of MHQ were correlated with all parameters of the MAS. The left hand section of the MHQ was less correlated with MAS. There was no statistically meaningful correlation between the pain section of the MHQ and MAS (p>0.05).

DASH-T and MAS were quicker than the MHQ to complete. The MHQ included some reverse lines which could disorient the subject. Activity descriptions on the MAS and MHQ were easy to understand, but the DASH-T was more complicated for patients to understand.

## Discussion

The last decade has seen an increase in the usage of different questionnaires to assess outcome in hand disorders. Some researchers have stated that these questionnaires can be used instead of clinical assessment methods and are more efficient than those that require clinical assessment of objective measures.<sup>[14]</sup> However, many clinicians are unsure of what type of outcome information should be routinely collected and which tools are clinically useful. Additionally, because there are many questionnaires specific to hand surgery, selecting an appropriate outcome instrument presents difficulties.<sup>[2]</sup>

The aim of this study was to investigate the relationship, strength, weakness and clinical usage of the three most commonly used questionnaires in hand rehabilitation. Ideally, the clinometric properties of measurement

**Table 5.** Correlation of MAS with MHQ.

		MAS						
		Total	Eating	Hygiene	Dressing	Manipulation	Cleaning	Other
MHQ	Function							
	Right	0.260*	0.207	0.330 <sup>†</sup>	0.257*	0.262*	0.156	0.077
	Left	0.193	0.091	0.180	0.212	0.08	0.110	0.305*
	ADL	0.75 <sup>†</sup>	0.636 <sup>†</sup>	0.706 <sup>†</sup>	0.676 <sup>†</sup>	0.607 <sup>†</sup>	0.559 <sup>†</sup>	0.604 <sup>†</sup>
	Work	0.58 <sup>†</sup>	0.511 <sup>†</sup>	0.506 <sup>†</sup>	0.521 <sup>†</sup>	0.436 <sup>†</sup>	0.260*	0.390 <sup>†</sup>
	Pain	-0.195	-0.039	-0.94	-0.135	-0.170	0.015	-0.232
	Aesthetics							
	Right	0.261*	0.202	0.240	0.257*	0.259*	0.103	0.246*
	Left	0.278*	0.133	0.270*	0.233	0.179	0.214	0.378 <sup>†</sup>
	Satisfaction							
	Right	0.43 <sup>†</sup>	0.340 <sup>†</sup>	0.419 <sup>†</sup>	0.409 <sup>†</sup>	0.428 <sup>†</sup>	0.254*	0.251*
	Left	0.185	0.071	0.206	0.182	0.079	0.108	0.290*
	Total							
	Right	0.55 <sup>†</sup>	0.483 <sup>†</sup>	0.552 <sup>†</sup>	0.530 <sup>†</sup>	0.537 <sup>†</sup>	0.307*	0.366 <sup>†</sup>
	Left	0.40 <sup>†</sup>	0.272*	0.380 <sup>†</sup>	0.390 <sup>†</sup>	0.291*	0.229	0.463 <sup>†</sup>

\*p<0.05; <sup>†</sup>p<0.01

tools are reliability, validity, applicability and responsiveness (able to detect clinical importance changes). All three questionnaires were adapted to Turkish with good clinometric properties as they were constructed by a multidisciplinary group of experts.

The DASH is a useful questionnaire that assesses function and symptoms in a single scale. Having sports/music, as well as work, as independent domains is the advantage of this scale. DASH calculates the disability score without taking into consideration the injured or dominant hand.<sup>[9]</sup> The MHQ is a scale assessing functions of both the injured and uninjured hands; therefore, it can be used when comparison between hands is needed. The MHQ has different domains; it is the only scale that includes sections on “aesthetic” and “satisfaction with hand”, which are important decision making parameters in hand injuries.<sup>[11]</sup> Results showed the high influence of these parameters even in patients without poor hand appearance. However, neither of these scales can completely reflect the patients’ independence level in daily living activities. The MAS is a scale that can address global activity limitations in many areas, including the necessity of each task, allowing the therapist to plan a patient-centered treatment program tailored to the individual patients’ requirements and relevant to their daily activities.<sup>[12]</sup> Results confirmed that the MAS is also advantageous in including instrumental activities, such as “cleaning” and “object manipulation” which demonstrate larger limitations.

According to the correlation results of our study the sports-music section of the DASH-T was not correlated

with the other questionnaires. This may be due to a low number of responses to that section. The MAS was well-correlated with other assessment parameters, especially with the DASH and grip strength. Only the house cleaning and dressing parameters of MAS were not correlated with the VAS which may show that patients begin these activities as soon as possible despite feeling pain.

Even though more than 50% of patients injured their left side, the MHQ left side domains did not show any correlations with other assessments. Possible explanations are that patients use the right (dominant) side more frequently in daily living or that other questionnaires did not properly reflect left side injuries. Although the MHQ is advantageous in assessing both hands separately, it does not seem to have any effect on determining the non-dominant side injury.

Previous studies have demonstrated that a reduced questionnaire length may result in better response rates in postal surveys. The ease of understanding, ease of completion, usefulness, relevance and time taken to complete the questionnaire are important issues for their utility.<sup>[15]</sup> We can say that because the questionnaires were culturally adapted for the Turkish population it was easy for the patients to understand all questionnaires. The DASH-T and MAS took less time to complete. For the MAS, patients experienced difficulty in deciding the necessity of a given activity. The MHQ, however, is a longer questionnaire. Furthermore, sometimes patients became bored of answering the same questions for the injured and uninjured hand and did not



pay sufficient attention. Patients must therefore be careful when completing this questionnaire.

Missing responses may compromise the validity of the questionnaire. Therefore, even though patients should be notified of the necessity in completing the entire questionnaire, some responses may still be missing.<sup>[16]</sup> For the DASH questionnaire, the score cannot be calculated with over 3 missing answers. For the MHQ, the entire questionnaire must be completed. For the MAS, no rule was stated regarding missing values. Some activities may not be applicable for every patient. In the DASH-T questionnaire, these activities were Item 8 “garden or do yard work”, Item 9 “make a bed”, and Item 20 “sexual activities”. For the MAS, they were “shave”, “make-up”, “make bed”, “dust”, “clean basin and tub”, “driving”, and “typing/computer work”. In the MHQ, all questions were applicable.

Users of these questionnaires must be aware of the many extrinsic factors that may affect the outcome. Psychological reactions, such as depression, anxiety and lack of motivation may be the cause of poorer scores.<sup>[16]</sup> Timing is another important issue. Questionnaires should not be completed in the initial treatment session for patients beginning treatment immediately following a long period of immobilization due to relatively low participation in daily life activities.

In conclusion, although determining the best scale is difficult, it will often be the one in which the aims most closely match those of the intended user. While each instrument has different advantages and disadvantages, all correlate with each other and are applicable for outcome studies related to the field of hand and wrist surgery.

**Conflicts of Interest:** No conflicts declared.

## References

- Colville RJ, Nicholson KS, Belcher HJ. Hand surgery and quality of life. *J Hand Surg Br* 1999;24:263-6.
- Szabo RM. Outcomes assessment in hand surgery: when are they meaningful? *J Hand Surg Am* 2001;26:993-1002.
- MacDermid JC, Stratford P. Applying evidence on outcome measures to hand therapy practice. *J Hand Ther* 2004;17:165-73.
- Gabel CP, Melloh M, Michener LA, Burkett B. Clinimetric evaluation of measurement tools used in hand therapy to assess activity and participation. *J Hand Ther* 2010;23:83-4.
- Guillemin F, Bombardier C, Beaton D. Cross-cultural adaptation of health-related quality of life measures: literature review and proposed guidelines. *J Clin Epidemiol* 1993;46:1417-32.
- Düger T, Yakut E, Öksüz Ç, Yörükan S, Bilgütay BS, Ayhan Ç, et al. Turkish adaptation and validity of the DASH questionnaire. [Article in Turkish] *Fizyoterapi Rehabilitasyon* 2006;17:99-107.
- Öksüz Ç, Akel BS, Oskay D, Leblebicioğlu G, Hayran KM. Cross-cultural adaptation, validation and reliability process of the Michigan Hand Outcomes Questionnaire in a Turkish population. *J Hand Surg Am* 2011;36:486-92.
- Akel BS, Öksüz C, Karahan S, Düger T, Kayihan H. Reliability and validity of milliken activities of daily living scale (MAS) in measuring activity limitations of a turkish population. *Scand J Occup Ther* 2011 Jun 1.
- Davis AM, Beaton D, Hudak P, Amadio P, Bombardier C, Cole D, et al. Measuring disability of the upper extremity: a rationale supporting the use of a regional outcome measure. *J Hand Ther* 1999;12:269-74.
- The DASH outcome measure [Internet]. Toronto, Ontario: Institute for Work & Health; [cited 2012]. Available from: <http://www.dash.iwh.on.ca>
- Chung KC, Pillsbury SM, Walters MR, Hayward RA. Reliability and validity testing of the Michigan Hand Outcomes Questionnaire. *J Hand Surg* 1998;23:575-87.
- Seaton MK, Groth GN, Matheson L, Feely C. Reliability and validity of the Milliken Activities of Daily Living Scale. *J Occup Rehabil* 2005;15:343-51.
- Manual: How to use tracker FCE software to conduct functional capacity evaluations. Salt Lake City, UT: J-Tech Medical, 2000.
- Katz JN, Gelberman RH, Wright EA, Lew RA, Liang MH. Responsiveness of self-reported and objective measures of disease severity in carpal tunnel syndrome. *Med Care* 1994;32:1127-33.
- Burchell B, Marsh C. The effect of questionnaire length on survey response. *Qual Quant* 1992;26:233-44.
- Dias JJ, Rajan RA, Thompson JR. Which questionnaire is best? The reliability, validity and ease of use of the Patient Evaluation Measure, the Disabilities of the Arm, Shoulder and Hand and the Michigan Hand Outcome Measure. *J Hand Surg Eur* 2008;33:9-17.