

THE DASH AND QuickDASH

Disabilities of the Arm, Shoulder and Hand

OUTCOME MEASURES e-BULLETIN FALL 2012

The Institute for Work & Health (the Institute) is pleased to send you the Fall 2012 edition of the DASH and QuickDASH e-bulletin, which is produced and distributed twice a year.

The aim of the e-bulletin is to provide you with information about the following:

- research updates (as available) on DASH and QuickDASH;
- frequently asked questions (FAQs); and
- news on translations, associated tools and products in progress

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Research Updates

Measurement Properties of the QuickDASH (Disabilities of the Arm, Shoulder and Hand) Outcome Measure and Cross-Cultural Adaptations of the QuickDASH: A Systematic Review

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The ability to measure outcomes related to function in people with upper limb disorders using a short, yet robust instrument has many practical advantages over long-form instruments. The DASH (Disabilities of the Arm, Shoulder and Hand), a 30-item self-report measure, is one of the most commonly used measures for the upper limb. The QuickDASH, a shortened version (11-items), is becoming more widely used since its development in 2005.

A systematic review used a best evidence synthesis approach to critically appraise the measurement properties [using CONsensus-based Standards for the selection of health Measurement INSTRUMENTS (COSMIN) checklists] of the QuickDASH and cross-cultural adaptations. The COSMIN is a

relatively new, robustly developed guide for appraising measurement properties for different instruments and is still being refined (Angst 2011; De Vet 2011). Unfortunately, to date there has been no direct comparison to other appraisal systems.

A standard search strategy was conducted between 2005 (year of first publication of the QuickDASH) and March 2011 in MEDLINE, EMBASE and CINAHL. The search identified 14 studies (15 published articles) to include in the best evidence synthesis of the QuickDASH. A further 11 articles were identified to include in the best evidence synthesis on eight cross-cultural adaptation versions of the QuickDASH.

The measurement properties of the QuickDASH have been evaluated in multiple studies from multiple centres and across most of the measurement properties. The best evidence synthesis of the QuickDASH suggests that this tool is performing well with strong positive evidence available for reliability (internal consistency and test-retest reliability) and hypothesis testing, and moderate positive evidence for structural validity testing. Although a lot of support was found for responsiveness of the QuickDASH, the methods used in these studies did not get strong ratings. For example, although COSMIN has come to agree with the use of effect sizes and standardized response means as a summary of responsiveness when change has occurred, the criteria used to determine if there is good quality evidence has not yet been changed by that group, and still is based on only correlation coefficients or ROC curve results. The only correlations we had were slightly lower, 0.4, though higher than many of those cited in some of the work by Stratford and Norman. COSMIN requires 0.5 or greater, which meant the available evidence on the QuickDASH did not make this cut and was deemed to be evidence against its responsiveness. In this situation, the QuickDASH was deemed to have strong negative evidence for responsiveness.

The COSMIN approach was also applied to the cross-culturally adapted versions. Methods used in these versions did not meet the COSMIN mark, leading to overall poor methodological quality. The actual findings are available in our manual.

We were surprised that the quality of the studies in the review was found to be low, but this is true of the other published reviews using the COSMIN criteria. This was often due to underreporting of characteristics of the study when compared to the COSMIN criteria for reporting. With COSMIN as the yardstick, it is clear that we need to sharpen reporting of our measurement studies (e.g. report on missing data, articulate *a priori* hypotheses clearly) and work with larger sample sizes. Future studies will likely meet this mark; a challenge for us is what to do with the wealth of knowledge we have from the work done to date. We suggest examining where the studies fell short, and then determining if the shortcoming involved a reporting issue (i.e. we don't traditionally report missing data as thoroughly as COSMIN requests) or a flaw in the actual study design (i.e. nature of the study set up, hypothesis of change). This information is available from us at IWH.

References

Angst F. The new COSMIN guidelines confront traditional concepts of responsiveness. *BMC Med Res Methodol* 2011; 11:152.

de Vet HC, Terwee CB, Mokkink LB, Knol DL. *Measurement in Medicine: A Practical Guide*. Cambridge, UK: University Press; 2011.

Frequently Asked Questions (FAQs)

Q. How long does the *QuickDASH* take to score and administer?

A. The *QuickDASH* takes about five minutes to complete, plus about two minutes to score.

Q. What is reliability? Is the *QuickDASH* a reliable measurement tool?

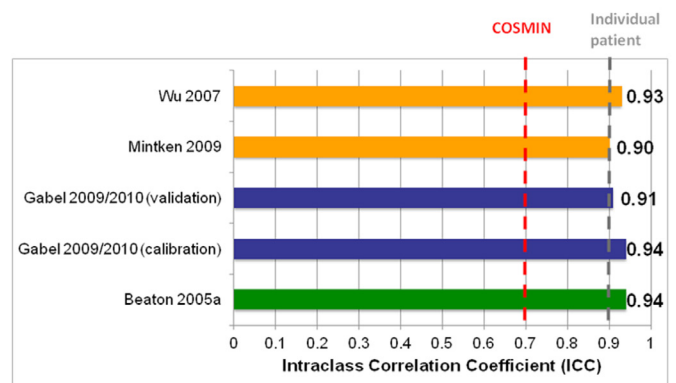
A. Testing reliability helps to understand how consistently an instrument measures the same phenomenon in the same subject when everything except one variable is held constant.

Actually... reliability is saying that we can consistently get the same score over time. It does not say anything about what is being measured or how valid the tool is, just that it is consistent.

There are several types of reliability. For instance, **test-retest reliability** is a reflection of the ability of an instrument's score to remain the same on two or more occasions when there has been no underlying change in the attribute being measured (Guyatt 1992; Kirshner 1985).

Test-retest reliability of the *QuickDASH* has been evaluated in four studies, measured using the Intraclass Correlation Coefficient (ICC) (type [2,1] Shrout 1979) and has met recommended standards in diverse upper limb patient groups (ICC ranging from 0.90 to 0.94) (see Figure 1. *QuickDASH* test-retest reliability: Summary of results across studies). The test-retest reliability across these four studies shows the ICC all meet the COSMIN cut-point for a positive rating ≥ 0.70 (red line). The studies also meet the criteria for use in individual patients (with all ICCs > 0.90 , grey line).

Figure 1. *QuickDASH* test-retest reliability: Summary of results across studies



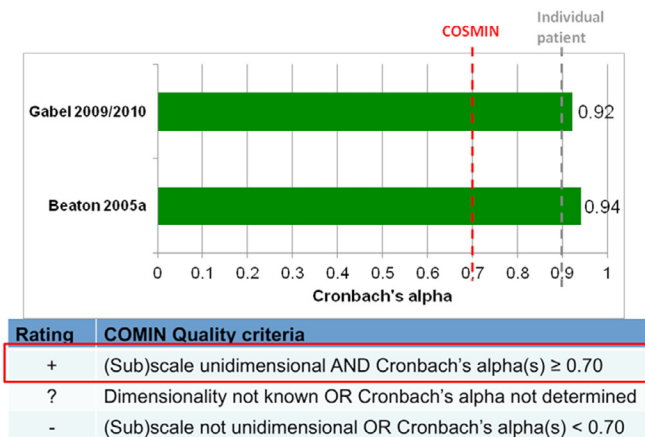
In the *QuickDASH* systematic review (see above), the overall methodological quality of the four studies was rated as follows: one excellent (Beaton 2005); one fair (Gabel 2009/Gabel 2010); and two poor (Mintken 2009; Wu 2007) (based on COSMIN four-point ratings). Smaller sample sizes in two studies (Gabel 2009/Gabel 2010; Mintken 2009) contributed to the lower quality ratings. The methodological quality was further compromised by the timing of the administration (one day apart) and the differing test conditions (hospital/home) (Wu 2007).

The best evidence synthesis for test-retest reliability thus resulted in **strong positive evidence** (one study with excellent methodological quality).

Another type of reliability is **internal consistency**, which is essentially how consistently responses compare across items in a measure. Cronbach's alpha coefficient is an estimate of internal consistency and is a function of the number of items in a scale and their magnitude of intercorrelation (Spector 1992). An ideal internal consistency of a multi-item scale is between 0.90 and 0.95.

Internal consistency has been evaluated in two studies with excellent (Beaton 2005) and good (Gabel 2009/Gabel 2010) methodological quality ratings. The Cronbach's alpha was high (0.92 and 0.94) and within the ideal range (0.90-0.95) for a multi-item scale (see Figure 2. *QuickDASH* reliability (internal consistency): Summary of results across studies). The *QuickDASH* received a "positive" rating because the two studies found it is a "unidimensional scale" and "Cronbach's alpha is ≥ 0.70 " (red line). These studies also meet the criteria for use in individual patients (with both alphas >0.90 , grey line).

Figure 2. QuickDASH reliability (internal consistency): Summary of results across studies



The best evidence synthesis for internal consistency of the *QuickDASH* (see above *QuickDASH* systematic review) thus resulted in **strong positive evidence** (two studies with excellent and good methodological quality).

Inter-observer reliability is not discussed here because the *QuickDASH* is self-administered and hence the observer (i.e. the clinician or researcher) has less impact on the completion of the questionnaire. This type of reliability is not relevant in this situation.

From these findings, we can therefore be confident that the scores you obtain on the *QuickDASH* will be reproducible.

References

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Wu A, Edgar DW, Wood FM. The *QuickDASH* is an appropriate tool for measuring the quality of recovery after upper limb burn injury. *Burns* 2007; 33: 843-849.

Q. Is there a published 'normal' QuickDASH score for the population by age group?

A. The United States general population normative data [from the AAOS (American Academy of Orthopaedic Surgeons) data set stratified by males and females, by age groups and by age groups for males and females] for the DASH and Optional Modules (Work, Sport/Performing Arts) are published in the new DASH/QuickDASH User's Manual. See link to DASH/QuickDASH User's Manual: <http://www.dash.iwh.on.ca/dash-manual>

Unfortunately, we did not have the QuickDASH population norms available when the manual was

released. We have recently run the QuickDASH scores against the same AAOS data set, and these are presented in the tables below.

United States General Population Norms

Normative data for the DASH Outcome Measure has been collected in a large general population survey (n=1800) conducted by the AAOS. This data offers a means to compare an individual's score against the United States (US) general population and against age- and sex-matched subgroups. The results of this study have been published by Hunsaker (2002). A summary of the results is presented in Tables 1 to 5 below.

Norms for General US Population

Table 1 presents descriptive statistics for the DASH Function/Symptom, the DASH Optional Sports/Performing Arts Module, the DASH Optional Work Module and the QuickDASH in the general population sampled. The descriptive statistics include the sample size (N), mean, median (50th percentile), 25th and 75th percentiles, standard deviation, and the range of scores.

Table 1: DASH norms for general US population: Total sample

	DASH Function/ Symptom (30-item DASH)	DASH Optional Sports/Performing Arts Module	DASH Optional Work Module	QuickDASH
Total Sample				
N	1706	1113	1610	1822
Mean	10.1	9.75	8.81	10.9
25th Percentile	1	0	0	0
50th Percentile (Median)	4	0	0	4.5
75th Percentile	13	0	6	14.3
Standard Deviation	14.68	22.72	18.37	15.3
Range	0-86	0-100	0-100	0-88.6

Norms for Males and Females

Table 2 presents general US population norms separately by males and females (for all age groups combined). This table can be used to determine whether a score for males or females is higher or lower than the mean score for males and females in the general US population. From Table 2, it is clear that females tend to score higher (more disability) than males on each of the DASH measures.

Table 2: DASH norms for males and females: General US population

	DASH Function/ Symptom (30-item DASH)	DASH Optional Sports/Performing Arts Module	DASH Optional Work Module	QuickDASH
Males				
N	698	515	660	736
Mean	7.43	9.17	7.91	7.65
25th Percentile	0	0	0	0
50th Percentile (Median)	3	0	0	2.27
75th Percentile	9	6	6	9.09
Standard Deviation	12.1	20.72	18.09	12.95
Range	0-80	0-100	0-100	0-82.21
Females				
N	1008	598	950	1086
Mean	11.96	10.26	9.44	13.08
25th Percentile	1	0	0	2.27
50th Percentile (Median)	5	0	0	6.82
75th Percentile	17	0	13	18.18
Standard Deviation	11.96	21.32	18.54	16.33
Range	0-86	0-100	0-100	0-88.6

Norms for Age Groups

Table 3 presents general US population norms for six different age groups (for females and males combined). It is evident from the data presented that there is a linear increase in DASH Function/Symptom, DASH Optional Modules and QuickDASH scores (more disability) with an increase in age.

Table 3: DASH norms for six age groups, males and females combined: General US population

	DASH Function/ Symptom (30-item DASH)	DASH Optional Sports/Performing Arts Module	DASH Optional Work Module	QuickDASH
Ages 19-34				
N	314	225	294	325
Mean	5.89	5.12	4.99	6.32
25th Percentile	0	0	0	0
50th Percentile (Median)	2	0	0	2.27
75th Percentile	6	0	0	6.82
Standard Deviation	11.28	15.48	14.35	11.9
Range	0-86	0-100	0-100	0-88.6

	DASH Function/ Symptom (30-item DASH)	DASH Optional Sports/Performing Arts Module	DASH Optional Work Module	QuickDASH
Ages 35-44				
N	395	278	386	406
Mean	6.94	7.64	7.59	7.73
25th Percentile	0	0	0	0
50th Percentile (Median)	2	0	0	2.27
75th Percentile	8	0	6	9.09
Standard Deviation	11.67	19.14	16.38	12.46
Range	0-80	0-100	0-100	0-81.82
Ages 45-54				
N	347	235	331	371
Mean	9.2	8.74	7.71	10.1
25th Percentile	0	0	0	0
50th Percentile (Median)	3	0	0	4.55
75th Percentile	12	0	6	13.64
Standard Deviation	14.55	21.87	17.73	15.18
Range	0-83	0-100	0-100	0-86.36
Ages 55-64				
N	265	162	247	281
Mean	11.54	11.33	11.03	12.42
25th Percentile	1	0	0	2.27
50th Percentile (Median)	6	0	0	6.82
75th Percentile	16	13	13	17.63
Standard Deviation	14.87	24.4	21.71	15.52
Range	0-75	0-100	0-100	0-75
Ages 65-74				
N	218	121	205	243
Mean	14.05	13.45	10.36	14.91
25th Percentile	3	0	0	2.52
50th Percentile (Median)	8	0	0	9.09
75th Percentile	20	19	19	22.47
Standard Deviation	15.39	24.92	18.31	16.42
Range	0-80	0-100	0-94	0-81.82

	DASH Function/ Symptom (30-item DASH)	DASH Optional Sports/Performing Arts Module	DASH Optional Work Module	QuickDASH
Ages 75 and over				
N	167	92	147	196
Mean	19.97	22.42	16.27	19.27
25th Percentile	5	0	0	4.55
50th Percentile (Median)	15	0	6	13.98
75th Percentile	28	25	25	27.27
Standard Deviation	19.19	35.29	22.82	18.89
Range	0-83	0-100	0-100	0-82.21

Norms for Age Groups, Males and Females

Table 4 and Table 5 present DASH general US population norms by age group separately for males and females. The data shows a general trend across most age groups for higher DASH (Function/Symptom, DASH Optional Module and *QuickDASH*) scores (more disability) for females than for males.

Table 4: DASH norms for males by age group: General US population

	DASH Function/ Symptom (30-item DASH)	DASH Optional Sports/Performing Arts Module	DASH Optional Work Module	QuickDASH
Ages 19-34 Males				
N	121	99	114	127
Mean	1.93	2.79	1.54	2.22
25th Percentile	0	0	0	0
50th Percentile (Median)	0	0	0	0
75th Percentile	2	0	0	2.27
Standard Deviation	3.93	8.26	6.47	4.69
Range	0-31	0-50	0-38	0-34.09
Ages 35-44 Males				
N	174	135	170	179
Mean	6.3	7.84	8.08	6.72
25th Percentile	0	0	0	0
50th Percentile (Median)	2	0	0	2.27
75th Percentile	7	6	6	6.82
Standard Deviation	11.81	18.39	18.3	12.63
Range	0-80	0-100	0-100	0-81.82

	DASH Function/ Symptom (30-item DASH)	DASH Optional Sports/Performing Arts Module	DASH Optional Work Module	QuickDASH
Ages 45-54 Males				
N	136	105	133	143
Mean	5.22	8.36	6.09	5.47
25th Percentile	0	0	0	0
50th Percentile (Median)	2	0	0	2.27
75th Percentile	6	0	0	6.82
Standard Deviation	8.61	18.77	15.04	8.98
Range	0-48	0-100	0-100	0-47.57
Ages 55-64 Males				
N	115	78	104	121
Mean	10.01	9.97	11.73	10.14
25th Percentile	0	0	0	0
50th Percentile (Median)	4	0	0	4.55
75th Percentile	13	13	9.5	13.64
Standard Deviation	14.45	22.17	23.74	15.29
Range	0-73	0-100	0-100	0-70.45
Ages 65-74 Males				
N	89	56	85	93
Mean	10.98	14.75	9.42	11.52
25th Percentile	2	0	0	2.27
50th Percentile (Median)	7	0	0	6.82
75th Percentile	16	25	19	15.91
Standard Deviation	12.78	24.22	18.73	14.75
Range	0-73	0-100	0-94	0-81.82
Ages 75 and over Males				
N	63	42	54	73
Mean	16.1	21.57	15.59	14.59
25th Percentile	4	0	0	0
50th Percentile (Median)	11	3	6	2.27
75th Percentile	23	25	25	6.82
Standard Deviation	16.46	34.69	22.61	17.68
Range	0-68	0-100	0-100	0-82.81

Table 5: DASH norms for females by age group: General US population

	DASH Function/ Symptom (30 item DASH)	DASH Optional Sports/Performing Arts Module	DASH Optional Work Module	QuickDASH
Ages 19-34 Females				
N	193	126	180	198
Mean	8.36	6.96	7.18	8.95
25th Percentile	0	0	0	0
50th Percentile (Median)	3	0	0	2.27
75th Percentile	11	0	0	11.36
Standard Deviation	13.49	19.19	17.27	14.18
Range	0-86	0-100	0-100	0-88.64
Ages 35-44 Females				
N	221	143	216	227
Mean	7.44	7.45	7.21	8.53
25th Percentile	0	0	0	0
50th Percentile (Median)	3	0	0	4.55
75th Percentile	8	0	13	11.36
Standard Deviation	11.59	19.9	14.26	12.29
Range	0-74	0-100	0-100	0-75
Ages 45-54 Females				
N	211	130	198	228
Mean	11.77	9.04	8.8	13.01
25th Percentile	1	0	0	0
50th Percentile (Median)	4	0	0	4.92
75th Percentile	16	0	6	18.18
Standard Deviation	16.86	24.15	19.29	17.41
Range	0-83	0-100	0-100	0-86.36
Ages 55-64 Females				
N	150	84	143	160
Mean	12.71	12.6	10.52	14.15
25th Percentile	2	0	0	2.27
50th Percentile (Median)	7	0	0	9.09
75th Percentile	18	16	13	20.45
Standard Deviation	15.12	26.38	20.18	15.51
Range	0-75	0-100	0-100	0-75

	DASH Function/ Symptom (30 item DASH)	DASH Optional Sports/Performing Arts Module	DASH Optional Work Module	QuickDASH
Ages 65-74 Females				
N	129	65	120	150
Mean	16.17	12.32	11.03	17.01
25th Percentile	4	0	0	2.27
50th Percentile (Median)	10	0	0	4.55
75th Percentile	22	6	19	25
Standard Deviation	16.68	25.65	18.06	17.09
Range	0-80	0-100	0-75	0-77.27
Ages 75 and over Females				
N	104	50	93	123
Mean	22.32	23.14	16.66	22.04
25th Percentile	7	0	0	6.82
50th Percentile (Median)	18	0	6	18.18
75th Percentile	30.5	25	25	31.82
Standard Deviation	20.33	36.12	23.05	19.09
Range	0-83	0-100	0-100	0-81.82

Note: All raw DASH scores were already rounded prior to calculating statistics, except for the QuickDASH. The QuickDASH was calculated afterward and was not rounded.

Translation and Tool News

Newly approved translations

Serbian language:

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For all available translations:

<http://www.dash.iwh.on.ca/available-translations>

Translations in progress

Please visit the DASH website to view the list of translations that are currently in progress:

<http://www.dash.iwh.on.ca/translations-in-progress>

Associated tools

Update on the DASH iPad Application

We are pleased to report that development of the DASH iPad application has progressed well. The application is currently in the final stages of development and we anticipate its launch in the Apple store by Winter. Please keep checking on our DASH website for its release:

www.dash.iwh.on.ca

News on scoring tools

See the following link for tools to help with scoring:

<http://www.dash.iwh.on.ca/scoring>

There will also be a scoring application in the DASH iPad application mentioned above.

Free Scoring Systems Service courtesy of Orthopaedic Scores, U.K.:

<http://www.orthopaedicscore.com/>

Useful Links

DASH website:

<http://www.dash.iwh.on.ca/home>

Translations:

<http://www.dash.iwh.on.ca/translations>

Conditions of Use for the DASH and *QuickDASH*:

<http://www.dash.iwh.on.ca/conditions-use>

Information About DASH and *QuickDASH* Outcome Measures Licences:

<http://www.dash.iwh.on.ca/licences>

Recommendations for the Cross-Cultural Adaptation of Health Status Measures (PDF, 393KB):

<http://www.dash.iwh.on.ca/system/files/X-CulturalAdaptation-2007.pdf>



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