Correlation of the Hand 20 with the International Classification of Functioning, Disability, and Health and comparison of the results with those of the Disability of the Arm, Shoulder and Hand

Terufumi Iitsuka, Tomoko Ohura, Takashi Fujita

Division of Occupational Therapy, Faculty of Care and Rehabilitation, Seijoh University

Abstract: The present study aimed to determine the correlation of the Hand 20, a patient-based outcome evaluation widely used in Japan, with the International Classification of Functioning, Disability, and Health (ICF) and compare the results with those of previous studies on the Disability of the Arm, Shoulder and Hand (DASH) score. As a result of the study, it was found that the Hand 20 includes 5 items in the chapters of Body Functions, 23 items in the chapters of Activity/Participation, and 2 items in the chapters on Personal Factors in the ICF. The results show that the Hand 20 has a larger number of assessment items categorized into the muscle function (b740) and hand dexterity (d440) than that of DASH. The present study concludes that the Hand 20 is a measurement method suitable for assessing hand functions and performance. These findings provide insights to select appropriate outcome assessment methods and interpret outcomes between the two different methods.

Keywords: ICF, Hand20, DASH

(*Asian J Occup Ther* 11: 27–33, 2016)

Introduction

In the recent approaches for outcomes evaluation of orthopedic rehabilitation, not only objective outcomes focusing on functional or biological aspects but also patient-based outcomes have come to play an important role in determining the impacts of disease or effects of intervention on psychosocial aspects (Dawson & Carr, 2001). Health-related quality of life (QOL) is the most common patient-based outcome of medical care. Its assessment system includes comprehensive, disease-specific, and body region-specific scales (Mcdowell, 2006).

The Disabilities of the Arm, Shoulder, and Hand (DASH) score has been widely used as a body region-specific scale for outcomes evaluation in the field of hand surgery. The DASH questionnaire consists of 30

questions pertaining to disability/symptoms and 4 pertaining to work and participation in sports/performing arts. Each item is scored by each patient using a Likert scale (Hudak, Amadio & Bonbardi, 1996). The questionnaire has been translated into each patient's native language, and its reliability, validity, and responsiveness have been verified (Christina, Isam & Charlotte, 2003; Imaeda, Toh, Nakao, Hirata & Ijichi, 2006; Offenhäuser, Ewert, Sangha & Stucki, 2003; Padula et al., 2003). However, the scope of the DASH questionnaire was reported to be limited to the 18- to 65-year-old age group ("The DASH outcome measure", n.d.) and some questions are difficult to respond to because of cultural background, except in the United States (Lee et al., 2004, 2005).

The Hand Frontier, a nonprofit organization, developed the Hand20 questionnaire, which takes into consideration the Japanese cultural background, and reported its reliability, validity, and responsiveness, as well as its concurrent validity with the DASH version by the Japanese Society for Surgery of the Hand [DASH-JSSH] (Suzuki et al., 2010). Considering that the DASH-JSSH consists of questions that elderly respondents tend not to respond to, such as those pertaining to the item "Having

Received: 5 December 2013, Accepted: 4 March 2014

Corresponding to: Terufumi Iitsuka, Division of Occupational Therapy, Faculty of Care and Rehabilitation, Seijoh University, 2-172 Fukinodai, Tokai, Aichi 476-8588, Japan
e-mail: iitsuka@seijoh-u.ac.jp

©2016 Japanese Association of Occupational Therapists

sexual life,” the Hand20 was designed to exclude such items. Moreover, the Hand20 reinforces 19 of the 20 questions with illustrations for the convenience of elderly respondents to further avoid unanswered items, which if missing could affect the overall score (Fig. 1). Additionally, the Hand20 has some particular items which ask about activities using the affected hand, facilitating effective intervention. These advantages have led to the wide acceptance of the Hand20 in Japan (Yoshida et al., 2011; Iwatsuki et al., 2011).

Thus, in Japan, either the DASH or Hand20 is primarily used as a patient-based evaluation tool in the field of hand surgery. However, when comparing the usefulness of the 2 scoring systems in determining the effects of intervention, it is important to know the characteristics of each evaluation tool and judge them appropriately. Thus, adequate consideration of the subjective difficulties in measuring specific aspects of a patient's health condition by each evaluation system is important.

Cieza et al. (2002, 2005) proposed to consider the association of an assessment instrument with the International Classification of Functioning, Disability

and Health (ICF) score because the ICF is necessary to achieve a consensus on the appropriate functional outcome parameters and is useful for comparing study results or choosing the appropriate assessment system. In addition, given that determining which outcome parameters should be evaluated and how they should be evaluated are important in outcomes assessment, the instrument's scope of scoring functional aspects should be based on the ICF score, thereby elucidating the relationship between intervention and its outcome.

The concurrent validity of the Hand20 with the DASH was previously reported. As suggested by Cieza et al. (2005), further determining the correlation of an assessment tool with the ICF may reveal the characteristics in each scope of scoring and may be useful in comparing outcomes. Furthermore, Drummond, Sampaio, Mancini, Kirkwood & Stamm (2007) reported on the DASH score and clarified its association with the ICF.

In conforming with the guidelines proposed by Cieza et al., the present study aimed to determine the correlation of Hand20 with the ICF and compare the results with those of previous studies on the DASH score.

Questions		Mark the point the best describing your situation												
1	Wash your face with both hands.	No limitation	0	1	2	3	4	5	6	7	8	9	10	Impossible
2	Cut all 10 nails on the digits of both hands properly. (using a nail cutter)	No limitation	0	1	2	3	4	5	6	7	8	9	10	Impossible
3	Do up shirt buttons with both hands.	No limitation	0	1	2	3	4	5	6	7	8	9	10	Impossible
4	Pick coins out of a purse with the affected hand.	No limitation	0	1	2	3	4	5	6	7	8	9	10	Impossible
5	Turn on/off the faucet with the affected hand.	No limitation	0	1	2	3	4	5	6	7	8	9	10	Impossible
6	Open a milk carton with both hands.	No limitation	0	1	2	3	4	5	6	7	8	9	10	Impossible
7	Open a PET bottle.	No limitation	0	1	2	3	4	5	6	7	8	9	10	Impossible
8	Roll up and squeeze a towel hard.	No limitation	0	1	2	3	4	5	6	7	8	9	10	Impossible
9	Peel an apple using a knife.	No limitation	0	1	2	3	4	5	6	7	8	9	10	Impossible
10	Operate a door knob and open a heavy door with the affected hand.	No limitation	0	1	2	3	4	5	6	7	8	9	10	Impossible
11	Push a heavy object up and onto the shelf overhead using both hands. (about 5 kg)	No limitation	0	1	2	3	4	5	6	7	8	9	10	Impossible
12	Hang wet clothes on a clip hanger.	No limitation	0	1	2	3	4	5	6	7	8	9	10	Impossible
13	Wash your hair with both hands.	No limitation	0	1	2	3	4	5	6	7	8	9	10	Impossible
14	Turn over pages of a newspaper with the affected hand.	No limitation	0	1	2	3	4	5	6	7	8	9	10	Impossible
15	Do manual work without too much difficulty.	No limitation	0	1	2	3	4	5	6	7	8	9	10	Impossible
16	Do you hesitate to show people your affected hand for cosmetic reasons?	No limitation	0	1	2	3	4	5	6	7	8	9	10	Impossible
17	Do you experience difficulties in recreational activities (painting, knitting, sports)?	No limitation	0	1	2	3	4	5	6	7	8	9	10	Impossible
18	Do you experience difficulties in activities of daily living?	No limitation	0	1	2	3	4	5	6	7	8	9	10	Impossible
19	How much pain do you have in your affected hand?	No limitation	0	1	2	3	4	5	6	7	8	9	10	Impossible
20	Do you feel less confident because of your affected hand?	No limitation	0	1	2	3	4	5	6	7	8	9	10	Impossible

Thank you.

Fig. 1. Hand20

Methods

Determining correlation with the ICF

In the ICF (World Health Organization, 2008), information is classified into 2 parts: Functioning and Disability as Part 1 and Contextual Factors as Part 2. Along with these parts, the ICF code expresses regions with lower case letters as follows: in Part 1, “b,” “s,” and “d” represent body functions, body structures, and activities and participation, respectively; in Part 2, “e” represents environmental factors. Furthermore, 2 to 4 numbers are added for individual classification. The classification into the “activities and participation” category was common. Although they should have been fundamentally expressed as “a” (activities) and “p” (participation) (Ueda, 2010), it was decided to code them as “d” for comparison with previous studies.

The Japanese version of the Hand20 was used in this study. However, the codes written in English provided by previous studies (Suzuki *et al.*, 2010) were used in this paper. We complied with the guidelines proposed by Cieza (2002, 2005). The correlation guidelines consist of 8 items to correlate with the appropriate ICF codes that correspond to all the concepts that might be considered as applicable to the second-level items in the evaluation table. The classification into either “other specified” or “unspecified” was not performed; instead, the coding for the relatively lower level was applied. Personal factors were coded as “pf.” Factors that were not defined in the ICF code were coded as “nd.”

Consequently, 2 researchers (T.I. and T.O.) acquired adequate prior knowledge of the ICF, correlation guidelines, and Hand20 and performed the correlation analysis independently. Subsequently, they compared each other’s classifications. When a consensus on an assessment tool was reached between the 2 researchers, that instrument was adopted, as well as its corresponding classification codes. When no consensus was achieved, a third researcher (T.F.), who had been a lecturer on the ICF to the undergraduates in the university, made the decision.

Analysis

According to the above-mentioned correlation guidelines, the Hand20 was evaluated using the ICF codes. The rate of concordance of the final code after having reached an agreement (T.I. and T.O.) was expressed by the kappa coefficient. The coding of Hand20 was subsequently compared with that of the DASH. Although the DASH was classified into the second level including the “disability/symptom,” “work,” and “sports/performing arts” categories, the Hand20 could not be

appropriately classified; therefore, we compared the scores from the “disability/symptom” category only. We also compared the differences in the number of codes and the rate of concordance of each ICF code between the DASH and the Hand20.

Results

1. Linking to the ICF in Hand20 (Table 1, 2)

As a result of having classified the items according to the ICF codes, 20 questions in the Hand20 were correlated with 30 ICF codes, covering 6 chapters: Sensory Functions and Pain, Neuromusculoskeletal and Movement-related Functions, General Tasks and Demands, Mobility, Self-care, and Community, Social, and Civic Life. These correlation codes included 5, 23, and 2 items pertaining to body functions, activities and participation, and personal factors, respectively. None of the items was classified as a body function/structure or an environmental factor.

For the body functions, 2 items were classified as sensation of pain (b280), 2 items were classified as muscle function (b730), and 1 was classified as muscle endurance function, respectively (b740).

For the “activities and participation” category, 2 items were classified as “carrying out daily routine” (d230) in Chapter 2 (General Tasks and Demands); 1, 4, and 7 items were classified as “lifting and carrying objects” (d470), “fine hand use” (d440), and “hand and arm use” (d445), respectively, in Chapter 4; 3 and 1 items were classified as “washing oneself” (d510) and “caring for body parts” (d520) in Chapter 5; 1 item was classified as “preparing meals” (d630) in Chapter 6; and 1 item was classified as “caring for household objects” (d650) in Chapter 7.

Question no. 17 “Do you experience difficulties in recreational activities? (e.g., painting, knitting, and sports)” was most frequently linked to the classification items, including “recreation and leisure” (d920), “sports” (d9201), “art and culture” (d9202), and “handicrafts” (d9203).

The kappa coefficient indicating the rate of concordance of the final code after a consensus was reached was substantial (Kappa index = 0.69, $P = 0.02$) (Landis & Koch, 1977). Items 11 (“Push a heavy object up and onto the shelf overhead using both hands; approximately 5 kg”), 14 (“Turn over pages of a newspaper with the affected hand”), and 15 (“Do manual work without too much difficulty?”) in the Hand20 questionnaire required discussion with the third person to obtain an agreement.

Table 1. Linking between the Hand20 and the ICF

No.	Item Hand20	Meaningful Concept	ICF code/ICF category	Additional Information
1	wash your face with both hands	washing oneself	d5100 washing body parts	face
2	cut all 10 nails on the digits of both hands properly. (using a nail cutter)	caring for body parts	d5203 caring for finger nails	using a nail cutter
3	Do up shirts buttons with both hands.	fine hand use	d440 fine hand use	do up shirts buttons with the affected hand
4	pick up coins out of a purse with the affected hand.	picking up	d4400 picking up	coins out of a purse
5	turn on/off the faucet with the affected hand.	turning/twisting	d4453 turning or twisting the hands or arms	the faucet with the affected hand
6	open a milk curton with both hands.	fine hand use	d440 fine hand use	a milk curton
7	open a PET bottle.	open	d4453 turning or twisting the hands or arms	a PET bottle
8	roll up and squeeze a towel hard.	turning/twisting	d4453 turning or twisting the hands or arms	a towel
9	peel an apple using a knife.	cooking	d6300 preparing simple meals	
10	operate a door knob and open a heavy door with the affected hand.	turning/twisting opening/pushing	d4453 turning or twisting the hands or arms d4451 pushing	door knob a heavy door
11	push a heavy object up and onto the shelf overhead using both hands. (about 5kg)	putting down reaching muscle power function	d4305 putting down objects d4452 reaching d730 muscle power functions	overhead about 5kg
12	hang wet clothes on a clip hanger.	housework	d6400 washing and drying clothes and garments	wet clothes a clip hanger
13	wash your hair with both hands.	washing oneself	d5100 washing body parts	hair
14	turn over pages of a newspaper with the affected hand.	fine hand use hand and arm use	d440 fine hand use d445 hand and arm use	a newspaper
15	do manual work without too much difficulty.	muscle power functions muscle endurance functions	d230 caring out daily routines b730 muscle power functions b740 muscle endurance functions	manual work with the affected hand
16	do you hesitate to show people your affected hand for cosmetic reasons?		pf	
17	do you experience difficulties in recreational activities (eg., painting, knitting, sports, etc.)?	recreation painting knitting sports	d920 recreation and leisure (d9201 sports) (d9202 arts and culture) (d9203 crafts)	sports painting knitting
18	do you experience difficulties in activities of daily living?	carrying out daily routine	d230 carrying out daily routine	
19	how much pain do you have in your affected hand?	pain	b28014 pain in upper limb b28016 pain in joints	affected hand
20	do you feel less confident because of your affected hand?		pf	

2. The difference of item numbers between Hand20 and DASH (Table2)

For the DASH and Hand20 questionnaires, the concordance rate was calculated by dividing the number of items in the ICF first and then the second-level classifications by the total number of items: 2–13% for the DASH and 3–23% for the Hand20. The ICF code was concentrated on the “sensation of pain” (b280) and “hand and arm use” (d445) for the DASH and on “hand and arm use” (d445) alone for the Hand20. In addition, no item corresponded to “sleep functions” (b134) in the DASH and to “touch function” (b265), “mobility of bone functions” (b720), and “sensations related to mus-

cles and movement functions” (b780) in the Hand20. For activities and participation, no item corresponded to “writing” (d170), “using transportation” (d470), “dressing” (d540), “eating” (d550), “doing housework” (d640), “informal social relationships” (d750), “family relationships” (d760), “intimate relationships” (d770), and “remunerative employment” (d850) in the Hand20. For body functions, no item corresponded to “muscle endurance functions” (b740) in the Hand20. For activities and participation, no item corresponded to “fine hand use” (d440) in the DASH.

Table 2. Comparison of the Hand20 with the DASH

ICF categories		Number of items (ratio; %)	
One-level classification	Two-level classification	DASH	Hand20
body function			
Chapter 1 MENTAL FUNCTIONS	global mental functions	sleep functions (b134)	1 (2.2)
Chapter 2 SENSORY FUNCTIONS AND PAIN	additional sensory functions	touch sensation (b265)	1 (2.2)
	pain	sensation of pain (b280)	6 (13.0) 2 (6.7)
Chapter NEUROMUSCULOSKELETAL AND MOVEMENT-RELATED FUNCTIONS	functions of the joints and bones	mobility of bone functions (b720)	1 (2.2)
	muscle functions	muscle power functions (b730)	2 (4.3) 2 (6.7)
		muscle endurance functions (b740)	1 (3.3)
	movement functions	sensations related to muscles and movement functions (b780)	1 (2.2)
activities and participation			
Chapter LEARNING AND APPLYING KNOWLEDGE	applying knowledge	writing (d170)	1 (2.2)
Chapter 2 GENERAL TASKS AND DEMANDS		carrying out daily routine (d230)	1 (2.2) 2 (6.7)
Chapter 4 MOBILITY	carrying, moving and handling objects	lifting and carrying objects (d430)	2 (4.3) 1 (3.3)
		fine hand use (d440)	4 (13.3)
		hand and arm use (d445)	6 (13.0) 7 (23.3)
	moving around using transportation	using transportation (d470)	1 (2.2)
Chapter 5 SELF-CARE		washing oneself (d510)	1 (2.2) 2 (6.7)
		caring for body parts (d520)	1 (2.2) 1 (3.3)
		dressing (d540)	1 (2.2)
		eating (d550)	1 (2.2)
Chapter 6 DOMESTIC LIFE	household tasks	preparing meals (d630)	1 (2.2) 1 (3.3)
		doing housework (d640)	4 (8.7)
	caring for household objects and assisting others	caring for household objects (d650)	1 (2.2) 1 (3.3)
Chapter 7 INTERPERSONAL INTERACTIONS AND RELATIONSHIPS			1 (2.2)
	particular interpersonal relationships	informal social relationships (d750)	3 (6.5)
		family relationships (d760)	1 (2.2)
		intimate relationships (d770)	1 (2.2)
Chapter 8 MAJOR LIFE AREAS	work and employment	remunerative employment (d850)	1 (2.2)
Chapter 9 COMMUNITY, SOCIAL AND CIVIC LIFE		recreation and leisure (d920)	3 (6.5) 4 (13.3)
		pf	1 (2.2) 2 (6.7)

Discussion

In this study, the difference in the number of questions influenced the correlation with the ICF (10 chapters and 44 items for the DASH vs. 6 chapters and 30 items for the Hand20). In addition, the ICF code was concentrated on “sensation of pain” (b280) and “hand and arm use” (d445) for the DASH and on “hand and arm use” (d445) alone for the Hand20, which were considered characteristic of each scoring system. Regarding the correlation with the ICF, the rate of interrater agreement was significant.

The reliability and validity of the Hand20 were previously verified, and its concurrent validity with the DASH score was 0.91, indicating high correlation (Suzuki, 2010). However, the health-related QOL should

not be interpreted using only the scores, and each scope of scoring should be prescribed with a common framework. It is important that the scores be considered as one of the indexes for comparing or choosing an assessment tool. In this study, the ICF proposed by the WHO (World Health Organization) was considered as the unifying framework. The Hand20 was compared with the DASH in conformity with the correlation guidelines proposed by Cieza *et al.* (2002, 2005). Regarding the results on the characteristics of the aspects of body functions in the Hand20, no item corresponded to the sleep functions under the mental functions in the first level in Chapter 1. In the DASH, sleep disorder is considered to be caused by arm pain and supplemented by the question “How painful is the affected hand?” in the Hand20. However, items related to touch function are not covered in the

Hand20 despite the fact that sensitivity to decreased touch function is a concern in peripheral neuropathy. To overcome this limitation, the use of disease-specific evaluation is recommended. For neuromusculoskeletal and movement-related functions, some differences were observed but were not relevant items in the DASH and the Hand20. It is a common point that items in the ICF are more focused on aspects of body functions.

For activities and participation, no item corresponded to “writing” in Learning and Applying Knowledge (Chapter 1). Conversely, “fine hand use” was as frequent as 23.3% in the Hand20. These results might be because the DASH focuses on disorders in the entire arms, whereas the Hand20 focuses on hand-specific, health-related QOL. Furthermore, the DASH included many questions on interpersonal interactions and relationships (informal social relationships, family relationships, intimate relationships, and remunerative employment). This difference in the conceptual framework led to the difference between the 2 instruments. Therefore, the fundamental principles of the Hand20 may be considered as based on the conceptual framework that disorders of the hand have a minimum influence on the aspects of participation.

In the Hand20, only few items are associated with self-care and instrumental activities of daily living such as dressing, eating, doing housework, and using transportation. These reflect the differences in the conceptual framework between the 2 assessment tools. The Hand20 is more focused on the hand and skill activities than the DASH. In contrast, for the personal factors, the DASH included only 1 item, whereas the Hand20 included 2 items, suggesting that the impact of hand disorder on personal factors is of particular concern.

Thus, the characteristics of the DASH include many social aspects such as health-related QOL, on which whole-arm disorders have an impact, whereas the Hand20 includes many performance aspects pertaining to health-related QOL, on which mainly hand disorders have an impact. Therefore, although the Hand20 is considered sensitive for evaluating performance aspects in disorders confined to the hand, it was suggested that it lacks sensitivity to measuring its impact on social aspects.

To utilize evidence derived from the study results, it is important to further consider whether an instrument should be used to guide the decision of appropriate treatment after having carefully examined the evaluation index used to measure the effect of intervention. In this study, the characteristics of the DASH and Hand20 were examined thoroughly. The results of this study will be useful in deciding which evaluation index should be used in clinical practice.

Conclusion

In conformity with the ICF correlation guidelines, as a result of having classified each item of the Hand20 and DASH, we found that the Hand20 is intended for diseases confined to the hand and that the DASH consisted of a comprehensive conceptual framework that includes social aspects on which whole-arm disorders have an impact. In addition, the sensitivity of the Hand20 for evaluating impaired touch function is unclear. Thus, identifying the differences in the conceptual frameworks between the 2 instruments is important for instrument selection and interpretation of results using the DASH and Hand20, which have been widely used in the field of hand surgery in Japan.

Acknowledgment: The author would like to thank Dr. Hitoshi Hirata, MD, Professor of Department of Hand Surgery at Nagoya University and Chairman of Hand Frontier, for cooperating and accepting the use of Hand20 English version.

References

- Christina, G., Isam, A., & Charlotte, E. (2003). *The disabilities of the arm, shoulder and hand (DASH) outcome questionnaire: longitudinal construct validity and measuring self-rated health change after surgery*. In BMC Musculoskeletal Disorders. Available at: <http://www.biomedcentral.com/1471-2474/4/11>.
- Cieza, A., Brockow, T., Ewert, T., Amman, E., Kollerits, B., Chatterji, S., Üstün, TB., & Stucki, G. (2002). Linking health-status measurements to the international classification of functioning, disability and health. *J Rehabil Med*, **34**, 205–210.
- Cieza, A., Geyh, S., Chatteerji, S., Kostanjsek, N., Üstün, B., & Stucki, G. (2005). ICF linking rules: update based on lessons learned. *J Rehabil Med*, **37**, 212–218.
- DASH Outcome Measure Institute for Work & Health, *frequently asked questions*. Available at <http://www.dash.iwh.on.ca/faq.htm> (accessed 20 February, 2014).
- Dawson, J., & Carr, A. (2001). Outcomes evaluation in orthopaedics. *Journal of bone and joint surgery. European*, **83**, 313–315.
- Drummond, A., Ferreira Sampaio, R., Cotta Mancini, M., Noce Kirkwood, R., & Stamm, TA. (2007). Linking the Disabilities of Arm, Shoulder, and Hand to the international classification of functioning, disability, and health. *J Hand Ther*, **20**, 336–344.
- Hudak, PL., Amadio, PC., & Bonbardier, C. The Upper Extremity Group (UECG) (1996). Development of an upper extremity outcome measure: The DASH (disabilities of the arm, shoulder and hand). *Am J Ind Med*, **29**, 602–608.
- Imaeda, T., Toh, S., Nakao, Y., Nishida, J., Hirata, H., Ijichi, M., Kohri, C., & Nagano, A. (2005). Validation of the

- Japanese Society for Surgery of the Hand version of the disability of the Arm, Shoulder, and Hand questionnaire. *J Orthop Sci.* **10**, 353–359.
- Iwatsuki, K., Kurimoto, S., Yamamoto, M., Tatebe, T., Shinohara, T., & Hirata, H. (2011). Syukonkankaihoujyutu oyobi syukonnai suteroidotyusyago ni okeru jyousi-kinouhyouka no keijitekihenka nituite [The functional assessment after steroid injection and open carpal tunnel release]. *Peripheral nerve.* **22**, 50–56.
- Landis, R., & Koch, G. (1977). The measurement of observer agreement for categorical data. *Biometrics.* **33**, 159–174.
- Lee, E., Lau, S., Chung, M., Li, S., & Lo, S. (2004). Evaluation of the Chinese version of the Disability of the Arm, Shoulder and Hand (DASH-HKPWH): cross-cultural adaptation process, internal consistency and reliability study. *J Hand Thera.* **17**, 417–423.
- Lee, E., Chung, M., Li A., & Lo, K. (2005). Construct validity of the Chinese version of the disabilities of the arm, shoulder and hand questionnaire (DASH-HKPWH). *Journal of Hand Surgery. British & European.* **30**, 29–34.
- McDowell, I. (2006). *Measuring Health: Guide to rating scales and questionnaires*, 3rd ed., Oxford University Press, Newyork.
- Offenbacher, M., Ewert, T., Sangha, O., & Stucki, G. (2003). Validation of a German version of the Disabilities of Arm, Shoulder, and Hand questionnaire (DASH-G). *Z Rheumatol.* **62**, 168–177.
- Padua, R., Padua, L., Ceccarelli, E., Romanini, E., Zanolli, G., Amadio, P., & Campi, A. (2003). Italian Version of the Disability of the Arm, Shoulder and Hand (DASH) questionnaire: cross-cultural adaptation and validation. *The journal of hand surgery. British & European.* **28**, 179–186.
- Suzuki, M., Kurimoto, S., Shinohara, T., Tatebe, M., Imaeda, T., & Hirata, H. (2010). Development and validation of an illustrated questionnaire to evaluate disabilities of the upper limb. *J Bone Joint Surg Br.* **92**, 963–969.
- Ueda, S. (2010). *ICF no rikai to katsuyou [The Comprehension and Application of Internal Classification of Functioning, Disability and Health]*, Houbun sya, Tokyo.
- World Health Organization (2008). *Kokusai seikatsu kinou bunrui [International Classification of Functioning, Disability and Health]*, Chuou Houki Syuppan, Tokyo.
- Yoshida, A., Kisanuki, O., Shimizu, T., Omokawa, S., & Yajima, H. (2011). Toukotsu eni syousoku pure-to bat-teizenngo no tekansetsukinou no henka [The difference of wrist function between removing a distal radius volar plate]. *The Journal of Japanese Society for Surgery of the Hand.* **28**, 13–15.