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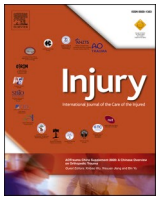

Modified Chinese disabilities of arm, shoulder and hand tool: Validity and reliability for upper extremity injuries

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ABSTRACT

Design: Clinimetric evaluation study.
Introduction: The Chinese Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire has necessitated the development of a revised version to the specific needs of individuals with upper extremity injuries with the progress of times and lifestyle changes.
Purpose of the study: This research aimed to evaluate the reliability and validity of Modified Chinese Disability of Arm, Shoulder and Hand (MC-DASH) questionnaire in individuals with upper extremity injuries.
Methods: One hundred and one individuals with upper extremity injuries (UEI) were recruited. The function of upper extremity was measured using the electronic version of MC-DASH, and compared against the Chinese Disability of Arm, Shoulder and Hand. The MC-DASH was reassessed within three days in all individuals. We investigated the internal consistency, test-retest reliability, content validity, criterion validity, and construct validity of MC-DASH.
Results: The internal consistency was deemed sufficient, as indicated by a Cronbach's alpha of 0.986 and an intraclass correlation coefficient of 0.957. Moreover, the mean total scores of MC-DASH on the first-test and retest were 37.86 and 38.19, respectively (ICC: 0.957, 95 %CI: 0.937–0.971, $p < 0.001$). Furthermore, the MC-DASH version exhibited satisfactory content validity evidenced by its strong correlation ($R = 0.903$, $p < 0.001$) with the Chinese DASH. Three major influencing factors were identified from 37 items. The cumulative variance contribution rate of the MC-DASH questionnaire was 75.76 %, confirming its construct validity.
Conclusion: The Modified Chinese Disability of Arm, Shoulder and Hand questionnaire has been shown to be a valid, reliable, and practical tool for use in patients with upper extremity injuries.

Introduction

Upper extremity injuries (UEI) often result from accidents in both life and work settings. Defining UEI can be intricate since it encompasses various tissues, including the skin, nerves, tendons, and bones [1]. Generally, UEI may result in the loss or impairment of hand and upper extremity function [2], thereby threatening the independence of those affected. To preserve and enhance the functionality of the upper extremity function, it is essential to undergo surgery and rehabilitation therapy [3]. Therefore, using reliable and valid assessment tools can accurately identify issues and measure treatment outcomes. Numerous clinical tools have been developed for measuring upper extremity function, such as Minnesota Manual Dexterity Test (MMDT), Simple Test for Evaluating Hand Function (STEF), and Purdue Pegboard Test [4]. Nevertheless, these assessment instruments primarily concentrate on a comprehensive evaluation of upper extremity motions within controlled laboratory environments, so they may not fully capture the functional capabilities and personal experiences of individuals in their everyday

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routines, encompassing employment, recreational pursuits.

The Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire, which measures upper-extremity function, is a widely utilized assessment tool [5,6]. It measures different elements of upper extremity capability, including activities of daily living (ADL), symptoms, work-related tasks, and leisure activities. The DASH questionnaire is standardized, easy to administer, and time efficient. It is applicable to various conditions and also keeps the patients involved in the evaluation procedure. Further, it actively involves patients in the assessment procedure, offering valuable perspectives on their functional condition during the evaluation period [7]. The purpose of DASH is to identify upper extremity disorders of varying severity, monitor changes over time, and assess the effectiveness of interventions [8].

The DASH has been translated and culturally adapted into almost thirty languages in both developed and developing regions [9]. The validity and reliability of the Chinese DASH questionnaire have been demonstrated in three different versions [10–12]. Of these three versions, DASH—HKPWH [11] is the earliest and most widely used version in clinic, and it is fully translated and used in accordance with DASH since 2004. However, as time passes and technology advances, residents' way of lifestyles, work patterns and entertainment have changed dramatically in nearly twenty years. For instance, the smartphone has gained immense popularity, making it an increasingly indispensable tool in our daily lives that warrants inclusion in the assessment. Hence, it has necessitated the development of a revised evaluation instrument tailored to the specific needs of individuals with upper extremity injuries. This study was conducted at the Sun Yat-sen University First Affiliated Hospital, with two primary objectives: 1) to revise the Chinese Disability of Arm, Shoulder and Hand, now labeled as the Modified Chinese Disability of Arm, Shoulder and Hand (MC-DASH), to align with the characteristics of individuals with upper extremity injuries, and 2) to establish the reliability and validity of the MC-DASH questionnaire.

Materials and methods

Ethical compliance statement

Ethical approval was obtained from Sun Yat-sen University First Affiliated Hospital (No. 2023505) in accordance with the principles set forth in the World Medical Association Declaration of Helsinki. Written informed consent was provided by all the participants.

Participants and setting

Individuals with upper extremity injuries were notified of the recruitment program as potential participants when visiting the rehabilitation clinic of Sun Yat-sen University First Affiliated Hospital. They were included as a convenience sample once they consent and meet our criteria. The inclusion criteria for individuals in this study required them to be over 18 years old, conscious, being fluent in Chinese, and be able to read words. The exclusion criteria were upper extremity dysfunction caused by other diseases or disabling medical conditions, inability to complete questionnaires due to language challenges or cognitive impairment, and declining to participate in the study.

Prior to the assessment, individuals were briefed on the purpose and the evaluation method of this study. After that, they were then guided on how to complete three online e-questionnaire, including general background information, Chinese DASH, and MC-DASH following standardized procedures. The general background information consisted of sex, age, occupation, dominant hand, injury hand, combined with nerve injury, and duration since injury. The Chinese DASH and MC-DASH focused on identifying difficulties in completing tasks after upper extremity injury based on their regular routines and current bilateral upper extremity functionality. Within three days, all individuals were reassessed with the MC-DASH questionnaire in the same office of hospital.

All data was collected by three proficient researchers in a random order of their arrival for therapy. The data would be checked twice by another two researchers for the assurance of data integrity and accuracy, and then entered into the database. Those data would be considered invalid if individuals did not response on either the MC-DASH or the Chinese DASH questionnaire.

Questionnaire development

Guided by purpose of limitations identified and tool modification, the Chinese DASH was modified with the goal to be applicable across UEI. Four hand surgeons and four UEI therapists with more than 10 years of experience, and eight patients with UEI were invited to refine the Chinese DASH items. This adaptation involved several key modifications to the Chinese DASH questionnaire (Table 1). These changes were implemented to ensure the questionnaire's relevance and comprehensibility among Chinese individuals. To address cultural and lifestyle differences, items from the Chinese DASH were carefully reviewed. Some items were deleted or merged, while others received additional details and descriptions to enhance patient comprehension. For example, changes were made to items related to eating habits, household chores, and leisure activities to better align with Chinese customs.

Consequently, 37 MC-DASH items were developed for this study (see Supplementary material). Similar to Chinese DASH (38 items in total), the MC-DASH questionnaire primarily comprised of four sections: ADL, symptoms, work, and leisure. Part A (ADL) evaluated the level of disability in the utilization of the upper extremities to participate in basic daily living and housework. Part B (symptoms) gauged upper-extremity discomfort. Part C (Work) measured performing work or study tasks. Part D (leisure) assessed limitations in using upper limbs for leisure activities including sports, instrumental playing, sexual activities, and social engagement.

Calculation for the mc-dash score

There are 37 items on the MC-DASH, including ADL (18 items), symptoms (7 items), work (6 items), and leisure (6 items). When individuals were assessed using the MC-DASH, the questionnaire score was not valid if any questions were unanswered. The grading of each item is determined by a five-point Likert scale ranging from 1 to 5, where 1 indicates no difficulty, 2 represents mild difficulty, 3 indicates moderate difficulty, 4 signifies severe difficulty, and 5 represents inability. Moreover, each part was calculated by formula of this: Score = [(Total score /N) − 1] × 25. Specially, N means number of items. Each part of the score ranged from 0 to 100, just like the total score. Lower scores indicated lesser upper extremity dysfunction; conversely, higher scores indicated more severe dysfunction.

Reliability

To evaluate the internal consistency, describing homogeneity, Cronbach's alpha and the half-confidence coefficient were employed. An excellent rating is assigned to values above 0.9, while a value above 0.7 suggests acceptable consistency [13,14]. The strength and direction of the correlation between results were evaluated using the intraclass correlation coefficient (ICC) and Bland-Altman's 95 % limits of agreement to determine the test-retest reliability [15]. Good agreement of results indicates a smaller interval between results and the mean difference, in-turn indicating a bias within the subsample of the study population that individuals are requested to answer the MC-DASH questionnaire twice within a period of three days. At both the first and second evaluation, the patient had to be in the same condition. For instance, if the patient wore an orthosis, the orthosis was to be considered in both assessments when asking the patient to self-evaluate. Coefficients range from 0 to 1, with a coefficient greater than 0.7 indicating

Table 1
Specific modifications included.

	Items of Chinese DASH	Methods to modify
Part A		
1	扭开紧或新的瓶盖 (Open a tight or new jar)	Adding activity of opening fast-food container
2	写字 (Write)	Adding activity of draw, and moving this item to the Part C;
3	扭动钥匙 (Turn a key)	Deleting
4	预备餐食/煮饭 (Prepare a meal)	Expanding the item to include details such as washing, cutting, stir-frying, and plating
5	推开重的门 (Push open a heavy door)	Adding activity of closing a door
6	将物件摆放在高过头顶的架上 (Place an object on a shelf above your head.)	Describing this item with more detailed method of taking away an object
7	做消耗大量体力的家务(例如:抹窗或洗擦地板) (Do heavy household chores (e.g., wash windows, wash floors).)	Replacing the example of this item by cleaning the floor and windows, washing the walls, replacing bottled drinking water etc.
8	园艺或种植 (Garden or do yard work)	Revising items related to gardening and yard work to reflect common practices in the local context, and merging it with the other items.
9	整理床铺 (Make a bed.)	Changing this item to specific tasks for better understanding;
10	携带购物袋或公事包 (Carry a shopping bag or briefcase)	Diversify this item with more context, such as a school bag, a heavy backpack
11	携带重物(超过10磅) (Carry a heavy object (over 10 lbs).)	Adjusting "over 10 lbs" to "over 5 kg" based on usage of weight units in local;
12	更换高过头顶的灯泡 (Change a lightbulb overhead.)	Expanding the item to include similar tasks of changing curtains or other items
13	清洗或吹干头发 (Wash or blow dry your hair.)	Expanding the item to include similar tasks of washing face, applying makeup or shave
14	清洗背部 (Wash your back.)	Expanding the item to include similar tasks of washing opposite arms
15	穿套头衣物 (Put on a pullover sweater.)	Expanding the item to include more varied clothes of a hoodie and pants that fit closely
16	用刀切食物 (Use a knife to cut food.)	Transforming the item to more varied life scene by eating with chopsticks, spoons, knives, or forks, and holding a bowl or cup for drinking, based on local habit
17	进行一些需要较少体力的业余活动(例如:玩纸牌游戏, 编织等) (Recreational activities which require little effort (e.g., cardplaying, knitting, etc.).)	Enriching example of this item by including playing chess, using remote controls, video games, etc. based on local culture
18	进行一些需要上肢(包括肩膀,手臂或手部)发力或承受压力的业余活动(例如:打高尔夫球,打排球,打网球,拳击等) (Recreational activities in which you take some force or impact through your arm, shoulder or hand (e.g., golf, hammering, tennis, boxing, etc.).)	Enriching example this item by including using a tool for growing vegetables or other plants, playing tennis, or keeping fit, etc. based on local culture
19	进行一些需要手臂自由活动的业余活动(例如:玩飞碟,打羽毛球等) (Recreational activities in which you move your arm freely (e.g., playing frisbee, badminton, etc.).)	Enriching example of this item by including dancing and gymnastics based on local culture
20	搭乘交通工具从一处地方到另一处地方 (Manage transportation needs (getting from one place to another).)	骑单车,摩托,驾驶汽车 Expanding the item to include details such as riding a bike, a motorcycle, or driving a car; Moving this item to part C;
21	进行性行为 (Sexual activities.)	Moving this item to part D;
22	过去一星期内, 因为你肩膀,手臂或手部的问题而影响你和家人,朋友,邻居或团体的正常社交活动, 其程度有多大∝ (During the past week, to what extent has your arm, shoulder or hand problem interfered with your normal social activities with family, friends, neighbours or groups?)	Expanding the item to include details such as handshakes, hugs, hand signals, and toasts for common social gestures; moving it to Part D;
23	过去一星期内, 你的工作或其它日常活动, 有没有因你肩膀,手臂或手部的问题而受到限制∝ (During the past week, were you limited in your work or other regular daily activities as a result of your arm, shoulder or hand problem? (circle number))	Move this item to part
Part B		
24	肩膀,手臂或手部感到痛楚 (Arm, shoulder or hand pain.)	Setting this item to a specific background of pain onset of being at rest and not moving
25	从事某些特定的活动时, 肩膀,手臂或手部感到痛楚 (Arm, shoulder or hand pain when you performed any specific activity.)	No Change.
26	肩膀,手臂或手部有被针刺的感觉 (Tingling (pins and needles) in your arm, shoulder or hand.)	Changing tingling with numbness or to cover symptoms of patients with burns and nerve injuries and to not duplicate two existing pain description
27	肩膀,手臂或手部软弱无力 (Weakness in your arm, shoulder or hand.)	No Change.
28	肩膀,手臂或手部僵硬 (Stiffness in your arm, shoulder or hand.)	No Change.
29	过去一星期内, 由于你肩膀,手臂或手部的痛楚而引起睡眠困难, 其程度有多大∝ (During the past week, how much difficulty have you had sleeping because of the pain in your arm, shoulder or hand?)	No Change.
30	由于肩膀,手臂或手部的问题, 我觉得自己的办事能力,自信心或效率, 比以前降低 (I feel less capable, less confident or less useful because of my arm, shoulder or hand problem.)	No Change.
Part C		
31	以惯常的技巧和方法工作, 困难有多大∝ (using your usual technique for your work?)	Removing all items of this part due to unclear task for patients to understand; Incorporating necessary activities, such as computer-related activities, considering their ubiquitous use in work.
32	由于肩膀,手臂或手部痛楚, 做日常工作的困难有多大∝ (doing your usual work because of arm, shoulder or hand pain?)	
33	工作时, 要达到你想做到的一样, 困难有多大∝ (doing your work as well as you would like?)	
34	用你平常所需要的时间去完成工作, 困难有多大∝ (spending your usual amount of time doing your work?)	
Part D		
35	以惯常的技巧弹奏乐器或进行体育活动, 困难有多大∝ (using your usual technique for playing your instrument or sport?)	Removing all items of this part due to cultural and popular entertainment differences; Incorporating smartphone-related activities, considering their ubiquitous use in leisure and social interactions.
36	弹奏惯用的乐器或进行惯常的体育活动时, 因为肩膀,手臂或手部痛楚, 而引	

(*continued on next page*)

Table 1 (*continued*)

	Items of Chinese DASH	Methods to modify
	起的困难有多大∝ (playing your musical instrument or sport because of arm, shoulder or hand pain?)	
37	弹奏惯用的乐器或进行惯常的体育活动时, 要达到你想做到的一样, 困难有多大∝ (playing your musical instrument or sport as well as you would like?)	
38	用你平常所需要的时间去练习乐器或进行体育活动, 困难有多大∝ (spending your usual amount of time practising or playing your instrument or sport?)	

*Mark the corresponding English words in parentheses after each item for easy understanding.

good reliability [16].

Validity

The content validity of MC-DASH was assessed by demonstrating a normally distributed sample and investigating floor and ceiling effects. The presence of these effects was evaluated by analyzing histograms and determining if more than 15 % of individuals scored at the lowest or highest levels [16]. Simultaneously, in order to evaluate the criterion validity, the correlation coefficient of Pearson was employed to assess the association between MC-DASH, the Chinese DASH [11], and each item. Correlations were assessed using the Pearson's correlation coefficient (R). We determined the correlation strength as excellent ($r < 0.75$), good ($0.50 < r < 0.75$), moderate ($0.25 < r < 0.50$), or weak ($r < 0.25$) [17]. To further investigate construct validity, exploratory factor analysis using Kaiser's criterion with varimax rotation was applied to identify whether the questionnaire items formed one overall factor or several factors [16].

Data analysis

The analysis of the data was performed using SPSS version 27.0 (IBM Corporation, Armonk, New, USA). Statistical significance was set at $p < 0.05$. General background information was analyzed using a descriptive method.

Results

One hundred and eighty-seven patients with UEI were invited to participate in the study. Nevertheless, 86 individuals were subsequently excluded due to incomplete responses on either the MC-DASH or the Chinese DASH questionnaire. As a result, the total number of participants with UEI was 101 individuals. The included individuals exhibited a diverse demographic profile. The average age of the individuals was 39.5 years, with a range spanning from 18 to 76 years. The general background information of individuals with upper extremity injuries are listed in Table 2. Moreover, the MC-DASH questionnaire was completed in an average of 6.5 min (37 items) while the Chinese DASH questionnaire took 8.0 min (38 items) on average.

Reliability

The coefficient alpha of MC-DASH was 0.986, in which the Cronbach's alpha coefficients for ADL (Part A), symptoms (Part B), work (Part C), and leisure (Part D) were 0.983, 0.891, 0.946, and 0.922, respectively. The half-confidence coefficient for the total MC-DASH score was 0.952, and those for ADL (Part A), symptoms (Part B), work (Part C), and leisure (Part D) were 0.967, 0.892, 0.953, and 0.897, respectively. The MC-DASH questionnaire demonstrated good internal consistency. (see Table 3)

Table 2
Patients general background information.

Variable	Value
Sex, (n,%)	
Males	64 (63 %)
Females	37 (37 %)
Age, mean (SD)	39.50 (12.14)
Diagnosis, (n,%)	
Nerve injury	5 (5 %)
Musculoskeletal injury	71 (70 %)
Complex mixed trauma	25 (25 %)
Duration since injury, mean, day (SD)	231.8 (383.2)
Injuries hand, (n,%)	
Left	51 (50 %)
Right	41 (41 %)
Both	9 (9 %)
Dominant hand, (n,%)	
Left	7 (7 %)
Right	94 (93 %)
Occupation, (n,%)	
Manual labor	29 (29 %)
Mental work	63 (62 %)
Mixed	9 (9 %)

*SD: Standard Deviation; n: number.

A total of 101 individuals completed the MC-DASH twice within a three-day period. The mean scores at the first and second time points did not show any statistically significant variation ($t = -0.45$, $p = 0.66$), suggesting that the condition of the samples remained relatively stable between the first (37.86 ± 25.19) and the second (38.19 ± 24.99) measurements (see Table 4).

Validity

The validity of MC-DASH questionnaire was confirmed by 101 individuals with UEI that the all the items were relevant to their upper extremity problems. The distribution of MC-DASH scores at baseline followed a nearly normal distribution, with a mean of 37.86 ± 25.19 (Fig. 1). On the baseline MC-DASH scale, only a small fraction of the participants, less than 15 %, achieved a disability score of 0, indicating the maximum health status score (ceiling level). None of the individuals had a disability score of 100, which was the minimum health status score (floor level).

The MC-DASH generally exhibited strong criterion validity as it showed a high correlation ($R = 0.903$, $p < 0.001$) with the original Chinese iteration of DASH. Additionally, each section of the MC-DASH showed a significant correlation with the total MC-DASH score, with R-values of 0.987, 0.809, 0.965, and 0.952 ($p < 0.001$) for parts A, B, C, and D, respectively. A strong correlation was found between the overall MC-DASH score and 18 ADL items, 7 symptom items, 6 work items, and 6 leisure items, with R values ranging from 0.725 to 0.871, 0.540 to 0.771, 0.487 to 0.682, and 0.720 to 0.823, respectively ($p < 0.001$).

With regards to construct validity, an exploratory factor analysis revealed that the Kaiser-Meyer-Olkin (KMO) test yielded a value of 0.944, while the χ^2 of the Bartlett spherical test was 4927.01 ($p < 0.001$). These results suggest that factor analysis is suitable for investigating item distinctions. Following the rotation for maximum variance,

Table 3
Internal consistency reliability.

Module	Cronbach α	half-confidence coefficient
ADL (Part A)	0.983	0.967
symptom (Part B)	0.891	0.892
work (Part C)	0.946	0.953
leisure (Part D)	0.922	0.897
Total score	0.986	0.952

Table 4
Test-retest reliability.

Module	First time	Second time	ICC	95 % CI
ADL (Part A)*	38.72(27.93)	39.15 (27.07)	0.949	0.925,0.965
Symptom (Part B)*	30.73(20.05)	31.26(21.66)	0.850	0.786,0.897
Work (Part C)*	43.85(29.25)	43.85(27.80)	0.926	0.893,0.950
Leisure (Part D)*	37.62(26.79)	37.75(25.53)	0.933	0.903,0.955
Total score	37.86 (25.19)	38.19(24.99)	0.957	0.937,0.971

* $p > 0.05$.

three primary factors that had a significant impact were identified from the entire set of 37 items in the MC-DASH questionnaire. The Chinese DASH questionnaire demonstrated a strong structural validity with a cumulative variance contribution rate of 75.76 %.

Discussion

The objective of this research was to demonstrate the validity, and reliability of the MC-DASH. Based on the findings of our research, MC-DASH preserves good reliability and validity. Moreover, the MC-DASH questionnaire was much easy to understand for individuals with upper extremity injuries and it took an average of 6.8 min only to complete without assistance. In comparison to Chinese DASH [11], the MC-DASH offers many advantages in terms of cultural and times adaptability, hand trauma symptoms, and questionnaire structure. These studies will enrich the tools available for individuals with UEI to self-evaluate and functionally assess the upper extremity.

According to the findings of this study, the MC-DASH demonstrated satisfactory internal consistency and test-retest reliability. The internal consistency reliability of the MC-DASH was sufficient, with an alpha coefficient of 0.986. An analysis of test-retest reliability was performed on the entire sample of recruited participants, revealing excellent reliability. Additionally, the reliability results of MC-DASH seemed better than other version of DASH [3,10-12,18–28]. Accordingly, the MC-DASH may be well suited in the context of modern society for assessing upper extremity function in individuals with UEL. In addition to adapting to the changing lifestyle of the times, all 101 individuals retested the MC-DASH, which may have contributed to the high reliability of the retest. The sample size for the retest was also larger than that of other versions, potentially influencing the high reliability of the retest.

In this study, the content, criteria, and construct validity of the MC-DASH were good. The MC-DASH showed content validity without floor or ceiling effects, owing to the good distribution of items. A strong correlation was observed between the MC-DASH and Chinese DASH score in general. Additionally, each section of the MC-DASH score was significantly correlated with the total score of MC-DASH. The total MC-DASH score significantly correlated with each item. All the data showed excellent criterion validity. In terms of the construct validity, by employing maximum variance rotation, three main influencing factors were identified from the 37 MC-DASH questionnaire items, with a cumulative variance contribution rate of 75.76 %. Part A contained three influencing factors, Part B contained one influencing factor, Part C contained three influencing factors, and Part D contained three influencing factors. Undoubtedly, part B had the highest, however, Parts A, C, and D also contain three factors; therefore, certain items of the MC-DASH questionnaire required additional adjustments to improve its reliability.

The excellent reliability and validity demonstrated by MC-DASH questionnaire carry profound implications for both clinical practice and research endeavors. These implications underscore the significance of the MC-DASH as a valuable tool in the assessment of upper extremity function. In clinical practice, the MC-DASH's robust psychometric properties carry significant implications. These properties empower healthcare professionals to provide enhanced patient care by accurately assessing upper extremity function, confidently tracking patient progress, evaluating intervention effectiveness, and making informed treatment decisions. The MC-DASH's high reliability and validity further facilitate tailored rehabilitation, allowing clinicians to pinpoint specific areas of upper extremity dysfunction and design personalized rehabilitation plans that effectively address patients' unique needs and goals. Moreover, the MC-DASH's cultural adaptability fosters patient engagement by aligning with contemporary Chinese culture, promoting patients' self-assessment, and encouraging active involvement in care decisions, thus promoting patient-centered care principles. The 'prepare a meal' task in Chinese DASH, for example, was elaborated in MC-DASH as 'Wash, cut, and stir-fry foodstuff, plate' with more details to enhance

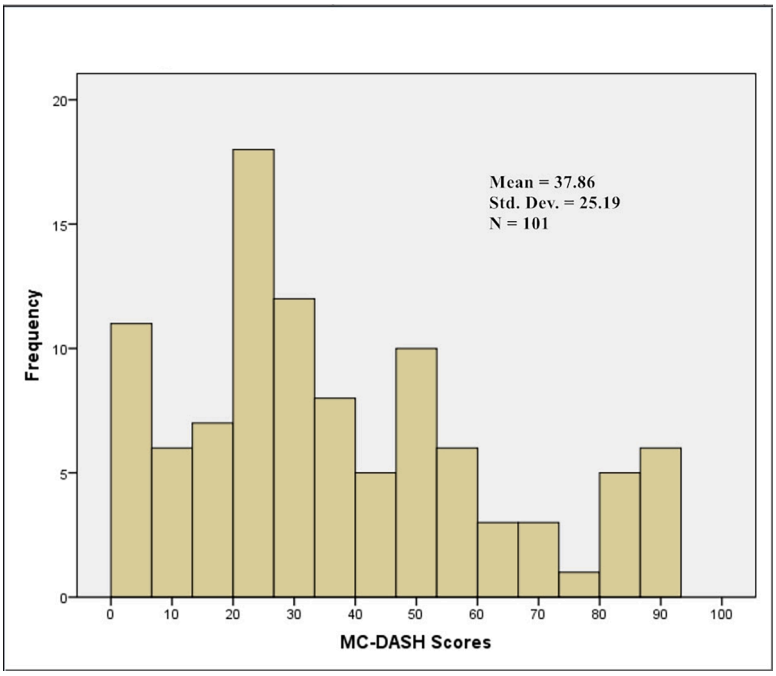

Fig. 1. The distribution of M-DASH scores at baseline.

comprehension among injured individuals.

In the realm of research, the MC-DASH's robust psychometric properties hold profound implications. These properties are pivotal in ensuring accurate data collection, as researchers heavily rely on reliable and valid instruments to gather consistent and meaningful data. The MC-DASH's strength in this regard bolsters the credibility of research outcomes related to upper extremity injuries. Furthermore, its adaptability to contemporary Chinese culture enhances its applicability for comparative studies across regions and populations, enabling researchers to assess upper extremity function consistently. This adaptability fosters cross-cultural comparisons and the generalization of findings, enriching the scope of research. Additionally, in clinical trials and intervention studies, the MC-DASH can take on a central role as a primary outcome measure, thanks to its unwavering reliability and validity. This empowers researchers to confidently assess the impact of interventions on upper extremity function, facilitating evidence-based decision-making and furthering the advancement of healthcare knowledge.

Limitations and future directions

This study had some limitations. Individuals were recruited from only one local hospital, which could have led to bias in the sampling process. Patients with upper extremity injuries in this study might differ greatly from their counterparts in other clinical units in terms of their personality traits. Consequently, these conclusions can only be applied to individuals sharing similar traits and working in a comparable clinical setting. Additionally, the sample size of the study was limited, which was consistent with other studies in which the DASH score was validated.

Future research on the MC-DASH should focus on expanding its validation and applicability. This can be achieved by conducting studies involving a more diverse and extensive individual pool, representing various age groups, occupational backgrounds, and geographical regions within China. A larger and more diverse sample will enhance the questionnaire's generalizability and its ability to capture the experiences of a broader population. Furthermore, longitudinal studies can be valuable in assessing the MC-DASH's sensitivity to changes in upper extremity function over time. This will provide crucial insights into its effectiveness in monitoring rehabilitation progress, which is particularly important for individuals with upper extremity injuries. Additionally, comparative studies can be undertaken to evaluate how the MC-DASH performs in relation to other established upper extremity assessment tools, both within the Chinese context and on an international scale. This comparative analysis will help identify the unique strengths and applications of the MC-DASH.

Conclusion

We conclude that the modified Chinese disability scale for the arm, shoulder, and hand questionnaire are valid, reliable and practical for individuals with upper extremity injuries. Further studies are required to estimate the reliability and validity of other conditions of the upper extremities in clinical practice.

Data available

The data that support this study are available openly in the Secience Data Bank at https://www.scidb.cn/anonymous/aW11cTJt.

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Declaration of generative ai in scientific writing

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Declaration of competing interest

The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.injury.2024.111367.

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