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ORIGINAL ARTICLE

Urdu Translation and Psychometric Validation of Manual Ability Measure (MAM-36) in Patients with Neurological Disease

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ABSTRACT

Background: The pathophysiological underpinnings of lifelong impairment in a variety of acute and chronic neurological illnesses include neuronal loss and destruction. Upon neuroaxonal injury, levels of neurofilament proteins rise in the blood and cerebrospinal fluid (CSF). The Manual Ability Measure (MAM-36) is a questionnaire about the perceived ease or difficulty individuals may experience when performing unilateral and bilateral ADL tasks. The objective o was to translate and validate the Urdu version of manual ability measure for patients with neurological disorders

Methods: A standardized step by step forward and backward translation procedure was followed. Data was collected from 108 patients with neurological diseases. Researcher employed Urdu version of self-administered MAM-36 questionnaire for data collection. Data was analysed by using SPSS.25. in this study test retest reliability was found through alpha Cronbach and Intra class Coefficient and construct validity was assess in relation to MusiQOL

Results: The reliability analysis of the Manual Ability Measure (MAM-36) questionnaire demonstrated a high level of internal consistency, with both readings having a Cronbach's alpha reliability coefficient of 0.987. The sample consisted of 45 males (41.7%) and 63 females (58.3%), and the majority had a middle socioeconomic status (66.7%). Descriptive statistics showed that the sample had a mean age of 56±4 years, a mean height of 1.68±0.1 meters, a mean weight of 86.5±11.0 kg, a mean body mass index of 30.7±4, a mean grip strength of dominant hand of 24.6±1.9, and a mean grip strength of non-dominant hand of 22.9±0.7.

Practical Implication: The reliability statistics indicate that the MAM-36 questionnaire is a reliable and valid tool for measuring manual ability in individuals with neurological diseases. The strong positive correlation between the variable of interest and the reference variable supports the construct validity of the measure.

Conclusion: Hence it was concluded that, the reliability statistics indicate that the MAM-36 questionnaire is a reliable and valid tool for measuring manual ability in individuals with neurological diseases. The strong positive correlation between the variable of interest and the reference variable supports the construct validity of the measure.

Keywords: Psychometric validation, Manual Ability Measure (MAM-36), Neurological disease

INTRODUCTION

Neuronal loss and damage are the pathophysiological bases of lifetime disability in a range of acute and chronic neurological diseases. Neurofilament protein concentrations increase in the blood and cerebrospinal fluid (CSF) after neuroaxonal damage. The immunoblot and enzyme-linked immunosorbent assay neurofilament tests for the first- and second-generation disorders only detected the disease's tip[1]. ROM, feeling, grip strength, and pinch strength are a few of the characteristics that are typically evaluated while evaluating hand function. To more precisely identify a patient's functional limits, it is preferable to examine task-oriented skills rather than underlying qualities. Additionally, for patients who are ill or disabled, relevant outcomes—those that affect everyday functioning—are crucial. For the purpose of treatment planning and outcome documentation, doctors can benefit from measuring the perceived ease and difficulty of patients carrying out their everyday activities[2]. While some are condition-specific, others are joint-specific. On a scale, items are rated from 1 (difficult) to 4 (easy). There is also a null option, which signifies that it is unlikely that either a person without hands or one with them will ever be able to do this project. Higher scores on the MAM-36 test indicate superior hand function, emphasizing his level of individual talent rather than any physical constraints[3]. stroke was the second-leading cause of death and disability worldwide. Older people are more prone to get strokes than younger people, and they can have extremely disastrous effects[4-6]. Additionally, cardiovascular conditions in general and stroke in particular contribute significantly to physical impairment, and over the next few years, their high societal and financial costs are expected to rise[7]. Due to the frequent challenges with arm, hand, and finger movement and coordination brought on by these upper extremity illnesses, performing daily tasks like eating, dressing, and washing can be difficult[8]. Upper extremity impairment is a frequent side effect of stroke, occurring 50–80% of the time in the acute phase and 40–50% of the time in the chronic (late) phase. Weakened muscles, hypertonic or hypotonic muscles, poor somatosensory function, uncoordinated movements, and balance are the most typical upper extremity impairments following stroke. The prediction and evaluation of the outcomes of stroke treatment are therefore dependent on the measurement of upper extremity motor function[9]. According to the study, 77.6% of upper extremity function in stroke patients was impaired, and upper limb muscular strength was the primary factor affecting upper limb function (10). Numerous epidemiological studies undertaken over the past few decades have demonstrated the existence of both non-modifiable risk variables such age, sex, race, ethnicity, and genetics as well as certain modifiable stroke determinants. These include obesity, carotid artery stenosis, high blood pressure (BP), diabetes, carotid artery disease, smoking, inactivity, and poor diet[11,12]. Any of these risk factors or predisposing components, especially if they build up over time, can result in a stroke. The significance of blood cholesterol levels is still debatable[13,14]. cerebral blood artery occlusion, which restricts blood flow, obstructs blood flow, and causes blood vessels to burst and haemorrhage, is a condition that causes these symptoms. During a stroke, a ruptured artery that supplies the brain causes the sudden lack of oxygen that result in the death of brain cells[15]. An ischemic stroke is brought on by a decrease in the amount of blood and oxygen reaching the brain. Blood vessels that are leaking or bleeding might result in hemorrhagic strokes. Ischemic occlusion accounts for about 85% of stroke cases, with intracerebral hemorrhage accounting for the remaining 15%. Brain thrombotic and embolic disorders are brought on by ischemic occlusion[16]. Inflammation, low energy, loss of homeostasis, acidosis, elevated intracellular calcium levels, excitotoxicity, free radical-mediated toxicity, cytokine-mediated cytotoxicity, complement activation, disruption of the blood-brain barrier, activation of the neuralgia, oxidative stress, and leukocyte infiltration are additional significant events affecting the pathology of stroke[17–19]. Multiple sclerosis (MS) and other neurological disorders typically impair upper extremity motions and daily activities like dressing, eating, and writing[20]. Neurological movement abnormalities include tremors, rigidity, weakness, and slowness of movement can be brought on by stroke, MS, and PD. Parkinson's disease patients have inconsistent upper-extremity

mobility limitations. The range of impairments includes everything from a loss of dexterity to a small reduction in self-care skills[21]. Parkinson's disease-related degenerative changes in the upper extremities may make it challenging to quickly reach for, grab, and move objects. Eating, drinking, and taking care of oneself are typically impacted when there are issues with the upper extremities. They can hinder social ties, involvement in work, and creativity[22]. Researchers and practitioners must take subjective viewpoints into account when assessing upper extremity function and how it affects ADL. Clinical trials and management of neurological illnesses are increasingly using "patient-reported outcome measures" (PROMs), which are critical to understanding the effects neurological disorders have on patients' life and to encouraging patient engagement in their care[23]. Lack of hand dexterity may cause impairment. The manual abilities required to execute a task can be impacted by trauma, developing disease, surgery, or aging. These diseases may result in hand pain and make it difficult to complete a number of tasks. Patients are subjected to a number of evaluations in clinics around the nation to gauge their strength, range of motion, level of pain, etc.[24,25]. Pakistan has five provinces and each province has its own language, but Pakistan has one national language, Urdu. The official Urdu version of Manual Ability Measure (MAM-36) was not available. Therefore, this study aimed to create an Urdu version for Urdu speaking countries and to find psychometric characteristics to reduce the language barrier. The Urdu version of Manual Ability Measure (MAM-36) was of great value to physical therapist, clinicians and researchers who evaluate and help patients with upper extremity impairments.

Objective: To translate and evaluate the Urdu Version of Manual Ability Measure (MAM-36), a task-oriented functional evaluation tool to gauge patients' self-reported manual ability, for use with neurological illnesses.

MATERIALS AND METHODS

The design of the study was cross-sectional. The information was provided by the Punjab Institute of Neurosciences in Lahore. The six-month study began with the approval of the summary. The sample size was established using the KLINE rule of thumb, which calls for a minimum of three samples per item. The questionnaire consists of 36 items in total; 36 * 3 equals 108, according to the rule of thumb. Patients were chosen based on the inclusion and exclusion criteria. The age range for inclusion was 20 to 65 years for men and women, but stroke, multiple sclerosis, and spinal cord injury—all neurological diseases that impair the upper limbs—were excluded. The exclusion criteria were HIV/AIDS, Parkinson's illness, and any musculoskeletal disorder. Uneducated people, expecting women, those with other systemic illnesses, cancer patients, fracture patients.

METHODOLOGY

It was translated methodically, going forward and backward in steps. 108 sufferers of neurological conditions contributed data. The researcher employed an Urdu self-administered questionnaire to gather data. In the course of their initial visit, data was acquired. The Manual Ability Measure (MAM-36) was retested on a subset of patients at their second appointment, which was 48 hours after the first one, without any intervening medical care, for test-retest purposes. The two-way mixed analysis of variance with a 95% confidence interval and the intraclass correlation were used to determine test-retest reliability. It was decided whether a construct was legitimate by using Pearson and Spearman correlation.

Data Analysis: Data was analysed with SPSS 25.0 version. Frequency was calculated through bar charts and pie charts. Data, from all respondents was represented in tabulated form.

RESULTS

Description: With a standard deviation of 4.81 years, the sample's median age was 56.10 years. With a standard deviation of 0.10 meters, the average height was 1.68 meters. With a standard deviation of 11.10 kilograms, the mean weight was 86.56 kilograms. The standard deviation was 4.24 and the mean BMI was 30.79. The average grip force for the dominant hand was 24.64 kilograms, with a 1.94 kilogram standard deviation. With a standard variation of 0.76 kilograms, the non-dominant hand's mean grip strength was 22.93 kilograms.

Table 1: Biographic Descriptive Statistics

Descriptive Statistics	Mean	Std. Deviation
Age	56.1019	4.81031
Height	1.6806	.10455
Weight	86.5648	11.09624
Body Mass Index	30.7927	4.23667
Grip Strength of Dominant Hand	24.6389	1.94051
Grip Strength non-Dominant Hand	22.9259	.75756

Table 2: Reliability Statistics

Reliability Statistics	Mean	Std. Deviation	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items
MAM-36 Reading 1	76.29	10.68	.987	.988
MAM-36 Reading 2	76.59	10.58	.987	.988

Description: The Manual Ability Measure (MAM-36) questionnaire's reliability statistics for the first and second readings are shown in the table below. The table lists the mean, standard deviation, reliability coefficient, and Cronbach's alpha determined with standardized items for each reading. Reading 1 had a mean score of 76.29 and a standard deviation of 10.68, while Reading 2 had a mean score of 76.59 and a standard deviation of 10.58. The central tendency and variability of the data in each reading are described by these statistics. The Cronbach's alpha reliability value of.987 for both readings indicates that the questionnaire's items had a good level of internal consistency. These shows that manual dexterity can be assessed using the MAM-36 survey. The questionnaire items' strong Cronbach's alpha of.988 for both readings, based on standardized items, shows that they consistently evaluate the same underlying construct. This implies that utilizing the MAM-36 questionnaire to assess manual dexterity is a legitimate and trustworthy method. According to the reliability data in the table, the MAM-36 questionnaire is generally a valid and reliable technique to assess manual dexterity in the population that is the subject of the study.

Table 3: Inter-Item Correlation Matrix

	MAM-36 Reading 1	MAM-36 Reading 2
MAM-36 Reading 1	1.000	.975
MAM-36 Reading 2	.975	1.000

Description: The Manual Ability Measure (MAM-36) questionnaire's first and second readings are displayed in this matrix. How closely related the individual items in each reading are to one another is demonstrated by the matrix's display of the correlations between the two readings of the questionnaire's items. The MAM-36 questionnaire's Readings 1 and 2 showed a very strong correlation, with a value of.975. This demonstrates that the two readings of the questionnaire's items were very consistent. A correlation coefficient may reach 1.000, which denotes a perfect connection. The MAM-36 questionnaire appears to measure the same underlying construct consistently throughout both readings, according to the significant correlation coefficient in this situation, which also points to the excellent consistency of its items. The MAM-36 questionnaire is a trustworthy tool for assessing manual ability, as shown by the inter-item correlation matrix, which shows that there is a high level of consistency between the different questions in the questionnaire over the two readings.

Description: The intraclass correlation (ICC) coefficients and related statistics for a group of single and average measures on an interest variable are shown in the table below. The ICC statistic

evaluates the consistency with which measurements on the same topics were gathered using various methods or raters. The table displays that the matching F test result for single measures was 79.882 and that the ICC for single measures was.975, with a lower bound of.964 and an upper range of.983. This indicates the high level of agreement between measurements obtained using various methods or raters. Additionally supplied are the measurements' mean, variance, standard deviation, and statistical significance. According to the table, the relevant F test result was 79.882, and the average measurement ICC had lower and upper bounds of.982 and.991, respectively. In light of this, it can be shown that average measurements are much more reliable than individual ones. Overall, the ICC analysis's findings indicate that the measurements are generally accurate and that it is probably true that they measure the important variable consistently and precisely.

Table 4: Intraclass Correlation

	Intraclass Correlation	Lower Bound 95% CI	Upper Bound 95% CI	F Test	Mean	Variance	Std. Deviation	Sig
Single Measures	.975[a]	.964	.983	79.882	152.8889	446.829	21.13832	.000
Average Measures	.987[c]	.982	.991	79.882				.000

Table 5: Construct validity MAS-36 versus MusiQoL

Construct validity MAS-36 versus MusiQoL		Value	Approximate Significance
Interval by Interval	Pearson's R	.953	0.000
Ordinal by Ordinal	Spearman Correlation	.953	0.000

Description: The table below displays the findings of a construct validity comparison between the two unique measures, the MAS-36 and MusiQoL. Both Pearson's R and Spearman Correlation were employed in the experiment. The interval by interval and ordinal by ordinal correlation methods both yield correlation coefficients of.953 for the MAS-36 and MusiQoL questionnaires. The relationship is statistically significant because the assessed significance level is 0.000. These findings imply that the MAS-36 and MusiQoL questionnaires examine the same quality of life factors linked to oral health and measure similar constructs. The degree to which two measurements that are meant to measure the same concept are actually connected to one another is known as convergent validity, and it is supported by the two measures' significant positive correlation.

DISCUSSION

One of the pathophysiological causes of lifetime disability in a number of acute and chronic neurological diseases is neuronal loss and death. Neurofilament protein concentrations increase in the blood and cerebrospinal fluid (CSF) after neuroaxonal damage. The immunoblot and enzyme-linked immunosorbent assay neurofilament tests for the first- and second-generation disorders only detected the disease's tip[1]. Using third-generation (ECL) and fourth-generation (single-molecule array) methods, blood neurofilament levels can be monitored surprisingly sensitively and longitudinally in both moderately sick patients and healthy controls. Neurofilament is being developed in multicenter research as biomarkers that symbolize damage to brain tissue and enable long-term monitoring of disease activity and therapy effects in clinical trials for neurological illnesses[2]. Regardless of which hand a person uses, manual ability refers to their perceptual ability to use their hands to carry out functional tasks without the aid of technology or specially created adapted equipment[1]. Biomechanical measures like range of motion, feeling, grip strength, and pinch strength have historically been used to assess hand function[4]. Important details about the sample's demographics can be found in the table of gender distribution. It can be used to assess how gender is represented in the sample and to contrast it with other groups. You may understand the socioeconomic features of the sample and spot any potential socioeconomic status-based fluctuations in the variable of interest by using the socioeconomic status distribution table. The sample's characteristics for a number of variables are outlined in the descriptive statistics table. The sample can be compared to other populations using these statistics, and they can also be used to comprehend the distribution and variability of the relevant variables. The MAM-36 questionnaire's internal consistency and stability are demonstrated by the reliability statistics. For researchers and physicians using the questionnaire to evaluate manual dexterity in patients with neurological disorders, this information is crucial. Matrix of Inter-Item Correlations The inter-item correlation matrix shows how consistently the MAM-36 questionnaire's items perform. This data implies that the items are reliably assessing the same underlying construct, which raises the internal validity of the survey[6]. The measure's convergent validity—or how closely it relates to other measures to which it is theoretically supposed to be connected—is supported by the results of the construct validity analysis. Since the two measurements appear to capture the same things, strong correlation coefficients and low p-values demonstrate a close relationship between the relevant variable and the reference variable. The Manual Ability Measure (MAM-36) exam was successfully translated into Urdu, including the cultural nuances appropriate for that language, and the Urdu version demonstrated favorable psychometric qualities. With an inter-item correlation coefficient of .975 and a Cronbach's alpha reliability coefficient of.987, the survey showed excellent internal consistency and extremely good test-retest reliability. Strong positive correlations between the relevant variable and the reference variable were found, and the questionnaire also showed strong concurrent and discriminant validity. The primary conclusion of this study is that there is a significant link between the MAM-36 and MusiQoL. The findings of this translational study provide more evidence that the MAM-36 questionnaire can be used to measure manual dexterity in people with neurological illnesses like MS. The validated and widely used MAM-36 questionnaire, which was translated into Urdu for cultural concerns, is one of the study's strong points. Another is the use of various statistical methods, such as reliability and validity analyses, to evaluate the questionnaire's psychometric features. The study's sample size, which included a wide spectrum of people with neurological conditions, including MS, allowed for a thorough assessment of the questionnaire's psychometric qualities. For future studies and clinical applications, the study also offered helpful information regarding the sample's demographic and clinical characteristics[10].

CONCLUSION

These results provide important information about the sample and the measures used in the current study. The reliability statistics indicate that the MAM-36 questionnaire is a reliable and valid tool for measuring manual ability in individuals with neurological diseases. The strong positive correlation between the variable of interest and the reference variable supports the construct validity of the measure. These findings can be used by future researchers and clinicians to compare their findings to those of the current study or to build upon the current study's findings.

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