Upper Limb Self-efficacy Test (UPSET): A Measure of Confidence in the Use of the Upper Limb After Stroke.

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Received: July 10.2016; Accepted: July 13.2016

Abstract

Introduction: Self-efficacy means the degree of one's confidence in carrying out his activities tasks or duties. Following a stroke, a survivor may lose their self-efficacy depending on the level of their impairment. There is a specific measure known as stroke self-efficacy questionnaire to measure self-efficacy in various tasks after stroke. However, there seems to be no specific upper limb self-efficacy measure after stroke. The aim of this study was therefore to develop and validate an upper limb self-efficacy test (UPSET). **Method**: The developed UPSET was administered alongside, SSQ, MAL (amount of use and how well) and Tinetti gait subscale on 17 stroke patients with mean age, 53.35±10.60 on the first day and 2 days after the first day. The convergent validity between UPSET and SSQ, the discriminant/ divergent validity between UPSET and MAL (amount of use and how well) and Tinetti gait subscale, and the test-retest reliability between first and second UPSET measurements were determined using Pearson Product Moment Correlation. Additionally, the internal consistency of UPSET was determined using Cronbach's alpha. **Result**: The result showed that, there was a strong correlation between UPSET and SSQ, and high test-retest reliability between UPSET measurements at first and 2 days ($r>0.70$ and $p\leq0.001$). Additionally, the study showed that UPSET has good internal consistency (Cronbach's alpha=0.99). However, there were no significant correlations between UPSET and MAL (amount of use), MAL (how well) and Tinetti gait subscale ($r<0.40$ and $p>0.001$). **Conclusion:** The Upper Limb Self-efficacy Test (UPSET) is a valid and reliable instrument.

Keywords: : Stroke, rehabilitation, upper limb, self-efficacy, validity and reliability

Introduction

Self-efficacy is a construct denoting how confident one in carrying out his activities or duties is. Immediately after stroke and up to the ensuing days, months or years, some of the survivors lose their self-efficacy depending on the level of their impairment [1,2]. The problems with self-efficacy may lead to the loss of function, activity limitation and participation restriction. In contrast when stroke patients have good self-efficacy, it can result in great independence in activities of daily living (ADL), balance and other post-stroke outcomes [3-5].

To assess the degree of patients' self-efficacy following a stroke, a valid and reliable instrument is needed. The instrument can help clinicians and scientists alike provide specialized therapies such as motivational interviewing that can be used to improve the patients' self-efficacy during rehabilitation. Consequently, there is a measure known as Stroke Self-efficacy Questionnaire [6]. The Stroke Self-efficacy Questionnaire (SSQ) is a 13 points scale consisting of functional tasks involving both the upper and lower limb. It is reported to be a valid and reliable scale [5, 6]. However, the upper limb is complex as it performs many functions such as buttoning of shirt, flipping of coins, handshake, washing plates, bathing, cooking, eating, drinking and so on.

Additionally, the upper limb usually presents with many long term challenges during rehabilitation which makes it to deserve a special attention in assessment and rehabilitation [7,8]. However, the stroke self-efficacy questionnaire did not cover the array of tasks performed by the upper limb. Thus, it will be formally logical when a specific test or scale is designed to measure self-efficacy in using upper limb after a stroke. The aim of this study was therefore to develop a valid and reliable upper limb self-efficacy test (UPSET) that can be used to measure self-efficacy in using the upper limb after stroke. The study is expected to answer the following questions: 1) What is the convergent validity between UPSET and SSQ? 2) What is the divergent/ discriminant validity between UPSET and motor activity log (MAL) amount of use? 3) What is the divergent/ discriminant validity between UPSET and MAL how well 4) What is the divergent/ discriminant validity between UPSET and the gait subscale of Tinetti gait and balance scale? 5) What is the internal consistency of the items of UPSET? 6) What is the test-retest reliability of UPSET?

Material and Method

The study design is a cross sectional study (repeated measures design) developing and validating UPSET. The population of the study was stroke patients attending Physiotherapy at the Murtala Muhammad Specialists Hospital, Kano. The study was approved by the Research Ethics Committee of the Kano State Hospitals Management Board.

The sample size was calculated using the formula:

$$\frac{Z1 - {}^{Q}/_{2}{}^{2}\, SD^{2}}{d^{2}}$$

The formula was reported in a study by Charan and Biswas [9]. In the formula, Z1-$^{Q}/_{2}$ = Standard normal variate which is considered 1.96 at 5% type 1 error ($p<0.05$), SD= Standard deviation of the study variable which can be taken from a previously done or a pilot study, and d= Absolute error or precision. For the purpose of the present study, standard deviation (SD= ±16.87) was taken from a previous study by Wolf and colleagues validating Wolf Motor Function Test (WMFT) which is a measure of upper limb motor function [10]; and the absolute error or precision (d) was taken as 5%. Thus, with the above values, the sample size required for this study was estimated to be 44 stroke patients.

Development of the instrument

The instrument was developed by the author following an inspiration from a questionnaire measuring self-efficacy after stroke by Jones and colleagues [6]. Initially, there were 22 items in the instrument comprising of the daily tasks usually performed using the upper limb. However, two expert Physiotherapists in which one is a specialist in neurological rehabilitation, and the other holds a PhD with experience in instrument validation gave feedback which resulted in the removal of 2 items (that the items are similar to 2 other items in the instrument). Therefore, the final version of the instrument consists of 20 items.

Validation of the instrument

Two Physiotherapists were randomly selected to carry out the recruitment and the assessments respectively using a simple random sampling technique with the use of sealed envelopes. The therapists have 3 and 1 year post-graduation experiences respectively and they were trained on the use of the study instruments by the author. Additionally, they were made to practice the use of the instruments for a week before the commencement of the study. However, the therapist who carried out the assessment was blinded to the aim of the study.

The therapist who recruited the participants for the study explained the purpose of the study to them and obtained their consents. Participants were included in the study if they were not more than 6 months post-stroke, and had unilateral stroke, persistent hemiparesis (a score of 1-3) on the motor arm item of the NIH Stroke Scale with proximal upper extremity voluntary activity (a score of ≥3) on the upper arm item of the Motor Assessment Scale, no significant impairment in cognitive function (a score of ≤1 on the consciousness and communication items of the NIHSS, ability to perform two-steps commands and a score of <8 on the Short Blessed Memory Orientation and Concentration Scale) and no upper extremity injury that limited use prior to the stroke [11-13]. However, participants were excluded if they had hemispatial neglect as determined by asymmetry >3 errors on the Star Cancellation Test and sensory loss ≥2 on the sensory item of NIHSS [14]. Similar criteria were used in a constraint induced movement therapy study previously [15].

The assessor independently assessed the patients using the 4 outcome measures (MAL (amount of use and how well), UPSET, SSQ and Tinnetti gait subscale) at baseline and 2 days after the first assessment. The UPSET is a newly developed 20 item test (scale) measuring how confident the patients feel they are in carrying out activities with their hands following a stroke. It is scored on a 10 point scale with increasing ability from 0 to 10. The possible scores range from 0 to 200. The MAL is a 30 item scale measuring how well and amount of use of the upper limb [16]. It is measured on a 0 to 5 rating scale with 0 to 5 denoting increasing ability. The Stroke Self-efficacy Questionnaire (SSQ) is a 13 item scale measuring the patients' ability to perform everyday task after stroke [6]. The scale is scored on a 10 point scale with increasing ability from 0 to 10. Tinetti gait and balance scale is a valid measure for the measurement of gait and balance in patients with Parkinson's disease [17]. It is measured on a 3 point scale ranging from 0 to 3 with 0 denoting the worst impairment. The gait subscale has 7 items with a maximum score of 12. See appendix 1 for the UPSET.

Data analysis

Convergent validity between the UPSET and SSQ and convergent/ discriminant validity between UPSET and, MAL (amount of use and how well) and Tinetti gait subscale and the test-retest reliability of UPSET, and the relationships between age of the participants, and time since stroke and UPSET were determined using Pearson product moment correlation. The internal consistency of the items of UPSET was determined using Cronbach's alpha. Mann-Whitney U test was also used to determine gender difference in UPSET scores.

Result

The study included 17 participants with mean age 53.35±10.60 years (range= 30-70 years), and mean time since stroke onset 37.18±35.40 weeks (range=2-108 weeks). There were 11 females and 6 males, 16 participants with ischaemic stroke and 1 participant with haemorrhagic stroke, and 11 participants had right sided hemiplegia and 6 had left sided hemiplegia. See table 1 and figure 1 for the demographic characteristics of the study participants and the study flow chart respectively.

, and current validity with scales measuring similar construct

The relationship between upper limb self-efficacy measured using UPSET and stroke self-efficacy measured using SSQ, MAL (amount of use), MAL (how well) and Tinetti gait subscale at baseline was investigated using Pearson product-moment correlation coefficient. The relationship between these variables was presented in the correlation matrix in table 2.

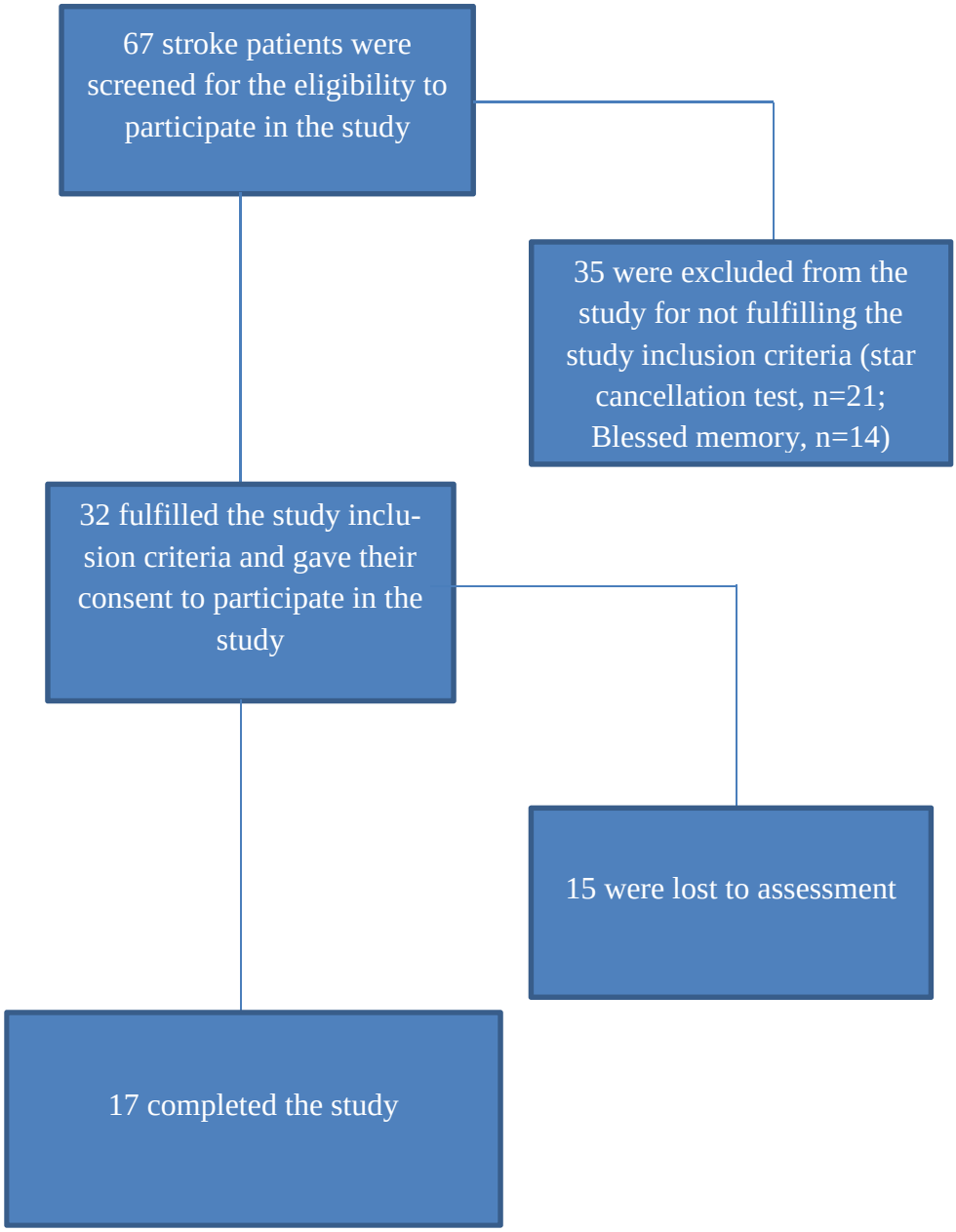

Figure 1: The study flow chart

Table 1: Demographic Characteristics of the Study Participants

SN	Variable	N=17
1	Age	53.35±10.60
2	Sex (M/F)	6/11
3	Time since stroke	37.18±35.40
4	Type of stroke (I/H)	16/1
5	Side affected (R/L)	11/6

Key: M/F=Male/Female, I/H=Ischaemic/Haemorrhagic, R/L=Right/Left

Table 2: Correlation Matrix showing the relationship between the variables

	1 UPSET	2 SSQ	3 MAL (AOU)	4 MAL (how well)	5 Tinetti (gait subscale)
1 UPSET			0.385		0.323
2 SSQ	0.783**				
3 MAL (AOU)					
4 MAL (how well)	0.396				
5 Tinetti (gait subscale)					

**significant at ≤0.001

Key: UPSET= Upper Self-efficacy Test, SSQ= Stroke Self-efficacy Questionnaire, MAL (AOU)= Motor Activity Log (Amount of Use), MAL (how well)= Motor Activity Log (how well).

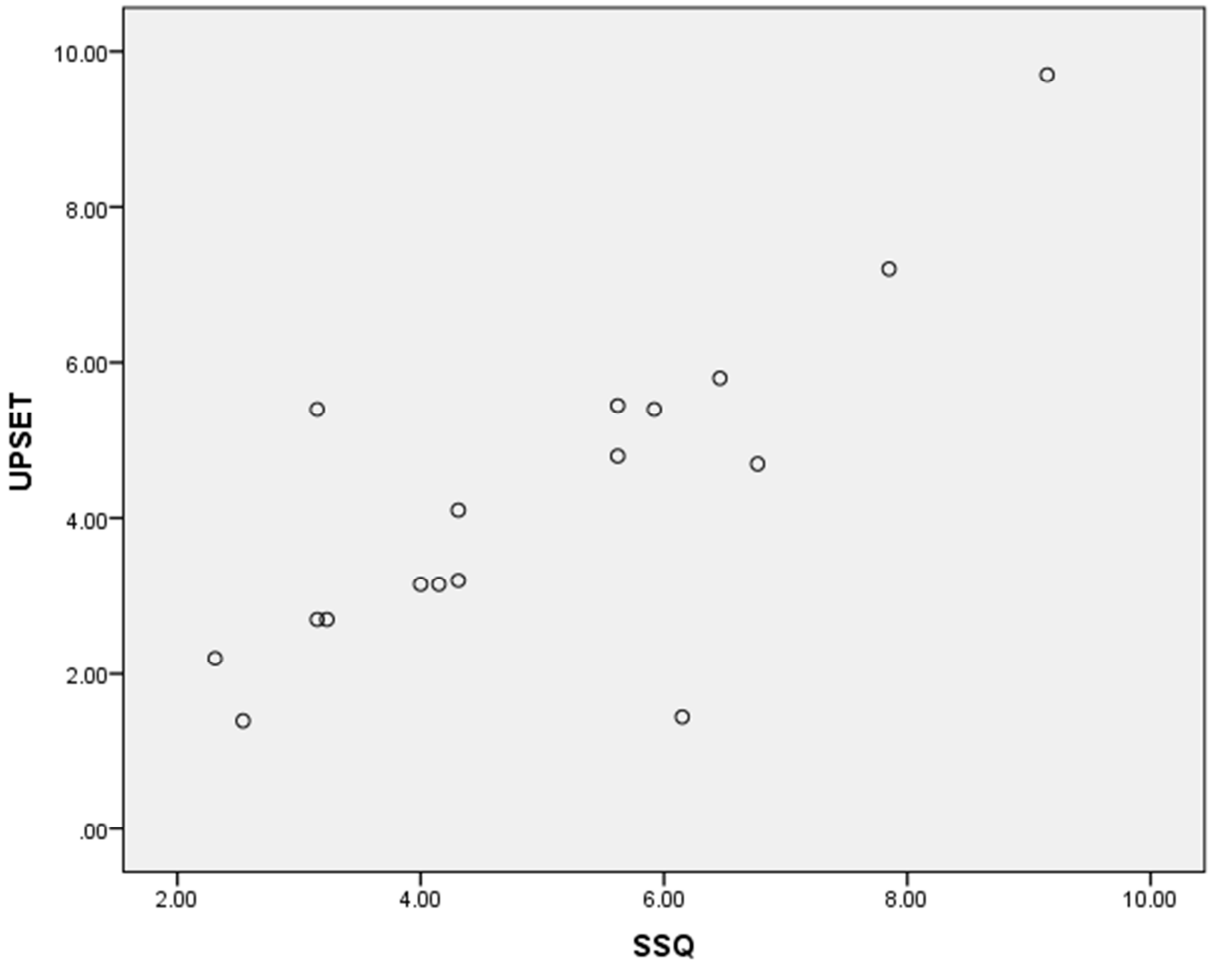

Figure 2: Scatter plot showing the relationship between UPSET and SSQ

For the relationship between UPSET and SSQ, there was a strong, positive correlation between the two variables, r=0.783, p<0.001, with high upper limb self-efficacy associated with high stroke self-efficacy. Thus, indicating that UPSET and SSQ measure similar constructs. See figure 2 for the scatterplot showing the relationship between the 2 variables.

For the relationship between UPSET and MAL amount of use, there was no significant correlation, r=0.385, and p=0.127. Additionally, between UPSET and MAL how well, there was no significant correlation, r=0.396 and p=0.116. Similarly, between UPSET and Tinetti gait subscale, there was no significant correlation, r=0.323 and p=0.207. Thus, indicating that, the measures (UPSET, MAL (amount of use and how well) and Tinetti gait subscale) actually measure different constructs. See figure 3, 4 and 5 for scatterplots showing the relationships between UPSET and MAL (amount of use), MAL how well and Tinetti gait subscale.

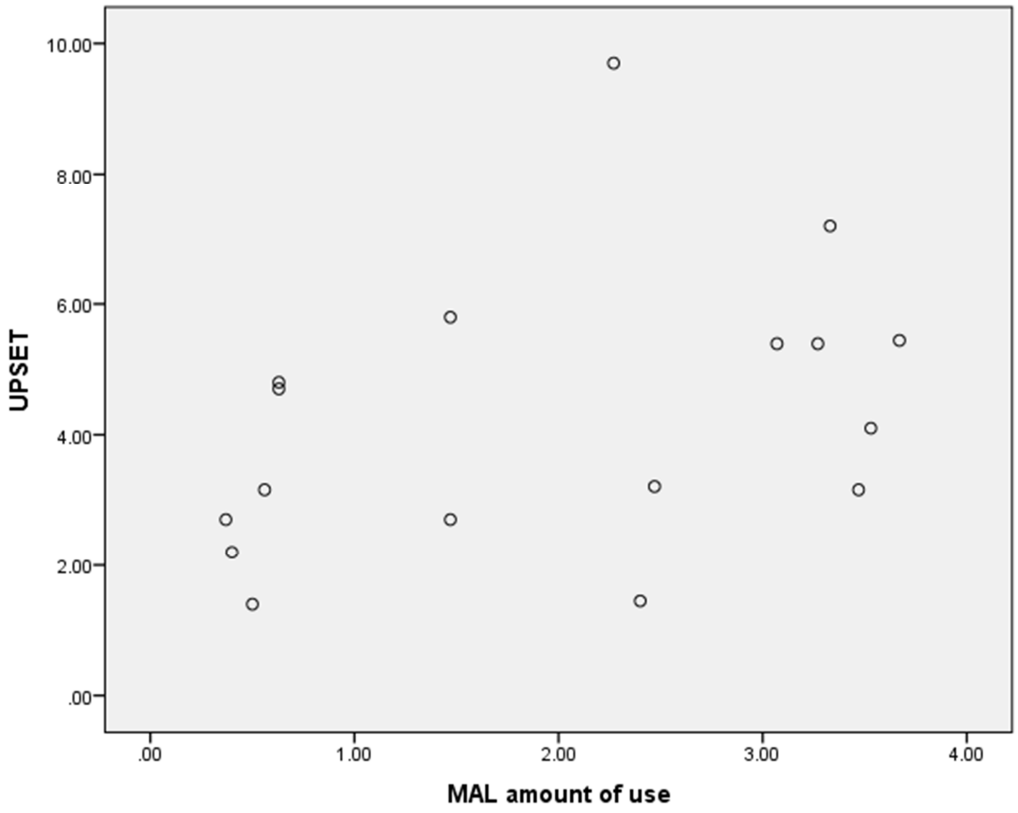

Figure 3: Scatter plot showing the relationship between UPSET and MAL (amount of use)

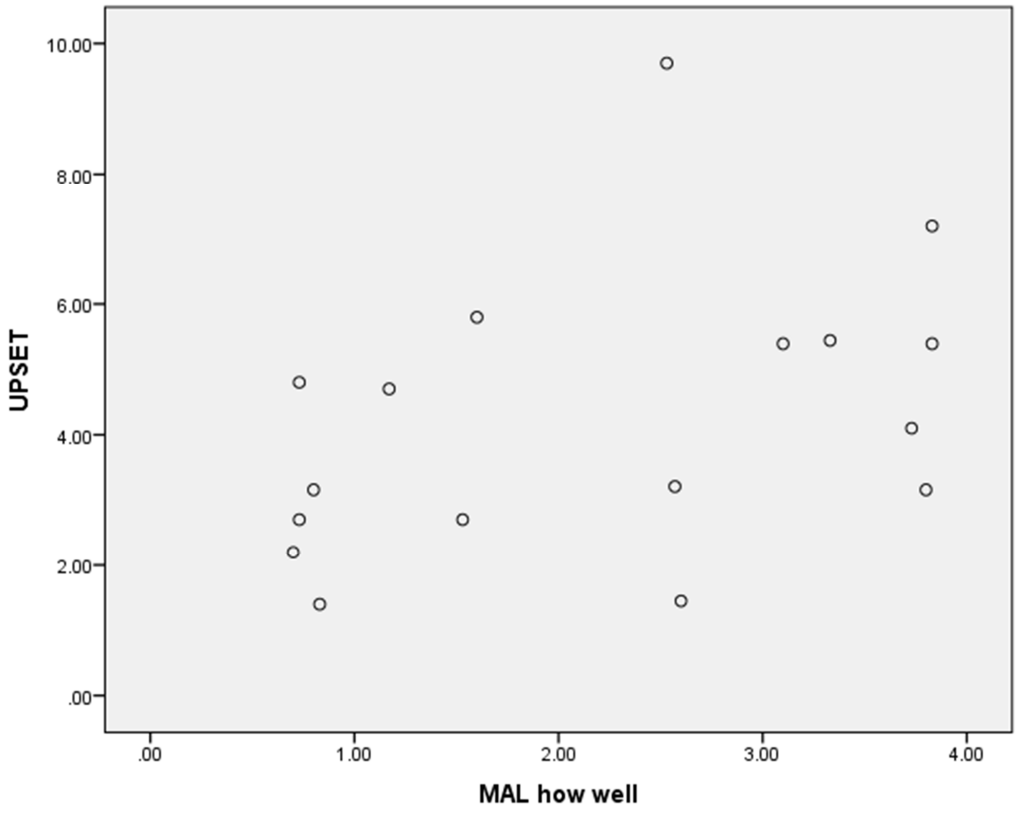

Figure 4: Scatter plot showing the relationship between UPSET and MAL (how well)

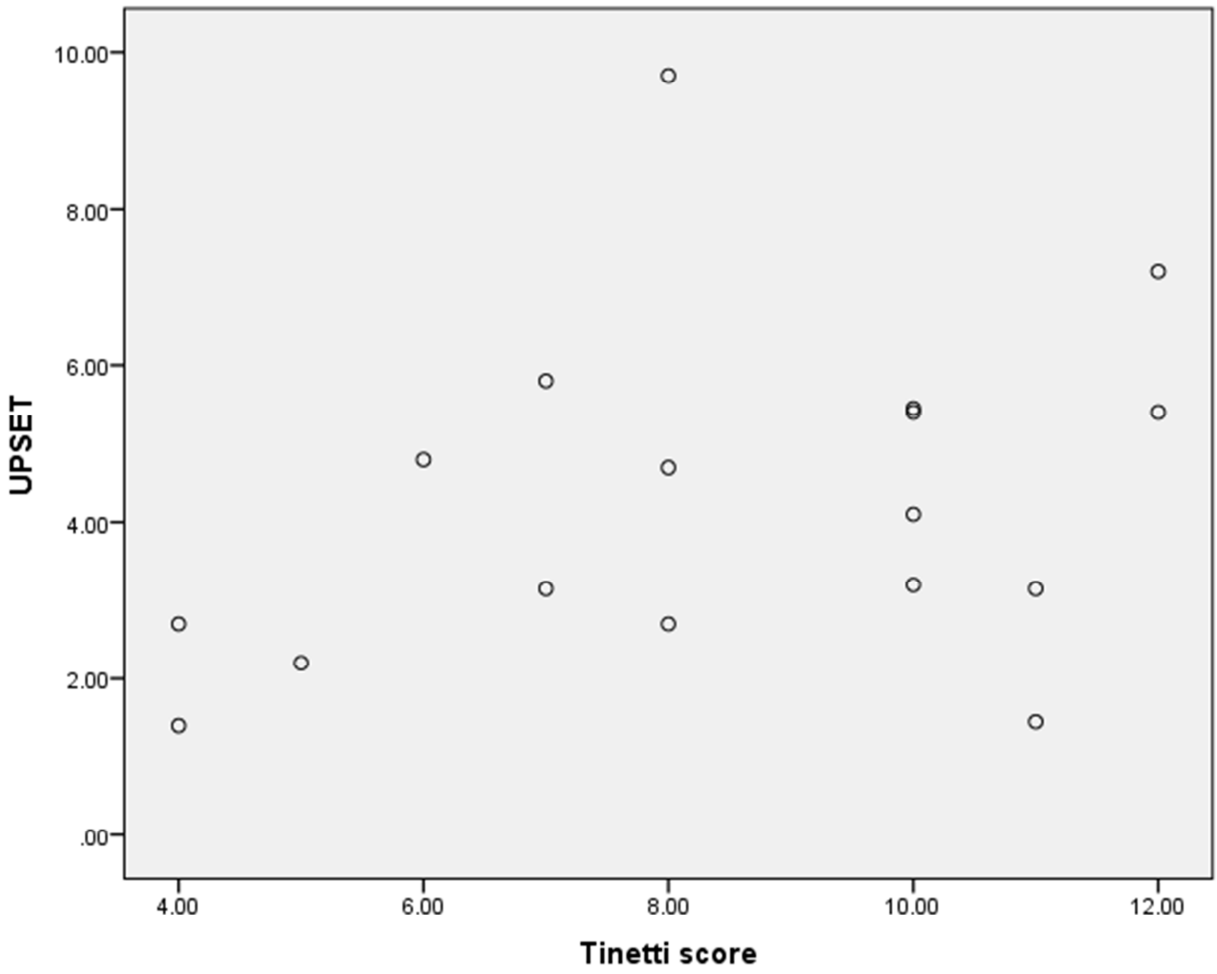

Figure 5: Scatter plot showing the relationship between UPSET and Tinetti (gait subscale)

For the test-retest reliability of UPSET between the first measurement of UPSET and the measurement after 2 days, there was a strong, positive correlation, r =0.748 and p=0.001. This indicates a high test-retest reliability of the instrument. Similarly, the internal consistency of UPSET was estimated to have Cronbach's alpha value of 0.99 indicating an excellent internal consistency of the items in the test. However**,** between UPSET and age of the participants and time since stroke, there were no significant correlations, r=-0.367 and p=0.147, and r=0.070 and p=0.791 respectively. These indicate that scores on UPSET do not depend of age of the participants and time since stroke.

Additionally, a Mann-Whitney U test revealed that, there was no significant difference in UPSET scores between (Male, n=7, mean rank=10.57) and female (n=10, mean rank=7.90), U=24.00, Z=-1.075, and p=0.282. This indicates that there is no gender in UPSET scores.

Discussion

The aim of the study was to develop and find out the convergent validity of Upper Limb Self-efficacy Test (UPSET) with Stroke Self-efficacy Questionnaire (SSQ), its test-retest reliability, internal consistency, and its discriminant/divergent validity with MAL (amount of use and how well) and Tinetti gait subscale. The result of the study showed that, there is a strong correlation between UPSET and SSQ, and high test-retest reliability between UPSET measurements at first and 2 days. These indicate that, UPSET and SSQ measure similar construct and that UPSET is a reliable measure for upper limb self-efficacy after stroke. Additionally, the study showed that UPSET has good internal consistency indicating that the items in the test measure same construct. However, there were no significant correlations between UPSET and MAL (amount of use), MAL (how well) and Tinetti (gait subscale) indicating that UPSET, and MAL (amount of use and how well) and Tinetti gait subscale measure different constructs.

Convergent validity and discriminant/ divergent validity are aspects of construct validity. When a measure has good construct validity, it makes it easier to be interpreted [18]. Thus, the clinical usefulness of UPSET since it has good construct validity cannot be overemphasized. Additionally, internal consistency is the measure of the degree of inter-item correlations in a given instrument [19]. Therefore, having an item with a high internal consistency such as USPET can help clinicians to actually determine aspects of upper limb self-efficacy in their patients. Similarly, the SSQ which is also a measure of self-efficacy has been previously reported to have a high criterion related validity compared with falls efficacy scale and high internal consistency [6]. These findings further buttress the high convergent validity found between UPSET and SSQ in the present study.

UPSET seems to be the first measure of self-efficacy in the use of upper limb after a stroke. Self-efficacy is associated with many outcomes after stroke such as quality of life or perceived health status, depression, ADL and physical function [3-5]. Thus, self-efficacy measures for the upper limb such as UPSET can help in improving clinical practice there by providing more information on the patient's functional status, and an opportunity for engaging the patients and the caregivers in the patient's rehabilitation. When patients and caregivers are engaged during rehabilitation, a more favourable outcome is usually obtained [20-22]. Furthermore, in the study, several screening outcome measures were used to measure cognitive ability, motor ability, neglect and consciousness in order to ascertain that the presence or lack of self-efficacy in using the upper limb is not due to the variables measured by those outcome measures. These pieces of information add to the reliability and validity of UPSET. A valid and reliable instrument usually gives accurate information on the construct it measures.

Conclusion

The Upper Limb Self-efficacy Test (UPSET) is a valid and reliable instrument used for measuring stroke patients' confidence in ability to use their upper limb after a stroke. Additionally, it seems that the measure may also be used in assessing patients' frustration with failure to perform task after stroke.

Acknowledgment

I want to specially thank Dr Fiona Jones, a Reader in Rehabilitation at the St George and Kingston Universities, London for providing me with more information on her stroke self-efficacy questionnaire and moral support.

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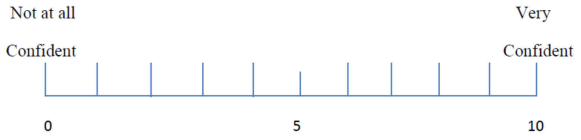
Appendix 1

Upper Limb Self-efficacy Test (UPSET)

The following questions are about your confidence in the ability to use your upper limb in the tasks that may be difficult for you since your stroke.

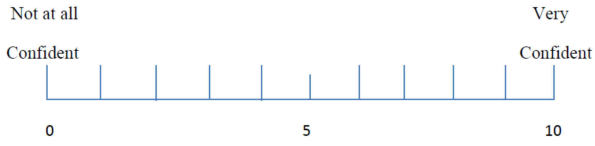
Please circle a point on the scale that appropriately represents how confident you feel you are about your ability to now carry out the tasks in the questions below despite your stroke.

0 indicates not at all confident, and 10 indicates very confident

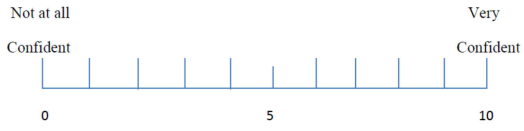


How confident do you feel now that you can

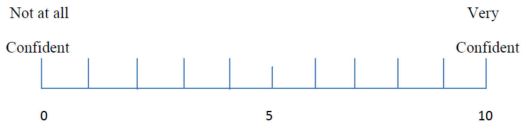
1) Pick up a cup with your hand and take it to the mouth



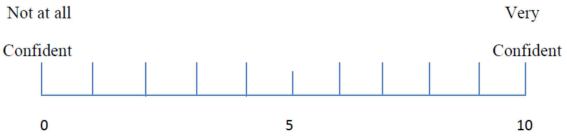
2) Use your hand to wash your face



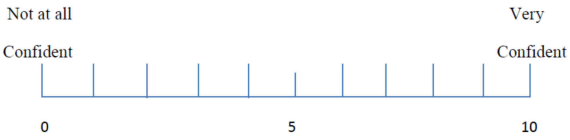
3) Use your hand to brush your teeth



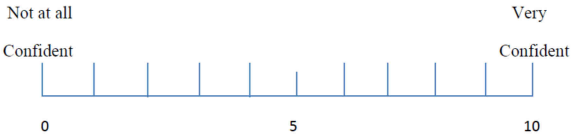
4) Use your hand to write



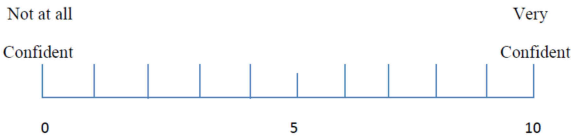
5) Use your hand to button your shirt



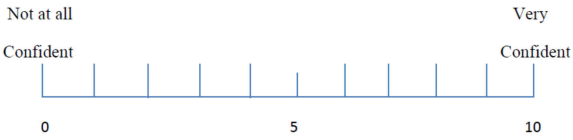
6) Use your hand to bathe



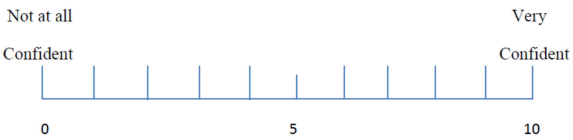
7) Use your hand to comb your hair



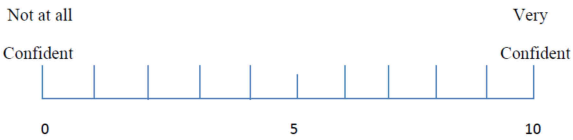
8) Use your hand to answer the phone



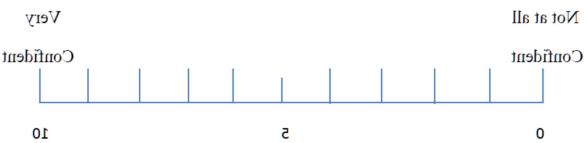
9) Use your hand to eat



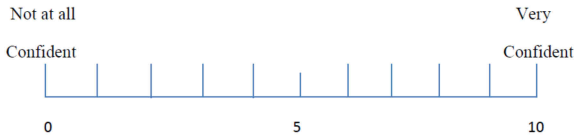
10) Use your hand to shake



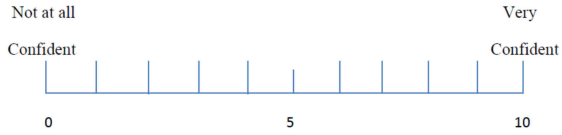
11) Use your hand to cut something with a knife



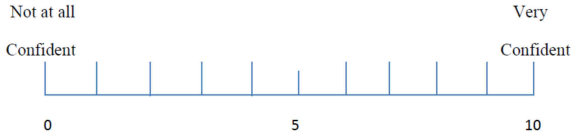
12) Use your hand to lock and unlock a lock with a key



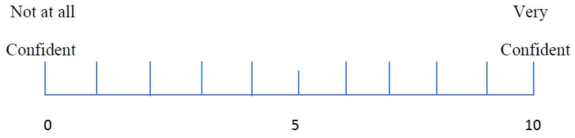
13) Use your hand to open and close the door



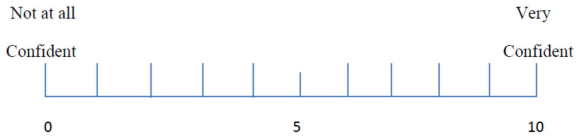
14) Use your hand to wash



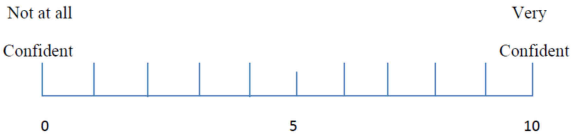
15) Use your hand to cook



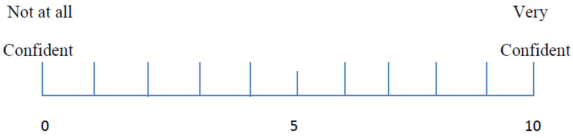
16) Use your hand to open and close the fridge



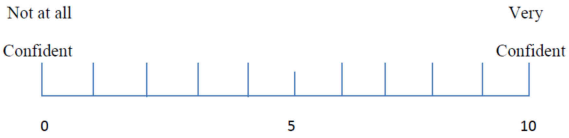
17) Use your hand to open and close the drawer



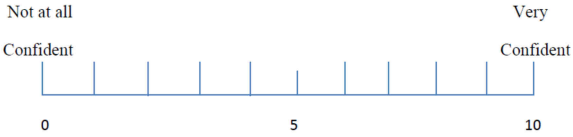
18) Use your and carry an object



19) Use your hand to open and close a tap



20) Use your hand to drive/ cycle



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Conflict of interest:
The authors have declared no conflict of interest.