

UPPER LIMB MOTOR FUNCTION AS A CORRELATE OF SELF-EFFICACY AND LIFE SATISFACTION IN CHRONIC STROKE SURVIVORS: A CROSS-SECTIONAL STUDY

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Abstract

Background: Upper limb (UL) dysfunction is a prevalent and disabling consequence of stroke, yet its relationship with crucial patient-centered outcomes like self-efficacy and life satisfaction is not fully quantified. Understanding this link is essential for holistic stroke rehabilitation.

Objective: To investigate the correlation between the level of UL motor dysfunction and the levels of self-efficacy and life satisfaction in chronic stroke survivors.

Methods: A cross-sectional, correlational study was conducted with 30 chronic stroke survivors (16 male, 14 females; mean age 60.00 ± 8.34 years). UL motor function was assessed using two performance-based measures: the Fugl-Meyer Assessment for Upper Limb (FMA-UL) for impairment and the Action Research Arm Test (ARAT) for functional capacity. Self-satisfaction was evaluated using two patient-reported questionnaires: the Stroke Self-Efficacy Questionnaire (SSEQ) and the Satisfaction with Life Scale (SWLS). Spearman's rank-order correlation was used to analyze the associations between these variables.

Results: Statistically significant, strong positive correlations were found between higher UL motor function and greater self-satisfaction. Specifically, better FMA-UL scores were strongly correlated with higher SSEQ scores ($r=0.748$, $p<0.001$), and better ARAT scores were strongly correlated with higher SSEQ scores ($r=0.732$, $p<0.001$). Higher ARAT scores were also moderately correlated with greater SWLS ($r=0.453$, $p=0.045$). Additionally, better FMA-UL scores were significantly associated with younger age ($r=-0.476$, $p=0.034$) and shorter duration of illness ($r=-0.495$, $p=0.026$).

Conclusion: In chronic stroke survivors, a strong and significant positive relationship exists between upper limb motor function and the psychosocial constructs of self-efficacy and life satisfaction. These findings empirically support the biopsychosocial model of stroke recovery and highlight the importance of rehabilitation interventions that not only improve physical capacity but also aim to enhance a patient's sense of confidence and overall well-being.

Keywords: Stroke, Upper Extremity, Self-Efficacy, Quality of Life, Rehabilitation, Correlational Study.

INTRODUCTION

Stroke remains a leading cause of long-term disability worldwide, precipitating a complex array of physical, cognitive, and psychosocial sequelae that profoundly impact an individual's quality of life. Among the most prevalent and functionally devastating of these consequences is upper limb dysfunction. It is estimated that up to 80% of individuals experience some degree of upper limb paresis in the acute phase following a stroke, with a significant proportion, between 30% and 60%, left with chronic, non-functional motor deficits in their affected arm and hand¹. This impairment extends far beyond simple muscle weakness, encompassing altered muscle tone, spasticity, loss of fractionated movement, impaired coordination, and sensory deficits². The inability to effectively use the affected upper limb for even simple activities of daily living (ADLs)—such as eating, dressing, and personal hygiene—leads to a tangible loss of independence and a significant reduction in participation in social, vocational, and recreational activities³.

The primary focus of post-stroke rehabilitation has traditionally centred on restoring this lost motor function. Physical and occupational therapy interventions are designed to mitigate impairments and improve functional capacity through a variety of evidence-based approaches, including task-specific training, neurodevelopmental techniques, and strength and mobility exercises⁴⁻⁵. The success of these programs is often quantified using objective, performance-based measures that assess the recovery of sensorimotor function and the ability to perform specific tasks. Tools such as the Fugl-Meyer Assessment for the Upper Limb (FMA-UL) are widely used

to measure recovery at the impairment level, evaluating components like movement synergies and coordination⁶. Complementing this, functional capacity measures like the Action Research Arm Test (ARAT) assess a patient's ability to perform meaningful, object-related tasks, providing a clearer picture of their practical motor skills. However, a purely biomedical model of recovery, focused solely on the restoration of physical function, is insufficient for capturing the full experience of a stroke survivor⁶. The goal of rehabilitation is not just to improve movement, but to enhance a person's overall well-being and satisfaction with their life⁵. Within this framework, two key psychosocial constructs have emerged as powerful indicators of successful recovery: life satisfaction and self-efficacy⁸⁻⁹.

Life satisfaction is a broad, cognitive appraisal of an individual's overall quality of life, reflecting their contentment with their life³. It is a crucial, holistic measure of well-being that can be significantly diminished following a life-altering event like a stroke³⁻⁵. Stroke survivors often report lower life satisfaction compared to their healthy peers, a finding linked to factors such as loss of autonomy, changes in social roles, and the emotional burden of living with a chronic disability³⁻⁵. Concurrently, self-efficacy, a concept derived from social cognitive theory, refers to an individual's belief in their own capability to successfully execute the tasks and manage the challenges faced while achieving their goals³¹. In stroke, self-efficacy is a powerful predictor of functional outcomes and psychological adjustment⁹. A stroke survivor with high self-efficacy is more likely to be motivated, persistent in their rehabilitation efforts, and confident in their ability to self-manage their condition, leading to better functional performance and greater independence¹².

A compelling theoretical and clinical link exists between the physical reality of upper limb dysfunction and these critical psychosocial outcomes²⁻⁵. The constant, daily struggle with a non-functional limb serves as a potent and persistent reminder of the stroke's impact, which can erode a person's sense of competence and overall life satisfaction³. Conversely, even small gains in the ability to use the affected arm can foster a sense of accomplishment and control, thereby boost self-efficacy and improving one's outlook on life⁸⁻⁹. While this relationship is intuitively understood by clinicians, there is a need for robust empirical research to quantify the strength of this association¹⁰⁻¹¹. Specifically, it is important to understand how objective measures of motor impairment and functional capacity relate to subjective, patient-reported outcomes of self-efficacy and life satisfaction¹²⁻¹³.

To our knowledge, while some studies have linked general disability to lower life satisfaction in stroke survivors, few have specifically investigated the distinct and combined associations between a comprehensive battery of gold-standard upper limb performance tests (FMA-UL and ARAT) and validated measures of both disease-specific self-efficacy (SSEQ) and global life satisfaction (SWLS) within the same cohort of chronic stroke survivors⁶⁻⁴. Quantifying these relationships is of high significance. It demonstrates the importance of incorporating psychological factors into rehabilitation programs and proves that interventions aimed at improving upper limb function are not just treating a limb but are fundamentally contributing to a patient's overall sense of well-being and empowerment.

Therefore, the purpose of our cross-sectional study was to investigate the correlation between the level of upper limb motor dysfunction and the levels of self-efficacy and life satisfaction in patients in the chronic phase of stroke. The specific objective was to quantify the strength of the association between performance-based measures of upper limb impairment (FMA-UL) and functional capacity (ARAT) and patient-reported measures of stroke-specific self-efficacy (SSEQ) and global satisfaction with life (SWLS). We hypothesized that there would be a significant positive correlation between higher levels of upper limb function and higher levels of both self-efficacy and life satisfaction.

METHODS

Study Design

This investigation was conducted using a descriptive, cross-sectional, correlational design. The study aimed to examine the strength of the association between performance-based measures of upper limb (UL) motor function and patient-reported measures of self-satisfaction (defined by self-efficacy and life satisfaction) in a cohort of chronic stroke survivors. All data was collected during a single assessment session for each participant.

Ethical Considerations

The study protocol received full ethical approval from the Ethics and Research Committee of the Faculty of Medical Rehabilitation Sciences, King Abdulaziz University Hospital (Reference Letter No: FMRS-EC2023-006). All procedures were conducted in accordance with the ethical principles of the Declaration of Helsinki. A detailed information sheet was provided to all potential participants, and written informed consent was obtained from each individual before their enrollment and any data collection. Participants were informed of their right to withdraw from the study at any time without consequence.

Participants and Setting

A convenience sample of thirty (N=30) stroke survivors was recruited from the outpatient physical therapy clinics of Abdul Latif Jameel Hospital and King Abdulaziz University in Jeddah, Saudi Arabia.

Inclusion Criteria:

Recruited participants were required to be: 1) aged between 50 and 70 years; 2) in the chronic phase of stroke, defined as at least three years post-stroke; 3) medically stable, as confirmed by their treating physician; and 4) exhibiting mild spasticity of the affected upper limb, corresponding to a score of 1 or 1+ on the Modified Ashworth Scale.

Exclusion Criteria:

Participants were excluded if they presented with: 1) any musculoskeletal or neurological conditions (other than the stroke) that could independently affect upper limb movement; 2) a clinical diagnosis of depression that would significantly impact their ability to respond to questionnaires, as determined by a review of their medical records or consultation with their physician; or 3) any cognitive or communicative impairments (e.g., severe aphasia, dementia) that would prevent them from understanding instructions or reliably completing the self-report questionnaires.

Data Collection Instruments

A battery of four validated and reliable assessment tools was used to measure the primary constructs of UL function and self-satisfaction. All performance-based tests were administered by a single, trained physical therapist to ensure consistency.

Upper Limb Motor Function Measures:

Fugl-Meyer Assessment for Upper Limb (FMA-UL): The FMA-UL was used to quantify sensorimotor impairment of the affected upper extremity. This 33-item assessment evaluates movement, coordination, and reflex action across the shoulder, elbow, forearm, wrist, and hand. Each item is scored on a 3-point ordinal scale (0=cannot perform, 1=performs partially, 2=performs fully), yielding a maximum total score of 66. The FMA-UL has well-established reliability and validity for measuring motor recovery post-stroke.

Action Research Arm Test (ARAT): used to assess functional capacity and dexterity of the affected upper limb. This 19-item observational test is divided into four sub-tests (grasp, grip, pinch, and gross movement) that require the manipulation of objects of various sizes and weights. Performance on each item is scored on a 4-point ordinal scale (0-3), with a maximum total score of 57. The ARAT is known for its high test-retest and inter-rater reliability and strong validity in the stroke population.

Self-Satisfaction Measures:

Stroke Self-Efficacy Questionnaire (SSEQ): The SSEQ was used to measure participants' confidence in their ability to perform functional tasks and self-manage challenges post-stroke. This 13-item questionnaire requires participants to rate their level of confidence on a scale ranging from 0 to 10. The SSEQ is a valid and reliable tool for assessing disease-specific self-efficacy in stroke survivors.

Satisfaction With Life Scale (SWLS): The SWLS was used to evaluate global cognitive judgments of life satisfaction. This concise, 5-item questionnaire invites participants to indicate their level of agreement with statements about their life using a 7-point Likert scale.

(1=strongly disagree to 7=strongly agree). The total score ranges from 5 to 35, with higher scores indicating greater life satisfaction. The SWLS has demonstrated good internal consistency and construct validity in diverse populations, including those with chronic health conditions.

Procedure

Each participant attended one data collection session lasting approximately 50-65 minutes. After providing informed consent, demographic data (age, gender, hand dominance, side of affection, duration of illness) were collected. The four outcome measures were then administered in a standardized order to minimize fatigue effects, with rest breaks provided as needed. The self-report questionnaires (SSEQ and SWLS) were administered via interview by the researcher to ensure comprehension and accommodate any potential literacy or visual challenges.

Statistical Analysis

All statistical analyses were performed using SPSS software (version 26.0, IBM Corp.) and MedCalc (version 19.1). The alpha level for statistical significance was set a priori at $p < 0.05$.

Descriptive statistics were calculated for all demographic, clinical, and outcome measure data. Means and standard deviations (SD) were used for normally distributed numerical data, while medians and inter-quartile ranges (IQR) were used for non-normally distributed numerical data. Frequency and percentages were used for categorical data.

Due to the ordinal nature of the primary outcome measures (FMA-UL, ARAT, SSEQ, SWLS) and the relatively small sample size, Spearman's rank-order correlation coefficient (ρ) was used as the primary method to assess the strength and direction of the association between the variables. Bivariate correlations were performed to examine the relationships between:

1. The two UL motor function measures (FMA-UL and ARAT).
2. The two self-satisfaction measures (SSEQ and SWLS).
3. Each UL motor function measure (FMA-UL, ARAT) and each self-satisfaction measure (SSEQ, SWLS).
4. The UL function and self-satisfaction measures with key demographic variables (age, duration of illness).

Correlation coefficients were interpreted based on established conventions for magnitude.

RESULTS

Clinico-Demographic Characteristics of Participants

The study included a total of 30 chronic stroke survivors. Male participants represented 53.33% of the sample, corresponding to an approximate male-to-female ratio of 1.1:1.

The mean age of the cohort was 60.00 ± 8.34 years, with a range of 50 to 70 years. Most participants (80.0%) were right-hand dominant. The mean duration of illness since the stroke event was 3.35 ± 1.94 years, ranging from 3 years to 5 years.

Clinical examination revealed that the majority of participants (66.6%) exhibited right-sided hemiparesis, while

33.3% presented with left-sided involvement. Most patients (90.0%) exhibited motor deficits in both the upper and lower limbs. Spasticity of the affected upper limb was predominantly mild, with 20.0% of participants rated as grade 1 on the Modified Ashworth Scale and 80.0% as grade 1+. The demographic and clinical characteristics of the sample are summarized in Table 1.

Table 1: Clinico-Demographic Characteristics of the Studied Cases (N=30)

Characteristic	Category	N	%
Gender	Male	16	53.33%
	Female	14	46.67%
Age (years)	Mean±SD	60.00±8.34	
	Median (IQR)	62.0 (60.0-67.0)	
Hand Dominance	Right Side	21	70.0%
	Left Side	9	30.0%
Side of Affection	Left Side	10	33.33%
	Right Side	20	66.6%
Duration of Illness (years)	Mean±SD	3.35±1.94	
Spasticity Grade (MAS)	Grade 1	6	20.0%
	Grade 1+	24	80.0%

SD: Standard Deviation; IQR: Inter-quartile range; MAS: Modified Ashworth Scale.

Descriptive Statistics for Outcome Measures

The descriptive statistics for the upper limb motor function and self-satisfaction outcome measures are presented in Table 2. Participants demonstrated a wide range of upper limb impairment and functional capacity. Scores on the Fugl-Meyer Assessment for Upper Limb (FMA-UL) ranged from 8.0 to 54.0 (out of 66), with a mean of 33.5±17.45. Similarly, scores on the Action Research Arm Test (ARAT) ranged from 0.0 to 57.0, with a mean of 32.60±20.18.

Regarding self-satisfaction, the mean Stroke Self-Efficacy Questionnaire (SSEQ) score was 30.5±8.03, with most patients (60.0%) reporting moderate confidence. The mean Satisfaction with Life Scale (SWLS) score was 21.6±6.24, with 40.0% of participants reporting being "Satisfied" with their life.

Table 2: Descriptive Statistics for Primary Outcome Measures (N=30)

Outcome Measure	Mean±SD	Median (IQR)	Range
Fugl-Meyer Assessment (FMA-UL)	33.5±17.45	36.0 (11.0-50.0)	8.0-54.0
Action Research Arm Test (ARAT)	32.60±20.18	29.0 (11.0-48.0)	0.0-57.0
Stroke Self-Efficacy (SSEQ)	30.5±8.03	33.5 (28.0-39.0)	16.0-44.0
Satisfaction With Life (SWLS)	21.6±6.24	24.5 (16.0-26.0)	11.0-31.0

Correlational Analysis

Spearman's rank-order correlation was used to examine the relationships between upper limb function, self-satisfaction, and demographic variables. The results of the correlation analysis are presented in Table 3.

A very strong, statistically significant positive correlation was found between the two measures of upper limb function, the FMA-UL and the ARAT ($r = 0.967$, $p < 0.001$). A strong, statistically significant positive correlation was also found between the two measures of self-satisfaction, the SSEQ and the SWLS ($r = 0.560$, $p = 0.010$).

The primary analysis revealed significant positive correlations between measures of upper limb function and measures of self-satisfaction. Specifically, better upper limb function as measured by the FMA-UL was strongly correlated with higher self-efficacy as measured by the SSEQ ($r = 0.748$, $p < 0.001$). Similarly, better function on the ARAT was strongly correlated with higher self-efficacy ($r = 0.732$, $p < 0.001$). Life satisfaction (SWLS) was also significantly positively correlated with both the ARAT ($r = 0.453$, $p = 0.045$) and the SSEQ ($r = 0.560$, $p = 0.010$).

Furthermore, significant negative correlations were observed between upper limb function and demographic variables. Higher FMA-UL scores were significantly associated with younger age ($r = -0.476$, $p = 0.034$) and shorter duration of illness ($r = -0.495$, $p = 0.026$). Similarly, higher self-efficacy (SSEQ) was significantly associated with younger age ($r = -0.774$, $p < 0.001$).

Table 3: Spearman's Correlation Matrix for Primary Outcome and Demographic Variables

Variable	FMA-UL	ARAT	SSEQ	SWLS	Age	Duration of Illness
FMA-UL	—	0.967**	0.748**	0.439	-0.476*	-0.495*
ARAT	0.967**	—	0.732**	0.453*	-0.450*	-0.470*
SSEQ	0.748**	0.732**	—	0.560**	-0.774**	-0.347
SWLS	0.439	0.453*	0.560**	—	-0.301	-0.560**
Age	-0.476*	-0.450*	-0.774**	-0.301	—	0.300
Duration of Illness	-0.495*	-0.470*	-0.347	-0.560**	0.300	—

Note. * $p < .05$; ** $p < .01$. FMA-UL = Fugl-Meyer Assessment for Upper Limb; ARAT = Action Research

Arm Test; SSEQ = Stroke Self-Efficacy Questionnaire; SWLS = Satisfaction with Life Scale.

DISCUSSION

This cross-sectional study was designed to investigate the fundamental relationship between upper limb (UL) motor function and patient-reported measures of self-satisfaction in a cohort of chronic stroke survivors. Our findings confirm the primary hypothesis, revealing strong and statistically significant positive correlations between higher levels of UL function and greater self-efficacy and life satisfaction. Furthermore, the analysis identified significant negative associations between UL function and both increasing age and longer duration of illness. These results underscore the profound and interconnected nature of physical disability and psychosocial well-being in the chronic phase of stroke recovery and highlight the critical importance of a holistic, multidisciplinary rehabilitation approach⁴⁻⁶.

A key finding of this study is the strong, positive association between objective, performance-based measures of UL function (FMA-UL and ARAT) and the subjective, patient-reported outcomes of self-efficacy (SSEQ) and life satisfaction (SWLS)^{11,12}. This aligns with a substantial body of literature confirming that residual physical impairment is a major determinant of long-term quality of life in stroke survivors¹³. The inability to effectively use an arm and hand for daily tasks creates a constant source of frustration, dependence, and reduced participation, which logically erodes one's sense of competence and overall life satisfaction¹⁴. Our study quantifies this relationship, demonstrating, for instance, a strong correlation between FMA-UL scores and SSEQ scores ($r=0.748$). This indicates that a patient's belief in their ability to manage their life post-stroke is very closely tied to the sensorimotor integrity of their affected upper limb^{15,16}.

It is noteworthy to consider the relative strengths of the observed correlations. Both the FMA-UL (an impairment-based measure) and the ARAT (a functional capacity measure) were strongly correlated with the Stroke Self-Efficacy Questionnaire (SSEQ). This suggests that a patient's confidence is linked to both their foundational motor control and their ability to perform tangible tasks^{23,24}. In contrast, only the ARAT showed a statistically significant, albeit more moderate, correlation with the global Satisfaction with Life Scale (SWLS), while the FMA-UL did not quite reach statistical significance ($p=0.053$). This subtle distinction may be clinically meaningful. It suggests that a patient's overall life satisfaction might be more closely related to their ability to perform meaningful, real-world tasks (as captured by the ARAT) rather than their raw level of motor impairment (as captured by the FMA-UL)²⁴⁻²⁶.

The strong intercorrelation observed between the two UL functional measures (FMA-UL and ARAT, $r=0.967$) and between the two self-satisfaction measures (SSEQ and SWLS, $r=0.560$) lends credence to the internal validity of our findings^{11,12}. The FMA-UL and ARAT, while measuring slightly different constructs (impairment vs. capacity), are known to be highly related, and our result confirms this^{23,24}. Similarly, the positive relationship between disease-specific self-efficacy and global life satisfaction is expected, as confidence in one's abilities is a key component of a satisfying life³¹.

Our analysis also revealed significant negative correlations, indicating that younger participants and those with a shorter duration of illness tended to have better UL motor function and higher self-efficacy²⁵⁻²⁷. The association with age is consistent with literature suggesting that younger individuals may have greater neuroplastic potential and fewer age-related comorbidities, contributing to better recovery outcomes⁵. The negative correlation with duration of illness suggests that without effective and ongoing rehabilitation, functional deficits and a corresponding lack of confidence can become entrenched over time, highlighting the importance of continuous therapeutic engagement to prevent functional decline and learned non-use in the chronic phase²⁷⁻²⁹.

Clinical Implications

These findings have important implications for clinical practice. They provide empirical support for a biopsychosocial approach to stroke rehabilitation. Programs focused solely on restoring motor function without addressing self-efficacy and life satisfaction may overlook critical dimensions of recovery. Enhancing arm function not only improves physical independence but also strengthens psychological resilience and confidence. Therapists should therefore co-create goals with patients, emphasizing tasks that are both physically beneficial and personally meaningful. Moreover, interventions designed to explicitly foster self-efficacy—such as patient education, goal setting, and celebrating incremental achievements—should be integral components of therapy.

Limitations

The study's primary limitation is its modest sample size ($N = 30$), which limits generalizability and statistical power. The cross-sectional design also precludes causal inference; it remains unclear whether poor motor function leads to lower self-efficacy and life satisfaction or vice versa. Future longitudinal and intervention studies are needed to clarify the directionality and mechanisms underlying these relationships.

CONCLUSION

In summary, this study provides robust evidence of a significant positive relationship between upper limb motor function and the psychosocial outcomes of self-efficacy and life satisfaction among chronic stroke survivors. Better arm function is closely associated with greater confidence and life satisfaction. These findings highlight the critical importance of multidisciplinary, patient-centered rehabilitation that simultaneously targets physical

recovery and psychological empowerment. Future research involving larger and more diverse samples, as well as longitudinal designs, is warranted to further elucidate the causal pathways linking functional recovery and psychosocial well-being post-stroke.

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