Original Article
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The Ability of Recovery Locus of Control Scale (RLOC) and Post-traumatic Stress Symptoms (PTSS) to Predict the Physical Functioning of Stroke Patients

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Abstract

Background: **The aim of this study was to address the ability of the recovery locus of control scale (RLOC) and post-traumatic stress symptoms (PTSS) to predict physical functioning among stroke patients. In addition, the best predictors within the subdomains of the RLOC and PTSS were also investigated.**

Methods: **A total of 147 stroke patients aged 33–85 years who had intact cognitive functioning were involved in the study. The Recovery Locus of Control Scale (RLOC), the Impact of Event Scale-Revised (IES-R), and the Barthel Index (ADL) were administered to respondents six weeks after stroke.**

Results: **The results showed that the RLOC and PTSS were significant predictors and were capable of predicting 31% of the physical functioning of stroke patients (adjusted R^2 = 0.31; *P* < 0.001). Furthermore, with respect to clinical factors, the affected lesion side contributed to predicting 7% of the physical functioning (R^2 = 0.07; *P* < 0.001). A hierarchical regression analysis found that the internal recovery locus of control (IRLOC) was a predictor capable of explaining 18% of the predicted physical functioning (adjusted R^2 = 0.18; *P* < 0.001). Meanwhile, avoidance was the most influential significant predictor among PTSS, contributing to 24% of the predicting physical functioning (adjusted R^2 = 0.24; *P* < 0.001).**

Conclusion: **In conclusion, the RLOC and PTSS were capable of predicting physical functioning among stroke patients.**

Keywords: *stroke, post-traumatic stress disorders, locus of control, physical activity, disability*

Introduction

Stroke is the third leading cause of death worldwide, including in Malaysia, after cancer and heart disease (1). Every year, there is a decreasing trend in the mortality rate, while the morbidity rate continues to increase. This trend shows that stroke survivors face significant burdens related to their illness, including different type of disabilities, such as physical disabilities, which predominantly causes limitations in their daily living (2). Statistics from the Ministry of Health (MOH) in Malaysia reported that the mortality rate for stroke in 2009 was decreased, with 0.02 patients per 100 000 individuals, compared with data in 2008. This is contrary to the morbidity rate, which showed an increasing trend with 1.14 patients per 100 000 individuals in the same year (1,3). Grooming, feeding, bowel control, toilet use, mobility, dressing, stairs use, and showering were major physical activities that stroke patients faced in their daily lives (4). A study from Wade and

Hewer (5) showed that bladder control function was affected in almost 20% of stroke patients who were severely affected.

A traumatic event such as stroke usually causes patients to experience a great deal of emotional distress. These negative emotional states, such as hopelessness, helplessness, and intense fear, can lead them to develop psychological distress in the form of posttraumatic stress symptoms (6,7). Post-traumatic stress symptoms (PTSS) are a group of symptoms used to diagnose patients with post-traumatic stress disorder (PTSD), which is a type of anxiety disorder. PTSD was shown to appear among individuals who experienced traumatic life events, such as combat veterans, victims of sexual abuse, and traffic accidents (8). This also includes experiencing a stroke (7,9–11). Knowing the characteristics of these symptoms might be beneficial in reducing the incidence of PTSD among stroke survivors. PTSS are comprised of three domains: intrusion, avoidance, and hyperarousal. Intrusion is a situation in which patients persistently re-experience distressing thoughts, nightmares, and intrusive images related to their trauma. Meanwhile, avoidance is a situation in which patients persistently avoid thoughts, feelings, places, and conversations associated with the trauma. Hyperarousal manifests with irritability, difficulty concentrating, and hypervigilance (12). A previous study showed that these three symptoms were commonly reported by stroke patients (11).

Perceived control is an individual belief patients have about their health, and it can affect their involvement in health-related behaviours designed to enhance recovery processes (13,14). Stroke patients usually lose their self-control after experiencing a stroke. Therefore, if they are able to positively perceive their level of self-control and can overcome negative thoughts towards stroke, they will have a faster recovery (8). Perceived control will determine the recovery process among patients, which is represented as the Recovery Locus Of Control (RLOC) and can be subdivided into an internal (IRLOC) and external (ERLOC) recovery locus of control (15). The IRLOC is the belief that only the patient themselves can determine their health condition, while the ERLOC is the belief that their health is determined by factors in their surroundings, such as fate or chance (16). Patients who have a high IRLOC usually became more independent and have a faster recovery (16). Assessment using the RLOC and consequent treatment is hoped to reduce psychological effects, such as helplessness, hopelessness and loss of self-control due to stroke because it is believed to encourage patients to have positive perceptions toward their recovery from stroke. Thus, they can increase their physical functioning and avoid permanent disability.

Theoretically, self-efficacy is associated with the locus of control, and it can be classified under the cognitive domain (17). A traumatic experience due to stroke causes the survivors to experience low self-efficacy due to their limitations and restrictions (18,19). As a result, negative thoughts may impair the patient's emotional states and result in unhelpful actions, such as poor compliance and blaming others. Meanwhile, PTSS are a group of emotional symptoms commonly manifested by stroke survivors. A high severity of these symptoms may cause patients to develop more complex psychological problems, such as anxiety and depression (20). These symptoms are believed to affect the thinking patterns of patients as well. Eventually, treating PTSS as an emotional domain and RLOC and as a cognitive domain became the focus of this study due to their inter-relatedness, which ultimately may influence the patient's behaviours toward their illness (21). Apart from that, knowing the domains in the RLOC and PTSS are useful for gaining knowledge about the best strategies for enhancing the recovery process. Therefore, this study aimed to identify the association between the RLOC and PTSS in regard to physical functioning and further predict the influence of the RLOC domains (internal and external) and PTSS domains (intrusion, avoidance and hyperarousal) on physical functioning among stroke patients.

Methods

This was a cross-sectional study with non-probability purposive sampling (respondents were selected based on specific criterion). Ethical approval was obtained from Ethics Committee of the University of Kebangsaan Malaysia Medical Centre (UKMMC).

Data collection

Potential respondents were identified from Stroke Registry Records and the Rehabilitation Unit in UKMMC. They were selected using the following inclusion criteria: respondents were diagnosed with stroke, six weeks had passed since the stroke, they were medically stable and not under constant medical monitoring, and they passed a cognitive screening test. The

exclusion criteria were an unclear diagnosis, receiving ongoing psychiatric treatment for mental health problems, a history of mental health problems, severe dysphasia, and if they were unable to read, see, write, or draw. Out of 213 potential respondents, 180 respondents were interested in being involved in the study. Respondents' cognitive abilities were assessed using the Addenbrooke's Cognitive Examination Revised (ACE-R). Those who had a score below the cut-off value (< 80), indicating cognitive impairment, were excluded. 32 respondents were excluded from the initial 180 respondents. Thus, the remaining respondents (n=148) were asked to complete the Barthel Index (ADL), the RLOC, and the Impact of Event Scale-Revised (IES-R). The assessments were divided into several stages in order to not exhaust the respondents. Information on each patient's socio-demographics and clinical factors were also recorded. However, only data from 147 respondents were analysed after the data screening process because one respondent was an extreme outlier.

Measures

Socio-demographics and clinical information were collected regarding the patient's age, gender, religion, marital status, educational level, area of living, primary care, number of strokes, affected lesions, rehabilitative therapies, and alternative treatments.

Cognitive impairment was measured using Addenbrooke's Cognitive Examination Revised (ACE-R) as a screening tool to access early cognitive dysfunction. It is comprised of 5 sub-scales of cognitive constructs, including the a; concentration/orientation (18 points), b; memory (26 points), c;fluency (14 points), d; language (16 points) and e; visuo-spatial (16 points) sub-scales. The total score for the ACE-R is 100, and it has a good reliability (α= 0.8). It was administered individually by a single researcher who has a background in psychology. In this study, the ACE-R showed a high internal consistency (α = 0.90) with good construct validity (Concentration/ Orientation: 0.91; Memory: 0.90; Fluency: 0.78; Language: 0.88; Visuo-spatial: 0.46).

Post-traumatic stress symptoms were measured using the Impact of Event Scale-Revised (IES-R) that was originally proposed by Weiss and Marmar (22). It is a self-reported tool that is intentionally designed to access current subjective distress related to traumatic life events. Originally, the IES only contained 15 items, while the new version, known as the IES-R, includes 7 newly added items for a total of 22 items (22). Out of the 7 new items, 6 of them are related to hyperarousal symptoms, and one item is related to intrusion. The item format for this tool is a Likert scale with five points of agreement ranging from 0= not at all, 1= a little bit, 2= moderately, 3=quite a bit to 4= extremely. Hyperarousal had good predictive validity for all types of trauma, while the validity of intrusion and avoidance depended on the types and severity of trauma. All of these sub-scales had an internal consistency above 0.8 (Intrusion: 0.87-0.92; Avoidance: 0.84-0.86; Hyperarousal: 0.79-0.90) (23). In the present study, the Cronbach alpha (α) for the IES-R was considered good at 0.93, whereas its construct validity varied (Intrusion: 0.59-0.82; Avoidance: 0.35-0.75; Hyperarousal: 0.34-0.64).

Recovery locus of control was measured using the Recovery Locus of Control Scale (RLOC) that was introduced by Partridge and Johnston (24). This scale contains 9 statements that are designed to evaluate the internal and external beliefs regarding the traumatic events that the patient has experienced. It is comprised of 5 statements measuring internal beliefs (statement 1, 3, 5 and 9) and another 4 statements measuring external beliefs (statement 2, 4, 6 and 8). The item format for this tool is in the form of a Likert scale with 5 points of agreement ranging from 1= strongly agree, 2= agree, 3= uncertain, 4= disagree to 5= strongly disagree. The total score for this tool ranged from 9-45. Thus, a higher total score indicated a better locus of control. The internal consistencies were 0.64, 0.77, and 0.53, while a study by Partridge and Johnston (24) showed that this measurement tool had good construct validity and internal consistency. The Cronbach alpha (α) for the RLOC scale in this study was 0.90, whereas its construct validities for internal and external beliefs ranged from 0.77–0.87 and 0.62–0.74, respectively.

The Barthel Index in Activities of Daily Living (ADL) by Mahoney and Barthel (4) was designed to measure the physical functioning of individuals. Then, it was reconstructed by Wade and Collin (25) to be applied to research of stroke and in clinical settings. It has 10 items that measure 10 different activities among respondents, including personnel care and mobility. The evaluation is based on the ability to carry out tasks independently without needing assistance. The total score for physical disability was classified as follows: a) no physical disability = 20, b) mild impairments = 15–19, c) moderately

disabled = 10–14, d) severe disability= 5–9, and e) very severely disabled = 0–4 (5). ADL showed good internal consistency with the Cronbach alpha above at 0.8 (0.84, 0.80, and 0.82) within one month and six month assessments. In this study, ADL had good internal consistency (α=0.94) and considerable construct validity, which ranged from 0.59–0.86.

All tests used in this study have been translated in Bahasa Malaysia using a back-to-back translation process. No permission from authors was required to translate these tests because they are freely assessed.

Statistical analyses

Data screening and cleaning were conducted before the data were analysed. Data with extreme outliers were detected (when z = ±3.29 value out of this range) and excluded. There was one extreme univariate outlier in this data, and that respondent was excluded. Only data from 147 respondents were analysed. The distribution of the data was also examined by referring to the value of skewness. All of these data were normally distributed with a value of skewness ranging from ± 1.

The data were then analysed using the Statistical Package for the Social Sciences (SPSS) version 20.0 (IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.) Descriptive statistics were reported in frequency and percentage for categorical data, while the means ± standard deviation (SD) were reported for continuous data. Pearson's correlations and Kendall's tau b correlations were used to examine the relationship between demographic data, clinical factors, RLOC, and PTSS with regard to physical functioning. Hierarchical regression analyses were carried out to examine the influence of RLOC and PTSS and to identify the best predictors for physical functioning among stroke patients. The results are presented as unstandardized (B) coefficients, 95% confidence intervals of beta (95% CI), R^2, and adjusted R^2 (ΔR^2). A significant level at P <0.05 was considered to be statistically significant.

Results

Sample characteristics

A total of 147 respondents were involved in this study; 82 (55.8%) were male, and 65 (44.2%) were female. Most of the respondents were in the 60-69 age group (36.7%), and the majority of them were Malay (56.5%) and also Muslim (58.5%). Most of them were married 111 (75.5%), and 63 (42.9%) had primary education. A majority of them had experienced their first stroke, 118 (80.3%), and the side of the affected lesion was distributed in similar proportions. In terms of type of physical disabilities, 30.6% were in the severe category (Table 1).

Distribution of the RLOC, PTSS, and Barthel Index (ADL)

The mean score for the internal RLOC was higher [17.62 (5.12)] than the mean score for the external RLOC [9.76 (2.77)]. Avoidance was the most prevalent symptom of the PTSS reported by patients 6 weeks after their stroke.

Correlations between demographic data, clinical factors, RLOC, and PTSS with physical functioning

A Kendall's tau b correlation test was conducted for all demographic and clinical variables, and only the affected lesion of the brain was significantly correlated (r = 0.24, P = 0.001) with physical functioning. This showed that different regions of the brain have an association with a patient's physical functioning (Table 3).
Higher RLOC score was significantly correlated (r = 0.51, P < 0.001) with physical functioning. However, there was a significant negative correlation (r = -0.41, P < 0.001) between PTSS and physical functioning.

Influence of RLOC and PTSS on the prediction of physical functioning

Table 4 shows the hierarchical regression analyses of the affected lesion side, RLOC, and PTSS in predicting physical functioning. With regards to the side of the lesion, a left-sided lesion resulted in worse physical functioning than did a right-sided lesion. In this regression analysis, we controlled for the affected lesion side because it was correlated with outcome. The affected lesion side was entered into step 1, and the RLOC score

Table 1: Demographic and clinical profile of the respondents

Respondents Profile (n= 147)	n	%
Gender		
Male	82	55.8
Female	65	44.2
Age (year)		
30-39	2	1.4
40-49	19	12.9
50-59	52	35.4
60-69	54	36.7
70 and above	20	13.6
Races		
Malay	83	56.5
Chinese	52	35.4
Indian	7	4.8
Others	5	3.4
Religion		
Islam	86	58.5
Buddha	52	35.4
Hindu	7	4.8
Others	2	1.4
Marital Status		
Single	6	4.1
Married	111	75.5
Divorced	24	16.3
Widowed	6	4.1
Level of Education		
Not Schooling	14	9.5
Primary Education (PMR and below)	63	42.9
Secondary Education (SPM-STPM/Diploma)	57	38.8
Tertiary Education (Bachelor degree and above)	13	8.8
Number of Stroke Attack		
1	118	80.3
2	27	18.4
3	2	1.4
Affected Lesion		
Left	73	49.7
Right	74	50.3
Type of Physical Disabilities		
No physical disability (20)	25	17.0
Mild impairments (15-19)	53	36.1
Moderately disabled (10-14)	24	16.3
Severe disability (5-9)	40	27.2
Very severely disabled (0-4)	5	3.4

Table 2: Degree of RLOC, prevalence of IES-R and Barthel Index Activity of Daily Living

Scores	Mean (SD)
Total score of RLOC	27.38 (6.98)
Internal RLOC (IRLOC)	17.62 (5.12)
External RLOC (ERLOC)	9.76 (2.77)
Total score of IES-R	63.81 (16.34)
Intrusion	20.34 (8.31)
Avoidance	23.14 (6.71)
Hyperarousal	20.33 (3.90)
Total score for Barthel Index (ADL)	13.86 (5.21)

Abbreviations: RLOC = Recovery Locus of Control Scale; ADL = Barthel Index; IES-R = Impact of Event Scale-Revised.

Table 3: Correlation between demographics and clinical factors with physical functioning

	1	2	3	4	5	6	7	8	a
Demographics and Clinical Factors									
Age	-								
Gender	0.14 (P = 0.059)	-							
Marital status	0.25 (P = 0.001)**	0.07 (P = 0.405)	-						
Educational level	-0.46 (P < 0.001)**	-0.17 (P = 0.032)*	-0.17 (P = 0.024)*	-					
Number of stroke attack	0.05 (P = 0.512)	-0.03 (P = 0.743)	0.11 (P = 0.166)	-0.01 (P = 0.946)	-				
Affected lesion side	0.07 (P = 0.369)	-0.16 (P = 0.058)	0.08 (P = 0.322)	-0.09 (P = 0.246)	-0.01 (P = 0.871)	-			
Rehabilitation therapy	0.01 (P = 0.928)	0.01 (P = 0.951)	-0.09 (P = 0.283)	0.07 (P = 0.347)	-0.06 (P = 0.462)	-0.02 (P = 0.798)	-		
Alternative rehabilitation	-0.17 (P = 0.026)*	-0.06 (P = 0.443)	-0.25 (P = 0.002)**	0.15 (P = 0.048)*	0.02 (P = 0.799)	-0.06 (P = 0.458)	0.06 (P= 0.480)	-	
Dependent Variable									
ADL Score	-0.02 (P = 0.789)	-0.08 (P = 0.271)	0.01 (P = 0.886)	-0.01 (P = 0.922)	-0.03 (P = 0.714)	0.24 (P = 0.001)**	0.04 (P = 0.561)	-0.07 (P = 0.314)	-

**$P < 0.01$, *$P < 0.05$; Kendall's tau b

Table 4: Hierarchical regression analyses of affected lesion side, RLOC and PTSS in predicting physical functioning

Variable entered	B	95% CI	*P* value	R^2	ΔR^2
Step 1				0.07	
Affected lesion side	2.77	1.14, 4.42	0.001**		
Step 2				0.38	0.31 (P < 0.001)**
Affected lesion side	2.24	0.88, 3.59	0.001**		
RLOC	0.31	0.20, 0.41	< 0.001**		
PTSS	-0.09	-0.13, -0.05	< 0.001**		

**P < 0.001
Abbreviations: RLOC = Recovery Locus of Control Scale; PTTS = Post-traumatic Stress Symptoms

and PTSS were entered into step 2. The result shows that the affected lesion side contributed approximately 7% towards physical functioning. In step 2, it was found that 31% (adjusted R2 =0.31) of physical functioning could be predicted by the RLOC and PTSS when we controlled for the affected lesion side. This relationship also explained a significant proportion of the variance [$F(2,143)= 35.80$, $P < 0.001$].

Because we already knew that the RLOC score was a significant predictor of physical functioning, the next step was to conduct an in-depth examination of which construct in the RLOC is the best predictor of physical functioning. The affected lesion side was also controlled in this analysis, and it was entered in step 1. Then, the internal RLOC (IRLOC) score was entered in step 2, while the external RLOC (ERLOC) score was entered in step 3. The results showed that IRLOC contributed approximately 18% (adjusted $R^2 = 0.18$) toward predicting physical functioning, and it explained a significant proportion of the variance [$F(1,144) = 34.13$, $P < 0.001$]. The ERLOC also explained a significant proportion of the variance [$F(1,143) = 14.43$, $P < 0.001$], with only a 7% contribution toward predicting physical functioning (adjusted $R^2 = 0.07$). Both of them could be considered significant predictors, but IRLOC was considered the best predictor because its contribution was higher than that of the ERLOC (Table 5).

To examine the influence of each domain in the PTSS in predicting physical functioning, further hierarchical regression analyses were carried out. The affected lesion side was controlled by entering that factor in step 1, and then intrusion was entered in step 2, avoidance was entered in step 3, and finally, hyperarousal was entered in step 4. The result showed that intrusion can explain a significant proportion of the variance [$F(1,144) = 6.05$, $P = 0.015$] with a 4% contribution toward predicting physical functioning (adjusted $R^2 = 0.04$). Avoidance contributed approximately 24% (adjusted $R^2 = 0.24$) to predicting physical functioning, and it also explained a significant proportion of the variance [$F(1,143) = 52.49$, $P < 0.001$]. The other symptom, hyperarousal, contributed only 0.2% (adjusted $R^2 = 0.002$) towards predicting physical functioning. Unfortunately, it did not explain a significant proportion of the variance [$F(1,142)= 0.53$, $P = 0.468$]. Hence, avoidance was the best predictor of physical functioning because its contribution was higher than that of the other symptoms (Table 6).

Discussion

In this study, the prevalence of a first stroke was 80.3% and that of severe physical disability was 30.6% among respondents. This prevalence was higher than that found in a previous study by Wang et al. (11) for both variables measured. Thus, it showed that respondents in this study experienced more severe disabilities, and this affected their daily living activities. In addition, the PTSS prevalence for all three domains (intrusion, avoidance and hyperarousal) in this study was also higher than that found in the study by Wang et al. (11). This difference might be due to differences in the diagnostic tools used. The Posttraumatic Diagnostic Scale (PDS) was used by Wang et al. (11). In contrast to the later study, we used the Impact of Event Scale-Revised (IES-R), which is different in the sensitivity and specificity of PTSS diagnosis. The RLOC scores among stroke patients in this study was lower compared to a study by Partridge and Johnston (24). This was due to differences in the age groups, where the mean age for this study was younger and classified as middle-aged adults compared with the previous study by Partridge and Johnston (24) that predominantly used older adults. However, this finding contradicts those of a previous study that indicated that older adults supposedly had a low locus of control compared with early adults and middle-aged adults (26).

The affected lesion side was significantly correlated in a positive way with physical functioning. It can explain that different regions of the brain play different roles, and if one region that controls more function of physical activities is affected, then it will lead to a more severe physical disability. The findings of an earlier report supported the idea that different areas of infarction will present with different symptoms of PTSS. For example, infarction in the basal ganglia region will cause patients to have symptoms of intrusion (6). Other research also associated the basal ganglia with skeletal muscle control and mobility in coordination. Therefore, it is possible for motor function to be affected whenever stroke occurs in the basal ganglia (27). As a result, if the affected lesion side was correlated with the development of PTSS, it is also believed to have an association with physical functioning because it is proved that different region of the brain control different functions. We conclude that different symptoms will develop if different regions of the brain are affected.

Table 5: Hierarchical regression analyses of affected lesion side, domains in RLOC (IRLOC & ERLOC) in predicting physical functioning (by entering IRLOC in step 2, ERLOC in step 3)

Variable entered	B	95% CI	*P* value	R^2	ΔR^2
Step 1				0.07	
Affected lesion side	2.77	1.14, 4.42	0.001**		
Step 2				0.25	0.18 (P < 0.001)**
Affected lesion side	2.44	0.95, 3.92	0.001**		
IRLOC	0.43	0.29, 0.58	0.001**		
Step 3				0.32	0.07 (P < 0.001)**
Affected lesion side	2.29	0.87, 3.71	0.002**		
IRLOC	0.27	0.10, 0.43	0.002**		
ERLOC	0.58	0.28, 0.88	< 0.001**		

**P < 0.001
Abbreviations: RLOC = Recovery Locus of Control Scale; PTTS = Post-traumatic Stress Symptoms; IRLOC = Internal Recovery Locus of Control Scale; ERLOC = External Recovery Locus of Control Scale.

Table 6: Hierarchical regression analyses of affected lesion side, domains in PTSS (intrusion, avoidance & hyperarousal) in predicting physical functioning (by entering intrusion in step 2, avoidance in step 3 and hyperarousal in step 4)

Variable entered	B	95% CI	*P* value	R^2	ΔR^2
Step 1				0.07	
Affected lesion side	2.77	1.14, 4.42	0.001**		
Step 2				0.11	0.04 (P = 0.015)*
Affected lesion side	2.81	1.20, 4.43	0.001**		
Intrusion	-0.12	-0.22, -0.02	0.015*		
Step 3				0.35	0.24 (P < 0.001)**
Affected lesion side	2.25	0.85, 3.64	0.002**		
Intrusion	0.09	-0.01, 0.19	0.080		
Avoidance	-0.46	-0.59, -0.34	< 0.001**		
Step 4				0.35	0.002 (P = 0.468)
Affected lesion side	2.19	0.79, 3.60	0.002**		
Intrusion	0.10	-0.00, 0.21	0.059		
Avoidance	-0.43	-0.58, -0.28	< 0.001**		
Hyperarousal	-0.10	-0.36, 0.17	0.468		

*P<0.05, **P<0.001
Abbreviations: PTTS = Post-traumatic Stress Symptoms.

In addition to the affected lesion side having an association with physical functioning, RLOC score also had a significant positive correlation with physical functioning, in that patients with a higher RLOC score will have increased physical functioning. This is because patients positively perceived that their stroke experience enhanced their recovery processes through consistent involvement in exercises, compliance in drug regimens, and fully participating in any rehabilitation programs planned for them. This conceptual basis will influence an individual involved in a rehabilitation program because perceived control can help them to recover from any disabilities related to stroke (24).

PTSS also showed a significant correlation with physical functioning but in a negative manner. This finding tells us that an increase in PTSS is correlated with a decrease in physical functioning. A posttraumatic response will be manifested as PTSS whenever past traumatic experiences are triggered. Originally, those traumatic experiences were stored in unconscious memory. However, any time information related to the trauma is present, they will be activated and brought to a conscious state, usually presenting as the symptom of intrusion in the form of flashbacks, nightmares, and avoidance (28). This situation shows that PTSS also arises from individual cognitive appraisal, which has a strong association with memory. If individuals wrongly perceived the traumatic events, then incorrect learning can occur unconsciously. This unconscious learning of traumatic events will also lead them to express the specific PTSS when being triggered in a conscious state (28). Hence, we can conclude that an increase in PTSS might cause the patient to have cognitive impairments. Thus, it will give them a loss of confidence in self-appraisal, which finally will affect their own physical functioning because they need someone to assist them in daily living activities due to their negative thoughts towards themselves.

Internal RLOC (IRLOC) and external RLOC (ERLOC) are significant predictors of physical functioning. Nevertheless, IRLOC was the most influential predictor compared with ERLOC due to its bigger contribution in predicting physical functioning. As a result, higher scores in IRLOC are correlated with patients having better physical functioning due to an individual self-efficacy that can lead them to recover more quickly from disability. A previous study conducted by Partridge and Johnston (24) also stated that if individuals have internal perceived control, it will help them to have better physical functioning and a faster recovery. Therefore, if they believe that they can recover only through their own efforts, they will be motivated to be involved in rehabilitation activities. This differs from those who have higher external beliefs that are predominantly related to mood factors, which might cause less involvement in any rehabilitation programs because participation is influenced by mood (24).

Avoidance is the best predictor for PTSS and the most influential symptom in predicting physical functioning among stroke survivors. In circumstances where individuals avoid talking and thinking about any related cues that might trigger a traumatic experience, they do not resolve their problems, and this will affect their functioning in daily life. This might happen because as opposed to running away from problems, facing them is a better coping skill. In addition, Schnurrth and Green (29) also said that whenever patients used an emotional-focused strategy, such as avoidance of problems, not expressing their problems in effective ways worsened their health status compared with those patients who used a problem-focused strategy. This is because they might be involved in disruptive behaviours if influenced by anger and loss of control in appropriate decision-making when under emotional distress.

A few recommendations are suggested to improve this study in the future. First, the study design has to be extended to a prospective study in order to illustrate the clear changes in the PTSS and RLOC scores at different time frames. At the same time, improvement in the type of disabilities among subjects can be observed using PTSS and RLOC scores. Additionally, brain imaging, such as Magnetic Resonance Imaging (MRI) or Computerized Tomography (CT), is meaningful as a complementary tool to examine the side of lesion and association with changes in PTSS and RLOC scores. A previous study examined the role of RLOC as a mediator of physical functioning. However, no study has yet observed an important role for PTSS in mediating physical functioning. Therefore, it is highly recommended to study the mediating and moderating effects of PTSS on physical functioning in future studies.

Conclusion

In conclusion, the RLOC and PTSS are psychological predictors of physical functioning. The Internal RLOC and avoidance were the most influential predictors, and these factors should be considered in any intervention program for stroke patients in order to enhance their physical recovery.

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Conflict of Interest

None

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Authors' Contributions

Conception and design: MFMZ, SEG, NCD, PS
Analysis and interpretation of the data, drafting of the article, provision of study materials or patient, collection and assembly of data: MFMZ
Critical revision of the article for the important intellectual content, final approval of the article: SEG, NCD, PS
Statistical expertise, administrative, technical or logistic support: SEG, NCD

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