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ORIGINAL ARTICLE

A Preliminary Analysis of Fatigue and Depressive Symptoms in Relation to Physical Activity Among Chronic Stroke Survivors

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ABSTRACT

Introduction: Depression and fatigue are common sequelae among chronic stroke survivors and may influence their physical activity levels. This preliminary study analysed associations between depressive symptoms, physical fatigue, and physical activity in chronic stroke patients.

Methods: A preliminary cross-sectional study was conducted from January to May 2025 involving chronic stroke outpatients (≥6 months) with Brunnstrom stage IV–V and MoCA-Ina ≥24. Depression was assessed using the Indonesian-validated DASS-21, fatigue using the Fatigue Severity Scale (FSS), and physical activity using the Global Physical Activity Questionnaire (GPAQ). Mann–Whitney U tests compared low versus moderate activity groups, and Spearman's rho evaluated correlations (α=0.05).

Results: Fatigue scores were higher in the low-activity group (34.8 ± 13.10) compared with the moderate-activity group (20.2 ± 6.64), showing a trend toward significance (p = 0.057). Depression scores did not differ between groups (p = 0.532). Spearman's analysis showed a moderate negative trend between fatigue and activity (rho = -0.592, p = 0.071), while depression demonstrated a weak non-significant association (rho=-0.073, p=0.841).

Conclusions: Physical fatigue showed a stronger trend toward lower activity levels than depressive symptoms, although associations were not statistically significant. Larger, adequately powered studies are needed to clarify these relationships.

Keywords : Brunnstorm, Chronic, Depression, Fatigue, GPAQ, Physical, Rehabilitation, Stroke

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INTRODUCTION

Stroke significantly impacts patients quality of life, particularly in the chronic phase, and remains a leading cause of disability worldwide.[1,2] In Indonesia, stroke prevalence is 12.1 per 1,000 individuals, with many survivors entering a chronic phase characterized by psychosocial complications such as post-stroke depression (PSD) and post-stroke fatigue (PSF).[3,4] Both PSF and PSD are frequently reported among stroke survivors and are known to impede participation and functional recovery.[5,6] Recent systematic reviews and cohorts (2021–2024) report PSF prevalence of 30–50%, consistently linking it to lower mobility, endurance, participation, and quality of life, and in some studies predicting poorer long-term recovery.[7-10] Similarly, PSD affects 30–50% of survivors and is associated with reduced motivation, limited rehabilitation engagement, and increased mortality risk.[2,11]

Prior research indicates that both PSD and PSF negatively correlate with motor function and quality of life.[12,13] Indonesian studies likewise report a substantial burden of PSD, with around 40% of chronic stroke patients demonstrating depressive symptoms that affect activities of daily living (ADL).[4] Importantly, emerging evidence suggests that physical fatigue may exert a more pronounced impact on motor performance and daily functioning than depression alone.[5,14] Despite the rehabilitation potential seen in chronic stroke survivors at Brunnstrom stages IV–V—where voluntary control and synergy reduction allow meaningful functional gains—the specific relationships between depression, physical fatigue, and physical activity in this subgroup remain poorly described in Indonesian populations.[4,15,16] This gap is particularly notable in Indonesia, where patients commonly experience delayed access to rehabilitation services, high variability in therapy intensity, and strong dependence on family caregivers factors that may uniquely influence the manifestation of fatigue, depressive symptoms, and activity levels compared with higher-resource settings.

Evidence focusing on Indonesian chronic stroke survivors at Brunnstrom IV–V remains particularly limited.[4,15,17] Given these contextual differences, examining whether fatigue plays a more dominant role than depression in shaping physical activity is especially relevant for Indonesian populations. Therefore, this preliminary study aims to examine these relationships to establish early evidence for integrated rehabilitation strategies that address both physical and psychosocial determinants of recovery.[18,19]

METHODS

Design

This research is a preliminary cross-sectional conducted from January to May 2025 at the Department of Physical Medicine and Rehabilitation, Dr. Hasan Sadikin General Hospital, Bandung, Indonesia. A cross-sectional approach was selected to examine associations between variables at a single time point, consistent with the exploratory nature of preliminary investigations. Ethics approved by the Health Research Ethics Committee, Faculty of Medicine Universitas Padjadjaran (Reference Number: DP.04.03/D.XIV.6.5/539/2025). All participants provided written informed consent. Given its exploratory purpose and limited sample, this study was designed as a pilot feasibility study.

Subjects

The inclusion criteria were individuals aged 40 to 70 years, chronic stroke ≥ 6 months, Brunnstrom stages IV-V for both upper and lower extremities, MOCA Ina score ≥24, able to communicate verbally , and willing to provide informed consent. The exclusion criteria includes major psychiatric comorbidity, recent botulinum toxin injection, neuromuscular disorder and peripheral musculoskeletal disorder or surgery in lower limb. A total of 10 participants were selected through purposive sampling, appropriate for preliminary feasibility work where estimation rather than hypothesis testing is prioritized.

Study Protocol and Data Collection

Participants underwent a comprehensive evaluation by a physical medicine and rehabilitation specialist following the screening. Demographic information (age, gender) was obtained through structured interviews. Depression was assessed using the validated Indonesian version of the DASS-21.[4] Fatigue was evaluated using the Fatigue Severity Scale (FSS), with a cut-off >4 indicating moderate to severe fatigue.[20] Physical activity levels were assessed using the Global Physical Activity Questionnaire (GPAQ), which estimates activity in MET-minutes per week and has been validated internationally, including in developing countries.[21]

Data analysis

Data were analysed utilizing SPSS software version 26.0. Continuous variables were reported as mean ± SD and categorical variables as frequencies. Normality was assessed using the Shapiro–Wilk test. Between-group comparisons were performed using the Mann–Whitney U test. Correlations were evaluated using Spearman's rho with 95% confidence intervals (bootstrap 1,000 resamples), and effect sizes (r) were provided where appropriate. As this study involved a small sample (n=10) selected for pilot feasibility, analyses were powered only for trend estimation rather than definitive inference; findings therefore require confirmation in larger samples.

RESULTS

The attributes of the study participants are shown in Table 1. This study included 10 people diagnosed with Brunnstrom stage IV-V, MoCA-Ina ≥24. The mean age of the participants was 59.7 ± 7.7 years, with a gender distribution of 30% female (n=3) and 70% male (n=7). All 5 individuals in the moderate-activity group were female, while the low-activity group consisted of more males. This unequal sex distribution may influence between-group comparisons and should be interpreted with caution. According to the Global Physical Activity Questionnaire (GPAQ), participants were categorized into two groups: 5 participants were low activity (<600 MET-minutes/week) and 5 participants were moderate activity (600-3000 MET-minutes/week). No significant age difference was seen between the groups ($p > 0.05$, Mann-Whitney U test).

Table 2 presents a comparison between depressive and fatigue levels between groups. Mann-Whitney U tests indicated no significant differences for depressive symptoms ($p = 0.532$). Fatigue scores were higher in the low-activity group (34.8 ± 13.10) compared with the moderate-activity group (20.2 ± 6.64), showing a near-significant trend ($p = 0.057$). Although the mean fatigue score differed by 14.6 points between groups, the difference did not reach statistical significance, likely due to the small sample size characteristic of preliminary pilot studies.

Table 3 summarizes the Spearman correlation analysis. Depression showed a weak and non-significant negative association with physical activity (rho = -0.073, p = 0.841). Fatigue demonstrated a moderate negative trend with activity level (rho = -0.592, p = 0.071), although this also did not reach statistical significance. These findings are interpreted as exploratory trends requiring confirmation in larger sample.

Table 1. Subject Characteristic

Variable	Low Activity (n=5)	Moderate Activity (n=5)
Age (years), (mean±SD)	59.8 ± 8.55	59.6 ± 7.23
Sex, n (%)		
Male	3 (60%)	0 (0%)
Female	2 (40%)	5 (100%)

Table 2 Comparison of Depression and Physical Fatigue Scores Between Groups

Variable	Low Activity (mean±SD)	Moderate Activity (mean±SD)	p-Value
Depression (DASS-21)	5.2 ± 4.38	3.6 ± 3.28	0,532
Fatigue (FSS)	34.8 ± 13.10	20.2 ± 6.64	0,057

Table 3. Spearman's Correlation Analysis between Depression, Physical Fatigue, and Activity Level

Variable	Correlation Coefficient (rho)	p-Value
Depression (DASS-21)	-0.073	0.841
Fatigue (FSS)	-0.592	0.071

DISCUSSION

In this preliminary cohort of chronic stroke survivors, fatigue demonstrated a stronger, though non-significant, inverse association with physical activity levels (Spearman rho=-0.592, p=0.071) compared to depression (rho=-0.073, p=0.841), which was clinically and statistically insignificant.[1,2] This pattern aligns with existing evidence showing that post-stroke fatigue (PSF) is more consistently associated with reduced mobility, endurance, participation, and overall quality of life than depressive symptoms.[7-9] Systematic reviews also highlight the high prevalence and persistent functional impact of PSF.[22] Although these findings resonate with prior literature, the present estimates remain imprecise due to the small sample size (n = 10), which likely limited the ability to detect statistically significant effects.[18]

The stronger association of fatigue with reduced activity levels compared to depression may reflect distinct neurobiological pathways including altered cortico-striatal processing and network dysconnectivity that sustain fatigue independent of mood symptoms.[10,23] Prior studies also report that PSF independently affects activities of daily living (ADL) in chronic stroke survivors.[5] However, because of the limited sample, our study cannot determine the relative causal influence of fatigue versus depression. No causal inference can be drawn from this cross-sectional design.

This study contributes preliminary evidence from an Indonesian chronic stroke population a group that often experiences delayed access to structured rehabilitation, variable therapy intensity, and high caregiver dependence. These contextual factors may modify how fatigue and depression interact with physical activity. Additionally, the focus on Brunnstrom IV–V survivors, who have sufficient voluntary motor control to potentially increase activity levels, underscores a meaningful clinical subgroup where identifying whether fatigue exerts a greater functional impact than depression is particularly relevant for rehabilitation planning.

Despite the non-significant trend, the prominence of fatigue over depression supports prioritizing PSF screening and management in clinical practice. Evidence-based strategies, including sleep hygiene, graded aerobic and resistance training, pacing techniques, and psychoeducation, remain reasonable approaches, and early trials of CBT-informed programs show encouraging results.[19,24] The non-significant yet clinically meaningful trend emphasizes the importance of considering PSF as an early rehabilitation target even in chronic survivors, supporting the shift toward personalized rehabilitation.

This pilot study, with n=10, a cross-sectional design, and reliance on interview-based physical activity (PA) metrics like the Global Physical Activity Questionnaire (GPAQ), is susceptible to recall and classification bias.[17] The small sample likely contributed to the near-significant fatigue p-value (p = 0.071), a common limitation in underpowered stroke studies.[18] Future research should include adequately powered samples, objective PA measurement (e.g., accelerometery), stratification by sex and clinical characteristics, pre-registered analyses, and longitudinal designs to clarify directionality. Ensuring the local validation of tools such as the Indonesian DASS-21[15], GPAQ[17], and IPAQ for stroke survivors[16] may further improve measurement reliability.

Strengths and Limitations

The strengths of this analysis include its focus on chronic stroke survivors and the use of validated psychometric instruments like the GPAQ and DASS-21.[15,17] However, limitations include the small sample size, cross-sectional design, and potential recall bias. These constraints are consistent with prior findings that small samples often fail to yield statistically significant results despite clinically relevant trends.[18]

Recommendations and Future Directions

Future studies should involve larger sample sizes, employ objective PA measures, and incorporate longitudinal follow-up to better determine the interaction between PSF, depression, and physical

activity. Incorporating community-based rehabilitation approaches, as supported by Indonesian studies,[25] may also improve outcomes by targeting PSF more effectively.

CONCLUSION

Preliminary findings suggest that physical fatigue appears to have a stronger association with lower physical activity levels than depression among chronic stroke survivors. However, these associations were not statistically significant and should be interpreted cautiously. Further confirmation in adequately powered and longitudinal studies is needed to clarify these relationships.

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