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Original Research Article

Correlation Between H-Reflex Excitability and Functional Motor Recovery in Chronic Stroke Survivors - A Cross-Sectional Observational Study

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ABSTRACT

Background: Stroke is a leading cause of long-term disability, often resulting in sensorimotor deficits and impaired mobility. Understanding neurophysiological mechanisms such as spinal excitability and their role in motor recovery is critical for optimizing rehabilitation strategies. The Hoffmann reflex (H-reflex), a marker of spinal motor neuron excitability, has shown potential for assessing recovery following stroke.
Objective: This study aimed to investigate the correlation between H-reflex excitability and functional motor recovery in chronic stroke survivors, focusing on the Hmax/Mmax ratio, latency, and amplitude of the H-reflex. Additionally, differences based on stroke type, hemiparesis side, and Brunnstrom recovery stages were explored.
Methods: A cross-sectional observational design was employed, involving 30 chronic stroke survivors. H-reflex parameters were recorded for affected and unaffected limbs using posterior tibial nerve stimulation. Motor recovery was assessed using the Fugl-Meyer Assessment (FMA) and spasticity graded with the Modified Ashworth Scale (MAS). Pearson's correlation, independent samples t-tests, one-way ANOVA, and multiple linear regression were performed to analyze relationships between H-reflex measures and motor outcomes.
Results: Hmax/Mmax ratio demonstrated a moderate positive correlation with FMA total motor scores ($r = 0.48$, $p = 0.02$), while latency showed a moderate negative correlation ($r = -0.35$, $p = 0.04$). Significant differences were observed in H-reflex parameters across stroke types ($t(28) = 2.45$, $p = 0.02$, Cohen's $d = 0.89$) and Brunnstrom recovery stages ($F(2, 27) = 4.32$, $p = 0.02$, $\eta^2 = 0.24$). Multiple regression analysis revealed that Hmax/Mmax ratio ($\beta = 0.42$, $p = 0.01$) and latency ($\beta = -0.28$, $p = 0.04$) significantly predicted motor recovery, accounting for 52% of the variance ($R^2 = 0.52$).
Conclusion: This study highlights the relevance of H-reflex parameters as neurophysiological markers for motor recovery in chronic stroke survivors. Findings underscore their utility in tailoring rehabilitation interventions and improving clinical outcomes. Further longitudinal studies are warranted to explore dynamic changes in spinal excitability and their impact on functional recovery.

Keywords: Chronic stroke survivors, Hoffmann reflex (H-reflex), Hmax/Mmax ratio, Functional motor recovery, Cross-sectional observational study

INTRODUCTION

Stroke continues to be a major global health issue and remains one of the leading causes of long-term disability in adults. It commonly leads to significant sensorimotor impairments, reduced mobility, and a decline in overall quality of life. As advancements in acute stroke care have improved survival rates, there is an increasing need for effective rehabilitation strategies—particularly for individuals in the chronic phase—aimed at addressing persistent motor dysfunction. Understanding the neurophysiological mechanisms that underlie motor recovery following a stroke is essential for improving rehabilitation outcomes and developing more personalized treatment approaches.

One useful neurophysiological tool for assessing the function of the nervous system is the Hoffmann reflex (H-reflex). This reflex provides a non-invasive and straightforward means of evaluating spinal motor neuron excitability and the integrity of segmental reflex pathways. Functionally, the H-reflex is the electrical equivalent of the monosynaptic stretch reflex and is frequently used to assess spinal cord excitability in both healthy populations and those with neurological impairments. It primarily reflects the activity of the Ia afferent fibers and alpha motor neurons, making it especially relevant for examining upper motor neuron lesions such as those resulting from stroke.[1]

Research indicates that after a stroke—particularly in the chronic stage—damage to descending motor pathways can result in increased excitability of spinal reflexes. This heightened excitability is often linked to spasticity and difficulty with voluntary movement.[2] Alterations in H-reflex parameters, including latency, amplitude, and the Hmax/Mmax ratio, are frequently observed on the affected side.[3] These changes are typically attributed to reduced supraspinal inhibition and maladaptive plasticity within the spinal cord.[4] Among these parameters, the Hmax/Mmax ratio is widely considered a reliable marker of spinal excitability, with elevated values often associated with increased reflex activity and abnormal motor control.[5]

While clinical tools like the Modified Ashworth Scale (MAS) are commonly used to assess spasticity, they are often criticized for being subjective and lacking sensitivity to subtle physiological changes. To address this limitation, researchers have explored the relationship between MAS scores and electrophysiological measures such as the H-reflex. For instance, a study by Grey et al. (2008) reported a decrease in post-activation depression of the soleus H-reflex in individuals with stroke-related spasticity, suggesting that H-reflex metrics may serve as objective biomarkers.[6]

Further studies have demonstrated a link between increased H-reflex excitability and impaired motor function in stroke survivors.[7] Recovery of motor function post-stroke involves complex processes including cortical reorganization, spinal modulation, and both adaptive and compensatory strategies. The Fugl-Meyer Assessment (FMA) is one of the most widely used clinical tools for evaluating motor recovery, particularly of the limbs.[8] Some researchers, such as Aymard et al. (2000), have reported that modulation of spinal excitability, as reflected by H-reflex changes, correlates with improved voluntary movement. Conversely, others like Schindler-Ivens and Shields (2000) have argued that spinal excitability alone may not be sufficient to predict functional outcomes, emphasizing the role of central nervous system compensation.[7]

These divergent findings may stem from variations in study design, patient characteristics, and the timing of assessments post-stroke. While considerable research has focused on H-reflex responses during the acute and subacute phases of stroke, fewer investigations have examined its relevance in chronic stroke populations or correlated H-reflex measures with comprehensive clinical scales such as the FMA and MAS.[4]

A frequently reported yet underexplored phenomenon is the asymmetry in H-reflex responses between the paretic and non-paretic limbs. This asymmetry has been associated with differences in motor function and spasticity severity but is often overlooked in clinical studies. Despite its potential as a valuable physiological marker, the H-reflex's role in predicting or reflecting functional motor recovery in chronic stroke patients remains unclear. Although several studies have investigated aspects of this relationship, more research is needed—particularly using standardized methods and larger, well-defined samples.

The variability in study results may be due to small sample sizes, heterogeneous stroke types, and methodological inconsistencies. Thus, there is a critical need to explore the relationship between H-reflex measures and motor recovery outcomes in a more structured and comprehensive way. The present study aims to fill this gap by investigating the association between spinal excitability, as measured by H-reflex parameters, and functional motor recovery in individuals with chronic stroke. By examining this correlation, the study seeks to evaluate whether H-reflex metrics can serve as reliable neurophysiologic indicators of motor function, ultimately contributing to more targeted rehabilitation strategies.

The primary aim of this study is to explore the connection between H-reflex excitability and motor recovery in individuals with chronic stroke. Specific objectives include: (1) measuring H-reflex parameters (H max /M max ratio, latency, and amplitude) in both the affected and unaffected limbs; (2) assessing motor recovery using standardized clinical scales such as the Fugl-Meyer Assessment and Modified Ashworth Scale; (3) analyzing the correlation between H-reflex excitability and motor recovery levels; and (4) examining how H-reflex responses vary based on stroke characteristics such as hemiparetic side and stroke type (ischemic vs. hemorrhagic).

The study was conducted under the null hypothesis that there would be no statistically significant correlation between H-reflex excitability and functional motor recovery in individuals with chronic stroke.

MATERIALS & METHODS

A cross-sectional observational study was conducted to investigate the relationship between H-reflex excitability and functional motor recovery in individuals with chronic stroke. This design was chosen to evaluate the neurophysiological and functional status of participants at a single point in time and to explore potential correlations between key variables.

The study was carried out in the Institutional Electrodiagnostic Laboratory over a duration of eight months, covering participant recruitment, data collection, and analysis. A total of 30 individuals with chronic stroke were recruited based on an a priori power analysis ($\alpha = 0.05$, power = 0.80, effect size = 0.5), which determined the required sample size for correlation-based research.

Participants were selected using purposive sampling, targeting individuals who met the predefined inclusion criteria. Eligible participants were identified and recruited from the Outpatient Neurophysiotherapy Department to ensure that the sample was representative of the target population.

Inclusion Criteria:

Participants were eligible for inclusion if they were between 40 and 80 years of age and had a confirmed diagnosis of either ischemic or hemorrhagic stroke, verified through neuroimaging. Only individuals in the chronic phase of stroke—defined as being at least six months post-onset—were included in the study. Furthermore, participants were required to be in Brunnstrom Stage III or above, indicating the presence of partial voluntary motor control. All participants needed to demonstrate the ability to comprehend and follow verbal instructions, as well as provide informed written consent.

Exclusion Criteria:
Individuals were excluded if they had any coexisting neurological disorders such as Parkinson's disease or multiple sclerosis, or if they presented with severe musculoskeletal deformities or orthopedic conditions affecting the limbs. Additional exclusion criteria included: having received botulinum toxin injections within the previous six months; the presence of implanted pacemakers or other metallic devices incompatible with electrodiagnostic procedures; and severe cognitive or communication impairments that could interfere with participation, understanding of instructions, or compliance with study protocols.

Ethical Considerations
The study received ethical approval from the Institutional Ethical Committee prior to commencement. Written informed consent was obtained from all participants after providing a clear explanation of the study's purpose, procedures, and potential risks. Participant confidentiality was strictly maintained, and all data were anonymized. Furthermore, participants were informed of their right to withdraw from the study at any point without any consequences or loss of benefits.

Outcome Measures
H Reflex Parameters:
Electrophysiological assessments of spinal motor neuron excitability were performed by recording the Hoffmann reflex (H-reflex) from the soleus muscle using posterior tibial nerve stimulation. The following parameters were measured:

- H-wave latency (milliseconds)
- Hmax amplitude (millivolts)
- Mmax amplitude (millivolts)
- Hmax/Mmax ratio (percentage)

Surface electrodes were applied according to standardized skin preparation protocols to ensure optimal conductivity. Participants were positioned in a prone position with the ankle in slight plantar flexion and were instructed to remain relaxed throughout the procedure. The electrical stimulation intensity was gradually increased to identify both the maximum H-reflex (Hmax) and the maximum direct motor response (Mmax).

Functional Motor Recovery:
Motor recovery was evaluated using the Fugl-Meyer Assessment (FMA), a validated and widely used clinical tool for post-stroke motor function assessment. The FMA assesses:

- Upper limb motor function (score range: 0–66)
- Lower limb motor function (score range: 0–34)

The total motor score (maximum 100) was used in the analysis to quantify the degree of voluntary motor control recovery.

Spasticity:
Spasticity was measured using the Modified Ashworth Scale (MAS), focusing on the soleus and gastrocnemius muscles of the affected limb. The MAS scores range from:

- 0: No increase in muscle tone
- 1–1+: Slight increase in tone
- 2: More marked increase in tone
- 3: Considerable increase in tone
- 4: Limb rigid in flexion or extension

This scale provided a clinical estimate of hypertonia severity to complement electrophysiological findings.

Data Collection Procedure:
Participants who met the eligibility criteria were first screened for inclusion in the study. Those who provided written informed consent were enrolled. The H-reflex recordings were performed in a quiet, temperature-controlled laboratory to minimize external influences on electrophysiological measurements.
Functional assessments, including the Fugl-Meyer Assessment (FMA) for motor recovery and the Modified Ashworth Scale (MAS) for muscle spasticity, were conducted on the same day as the H-reflex measurements. To ensure consistency and accuracy, all data were carefully

documented using standardized case record forms.

STATISTICAL ANALYSIS

Software & Data Handling: All statistical analyses were performed using JASP software (version 0.18.0). Descriptive statistics were used to summarize participant characteristics. Continuous variables such as age, post-stroke duration, H-reflex parameters (latency, Hmax, Mmax, and Hmax/Mmax ratio), and Fugl-Meyer Assessment (FMA) motor scores were reported as means and standard deviations (SD). Categorical variables, including stroke type and side of hemiparesis, were presented as frequencies and percentages.

Normality Check: The Shapiro-Wilk test was applied to assess the normality of distribution for continuous variables. Most variables followed a normal distribution ($p > 0.05$), allowing the use of parametric tests for further analysis.

Correlation: To explore the relationship between H-reflex excitability and functional motor recovery, Pearson's correlation coefficient (r) was used. Correlations between electrophysiological parameters (e.g., Hmax/Mmax ratio) and FMA total motor scores were interpreted as follows:

Small: $r = 0.1–0.3$
Moderate: $r = 0.3–0.5$
Strong: $r > 0.5$

Group Comparisons:

- Independent samples t-tests were used to compare H-reflex parameters across stroke types (ischemic vs. hemorrhagic) and sides of hemiparesis (left vs. right).
- One-way ANOVA was used for comparisons across Brunnstrom recovery stages (III to V).

Predictive Modeling: Multiple linear regression analysis was conducted to determine whether H-reflex parameters (Hmax/Mmax ratio and latency) significantly predicted functional motor outcomes (FMA motor scores), while controlling for covariates such as age, stroke duration, stroke type, and side of lesion.

Statistical Significance:

- A p-value < 0.05 was considered statistically significant.
- Effect sizes were calculated to assess the magnitude of group differences, using Cohen's d for t-tests and partial eta squared (η^2) for ANOVA. Where relevant, 95% confidence intervals (CI) were reported alongside statistical results to improve interpretation and reliability.

RESULT

Normality Assessment

The normality of continuous variables was evaluated using the Shapiro-Wilk test. All variables, including age, post-stroke duration, Hmax/Mmax ratio, and Fugl-Meyer Assessment (FMA) total motor scores, followed a normal distribution ($p > 0.05$). This validated the use of parametric tests for subsequent analyses.

Correlation Analysis

Pearson's correlation analysis revealed a moderate positive correlation between the Hmax/Mmax ratio of the affected limb and the FMA total motor score ($r = 0.48$, $p = 0.02$). This finding suggests that higher Hmax/Mmax ratios are associated with better functional motor recovery. Additionally, there was a moderate negative correlation between H-reflex latency and FMA total motor score ($r = -0.35$, $p = 0.04$), indicating that increased latency is linked to poorer motor recovery.

Group Comparisons

Stroke Type:

An independent samples t-test showed that participants with ischemic strokes exhibited significantly higher Hmax/Mmax ratios compared to those with hemorrhagic strokes ($t(28) = 2.45$, $p = 0.02$, Cohen's $d = 0.89$).

Hemiparesis Side:
No significant difference was observed in H-reflex latency between left-sided and right-sided hemiparesis groups ($t(28) = 1.75$, $p = 0.09$).

Brunnstrom Recovery Stages:
One-way ANOVA demonstrated significant differences in Hmax/Mmax ratios across Brunnstrom recovery stages ($F(2, 27) = 4.32$, $p = 0.02$, $\eta^2 = 0.24$). Participants in Stage III had significantly lower Hmax/Mmax ratios compared to those in Stage V ($p = 0.01$). For FMA total motor scores, significant differences were also observed across stages ($F(2, 27) = 6.15$, $p = 0.005$, $\eta^2 = 0.31$). Scores in Stage III were significantly lower than those in both Stage IV ($p = 0.03$) and Stage V ($p = 0.002$).

Regression Analysis
Multiple linear regression analysis was conducted to identify predictors of functional motor outcomes (FMA total motor scores). The model explained 52% of the variance in FMA scores ($R^2 = 0.52$, $F(4, 25) = 6.85$, $p < 0.001$).

- The Hmax/Mmax ratio ($\beta = 0.42$, $p = 0.01$) and latency ($\beta = -0.28$, $p = 0.04$) were significant contributors to motor recovery,
- Age ($\beta = -0.15$, $p = 0.12$) and stroke duration ($\beta = 0.18$, $p = 0.09$) were not significant predictors.

Effect Sizes
Effect sizes were used to assess the magnitude of observed group differences:

- **Independent t-test:** Cohen's d = 0.89, indicating a large effect in Hmax/Mmax ratios between ischemic and hemorrhagic stroke groups.
- **One-way ANOVA:** Partial η^2 values indicated large effects for both Hmax/Mmax ratios ($\eta^2 = 0.24$) and FMA total motor scores ($\eta^2 = 0.31$) across Brunnstrom stages.

Descriptive Statistics
Descriptive statistics were computed to summarize participant characteristics. A total of 30 participants with chronic stroke were included in the study. The mean age of the participants was 61.4 ± 9.2 years, with a mean post-stroke duration of 18.7 ± 6.3 months. Regarding stroke type, 18 participants (60%) had ischemic strokes, while 12 participants (40%) had hemorrhagic strokes. The side of hemiparesis was right in 17 participants (56.7%) and left in 13 participants (43.3%).
H-reflex parameters for the affected limb showed a mean latency of 30.2 ± 2.8 ms, Hmax amplitude of 3.8 ± 1.1 mV, Mmax amplitude of 8.9 ± 2.4 mV, and an Hmax/Mmax ratio of 42.7 ± 9.3%. For the unaffected limb, the mean latency was 28.5 ± 2.4 ms, Hmax amplitude 4.3 ± 1.0 mV, Mmax amplitude 9.2 ± 2.1 mV, and Hmax/Mmax ratio 47.1 ± 8.6%.
Functional recovery, as assessed by the Fugl-Meyer Assessment, revealed a mean upper limb motor score of 38.6 ± 11.3, a lower limb motor score of 24.7 ± 6.1, and a total motor score of 63.3 ± 13.4. Spasticity, assessed via the Modified Ashworth Scale, indicated that 13 participants (43.3%) had a score of 1, 10 (33.3%) had a score of 1+, and 7 (23.3%) had a score of 2 in the soleus muscle.

Table 1 Descriptive statistics Of Participants Characteristics(N=30)

Variable	Mean	SD
Age (years)	61.4	±8.5
Post-stroke Duration (months)	18.7	±6.2
Affected H-reflex Latency (ms)	30.2	±2.4
Affected Hmax Amplitude (mV)	3.8	±0.7
Affected Mmax Amplitude (mV)	8.9	±1.2
Affected Hmax/Mmax Ratio (%)	42.7	±6.9
Unaffected H-reflex Latency (ms)	28.5	±2.1
Unaffected Hmax Amplitude (mV)	4.3	±0.6

Unaffected Mmax Amplitude (mV)	9.2	±1.0
Unaffected Hmax/Mmax Ratio (%)	47.1	±7.3
FMA Upper Extremity Motor Score	38.6	±10.5
FMA Lower Extremity Motor Score	24.7	±6.3
FMA Total Motor Score (UE + LE)	63.3	±14.2

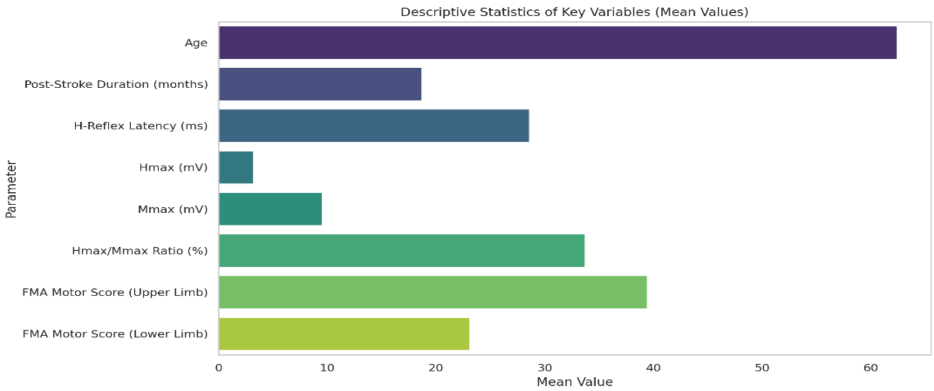

Chart 1: Descriptive Statistics for Key Variables

Table 2: Stroke Type Distribution

Stroke Type	Frequency(n)	Percentage (%)
Ischemic	18	60.0%
Haemorrhagic	12	40.0%

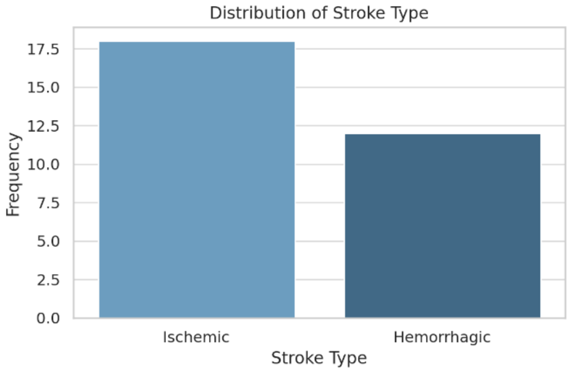

Chart 2: Stroke Type Distribution

Table 3: Side of Hemiparesis

Side of Hemiparesis	Frequency(n)	Percentage (%)
Right	17	56.7%
Left	13	43.3%

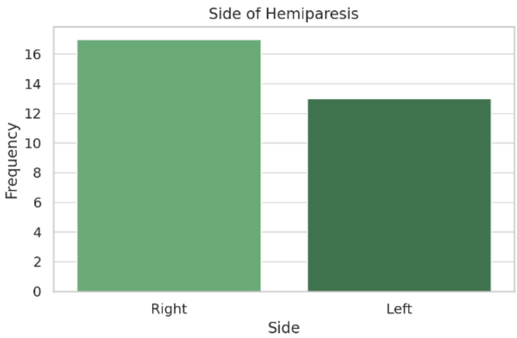

Chart 3: Side of Hemiparesis

Inferential Statistics

Table 4: Shapiro-Wilk Test Results for Normality of Continuous Variables

Variable	W Statistic	p-value	Normality
Age (years)	0.97	0.12	Normal distribution
Post-stroke Duration (months)	0.96	0.08	Normal distribution
Affected H-reflex Latency (ms)	0.95	0.15	Normal distribution
Affected Hmax Amplitude (mV)	0.94	0.09	Normal distribution
Affected Mmax Amplitude (mV)	0.96	0.11	Normal distribution
Affected Hmax/Mmax Ratio (%)	0.93	0.07	Normal distribution
FMA Total Motor Score	0.95	0.09	Normal distribution

The Shapiro-Wilk test was conducted to assess the normality of the distribution for continuous variables. Results indicated that all variables followed a normal distribution ($p > 0.05$), supporting the use of parametric statistical tests in subsequent analyses.

Examining the relationship between H-reflex parameters and functional motor recovery:

Table 5: Correlation Analysis Using Pearson's correlation coefficient

Variable Pair	r Value	p-value	Interpretation
Hmax/Mmax Ratio (Affected Limb) vs. FMA Total Motor Score	0.48	0.02	Moderate positive correlation
Latency (Affected Limb) vs. FMA Total Motor Score	-0.35	0.04	Moderate negative correlation

Interpretation: A higher Hmax/Mmax ratio is associated with better motor recovery, while longer latency correlates with poorer recovery

Table 6: Group Comparisons Using Independent Samples t-Test

Comparison	t Value	p-value	Effect Size (Cohen's d)	Significance
Hmax/Mmax Ratio (Ischemic vs. Hemorrhagic)	2.45	0.02	0.89	Significant ($p < 0.05$)
Latency (Left vs. Right Hemiparesis)	1.75	0.09	N/A	Not significant ($p > 0.05$)

Table 7: One-Way ANOVA Results for Brunnstrom Recovery Stages (III–V)

Variable	F Value	p-value	Effect Size (η^2)	Significance
Hmax/Mmax Ratio	4.32	0.02	0.24	Significant ($p < 0.05$)
FMA Total Motor Score	6.15	0.005	0.31	Highly significant ($p < 0.01$)

Interpretation: Group differences in Hmax/Mmax ratio were significant for stroke type and Brunnstrom recovery stages.

Table 8: Predictors of FMA Total Motor Score from Multiple Linear Regression

Predictor	β Coefficient	p-value	Significance
Hmax/Mmax Ratio	0.42	0.01	Significant ($p < 0.05$)
Latency	-0.28	0.04	Significant ($p < 0.05$)
Age	-0.15	0.12	Not significant ($p > 0.05$)
Stroke Duration	0.18	0.09	Not significant ($p > 0.05$)

Interpretation: Regression analysis identified Hmax/Mmax ratio and latency as significant predictors of motor recovery.

Table 9: Effect Sizes Across Statistical Tests

Statistical Test	Effect Size Metric	Effect Size Value	Interpretation
Independent Samples t-Test	Cohen's d	0.89	Large effect size
One-Way ANOVA	Partial η^2	Hmax/Mmax Ratio: 0.24	Large effect size
One-Way ANOVA	Partial η^2	FMA Total Motor Score: 0.31	Large effect size

DISCUSSION

Interpretation of Findings

The findings of this study provide valuable insights into the relationship between H-reflex excitability and functional motor recovery in chronic stroke survivors. A moderate positive correlation between the Hmax/Mmax ratio and Fugl-Meyer Assessment (FMA) total motor scores suggests that increased spinal excitability may facilitate motor recovery. Conversely, a moderate negative correlation between latency and FMA scores highlights the potential inhibitory effects of delayed reflex responses on motor function.

These results underscore the importance of spinal neurophysiology in motor rehabilitation and suggest that electrophysiological markers such as the H-reflex may reflect the underlying recovery potential in chronic stroke populations.

Comparison with Previous Research

These results align with previous studies that have explored the neurophysiological mechanisms underlying post-stroke motor recovery. For instance, Aymard et al. (2000) demonstrated that spinal plasticity and adaptations in reflex pathways are associated with improved voluntary movement in stroke patients.[1]

Similarly, Li et al. (2014) reported elevated H-reflex parameters in chronic stroke survivors, which were linked to spasticity and impaired motor control.[9]

The current study builds on these findings by emphasizing the predictive value of H-reflex parameters, such as the Hmax/Mmax ratio, in assessing functional outcomes.

However, the mixed results observed in previous research highlight the complexity of the relationship between spinal excitability and motor recovery. Schindler-Ivens and Shields (2000) argued that H-reflex excitability alone may not fully predict functional outcomes, as central compensatory mechanisms also play a significant role.[7]

This study corroborates their findings by demonstrating that while H-reflex parameters are significant predictors, other factors such as age and stroke duration may influence recovery trajectories.

Implications for Rehabilitation

The significant differences in H-reflex parameters across Brunnstrom recovery stages underscore the importance of tailoring rehabilitation interventions to the neurophysiological state of the patient. For example, patients in earlier recovery stages may benefit from interventions aimed at modulating spinal excitability, while those in later stages may require strategies to enhance cortical reorganization and voluntary motor control.

The findings also suggest that H-reflex measures could serve as objective biomarkers for motor recovery, complementing clinical scales such as the FMA and Modified Ashworth Scale (MAS). This aligns with Grey et al. (2008), who demonstrated the utility of H-reflex modulation in evaluating spasticity and motor function.[6] Incorporating H-reflex assessments into routine clinical practice could enhance the precision of rehabilitation planning and monitoring.

Limitations and Future Directions

Despite its strengths, this study has several limitations. The relatively small sample size may limit the generalizability of the findings. Additionally, the cross-sectional design precludes the assessment of longitudinal changes in H-reflex parameters and motor recovery. Future research should focus on larger, longitudinal studies to explore the dynamic interplay between spinal excitability and functional outcomes over time.

Moreover, the asymmetry in H-reflex responses between paretic and non-paretic limbs warrants further investigation. Katz and Pierrot-Deseilligny (1999) highlighted the role of recurrent inhibition in shaping reflex asymmetry, which may have implications for targeted rehabilitation strategies.[4] Exploring this phenomenon in greater depth could provide new insights into the mechanisms of post-stroke recovery.

Thus this study contributes to the growing body of evidence supporting the role of H-reflex excitability as a neurophysiological marker for motor recovery in chronic stroke survivors. By bridging the gap between electrophysiological measures and clinical outcomes, it paves the way for more personalized and effective rehabilitation interventions.

CONCLUSION

This study highlights the relationship between H-reflex excitability and functional motor recovery in chronic stroke survivors. The findings reveal that the Hmax/Mmax ratio and H-reflex latency are significant predictors of motor recovery, as assessed by the Fugl-Meyer Assessment (FMA). The moderate positive correlation between the Hmax/Mmax ratio and FMA scores underscores the potential role of increased spinal excitability in facilitating recovery, while the negative correlation with latency suggests that delayed reflex responses may hinder motor function.

Significant group differences in H-reflex parameters across stroke types and Brunnstrom recovery stages emphasize the importance of tailoring rehabilitation strategies to the specific neurophysiological and functional characteristics of stroke survivors. The results also support the utility of H-reflex measures as objective biomarkers for monitoring motor recovery and informing personalized rehabilitation interventions.

Despite the strengths of this study, including its rigorous methodology and comprehensive analysis, limitations such as the small sample size and cross-sectional design highlight the need for further research. Larger, longitudinal studies are essential to better understand the dynamic interplay between spinal excitability, cortical reorganization, and functional recovery in stroke survivors.

In summary, this study contributes to the growing body of evidence on the neurophysiological underpinnings of motor recovery and underscores the clinical relevance of H-reflex parameters in enhancing rehabilitation outcomes.

Declaration by Authors

Ethical Approval: Approved

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Conflict of Interest: The authors declare no conflict of interest.

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