Effect of Focal Muscle Vibration with taping on wrist spasticity and upper-extremity function in patient with stroke: A Randomized Controlled Trial

by

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MASTER OF PHYSIOTHERAPY

in

NEUROLOGY

Under the guidance of

DR. ASMA PARVEEN, SENIOR ASSISTANT PROFESSOR

DEPARTMENT OF NEUROLOGY

ABHINAV BINDRA SPORTS MEDICINE AND RESEARCH INSTITUTE

UTKAL SIGNATURE, PAHALA, BHUBANESWAR

2023-2025

Odisha University of Health Sciences

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Thank you.

Date: **Signature:**

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ABBREVIATIONS

ADL	Activity of daily living
ABSMARI	Abinav Bindra sport Medicine And Research Institute
FMA-UE	Fugl Meyer Assessment Upper Extremity
KT	Kinesio taping
FMV	Focal Muscle Vibration
MAS	Modified Ashworth Scale
MMSE	Minimental state examination
SPSS	Statistical Package for Social Sciences
SD	Standard Deviation

LIST OF TABLES

LIST OF GRAPHS

ABSTRACT

Background: Post-stroke spasticity of the upper limb often leads to functional limitations, restricting independence in daily activities. Innovative interventions such as focal muscle vibration (FMV) combined with therapeutic taping have recently gained attention for their potential to modulate muscle tone and enhance motor recovery.

Objective: This randomized controlled trial aimed to evaluate the combined effect of FMV and taping on wrist spasticity and upper extremity function in individuals with stroke.

Methods: Thirty participants fulfilling the inclusion criteria were randomly allocated into two groups: an experimental group(n=15) receiving FMV with taping in addition to conventional therapy, and a control group(n=15) receiving conventional therapy alone. Spasticity was assessed using the Modified Ashworth Scale (MAS), while functional recovery was measured through the Fugl-Meyer Assessment for Upper Extremity (FMA-UE). Pre- and post-intervention assessments were conducted over a treatment period of three weeks.

Results: Within-group analysis demonstrated significnt reduction in wrist flexor spasticity and improvement in upper limb motor function in both groups, with greater gains observed in the experimental group. Between-group comparison revealed statistically significant ($p < 0.05$) differences favoring the FMV with taping group for both MAS and FMA-UE scores. No adverse events or participant dropouts were reported.

Conclusion: The integration of FMV and taping appears to be a safe and effective adjunct to conventional physiotherapy, yielding superior outcomes in reducing spasticity and improving upper extremity function post-stroke. This approach may be considered a promising therapeutic option for enhancing neurorehabilitation outcomes.

Keywords:, focal muscle vibration, Stroke rehabilitation spasticity, taping, upper extremity function

CHAPTER 1
INTRODUCTION

INTRODUCTION

Stroke and Its Global Burden

Stroke is one of the leading causes of adult disability worldwide and is a major contributor to morbidity, mortality, and reduced quality of life [1]. It is estimated that approximately 15 million people suffer a stroke each year globally, of which around 5 million are left permanently disabled [2]. Stroke occurs due to either an interruption of blood supply to the brain (ischemic stroke) or rupture of a blood vessel (hemorrhagic stroke), both of which result in cell death and neurological deficits [3]. Advances in acute management have increased survival rates, but long-term disability remains a major challenge for rehabilitation professionals.

The impact of stroke extends beyond immediate neurological impairment. It places a substantial socioeconomic burden on patients, families, and healthcare systems. Survivors often face long-term dependence, reduced participation in social activities, and increased risk of depression and secondary health complications [4]. Rehabilitation is therefore central to improving recovery and functional independence.

Spasticity in Post-Stroke Patients

Among the complications following stroke, spasticity is one of the most prevalent and disabling. Spasticity has been defined by Lance as a “motor disorder characterized by a velocity-dependent increase in tonic stretch reflexes with exaggerated tendon jerks, resulting from hyperexcitability of the stretch reflex” [5]. It arises from damage to the upper motor neurons, leading to imbalance between excitatory and inhibitory inputs in the spinal cord [6].Spasticity can develop in up to 30–40% of stroke survivors within the first year, with the upper extremity more frequently affected than the lower limb [7]. The wrist and hand are particularly vulnerable because of their complex neuromuscular control and role in fine motor activity [8]. Excessive tone at the wrist flexors

commonly results in clenched fist postures, restricted voluntary movement, and difficulty performing functional tasks [9].

If unmanaged, spasticity can lead to secondary complications such as contractures, joint stiffness, pain, reduced hygiene, and skin breakdown [10]. Functionally, it severely limits the ability of patients to carry out activities of daily living (ADLs) such as feeding, grooming, and dressing. The psychological impact is also significant, as patients may feel frustrated and dependent [11]. Thus, targeting spasticity reduction is a priority in rehabilitation programs.

Upper Extremity Dysfunction Post-Stroke

The upper extremity plays a crucial role in personal care, work, and social interaction. Stroke survivors often experience a combination of weakness, spasticity, sensory loss, and poor coordination that hinder arm and hand use [12]. Recovery of upper extremity function is often slower and less complete compared to the lower extremity, due to the greater complexity of motor control and higher cortical involvement [13].

Functional impairments in the wrist and hand often persist even when patients regain ambulatory independence. This creates a unique challenge for rehabilitation, as upper limb recovery is a key determinant of overall quality of life and independence [14]. Studies have shown that patients with greater upper extremity function after stroke report higher satisfaction and improved reintegration into the community [15].

Conventional Rehabilitation Approaches

Conventional physiotherapy approaches for managing post-stroke spasticity and motor dysfunction include stretching, strengthening, task-specific training, positioning, and splinting

[16]. While these methods remain the foundation of care, their effects on spasticity are often temporary and may require frequent repetition [17].

Pharmacological interventions such as oral antispastic medications (e.g., baclofen, tizanidine) and botulinum toxin injections are also used. However, these approaches have limitations including systemic side effects, high cost, and variable efficacy [18]. Surgical options such as tendon release or intrathecal baclofen pumps are reserved for severe cases but are invasive and not widely accessible [19].

Given these limitations, there has been increasing interest in non-invasive adjunctive techniques that can complement conventional therapy to produce greater and more sustained improvements. Two such methods are focal muscle vibration (FMV) and therapeutic taping.

Focal Muscle Vibration (FMV)

FMV involves the application of localized, high-frequency, low-amplitude mechanical oscillations to targeted muscles or tendons [20]. It is thought to act primarily on Ia afferent fibers, modulating spinal excitability and influencing both reflex activity and cortical reorganization [21].

Research has demonstrated that FMV can reduce muscle hypertonia, improve voluntary muscle activation, and facilitate neuroplasticity [22]. For instance, Marconi et al. (2011) reported that repeated vibration of spastic muscles in chronic stroke patients led to long-term improvements in cortical excitability and motor function [23]. Similarly, Noma et al. (2012) showed that direct vibratory stimulation reduced spasticity and improved movement patterns [24].

The benefits of FMV may extend beyond immediate effects, as repeated sessions can reinforce sensory-motor integration, thereby supporting sustained recovery [25]. FMV is also non-invasive, cost-effective, and easy to administer, making it feasible for clinical practice.

Taping in Neurorehabilitation

Therapeutic taping, including kinesio taping and rigid taping methods, has gained popularity as an adjunctive intervention for neurological and musculoskeletal conditions [26]. The elastic properties of kinesio tape allow it to provide support while still permitting movement. The application of tape on the skin is believed to stimulate cutaneous mechanoreceptors, improve proprioception, enhance circulation, and influence muscle activation patterns [27].

In stroke rehabilitation, taping has been used to reduce spasticity, support weak muscles, and facilitate proper joint alignment. For example, Kalron and Bar-Sela (2013) reported that taping improved proprioceptive feedback and reduced abnormal tone [28]. Yasukawa et al. (2006) observed functional improvements in pediatric rehabilitation settings with kinesio taping [29].

Taping has the additional advantage of being inexpensive, non-invasive, and capable of providing continuous sensory input even outside therapy sessions. This prolonged stimulation may help reinforce the effects of active rehabilitation [30].

Rationale for Combining FMV and Taping While both FMV and taping have individually shown promise, research on their combined use is limited. The rationale for combining them is based on their complementary mechanisms:

FMV provides immediate modulation of reflex excitability and cortical activation [31].

Taping offers prolonged sensory stimulation and mechanical support that may extend the therapeutic window [32].

Together, they may have a synergistic effect, enhancing both spasticity reduction and motor recovery. By targeting both neural and biomechanical components of spasticity, this combined approach has the potential to optimize outcomes in stroke rehabilitation.

Outcome Measures

Two standardized measures were used in this study to evaluate outcomes:

Modified Ashworth Scale (MAS): Widely used to assess muscle spasticity, MAS is a clinical tool that grades resistance during passive movement [33]. Despite some limitations, it remains the most commonly applied measure of spasticity in clinical and research settings.

Fugl-Meyer Assessment for Upper Extremity (FMA-UE): A reliable and validated measure of upper extremity motor function in post-stroke patients, assessing movement, coordination, and reflex activity [34]. It provides comprehensive insight into functional recovery of the upper limb.

Using these tools allows objective evaluation of both spasticity reduction and motor improvement following the intervention.

Need for the Present Study

Despite promising results from earlier studies, there is limited evidence on the combined application of FMV and taping in post-stroke rehabilitation. Most existing research has focused on either vibration or taping alone, with few trials examining their synergistic effects on wrist spasticity and upper extremity function [35].

Given the burden of upper limb dysfunction after stroke and the limitations of conventional management, investigating novel, accessible, and non-invasive adjuncts is clinically relevant. This study seeks to address this gap by evaluating the effect of FMV with taping compared to conventional therapy alone in stroke survivors.

CHAPTER 2
AIMS AND OBJECTIVES

AIM AND OBJECTIVES

AIM:

The Aim of this study was to assess the combined effect of Focal Muscle Vibration and Taping in reduction of spasticity and improvement in upper extremity function in patients with stroke.

OBJECTIVES:

Primary Objectives

- To determine the effect of focal muscle vibration with taping on wrist spasticity in post-stroke patients using the Modified Ashworth Scale (MAS).
- To evaluate the effect of focal muscle vibration with taping on upper extremity motor function using the Fugl-Meyer Assessment for Upper Extremity (FMA-UE).

Secondary Objectives

- To compare the outcomes of the experimental group (focal muscle vibration + taping) with the control group (conventional physiotherapy) after 3 weeks of intervention.
- To analyse the short-term impact of the intervention on functional independence in daily activities.
- To explore the clinical applicability of focal muscle vibration combined with taping as an adjunct in neurorehabilitation practice.

CHAPTER 3
HYPOTHESES

HYPOTHESES

NULL HYPOTHESIS:

There will be no significant effect on spasticity (MAS Score) and improvement of motor performance (FMA-UE SCORE) after the combined therapy of Focal Muscle Vibration and Taping along with conventional therapy.

ALTERNATE HYPOTHESIS:

There will be significant difference in reduction of spasticity (MAS SCORE) and improvement of motor performance (FMA-UE Score) after the combined therapy of Focal Muscle Vibration and Taping with conventional therapy.

CHAPTER 4
REVIEW OF LITERATURE

REVIEW OF LITERATURE

1. Chen Y.L. et al. (2022) conducted a study on where they gave 15 daily sessions of 30 min each to Control group: Bobath-therapy and motor relearning. FV_GM and FV_TA groups: Focal vibration at 3 mm amplitude and 40 Hz frequency added to conventional protocol (30 min therapy +20 min vibration) to First ischemic or hemorrhagic stroke diagnosis—Age 25–80 years—Stroke onset between 1 month and 2 years prior—MAS score between 1+ and 3—Able to follow verbal commands and sign and found out Significant difference found in remission rates for MAS and Clonus Test scores in the vibration groups compared to the control group. The control group showed better improvement in walking capacity, while the FV_GM group demonstrated reduced gastrocnemius rigidity, spasticity, and ankle clonus**.[35]**

2. A study conducted by Celletti C. et al. (2017**)** by giving Two weekly sessions of one hour over 6 weeks. FMV + RMP group: Focal vibration at 0.2–0.5 mm amplitude, 100 Hz frequency, for three sets of 10 min each, with 1 min rest intervals + progressive modular rebalancing exercises focusing on upper limb kinetic chains. RMP + CP group: RMP exercises + traditional physiotherapy. CP group: Traditional physiotherapy and got Upper limb functionality improved most in the FMV + RMP and FMV + CP groups. Spasticity reduction observed in all groups with varying degrees of success. Pain decreased and muscle strength increased in the FMV groups as result.[36]

3. M. et al. (2019) did a study has given Three sets of 10 min each, with 1 min rest intervals, for 3 consecutive days. Study group: Focal vibration at 0.2–0.5 mm amplitude, 100 Hz frequency, applied to the belly of the affected muscle in supine position, with isometric contraction. Control group: Sham treatment and got Patients treated with r MV showed significant clinical improvement compared to the control group as result.[37]

4. Christian AVVANTAGGIATO et al. (2020) study involved 425 stroke patients. Most studies included chronic stroke patients (ten) and treated only the upper limb (eleven).

   There is evidence that LMV therapy is effective in reducing spasticity and improving motor recovery, especially when associated with conventional physical therapy.[38]

5. Hussain et.al (2022) conducted a study Aim was to find the impact of KT on managing spasticity of upper extremity and improvement of motor performance. In this study they have randomly taken 30 patients with stroke within 6 months and randomly enrolled then into Kinesio-taping and traditional organization. The tape was applied for 2- 3days (48-72 hrs)/weeks for 4 weeks. MAS was used to assess spasticity once before intervention and another one after intervention at 4 weeks. result found significant changes in spasticity score after applying KT.[39]

6. Jonathan et.al (2018) published a study **,** Aim was to find the effect of KT on hand function of hemiparetic patients. It was a randomised clinical trial where they gave KT to one group and another one was control group. There was significant improvement in MAS scale but no improvement in BBT. They concluded that KT has a significant improvement on spasticity.[40]

7. Jonathan et al (2018) given An evaluator-blinded, randomized clinical trial involving stroke victims was carried out in a physical therapy outpatient clinic. One group underwent KT intervention and the other was a control group. The Modified Ashworth Scale (MAS) and the Box and Block Test (BBT) were used as assessment tools. A data entry form was used in the Epi-info 7 software and descriptive statistics was thus calculated. The software Bio Stat 5.0 was employed when doing statistical tests. Associations were regarded as statistically

significant when $p < 0.05$, got result as all those who had received treatment with KT had spasticity improved by one point.[41]

8. Agnes Roby Bramy (2021**),** scoping review based on clinical studies, and discussed in relation to more general findings about hand and upper limb function (manipulation of objects, tool use in daily life activity) and also compensatory motor behavior in patients with a neurological impairment of dexterous upper-limb function.[42]

9. Susan et.al(2025**)** identify variations among administration and scoring instructions of 6 upper extremity Fugl-Meyer Assessment (FMA-UE) protocols and to achieve consensus regarding optimal administration procedures.[43]

10. The Mini-Mental State Examination is a standardized cognitive screening tool that evaluates orientation, attention, memory, language, and visuospatial skills. In stroke rehabilitation, cognitive status is important as it influences the patient's ability to comprehend instructions and actively participate in therapy. In the present study, the MMSE was used to ensure that participants had adequate cognitive function for inclusion and to exclude those with severe cognitive impairment.[44]

11. The Modified Ashworth Scale is a widely used clinical tool for assessing spasticity in patients with neurological disorders such as stroke. It measures resistance during passive muscle stretching and reflects increased muscle tone associated with hyperexcitability of the stretch reflex. In this study, the MAS was used as a primary outcome measure to quantify wrist flexor spasticity and to evaluate the effect of focal muscle vibration with taping on spasticity reduction[45]

12. Pandyan et al. (2005) described spasticity as a motor disorder characterized by a velocity-dependent increase in tonic stretch reflexes, resulting from upper motor neuron lesions. Post-stroke spasticity commonly affects the upper extremity, leading to functional limitations in daily activities. Early and effective management of spasticity is essential to optimize rehabilitation outcomes and improve quality of life.
13. Noma et al. (2012) reported that focal muscle vibration applied to spastic muscles in post-stroke patients can reduce spasticity and improve voluntary motor control. The proposed mechanism is based on modulation of Ia afferent activity, which influences excitability of spinal motor neurons. This non-invasive technique has been shown to be a promising adjunct in neurorehabilitation.
14. Kumar et al. (2019) investigated the use of kinesio taping in stroke patients and found that it significantly improved motor function and reduced spasticity. Taping provides proprioceptive input, supports joint alignment, and assists in motor relearning, thereby enhancing the functional use of the affected upper extremity.
15. Picelli et al. (2015) demonstrated that combining conventional rehabilitation with adjunct techniques such as vibration therapy or taping results in better spasticity reduction and functional recovery compared to routine physiotherapy alone. This highlights the potential benefits of multimodal strategies in stroke rehabilitation.

CHAPTER 5

MATERIAL AND METHODS

MATERIALS AND METHODS

METHODOLOGY

Study design: Randomized Control Trial

Study Population: Hemiplegic patients within 6months

Study Setting: Rehabilitation centres in and around Bhubaneswar**.**

Sampling Design: chit method

Sampling Criteria:

Inclusion: Subjects included in my study should be

- Diagnosed with stroke by neurologist
- Either left or right Hemiplegia
- Both gender
- aged 40-60 YEARS
- Modified Ashworth Scale :1-3
- Brunnstorm Stage: 2-4

Exclusion:

Subjects will be excluded if

- Participants having any previous history of Neuromuscular disease.
- Mini mental state examination (MMSE) score: <24
- Presence of any Visual and auditory impairment
- Presence of Skin sensitivity or any skin diseases

DURATION:1 year

1. Ethical clearance :1month
2. Sample collection: 2months
3. Data analysis:1months
4. Result and discussion :2months

5. Total study duration: 6months

MATERIALS TO BE USED

- Vibration machine (Thrive MD01)
- Kinesio tape
- **OUTCOME MEASURES**
- FMA-UE: For upper extremity function
- MAS: For spasticity

CHAPTER 6
PROCEDURE

PROCEDURE

- Permission from the head of the institution and approval from the ethical committee.
- Participants meets the inclusion criteria will be briefed about the study and written consent will be filled.
- Demographic data will be documented and pre-intervention assessment will be done.
- Assessment for spasticity and motor performances using **Modified Ashworth scale, FMA-UE,** will be done respectively.
- INTERVENTION: Focal Muscle Vibration (50-100Hz, .2-.5mm) will be given for 30 mins (3 sessions each of 10mins, 1mins rest interval in between) prior to the exercise to the extensor-muscles on forearm and

  forearm and hand followed by 20 mins task specific training. Focal Muscle Vibration and Kinesio Taping will be given for 3days / week for 3 weeks. (Kinesio taping will be changed after 24hrs).Follow up and post intervention outcome measure will be assessed and documented.
- Follow up and post intervention outcome measure are assessed and documented.

  Interpretation of data and result will be obtained

INTERVENTION

FOR EXPERIMENTAL GROUP:

Total time duration- 50 mins

FMV: 50-60HZ ,0.2-0.5mm Amplitude

Once a day for 30 mins (3 sessions each consist of 10mins,1min rest interval) prior to exercise, 3days/week for 3weeks

TAPING: ELASTIC TAPE

Applied for 72hours/week (changing of tape after 24hours) for 3weeks**.**

CONVENTIONAL THERAPY: Repetitive task training for hand function for 20mins (peg board activities, reach to grasp object with different shapes, sizes and weights).

FOR CONTROL GROUP:

Conventional physiotherapy:

Total time duration: 50mins

Task-specific training (peg board activities, reach to grasp with objects of different size, shape and weight**)**

- Focal Muscle Vibration (50-100Hz, .2-.5mm) will be given for 30 mins (3 sessions each of 10mins, 1mins rest interval in between) prior to the exercise to the extensor- muscles on forearm and wrist then Kinesio Tape will be applied on extensor group of muscles of forearm and hand followed by 20 mins task specific training.
- Focal Muscle Vibration and Kinesio Taping will be given for 3days / week for 3 weeks. (Kinesio taping will be changed after 24hrs)Follow up and post intervention outcome measure will be assessed and documented.

Figure 1

INSTRUMENT USED a) MD THRIVE 01 b) elastic kinesio tape c)scissors

FIGURE: 2 TASK SPECIFIC TRAINING FOR GRASP

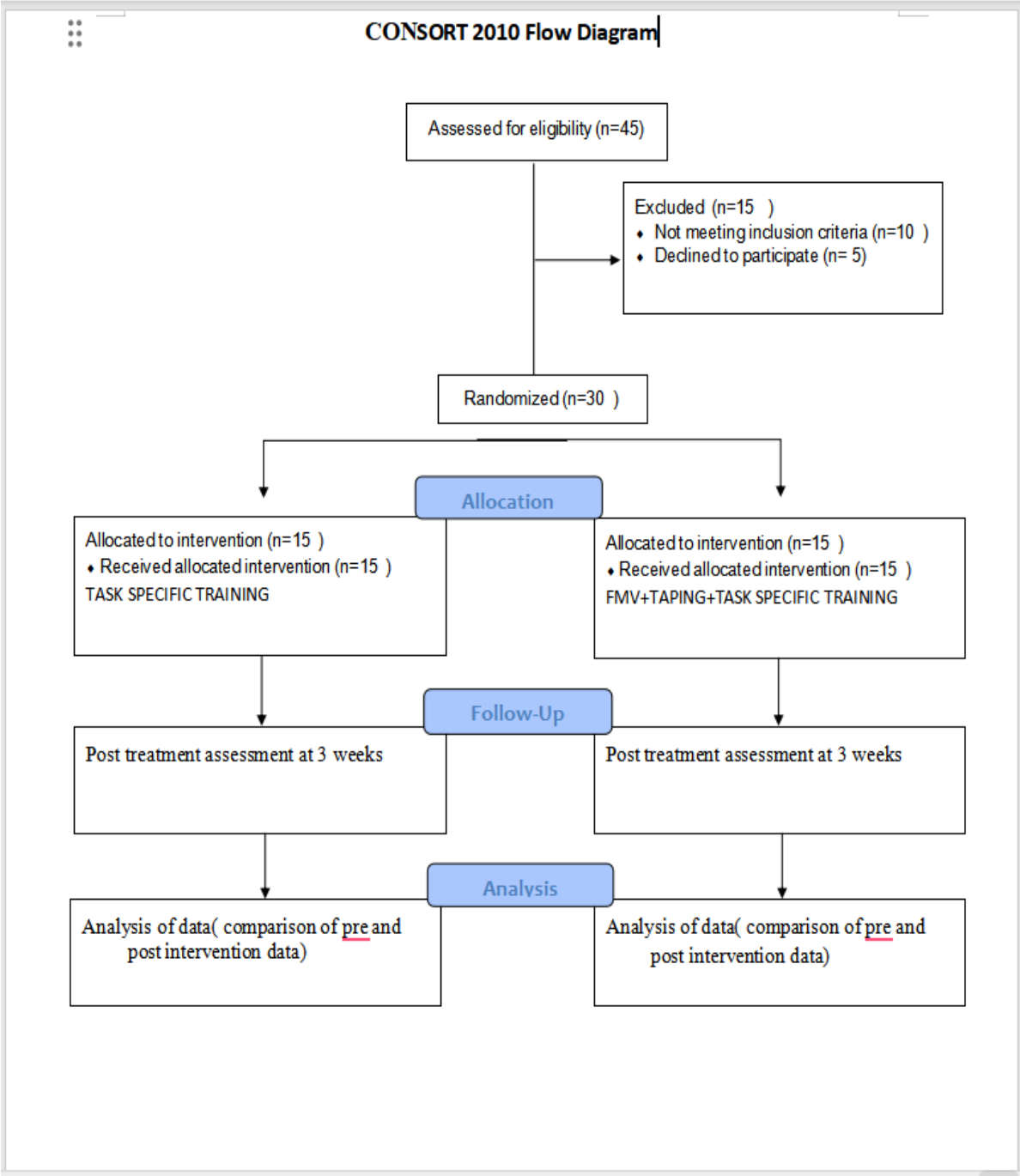
Figure 3 and 4

During intervention: Focal muacle vibration and taping

Figure 4

Task specific training after taping

Figure: post intervention task specific grasp


CONSORT 2010 Flow Diagram
Assessed for eligibility (n=45)
Excluded (n=15)
Not meeting inclusion criteria (n=10)
Declined to participate (n= 5)
Randomized (n=30)
Allocation
Allocated to intervention (n=15)
Received allocated intervention (n=15)
TASK SPECIFIC TRAINING
Allocated to intervention (n=15)
Received allocated intervention (n=15)
FMV+TAPING+TASK SPECIFIC TRAINING
Follow-Up
Post treatment assessment at 3 weeks
Post treatment assessment at 3 weeks
Analysis
Analysis of data(comparison of pre and post intervention data)
Analysis of data(comparison of pre and post intervention data)

CHAPTER 7
STATISTICAL ANALYSIS

STATISTICAL ANALYSIS

Data will be analysed using SPSS software version 27:

FINDING NORMALITY:

- Normality will be taken out using Shapiro- wilk test if sample size <50
- Normality will be taken out using Kolmogorov-Smirnov test if sample size >50

DESCRIPTIVE STATISTICS:

- If the sample are normally distributed, then the data will be presented using mean and standard deviation.
- If the sample are not normally distributed then the data will be presented using median and interquartile range (IQR)

INFERENTIAL STATISTICS:

Parametric test-

- Paired t- test designed to compare the mean of the same group.
- Unpaired t-test is designed to compare the mean of 2 different groups.

CHAPTER 8

RESULT

RESULTS

DESCRIPTIVE STATISTICS

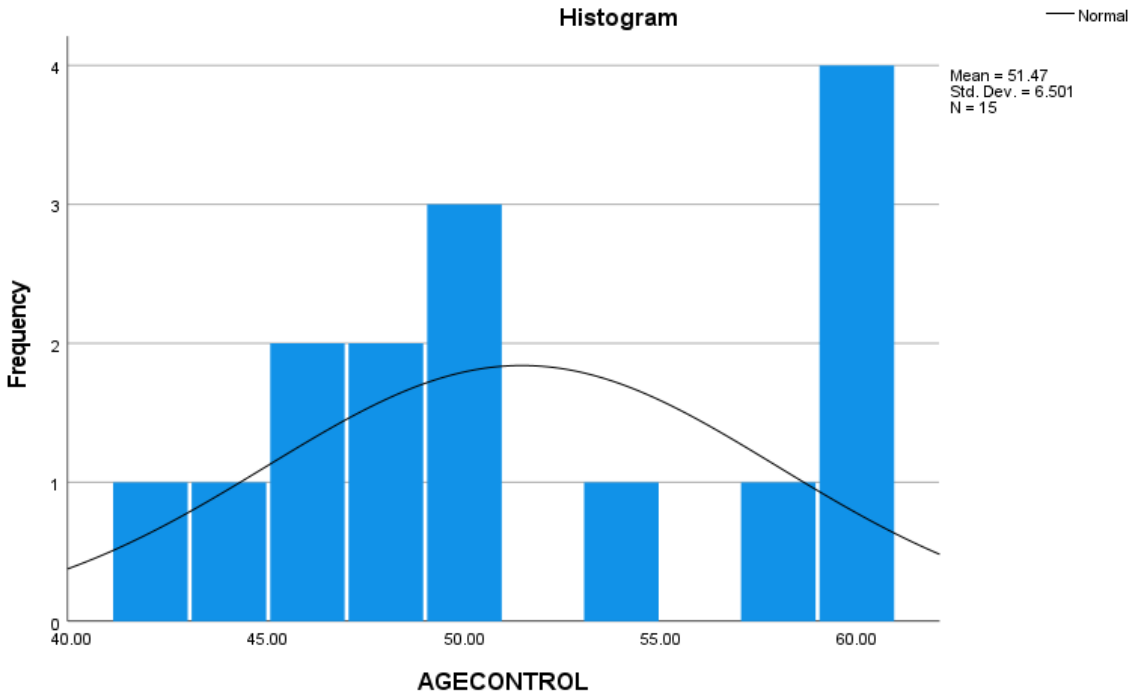
A total number of 30 hemiplegic patients were recruited for the study with age ranging from 40 to 60 years. There were 16 male and 14 female patients in the study. There was no drop out during the study. Data were collected at the 1st day of the visit and after the completion of study that is after 3 weeks.

Table 1: Demographic characteristics of participants

Sl. No.	**Baseline characteristics**	**Experimental Group(n=15)**	**p-value**	**Control Group (n=15)**	**p-value**
1.	DEMOGRAPHICS				
	Age (in years) (mean ±SD)	50.47±6.24	0.238	51.47±6.50	0.064
	Gender (male: female)	8:7		8:7	
2.	SCREENING TOOL				
	Brannstrom Stage	2-4		2-4	
3.	OUTCOME MEASURE				
	MAS SCORE(mean ±SD)	2.00(1.00)	<0.001	2.00(0.00)	<0.001
	FMA-UE SCORE (mean ±SD)	22.06±6.04	0.087	25±5.29	.35

Table.1 Depicts that in control group (Mean±SD)age is 51.47±6.50 years. In Experimental group (mean±SD) age is 50.47±6.24 years. Experimental Group and Control Group consist of 8 male and 7 female subjects each. Table X: Shapiro–Wilk test results for normality of baseline variables (Age, MAS, FMA-UE) in experimental and control groups. A p-value > 0.05 indicates normal distribution, whereas $p < 0.05$ indicates non-normal distribution.

FIgure 1(a) and 1(b) Normality curve showing distribution of AGE in Control and experimental group



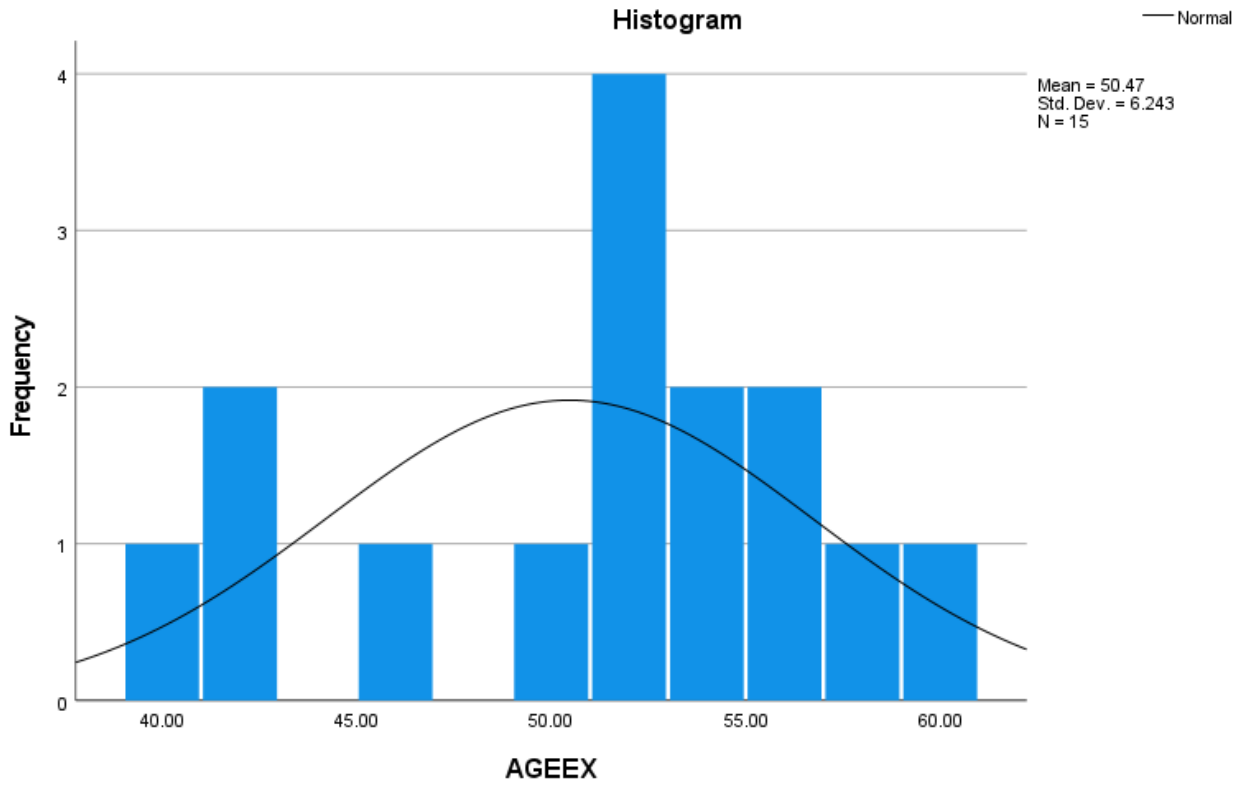
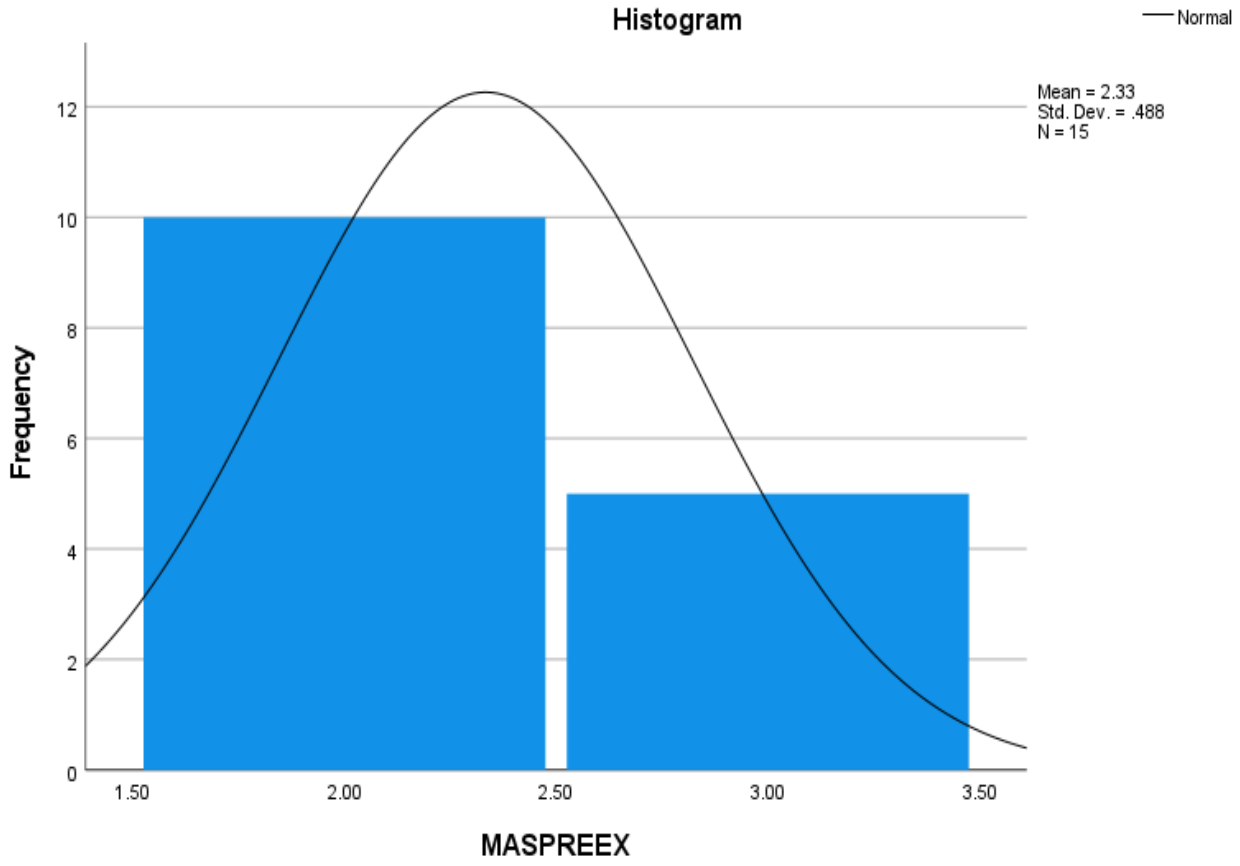
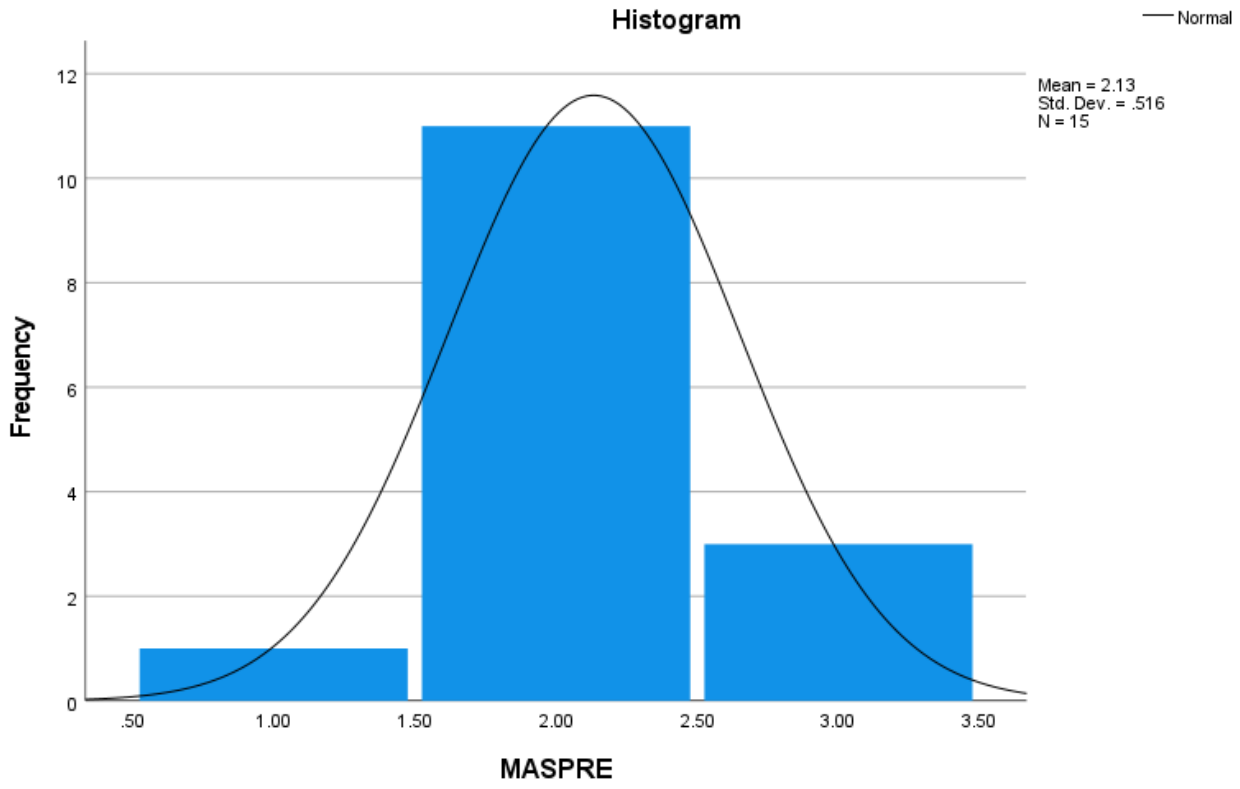
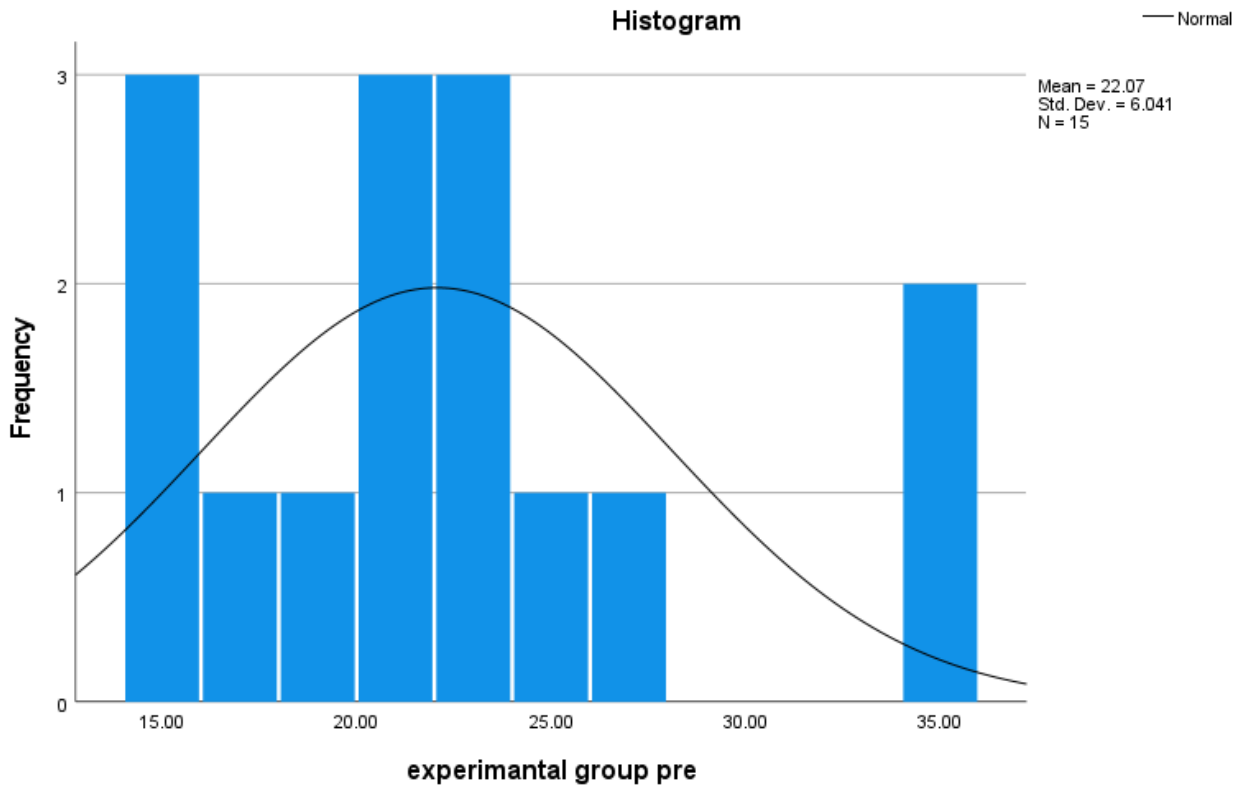


Figure 2(a) and 2(b) normality curve showing distribution of MAS score for experimental group







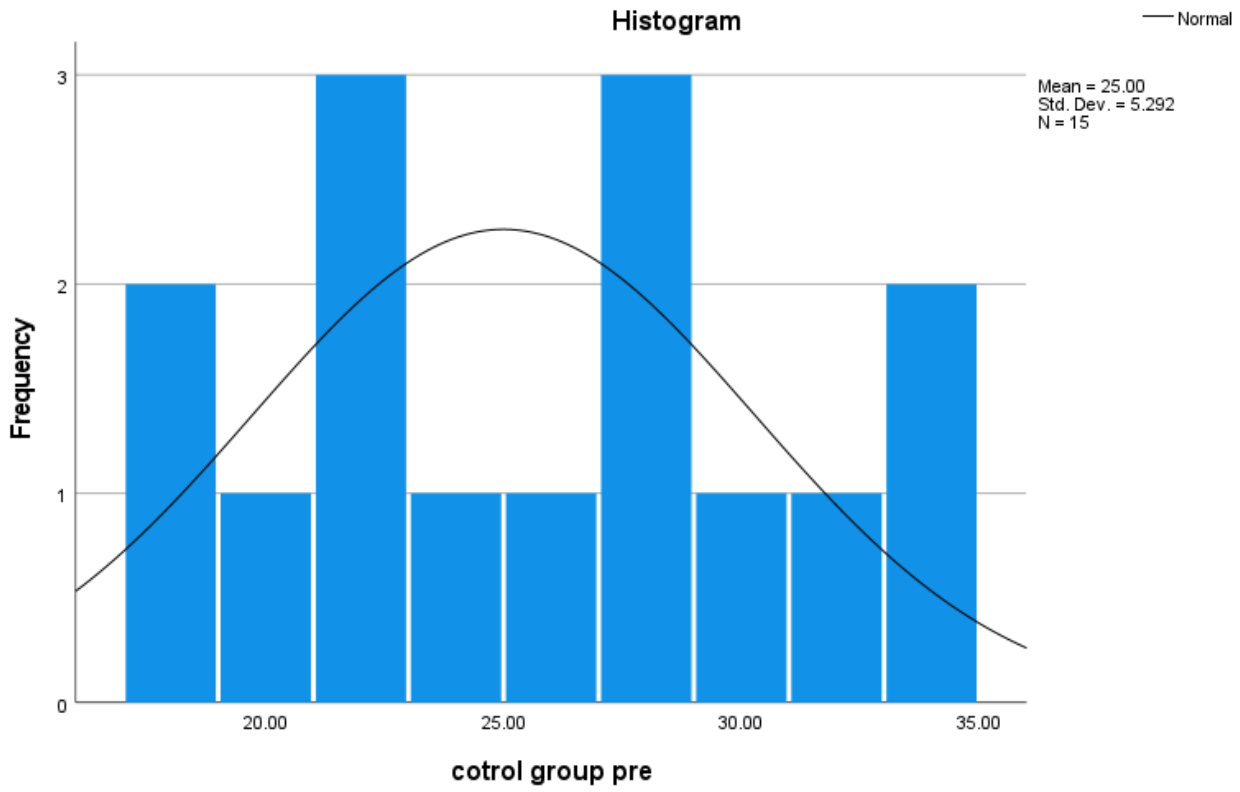
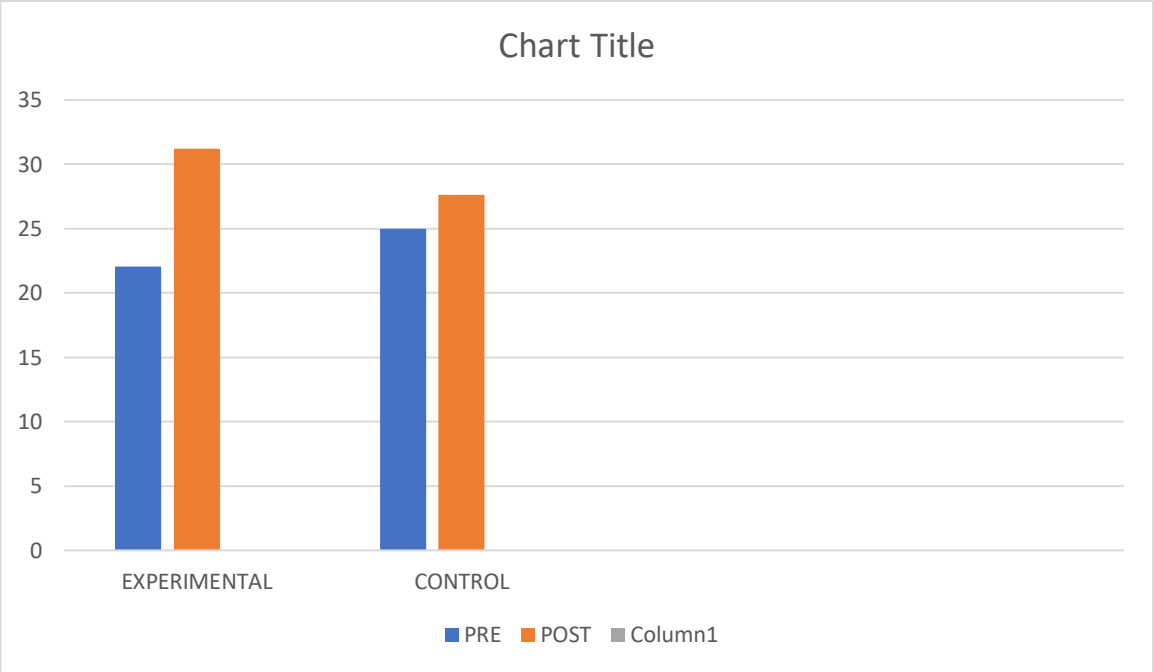


Figure 3(a) and 3(b): Normality curve showing distribution of FMA-UE scores of experimental and control group

Table -2 (a): Within group analysis of FMA -UE

Group	PRE (mean±SD)	p-value	POST(mean±SD)	t-value
experimental	22.07±6.04	<0.001	31.2±7.36	-10.6
Control	25±5.29	<0.001	27.6±5.20	-8.5

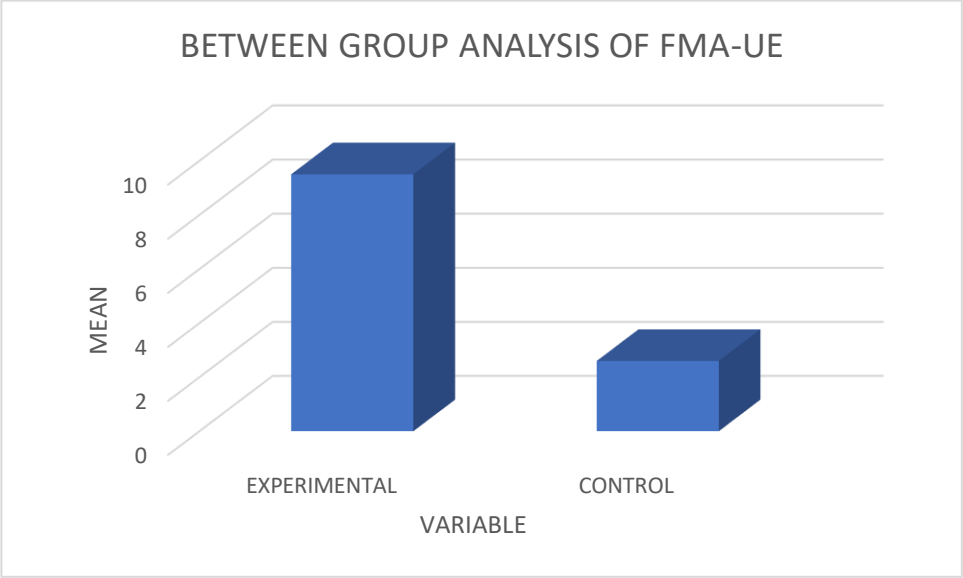
Table 2(a) and Graph 4(a) depict the result of the comparison (paired t- test) of FMAUE score within the group was found to be significant. In control group the t-value was -8.5 and the p-value was <0.001 which shows that there is significant improvement in FMAUE score in control group. In experimental group the t-value was -10.6 and the p-value was< 0.001, which suggest that there is a greater significant improvement in FMAUE score than that of control group.



Graph -4 (a): Within group analysis of FMAUE

Table-2(b): Between group analysis of FMA-UE

Experimental (Mean±SD)	Control(mean±SD)	t-value	p-value
9.5±3.99	**2.6±1.18**	**-6.44**	**< 0.001**



Graph -4(b): Between group analysis of FMAUE

Table 2(b) and Graph 2(b) depict between the group analysis (Independent t-test) change in FMAUE score of both the group shows control group(mean±SD) and **2.6±1.18** experimental group (mean±SD**9.5±3.99**and the t-value to be -6.44and p-value to be <0.001, which suggests that there is significant improvement in FMAUE score in Control group but there is greater significant improvement in FMAUE score in Experimental group.

Table-3(a): Within group analysis MAS

GROUP	PRE(mean±SD)	POST(mean±SD)	z-value	p-value
EXPERIMENTAL	2.33±0.49	1.27±0.46	-3.1	0.001
CONTROL	2.06±0.59	1.73±0.46	-1.8	0.59

Graph-5(a): Within group analysis MAS

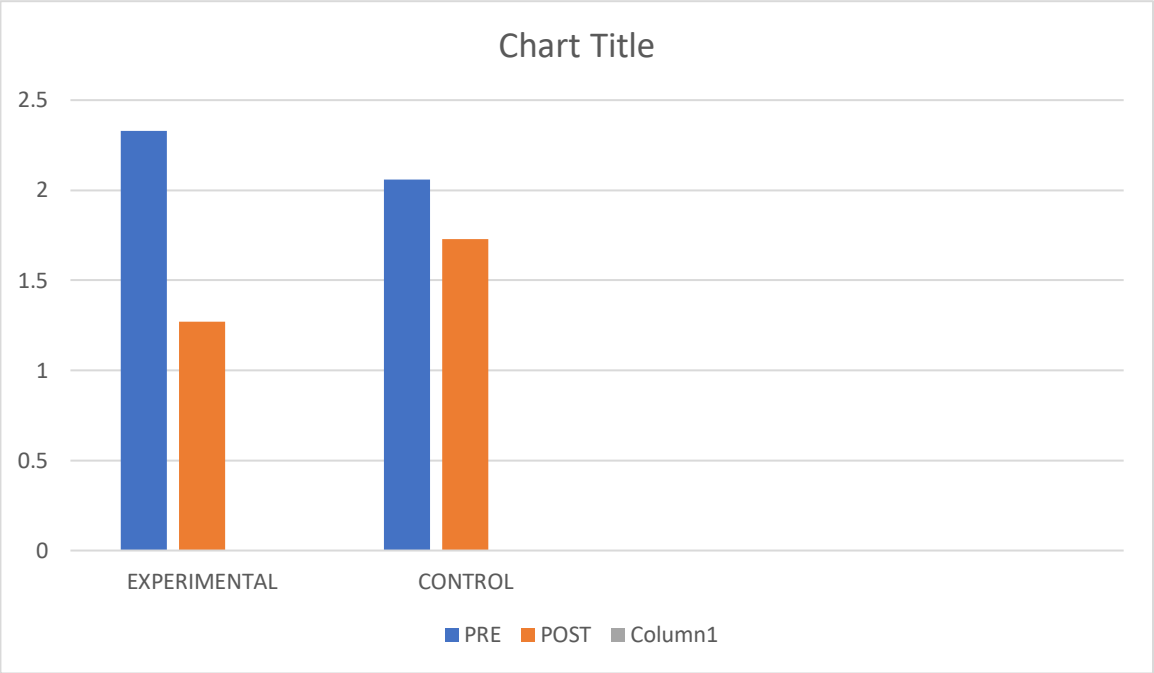
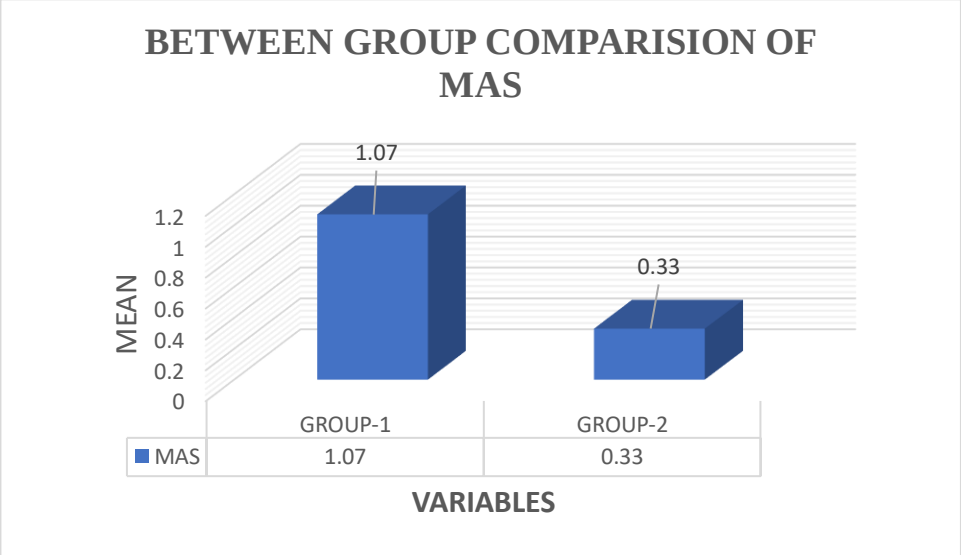


Table 3(a) and Graph 3(a) depict the result of the comparison (Wilcoxon sign rank test) of MAS score within the group was found to be significant. Pre-test value of both control & experimental group are (mean±SD) **2.06±0.59 and 2.33±0.49** respectively. The post value of control & experimental group to be (mean±SD) **1.73±0.46 and 1.27±0.46**respectively. This result shows that there is significant improvement in MAS score in control group but there is a greater significant improvement in MAS score in experimental group than that of control group.

Table-5(b): Between group analysis of MAS

Experimental(Mean±SD)	Control (Mean±SD)	z-value	p-value
1.07±.49	0.33±0.49	-2.92	0.006



Graph -3(b): Between group analysis of MAS

Table 3(b) and Graph 3(b) depict between the group analysis (Mann Whitney test) of change in MAS of both the group shows the control group (mean±SD) **0,33±0.49**and experimental group (mean±SD) **1.07±.49**and the z-value to be -2.92 and p-value to be 0.006, which suggests that there is significant improvement in MAS in Control group but there is greater significant improvement in MAS in Experimental group than that of control group**.**

CHAPTER 9
DISCUSSION

DISCUSSION

The present randomized controlled trial was designed to evaluate the combined effect of focal muscle vibration (FMV) and taping on wrist spasticity and upper extremity (UE) motor function in stroke patients. The major findings of this study revealed a statistically significant reduction in spasticity and improved upper extremity function in the experimental group that received FMV with taping in addition to conventional physiotherapy, compared to the control group that underwent only conventional therapy. Importantly, the intervention was well-tolerated, with no reported adverse effects or participant dropouts, which underscores the clinical feasibility and safety of this combined therapeutic strategy. The treatment protocol spanned three weeks with thrice-weekly sessions, aligning with established neurorehabilitation program durations, yet yielding meaningful improvements within this short timeframe.

These findings are consistent with prior reports indicating that FMV has the potential to modulate hyperexcitability of the stretch reflex pathway and decrease muscle spasticity in post-stroke populations [46]. The underlying neurophysiological rationale is that focal vibration applied to a specific muscle or tendon can activate Ia afferent fibers, thereby influencing spinal interneuron activity and enhancing presynaptic inhibition of alpha motor neurons [47]. This reduces excessive muscle tone, allowing for greater voluntary movement and functional use of the affected limb. The results of the present study further corroborate the hypothesis that combining FMV with adjunctive strategies like taping may produce additive benefits by providing both sensory stimulation and external mechanical support.

Taping as a therapeutic adjunct has been reported to facilitate proprioceptive input, improve joint alignment, and limit maladaptive movement patterns [48]. In this study, the application of taping along with FMV might have enhanced sensory feedback and provided sustained proprioceptive cues even after the vibration session ended. This synergistic effect could explain the greater improvements in Fugl-Meyer Assessment (FMA-UE) scores observed in the experimental group compared to the control. Previous research has also highlighted that taping

can reduce spasticity by modulating gamma motor neuron activity and improving cortical reorganization [49]. Thus, combining FMV with taping addresses both peripheral and central aspects of motor control, which likely contributed to the superior functional gains seen here.

In comparison with the control group, which demonstrated improvements but to a lesser degree, the experimental group's outcomes support the integration of FMV and taping into routine stroke rehabilitation. The improvements in spasticity measured by the Modified Ashworth Scale (MAS) were notably higher in the experimental group, suggesting that FMV coupled with taping provides more effective modulation of abnormal muscle tone than conventional therapy alone. These findings align with previous randomized trials where vibration therapy was shown to be superior to conventional physiotherapy in reducing spasticity and enhancing motor performance [50]. However, unlike earlier studies that employed whole-body vibration or focal vibration in isolation, the current trial uniquely combined FMV with taping, thereby offering a more comprehensive multimodal intervention.

Another important aspect is the absence of adverse events. Safety is a critical determinant in clinical translation, and this study observed no dropouts or side effects over the three-week protocol. Previous reports on vibration therapy have indicated mild discomfort or transient fatigue in some individuals [51], yet such issues were not encountered here, possibly because the vibration intensity and duration were carefully tailored to patient tolerance. This highlights that FMV, when combined with taping, is not only efficacious but also safe for integration into neurorehabilitation regimens.

The rapid improvements observed within a three-week timeframe deserve further attention. Typically, spasticity management and motor recovery are considered long-term rehabilitation goals. However, the experimental group in this study demonstrated measurable improvements within a relatively short intervention period. This accelerated response may be due to the neuroplasticity-enhancing properties of vibration, which have been shown to stimulate cortical

excitability and reorganize motor maps [52]. Taping, on the other hand, offers continuous afferent stimulation, prolonging the therapeutic effect beyond the treatment session. Together, these mechanisms might have facilitated faster neuromotor adaptation, explaining the robust outcomes achieved in a limited period.

The improvements in FMA-UE scores specifically highlight enhanced functional performance of the upper extremity. Stroke survivors often experience difficulty in regaining voluntary control over wrist and hand movements, which are essential for activities of daily living. By reducing spasticity and providing continuous proprioceptive feedback, FMV with taping may have enabled smoother execution of tasks, greater range of motion, and improved coordination. These results are consistent with neurorehabilitation models emphasizing task-specific sensory-motor integration as a driver of functional recovery [53].

Comparative literature further supports these observations. For instance, a recent RCT investigating FMV demonstrated significant improvements in motor recovery and reduction in tone in subacute stroke patients [54]. Similarly, studies on taping interventions in neurological populations have reported positive effects on spasticity reduction and functional activity [55]. The current study advances this evidence by showing that the combined use of FMV and taping produces superior outcomes than conventional therapy alone, thus bridging a gap in the literature where limited work has addressed combined sensory-motor modalities.

The control group in this trial also displayed improvement, albeit less pronounced. This highlights the importance of conventional physiotherapy in maintaining and promoting recovery in stroke rehabilitation. Standard approaches such as stretching, strengthening, and task-oriented training undoubtedly contribute to reducing spasticity and enhancing function. However, the greater effect observed in the experimental group suggests that conventional therapy may not fully address the complex sensory and motor impairments post-stroke. The

incorporation of novel modalities such as FMV and taping therefore represents a progressive step in modern rehabilitation strategies.

Another relevant aspect is patient compliance. Rehabilitation programs are often challenged by dropouts, particularly when interventions are perceived as burdensome or uncomfortable. The absence of dropouts in this study suggests that FMV with taping was well accepted by participants. This acceptability could be attributed to the non-invasive and relatively simple nature of the intervention, as well as the immediate sense of relaxation and improved mobility often reported following vibration therapy [56]. Such favorable patient perceptions are essential for long-term adherence and sustained recovery.

From a neurophysiological perspective, the findings can be explained by the dual-action mechanism of the interventions. FMV likely acted by modulating spinal reflex pathways and enhancing cortical excitability, while taping offered continuous afferent input and biomechanical stability. The combination of these two methods thus provides a more holistic approach by addressing both neural and musculoskeletal dimensions of motor recovery. This is in line with contemporary models of stroke rehabilitation, which advocate for multi-sensory stimulation to maximize plasticity and functional outcomes [57].

Interestingly, the study's findings also support the use of relatively short-duration interventions to achieve meaningful clinical outcomes. This has practical implications for healthcare systems, particularly in resource-limited settings where prolonged rehabilitation is often not feasible. If FMV with taping can yield significant improvements within three weeks, it may be an efficient adjunct to standard therapy, reducing the overall rehabilitation burden while still delivering substantial benefits to patients.

Moreover, the clinical relevance of these results extends beyond statistical significance. Improvements in MAS and FMA-UE scores directly translate to enhanced quality of life, independence, and social participation for stroke survivors. Spasticity reduction enables greater

ease in performing daily tasks, while improved upper limb function enhances self-care and mobility. Thus, the outcomes of this study have a meaningful impact on the lived experiences of patients, which should be considered an essential endpoint in rehabilitation research [58].

Future perspectives also emerge from this work. The favorable outcomes suggest that FMV and taping could be applied across different phases of stroke recovery, from subacute to chronic stages. Additionally, exploration into the dose-response relationship of vibration frequency, duration, and taping techniques may optimize the protocol for maximum benefit. Given the absence of adverse events, there is also potential for integrating this approach into community and home-based rehabilitation programs, increasing accessibility for patients unable to attend intensive hospital-based therapy.

In summary, the present study reinforces the efficacy of FMV with taping as a complementary intervention in post-stroke rehabilitation. It highlights significant improvements in spasticity reduction and functional recovery compared to conventional therapy alone, within a safe and feasible protocol of three weeks. The outcomes resonate with existing evidence while advancing the literature by demonstrating the additive benefits of combining two sensory-motor modalities. These findings hold promise for shaping future rehabilitation strategies and improving patient-centred outcomes in stroke care.

CHAPTER 10

LIMITATION AND FUTURE DIRECTION

LIMITATIONS

Limitations

While the results of this study are promising, certain limitations must be acknowledged:

- Small Sample Size: The study included only 30 participants, which may limit the statistical power and generalizability of the findings.
- Short Duration: The intervention lasted three weeks, and no follow-up was conducted to assess the long-term retention of benefits.
- Lack of Blinding: Due to the nature of the intervention, neither participants nor therapists could be blinded, which may have introduced performance and detection bias.
- Heterogeneity of Participants: The study did not stratify participants based on stroke chronicity, lesion site, or severity, which could have influenced outcomes.
- Limited Outcome Measures: Although MAS and FMA-UE are widely accepted tools, additional measures such as quality of life, functional independence, and participation levels could provide a more comprehensive understanding of intervention benefits.

Future direction

Future studies should aim to:

- Conduct multi-centre randomized controlled trials with larger sample sizes to validate findings.
- Extend the duration of intervention and include long-term follow-ups to assess sustainability of improvements.
- Explore variations in vibration parameters (frequency, intensity, duration) and taping techniques to determine optimal protocols.
- Incorporate objective measures such as electromyography (EMG) and neuroimaging to better understand neurophysiological mechanisms.

- Investigate the effects of vibration and taping across different stages of stroke recovery (acute, subacute, chronic).
- Assess patient-centred outcomes, including quality of life, ease of use, and caregiver burden, to evaluate the broader impact of these interventions.

CHAPTER 11

CONCLUSION

CONCLUSION

The outcomes of this randomized trial highlight that incorporating focal muscle vibration together with taping serves as an effective and well-tolerated adjunct to routine physiotherapy for stroke rehabilitation. Even within a relatively brief three-week program, this combined approach produced clearer improvements in reducing spasticity and restoring upper limb motor ability compared with conventional therapy alone. Importantly, no participants reported discomfort or withdrew from treatment, emphasizing the practicality and safety of this method in clinical settings.

The therapeutic benefit likely arises from the complementary actions of the two techniques: vibration assisting in modulation of hyperactive reflexes and promoting neuromotor reorganization, while taping offers sustained proprioceptive input and joint stability. By addressing both neural and musculoskeletal components of impairment, this dual strategy appears to accelerate recovery of function more effectively than standard care.

Overall, the findings support the integration of focal muscle vibration with taping into neurorehabilitation programs. Beyond statistical gains, the improvements observed in spasticity and functional performance translate into better independence and daily activity participation, underlining the real-world value of this intervention for individuals recovering from stroke.

CHAPTER 12
REFERENCES

REFERENCES

1. Feigin VL, Brainin M, Norrving B, Gorelick PB, Dichgans M, Wang W, et al. J Am Heart Assoc. 2020;9(3):e014494. World Health Organization. Global burden of stroke. WHO; 2019. Moon, J.-H.; Cho, H.-Y.; Hahm, S.-C. Influence of Electrotherapy with Task-OrientedTraining on Spasticity, Hand Function,Upper Limb Function, and Activitiesof Daily Living in Patients with Subacute Stroke:A Double-Blinded,Randomized, Controlled Trial.Healthcare 2021, .
2. Jones SP, Baqai K, Clegg A, Georgiou R, Harris C, Holland EJ, Kalkonde Y, Lightbody CE, Maulik PK, Srivastava PM, Pandian JD, Kulsum P, Sylaja PN, Watkins CL, Hackett ML. Stroke in India: A systematic review of the incidence, prevalence, and case fatality. Int J Stroke. 2022 Feb;17(2):132-140. doi: 10.1177/17474930211027834. Epub 2021 Jul 2.
3. EFFECT OF COMBINING TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION WITH EXERCISE REGIME ON SPASTICITY AND UPPER EXTREMITY FUNCTION FOLLOWING CHRONIC MIDDLECEREBRAL ARTERY STROKESrishti Banerjee *1, Mihirdev Jhala 2, Sadhana Mukhi 3. International Journal of Physiotherapy and Research, Int J Physiother Res 2020, Vol 8(6):3657-62. ISSN 2321-1822
4. Cavalcante, J.G.T., do Desterro Costae Silva, M., da Fonseca Silva, J.T., dos Anjos, C.C. and Soutinho, R.S.R. (2018) Effect of Kinesio Taping on Hand Function in Hemiparetic Patients. World Journal of Neuroscience, 8, 293-302.
5. Hussain T et al., DOI: https://doi.org/10.54393/pbmj.v5i7.424 Effects of Kinesio Taping in Management of Spasticity in Stroke Patients PAKISTAN BIOMEDICAL JOURNAL JULY 2022 VOL. 05, ISSUE. 07 https://www.pakistanbmj.com/journal/index.php/pbmj/index Volume 5, Issue 7(July 2022)
6. yu-chi huaNG 1, 2, po-cheng chEN 1, 2, hui-hsin tso 1, 2, yu-chien yaNG 1, 2, tzai-lun ho 1, 2, chau-peng lEoNG 1, 2 Effects of kinesio taping on hemiplegic hand in patients with upper limb post-stroke spasticity: a randomized controlled pilot study European Journal of Physical

and Rehabilitation Medicine 2019 October;55(5):551-7 DOI: 10.23736/S1973-9087.19.056843

7. Tae hoon kim,tae sung in Task related training combined with transcutaneous electricalnerve stimulation promote upper limb function in patient with chronic stroke tohuku j. exp.med 2013,231,93-100
8. Kamalakannan S, Gudlavalleti ASV, Gudlavalleti VSM, Goenka S, Kuper H. Incidence & prevalence of stroke in India: A systematic review. Indian J Med Res. 2017 Aug;146(2):175-185. doi: 10.4103/ijmr.IJMR_516_15. PMID: 29265018; PMCID: PMC5761027.
9. Alexander P Coupland et al.The definition of strok:Journal of the Royal Society of Medicine 2016;110(1) 9–12.
10. Valery L Feigin, Carlene MM Lawes, Derrick A Bennett, and Craig S Anderson. troke epidemiology: a review of population-based studies of incidence, prevalence, and case-fatality in the late 20th century: The Lancet Neurology 2003; 2: 43–53.
11. Valery L Feigin.Worldwide stroke incidence and early case fatality reported in 56
12. population-based studies: a systematic review: Lancet Neurology 2009;8:355–69.
13. .Jong-Ling Fuh,Shuu-Jiun Wang ,Hsiu-Chih Liu and Hann-Yeh Shyu. Incidence of
14. Stroke on Kinmen,Taiwan: Neuroepidemiology 2000;19:258–264.
15. H P Adams et al. Classification of subtype of acute ischemic stroke.Journal of American heart association 1993;24(1)
16. Hankey GJ. Stroke. Lancet. 2017;389(10069):641–54.
17. Kwakkel G, et al. Stroke. 2003;34(9):2220–6.
18. Langhorne P, Bernhardt J, Kwakkel G. Lancet Neurol. 2011;10(9):826–40.
19. Broeks JG, et al. Stroke. 1999;30(11):2493–9.
20. Pollock A, et al. Cochrane Database Syst Rev. 2014;(11):CD010820.
21. Ada L, et al. Stroke. 2006;37(6):1517–22.
22. Francisco GE, et al. Muscle Nerve. 2017;56(6):905–13.
23. Albright AL. J Child Neurol. 1996;11(Suppl 1):S1–11.

24. Burke D, et al. Exp Brain Res. 1976;23(3):365–85.

25. Roll JP, et al. Exp Brain Res. 1989;76(2):213–22.

26. Filippi GM, et al. J Neurol. 2009;256(3):364–71.

27. Marconi B, et al. Neurorehabil Neural Repair. 2011;25(1):48–60.

28. Noma T, et al. Brain Inj. 2012;26(6):748–55.

29. Versace V, et al. Clin Neurophysiol. 2018;129(9):1897–906.

30. Morris D, et al. J Orthop Sports Phys Ther. 2013;43(3):153–64.

31. Kase K, et al. Clinical therapeutic applications of the kinesio taping method. 2003.

32. Kalron A, Bar-Sela S. Eur J Phys Rehabil Med. 2013;49(5):699–709.

33. Yasukawa A, Patel P, Sisung C. Am J Occup Ther. 2006;60(1):104–10.

34. Murray H, Husk LJ. Physiother Can. 2001;53(4):311–7.

35. Chuang LL, et al. Arch Phys Med Rehabil. 2009;90(3):448–54.

36. ojhani-Shirazi Z, et al. J Bodyw Mov Ther. 2015;19(4):644–52.

37. Bohannon RW, Smith MB. Modified Ashworth Scale reliability. Phys Ther. 1987;67(2):206–

38. Fugl-Meyer AR, et al. Scand J Rehabil Med. 1975;7(1):13–31.

39. Kim Y, et al. NeuroRehabilitation. 2014;35(3):427–33.

40. Moon, J.-H.; Cho, H.-Y.; Hahm, S.-C. Influence of Electrotherapy with Task-OrientedTraining on Spasticity, Hand Function,Upper Limb Function, and Activitiesof Daily Living in Patients with Subacute Stroke:A Double-Blinded,Randomized, Controlled Trial.Healthcare 2021, .

41. Jones SP, Baqai K, Clegg A, Georgiou R, Harris C, Holland EJ, Kalkonde Y, Lightbody CE, Maulik PK, Srivastava PM, Pandian JD, Kulsum P, Sylaja PN, Watkins CL, Hackett ML. Stroke in India: A systematic review of the incidence, prevalence, and case fatality. Int J Stroke. 2022 Feb;17(2):132-140. doi: 10.1177/17474930211027834. Epub 2021 Jul 2.

42. EFFECT OF COMBINING TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION WITH EXERCISE REGIME ON SPASTICITY AND UPPER EXTREMITY FUNCTION FOLLOWING CHRONIC MIDDLECEREBRAL ARTERY STROKESrishti Banerjee *1,

Mihirdev Jhala 2, Sadhana Mukhi 3. International Journal of Physiotherapy and Research, Int J Physiother Res 2020, Vol 8(6):3657-62. ISSN 2321-1822

43. Cavalcante, J.G.T., do Desterro Costae Silva, M., da Fonseca Silva, J.T., dos Anjos, C.C. and Soutinho, R.S.R. (2018) Effect of Kinesio Taping on Hand Function in Hemiparetic Patients. World Journal of Neuroscience, 8, 293-302.
44. Hussain T et al., DOI: https://doi.org/10.54393/pbmj.v5i7.424 Effects of Kinesio Taping in Management of Spasticity in Stroke Patients PAKISTAN BIOMEDICAL JOURNAL JULY 2022 VOL. 05, ISSUE. 07 https://www.pakistanbmj.com/journal/index.php/pbmj/index Volume 5, Issue 7(July 2022)
45. yu-chi huaNG 1, 2, po-cheng chEN 1, 2, hui-hsin tso 1, 2, yu-chien yaNG 1, 2, tzai-lun ho 1, 2, chau-peng lEoNG 1, 2 Effects of kinesio taping on hemiplegic hand in patients with upper limb post-stroke spasticity: a randomized controlled pilot study European Journal of Physical and Rehabilitation Medicine 2019 October;55(5):551-7 DOI: 10.23736/S1973-9087.19.056843
46. Tae hoon kim,tae sung in Task related training combined with transcutaneous electricalnerve stimulation promote upper limb function in patient with chronic stroke tohuku j. exp.med 2013,231,93-100
47. Kamalakannan S, Gudlavalleti ASV, Gudlavalleti VSM, Goenka S, Kuper H. Incidence & prevalence of stroke in India: A systematic review. Indian J Med Res. 2017 Aug;146(2):175-185. doi: 10.4103/ijmr.IJMR_516_15. PMID: 29265018; PMCID: PMC5761027.
48. Alexander P Coupland et al.The definition of strok:Journal of the Royal Society of Medicine 2016;110(1) 9–12.
49. Valery L Feigin, Carlene MM Lawes, Derrick A Bennett, and Craig S Anderson. troke epidemiology: a review of population-based studies of incidence, prevalence, and case-fatality in the late 20th century: The Lancet Neurology 2003; 2: 43–53.
50. Valery L Feigin.Worldwide stroke incidence and early case fatality reported in 56
51. population-based studies: a systematic review: Lancet Neurology 2009;8:355–69.

52. .Jong-Ling Fuh,Shuu-Jiun Wang ,Hsiu-Chih Liu and Hann-Yeh Shyu. Incidence of
53. Stroke on Kinmen,Taiwan: Neuroepidemiology 2000;19:258–264.
54. H P Adams et al. Classification of subtype of acute ischemic stroke.Journal of American heart association 1993;24(1).
55. CJ, et al. Guidelines for adult stroke rehabilitation. Stroke. 2016;47(6):e98–169.
56. Lance JW. Symposium synopsis. In: Spasticity: disordered motor control. 1980. p. 485–94.Li S, Francisco GE. Stroke-induced spasticity: pathophysiology and treatment. Front Neurol. 2015;6:158.
57. Lundström E, Terént A, Borg J. Eur J Neurol. 2008;15(6):533–9.
58. Urban PP, Wolf T, et al. Stroke. 2010;41(9):2016–20.
59. Watkins CL, Leathley MJ, et al. Clin Rehabil. 2002;16(5):515–22.
60. Sommerfeld DK, Eek EU, Svensson AK, Holmqvist LW, von Arbin MH. Stroke. 2004;35(6):1346–50.
61. Barlow JH, et al. Patient Educ Couns. 2000;39(2-3):219–27.
62. Cramer SC. Brain. 2004;127(12):2479–94. .Annino G, Alashram AR, Alghwiri AA, Romagnoli C, Messina G, Tancredi V, et al. Effect of segmental muscle vibration on upper extremity functional ability poststroke: A randomized controlled trial. Med (United States). 2019;98(7):1–9.69
63. Carolee J Winstein et al. Effect of a task-oriented rehabilitation program on upper extremity recovery following motor stroke the ICARE randomized clinical trial. JAMA - Journal of the American Medical Association 2016; 315(6): 571-581.
64. .Nick S Ward, Leonardo G Cohen. Mechanisms Underlying Recovery of Motor Function After Stroke: Developmental Psychobiology 2012; 54(3) :254-262.
65. Birkenmeier RL, Prager EM, Lang CE. Translating animal doses of task-specific training to people with chronic stroke in 1-hour therapy sessions: A proof-of-concept study: Neurorehabilitation and Neural Repair. 2010;24(7):620–35.

66. KATHRYN HAYWARD, RUTH BARKER & SANDRA BRAUER. Interventions to promote upper limb recovery in stroke survivors with severe paresis: a systematic review: Disability and Rehabilitation 2010; 32(24): 1973–1986.
67. Marijke Rensink, Marieke Schuurmans, Eline Lindeman & Tho ra Hafsteinsdo´ ttir.Task-oriented training in rehabilitation after stroke: Journal of Advanced Nursing 2009; 65(4): 737754.
68. Jannette Blennerhassett and Wayne Dite. Additional task-related practice improves mobility and upper limb function early after stroke: A randomised controlled trial: Australian Journal of Physiotherapy 2004; 50(4): 219-224.
69. JuHyung Park, MSc. Effects of task-oriented training on upper extremity function and performance of daily activities in chronic stroke patients with impaired cognition: Journal of Physical Therapy Science 2016; 28(1): 316-318.70
70. Aye Aye Thant Effects of task-oriented training on upper extremity functional performance in patients with sub-acute stroke: a randomized controlled trial:Journal of Physical Therapy Science 2019; 31(1): 82–87
71. Todd W. Vanderah, Douglas J. Gould.Nolte's the human brain An Introduction to its Functional Anatomy 7th Edition.
72. Birte U. Forstmann, Max C. Keuken and Anneke Alkemade.An Introduction to Human Brain Anatomy 2015.
73. Arnaud Messe, David Rudrauf, Habib Benali, Guillaume Marrelec.Computational Biology 2014;10(3).
74. .Hafiza Iqra Javaid,Asra Roheen ,Farjad Afzal.Anatomy and Physiology of Brain in Context of Learning: A Review from Current Literature 2020; 26 (5).
75. .Rosanne L. Wille,George B. Jacobs,Robert C .Rubin,John H. Hubbard.Anatomy of the Brain and Skull:Journal of Neuroscience Nursing 1977; 9(3):99-101.
76. K Sembulingam,Prema Sembulingam P.Essentials of Medical Physiology 6th Edition.

CHAPTER 13
ANNEXURE

ANNEXURE: I

CONSENT FORM

Title of the Study: Effect of Focal Muscle Vibration with Taping on Wrist Spasticity and Upper Extremity Function in Stroke Patients - A Randomized Controlled Trial

Name of Principal Investigator: KABITA KRISHNA MAHANTA [MPT 1st year NEURO] Department of Physiotherapy, Abhinav Bindra Sports Medicine and Research Institute [ABSMARI], Bhubaneswar

Purpose of the Study: You are being invited to participate in a research study that aims to assess the effect of focal muscle vibration combined with taping on wrist spasticity and upper extremity function in patients with stroke. The goal is to determine whether this approach improves motor function and reduces muscle spasticity in the affected wrist.

Selection Criteria: You have been diagnosed with stroke and are currently experiencing wrist spasticity. You meet the inclusion criteria for this study and are eligible to participate voluntarily.

Study Procedures:

You will be randomly assigned to one of the study groups.

The intervention will include focal muscle vibration and taping on your affected wrist.

You will undergo assessments using standardized tools (e.g., Modified Ashworth Scale, and Fugl-Meyer Assessment for Upper Extremity) before and after the treatment sessions.

The duration of the study for each participant will be approximately 3 weeks, depending on your treatment schedule.

Potential Benefits:

Possible improvement in wrist spasticity and upper extremity function.

Contribution to research that may help other stroke survivors in the future.

Potential Risks or Discomfort:

Mild skin irritation or discomfort due to taping.

Temporary soreness from vibration.

All procedures will be explained, and precautions will be taken to ensure your safety and comfort. There is very low risk of adverse effects, but if any arise, immediate medical facilities will be provided.

Confidentiality: All personal and medical information will be kept strictly confidential. Your data will be used only for research purposes and will be anonymized in any reports or publications.

Voluntary Participation: Your participation is completely voluntary. You are free to withdraw from the study at any time without giving a reason and without any impact on your medical care.

Contact Info: Phone: 6370921390 Email: kabitakrishnamahanta768@gmail.com

Participant's Statement of Consent

Participant's Name: _____ Signature: _____ Date: _____

Investigator's Name: Kabita Krishna Mahanta, MPT 1st year, ABSMARI

I have read (or had read to me) the above information. I have had the opportunity to ask questions and they have been answered to my satisfaction. I understand that my participation is voluntary and that I can withdraw at any time.

Signature: _____ Date: _____

ANNEXURE:II

CONSENT FORM

ଅଧ୍ୟୟନର ଶୀର୍ଷକ: ଫୋକାଲ୍ ମସଲ୍ ଭିବ୍ରେସନ୍ ସହିତ ଟେପିଂର ପ୍ରଭାବ: ଷ୍ଟ୍ରୋକ୍ ପ୍ରତିବନ୍ଧିତ ରୋଗୀଙ୍କର କାଉଁଠିର ସ୍ପାଷ୍ଟିସିଟି ଓ ଉପର ଅଙ୍ଗର କାର୍ଯ୍ୟକ୍ଷମତା – ଏକ ର୍ୟାଣ୍ଡମାଇଜ୍ଡ କଣ୍ଟ୍ରୋଲ୍ ଟ୍ରାୟାଲ୍

ମୁଖ୍ୟ ଅନୁସନ୍ଧାନକାରୀ: କବିତା କୃଷ୍ଣ ମହାନ୍ତା [MPT 1st year NEURO] Department of Physiotherapy, Abhinav Bindra Sports Medicine and Research Institute [ABSMARI], Bhubaneswar

ଅଧ୍ୟୟନର ଉଦ୍ଦେଶ୍ୟ: ଆପଣଙ୍କୁ ଏକ ଅନୁସନ୍ଧାନ ଅଧ୍ୟୟନରେ ଅଂଶଗ୍ରହଣ କରିବାକୁ ଆମନ୍ତ୍ରଣ ଦିଆଯାଇଛି, ଯାହାର ଲକ୍ଷ୍ୟ ହେଉଛି କାଉଁଠିର ସ୍ପାଷ୍ଟିସିଟି ଓ ଉପର ଅଙ୍ଗର କାର୍ଯ୍ୟକ୍ଷମତାକୁ ଉନ୍ନତ କରିବା ପାଇଁ ଫୋକାଲ୍ ମସଲ୍ ଭିବ୍ରେସନ୍ ସହିତ ଟେପିଂ କେମିତି ମଦଦ କରେ ତାହା ମାପିବା।

ଚୟନ କ୍ରାଇଟେରିଆ: ଆପଣଙ୍କୁ ଷ୍ଟ୍ରୋକ୍ ରୋଗ ରୋଗୀ ବୋଲି ନିର୍ଦ୍ଧାରଣ କରାଯାଇଛି ଏବଂ କାଉଁଠିର ସ୍ପାଷ୍ଟିସିଟି ଅଛି। ଆପଣ ଏହି ଅଧ୍ୟୟନର ସମ୍ମିଳନ କ୍ରାଇଟେରିଆ ପୂରଣ କରୁଛନ୍ତି ଏବଂ ସୈଚ୍ଛିକ ଭାବେ ଅଂଶଗ୍ରହଣ କରିପାରିବେ।

ଅଧ୍ୟୟନ ପ୍ରକ୍ରିୟା:

ଆପଣଙ୍କୁ ଏକ ର୍ୟାଣ୍ଡମ୍ ଭାବରେ ଗୋଷ୍ଠୀରେ ବଣ୍ଟିତ କରାଯିବ।

ହସ୍ତକ୍ଷେପରେ କାଉଁଠିର ଫୋକାଲ୍ ମସଲ୍ ଭିବ୍ରେସନ୍ ସହିତ ଟେପିଂ ଅନ୍ତର୍ଗତ ରହିବ।

ଚିକିତ୍ସା ପୂର୍ବରୁ ଏବଂ ପରେ ମାନକ ଟୁଲ୍ (ଯେପରିକି Modified Ashworth Scale, Fugl-Meyer Assessment for Upper Extremity) ଦ୍ୱାରା ମୂଲ୍ୟାଙ୍କନ କରାଯିବ।

ଏହି ଅଧ୍ୟୟନର ପ୍ରତ୍ୟେକ ଅଂଶଗ୍ରହୀଣା ପାଇଁ ସମୟ ସମୀକ୍ଷା ଏବଂ ଚିକିତ୍ସା ଅନୁସାରେ ପ୍ରାୟ 3 ସପ୍ତାହ ହେବ।

ସମ୍ଭାବ୍ୟ ଲାଭ:

କାଉଁଠିର ସ୍ପାଷ୍ଟିସିଟି ଓ ଉପର ଅଙ୍ଗର କାର୍ଯ୍ୟକ୍ଷମତାର ସୁଧାର।

ଭବିଷ୍ୟତରେ ଅନ୍ୟ ଷ୍ଟ୍ରୋକ୍ ରୋଗୀଙ୍କୁ ସାହାଯ୍ୟ କରିପାରିବା ଅନୁସନ୍ଧାନରେ ଅଂଶଦାନ।

ସମ୍ଭାବ୍ୟ ଝୁଞ୍ଜ:

ଟେପିଂରେ ସାଧାରଣ ଚର୍ମ ଜ୍ୱାଳା କିମ୍ବା ଅସୁବିଧା।

ଭିବ୍ରେସନ୍ ଦ୍ୱାରା ସାର୍ବସାଧାରଣ ଦୁଃଖ ଅନୁଭବ।

ସମସ୍ତ ପ୍ରକ୍ରିୟା ବିସ୍ତୃତ ଭାବରେ ବ୍ୟାଖ୍ୟା କରାଯିବ ଏବଂ ସୁରକ୍ଷା ଏବଂ ସୁବିଧାକୁ ସୁନିଶ୍ଚିତ କରାଯିବ।

ଗୁପ୍ତତା: ସମସ୍ତ ବ୍ୟକ୍ତିଗତ ଏବଂ ଚିକିତ୍ସା ସମ୍ବନ୍ଧୀୟ ସୂଚନା ସଂରକ୍ଷିତ ରହିବ। ତଥ୍ୟ କେବଳ ଅନୁସନ୍ଧାନ ପ୍ରୟୋଗରେ ବ୍ୟବହୃତ ହେବ ଏବଂ ପ୍ରକାଶନରେ ଗୋପନୀୟ ରହିବ।

ସୈଚ୍ଛିକ ଅଂଶଗ୍ରହଣ: ଆପଣଙ୍କର ଅଂଶଗ୍ରହଣ ସୈଚ୍ଛିକ। ଆପଣ ଯେକୌଣସି ସମୟରେ ଅଂଶଗ୍ରହଣ ଛାଡ଼ିପାରିବେ, କୌଣସି କାରଣ ଦେବା ବା ଚିକିତ୍ସା ସେବାରେ ପ୍ରଭାବ ପଡ଼ିବ ନାହିଁ।

ସମ୍ପର୍କ ସୂଚନା: ଫୋନ୍: 6370921390 ଇମେଲ୍: kabitakrishnamahanta768@gmail.com

ଅଂଶଗ୍ରହୀଣାଙ୍କର ସୂଚନା ସହମତି

ଅଂଶଗ୍ରହୀଣାଙ୍କର ନାମ: _____ ସହମତି ସହି: _____ ତାରିଖ: _____

ଅନୁସନ୍ଧାନକାରୀର ନାମ: କବିତା କୃଷ୍ଣ ମହାନ୍ତା, MPT 1st year, ABSMARI

ମୁଁ ଉପରୋକ୍ତ ସୂଚନା ପଢ଼ିଛି (କିମ୍ବା ପଢ଼ି ଶୁଣାଯାଇଛି)। ମୋ ପ୍ରଶ୍ନଗୁଡିକର ସଠିକ୍ ଉତ୍ତର ମିଳିଛି। ମୋ ଅଂଶଗ୍ରହଣ ସୈଚ୍ଛିକ ଏବଂ ଯେକୌଣସି ସମୟରେ ମୁଁ ଛାଡ଼ିପାରିବି।

ସହି: _____ ତାରିଖ: _____

ANNEXURE: III

EVALUATION SHEET

Name:	
Age:	
Gender:	
Date Of Assessment:	
Date Of Onset:	
Affected Side:	
MMSE Score:	
MAS Score:	
FMA-UE Score:	
Brunnstrom Stage:	

ANNEXURE: IV

FMA-UE PROTOCOL — Rehabilitation Medicine, University of Gothenburg

FUGL-MEYER ASSESSMENT **ID:**
UPPER EXTREMITY (FMA-UE) **Date:**
Assessment of sensorimotor function **Examiner**:

Fugl-Meyer AR, Jaasko L, Leyman I, Olsson S, Steglind S: The post-stroke hemiplegic patient. A method for evaluation of physical performance. Scand J Rehabil Med 1975, 7:13-31.

A. UPPER EXTREMITY, sitting position					
I. Reflex activity			**none**	**can be elicited**	
Flexors: biceps and finger flexors (at least one) **Extensors**: triceps			0 0	2 2	
		Subtotal I (max 4)			
II. Volitional movement within synergies, without gravitational help			**none**	**partial**	**full**
Flexor synergy: Hand from contralateral knee to ipsilateral ear. From extensor synergy (shoulder adduction/ internal rotation, elbow extension, forearm pronation) to flexor synergy (shoulder abduction/ external rotation, elbow flexion, forearm supination). **Extensor synergy:** Hand from ipsilateral ear to the contralateral knee	Shoulder Elbow Forearm	retraction elevation abduction (90°) external rotation flexion supination	0 0 0 0 0 0	1 1 1 1 1 1	2 2 2 2 2 2
	Shoulder Elbow Forearm	adduction/internal rotation extension pronation	0 0 0	1 1 1	2 2 2
		Subtotal II (max 18)			
III. Volitional movement mixing synergies, without compensation			**none**	**partial**	**full**
Hand to lumbar spine hand on lap	cannot perform or hand in front of ant-sup iliac spine hand behind ant-sup iliac spine (without compensation) hand to lumbar spine (without compensation)		0	1	2
Shoulder flexion 0°- 90° elbow at 0° pronation-supination 0°	immediate abduction or elbow flexion abduction or elbow flexion during movement flexion 90°, no shoulder abduction or elbow flexion		0	1	2
Pronation-supination elbow at 90° shoulder at 0°	no pronation/supination, starting position impossible limited pronation/supination, maintains starting position full pronation/supination, maintains starting position		0	1	2
		Subtotal III (max 6)			
IV. Volitional movement with little or no synergy			**none**	**partial**	**full**
Shoulder abduction 0 - 90° elbow at 0° forearm neutral	immediate supination or elbow flexion supination or elbow flexion during movement abduction 90°, maintains extension and pronation		0	1	2
Shoulder flexion 90° - 180° elbow at 0° pronation-supination 0°	immediate abduction or elbow flexion abduction or elbow flexion during movement flexion 180°, no shoulder abduction or elbow flexion		0	1	2
Pronation/supination elbow at 0° shoulder at about 30° flexion	no pronation/supination, starting position impossible limited pronation/supination, maintains start position full pronation/supination, maintains starting position		0	1	2
		Subtotal IV (max 6)			
V. Normal reflex activity assessed only if full score of 6 points is achieved in part IV; compare with the unaffected side			**hyper**	**lively**	**normal**
Biceps, triceps, finger flexors	2 of 3 reflexes markedly hyperactive 1 reflex markedly hyperactive or at least 2 reflexes lively maximum of 1 reflex lively, none hyperactive		0	1	2
		Subtotal V (max 2)			
		Total A (max 36)			

B. WRIST support may be provided at the elbow to take or hold the starting position, no support at wrist, check the passive range of motion prior testing		none	partial	full
Stability at 15° dorsiflexion elbow at 90°, forearm pronated shoulder at 0°	less than 15° active dorsiflexion dorsiflexion 15°, no resistance tolerated maintains dorsiflexion against resistance	0	1	2
Repeated dorsifexion / volar flexion elbow at 90°, forearm pronated shoulder at 0°, slight finger flexion	cannot perform volitionally limited active range of motion full active range of motion, smoothly	0	1	2
Stability at 15° dorsiflexion elbow at 0°, forearm pronated slight shoulder flexion/abduction	less than 15° active dorsiflexion dorsiflexion 15°, no resistance tolerated maintains dorsiflexion against resistance	0	1	2
Repeated dorsifexion / volar flexion elbow at 0°, forearm pronated slight shoulder flexion/abduction	cannot perform volitionally limited active range of motion full active range of motion, smoothly	0	1	2
Circumduction elbow at 90°, forearm pronated shoulder at 0°	cannot perform volitionally jerky movement or incomplete complete and smooth circumduction	0	1	2
	Total B (max 10)			

C. HAND support may be provided at the elbow to keep 90° flexion, no support at the wrist, compare with unaffected hand, the objects are interposed, active grasp		none	partial	full
Mass flexion from full active or passive extension		0	1	2
Mass extension from full active or passive flexion		0	1	2
GRASP				
a. Hook grasp flexion in PIP and DIP (digits II-V), extension in MCP II-V	cannot be performed can hold position but weak maintains position against resistance	0	1	2
b. Thumb adduction 1-st CMC, MCP, IP at 0°, scrap of paper between thumb and 2-nd MCP joint	cannot be performed can hold paper but not against tug can hold paper against a tug	0	1	2
c. Pincer grasp, opposition pulpa of the thumb against the pulpa of 2-nd finger, pencil, tug upward	cannot be performed can hold pencil but not against tug can hold pencil against a tug	0	1	2
d. Cylinder grasp cylinder shaped object (small can) tug upward, opposition of thumb and fingers	cannot be performed can hold cylinder but not against tug can hold cylinder against a tug	0	1	2
e. Spherical grasp fingers in abduction/flexion, thumb opposed, tennis ball, tug away	cannot be performed can hold ball but not against tug can hold ball against a tug	0	1	2
	Total C (max 14)			

D. COORDINATION/SPEED, sitting, after one trial with both arms, eyes closed, tip of the index finger from knee to nose, 5 times as fast as possible		marked	slight	none
Tremor		0	1	2
Dysmetria	pronounced or unsystematic slight and systematic no dysmetria	0	1	2
		≥ 6s	**2 - 5s**	**< 2s**
Time start and end with the hand on the knee	6 or more seconds slower than unaffected side 2-5 seconds slower than unaffected side less than 2 seconds difference	0	1	2
	Total D (max 6)			

TOTAL A-D (max 66)	

H. SENSATION, upper extremity eyes closed, compared with the unaffected side		**anesthesia**	**hypoesthesia or dysesthesia**	**normal**
Light touch	upper arm, forearm palmary surface of the hand	0 0	1 1	2 2
		less than 3/4 correct or absence	**3/4 correct or considerable difference**	**correct 100%, little or no difference**
Position small alterations in the position	shoulder elbow wrist thumb (IP-joint)	0 0 0 0	1 1 1 1	2 2 2 2
			Total H (max12)	

I. PASSIVE JOINT MOTION, upper extremity, sitting position, compare with the unaffected side				**J. JOINT PAIN** during passive motion, upper extremity		
	only few degrees (less than 10° in shoulder)	decreased	normal	pronounced pain during movement or very marked pain at the end of the movement	some pain	no pain
Shoulder						
Flexion (0° - 180°)	0	1	2	0	1	2
Abduction (0°-90°)	0	1	2	0	1	2
External rotation	0	1	2	0	1	2
Internal rotation	0	1	2	0	1	2
Elbow						
Flexion	0	1	2	0	1	2
Extension	0	1	2	0	1	2
Forearm						
Pronation	0	1	2	0	1	2
Supination	0	1	2	0	1	2
Wrist						
Flexion	0	1	2	0	1	2
Extension	0	1	2	0	1	2
Fingers						
Flexion	0	1	2	0	1	2
Extension	0	1	2	0	1	2
Total (max 24)				**Total** (max 24)		

A. UPPER EXTREMITY	/36
B. WRIST	/10
C. HAND	/14
D. COORDINATION / SPEED	/ 6
TOTAL A-D (motor function)	/66

H. SENSATION	/12
I. PASSIVE JOINT MOTION	/24
J. JOINT PAIN	/24

ANNEXURE:V

MODIFIED ASHWORTH SCALE

- 0: No increase in muscle tone
- 1: Slight increase in muscle tone, with a catch and release or minimal resistance at the end of the range of motion when an affected part(s) is moved in flexion or extension
- 1+: Slight increase in muscle tone, manifested as a catch, followed by minimal resistance through the remainder (less than half) of the range of motion
- 2: A marked increase in muscle tone throughout most of the range of motion, but affected part(s) are still easily moved
- 3: Considerable increase in muscle tone, passive movement difficult
- 4: Affected part(s) rigid in flexion or extension

ANNEXURE: VI

BRUNNSTROM STAGES OF RECOVERY

Stage	CHARECTERISTICS ARM	HAND
1	Flaccidity: Inability to perform any movements	No hand function
2	Beginning development of spasticity; limb synergies or some of their components begin to appear as associated reactions	Gross grasp beginning; minimal finger flexion possible.
3	Spasticity increasing; synergy patterns or some of their components can be performed voluntarily	Gross grasp, hook grasp possible; no release
4	Spasticity declining; movement combinations deviating from synergies are now possible	Gross grasp present; lateral prehension developing; small amount of finger extension and some thumb movement possible.
5	Synergies no longer dominant; more movement combinations deviating from synergies performed with greater ease.	Palmar prehension, spherical and cylindrical grasp and release possible
6	Spasticity absents except when performing rapid movements; isolated joint movements performed with ease.	All types of prehension, individual finger motion and full range of voluntary extension possible

ANNEXURE:VII

MMSE SCALE

Mini-Mental State Examination (MMSE)

Patient's Name:_____ Date:_____

Instructions: Ask the questions in the order listed.
Score one point for each correct response within each question or activity.

Maximum Score	Patient's Score	Questions
5		"What is the year? Season? Date? Day of the week? Month?"
5		"Where are we now: State? County? Town/city? Hospital? Floor?"
3		The examiner names three unrelated objects clearly and slowly, then asks the patient to name all three of them. The patient's response is used for scoring. The examiner repeats them until patient learns all of them, if possible. Number of trials:_____
5		"I would like you to count backward from 100 by sevens." (93, 86, 79,72, 65, …) Stop after five answers. Alternative: "Spell WORLD backwards." (D-L-R-O-W)
3		"Earlier I told you the names of three things. Can you tell me what those were?"
2		Show the patient two simple objects, such as a wristwatch and a pencil, and ask the patient to name them.
1		"Repeat the phrase: 'No ifs, ands, or buts.'"
3		"Take the paper in your right hand, fold it in half, and put it on the floor." (The examiner gives the patient a piece of blank paper.)
1		"Please read this and do what it says." (Written instruction is "Close your eyes.")
1		"Make up and write a sentence about anything." (This sentence must contain a noun and a verb.)
1		"Please copy this picture." (The examiner gives the patient a blank piece of paper and asks him/her to draw the symbol below. All 10 angles must be present and two must intersect.) 
30		**TOTAL**

INTERPRETATION OF THE MMSE

Method	Score	Interpretation
Single Cut off	<24	Abnormal
Range	<21 >25	Increased odds of dementia Decreased odds of dementia
Education	21 <23 <24	Abnormal for 8th grade education Abnormal for high school education Abnormal for college education
Severity	24-30 18-23 0-17	No cognitive impairment Mild cognitive impairment Severe cognitive impairment

INTERPRETATION OF THE MMSE SCORE

Score	Degree of Impairment	Formal Psychometric Assessment	Day-to-Day Functioning
25-30	Questionably significant	If clinical signs of cognitive impairment are present, formal assessment of cognition may be valuable	May have clinically significant but mild deficits. Likely to affect only most demanding activities of daily living.
20-25	Mild	Formal assessment may be helpful to better determine pattern and extent of deficits.	Significant effect. May require some supervision, support and assistance.
10-20	Moderate	Formal assessment may be helpful if there are specific clinical indications.	Clear impairment. May require 24-hour supervision.
0-10	Severe	Patient not likely to be testable.	Marked impairment. Likely to require 24-hour supervision and assistance with

ANNEXURE: VIII

MASTER CHART

GROUP	AGE/GENDER	BRUNNSTROM STAGE	MAS SCORE		FMA-UE SCORE	
			PRE	POST	PRE	POST
1	46/M	4	2	2	24	27
1	59/M	2	2	2	27	30
1	54/F	4	3	2	33	35
1	50/M	2	2	2	21	25
1	47/F	4	2	1	31	33
1	60/F	4	3	2	34	36
1	46/M	2	1	1	18	19
1	58/M	2	2	2	19	21
1	50/F	4	2	2	21	22
1	50/M	3	3	2	27	28
1	60/M	2	2	1	29	31
1	43/F	3	2	2	25	29
1	47/F	3	2	2	18	22
1	42/M	3	2	2	27	31
1	60/F	2	2	1	21	25
2	41/F	3	3	1	34	41
2	51/F	2	2	1	25	39
2	45/M	3	2	2	21	33
2	41/M	4	3	1	15	25
2	60/M	4	2	1	15	27
2	40/M	2	3	2	34	47
2	51/F	4	2	1	27	35
2	51/M	4	2	1	23	28
2	56/M	3	3	1	17	22
2	49/F	2	2	2	21	35
2	55/F	3	2	1	20	28
2	54/M	3	2	1	22	33
2	54/M	3	3	1	23	29
2	58/F	3	2	2	19	26
2	51/F	3	2	1	15	20

• KEY TO MASTERCHART –

GROUP 1 – Control group,
GROUP 2 – Experimental group
FMA-UE- Ful Meyer Assessment Upper Extremity
MAS – Modified Ashworth Scale

ANNEXURE: IX

THRIVE Handy Massager MD-01

Product Brochure

■ *Key Features*

• Compact and lightweight hand massager.
• Two vibration modes (Fast & Slow) for customizable relief.
• Flexible vibration head adapts to different body parts.
• Ideal for relieving stiffness and promoting relaxation.

■■ *Specifications*

Power Supply	AC 100 V, 50/60 Hz, 10 W
Vibration Speed	Fast: ~6,700 vibrations/min Slow: ~5,200 vibrations/min
Rated Usage Time	Approx. 20 minutes
Dimensions	Length ~30 cm; Head diameter ~6 cm
Weight	~420 g
Power Cord Length	~2 meters
Material	Body: PC resin; Head: EVA resin
Certification	Medical Device Certification No. 226AKBZX00050A01

■■ *Safety & Usage Notes*

• Do not use continuously for more than 20 minutes.
• Avoid use on wet skin or near water.
• Not recommended for individuals with pacemakers or certain medical conditions without consulting a doctor.
• Keep out of reach of children.

■ *Package Includes*

• THRIVE MD-01 Handy Massager
• User Manual
• Warranty Card

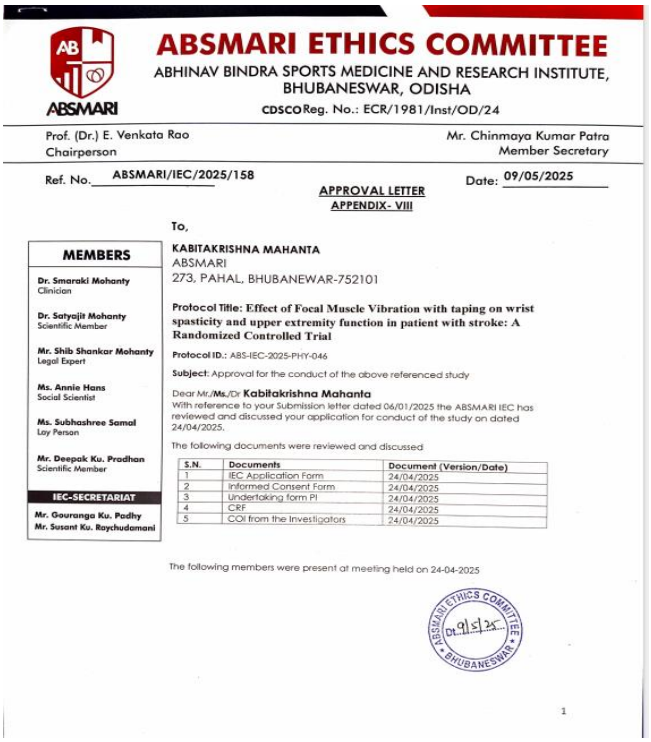
■ *Benefits*

• Portable and easy to use at home or office.
• Helps relieve muscle fatigue and stiffness.
• Lightweight design suitable for daily use.

Manufacturer: THRIVE Japan
Category: Electric Hand Massager

ANNEXURE : X

ETHICAL CLEARANCE



ABSMARI ETHICS COMMITTEE

ABHINAV BINDRA SPORTS MEDICINE AND RESEARCH INSTITUTE, BHUBANESWAR, ODISHA

CDSCO Reg. No.: ECR/1981/Inst/OD/24

Prof. (Dr.) E. Venkata Rao
Chairperson

Mr. Chinmaya Kumar Patra
Member Secretary

Ref. No. ABSMARI/IEC/2025/158 Date: 09/05/2025

APPROVAL LETTER
APPENDIX- VIII

To,

KABITAKRISHNA MAHANTA
ABSMARI
273, PAHAL, BHUBANEWAR-752101

MEMBERS
Dr. Smaraki Mohanty, Clinician
Dr. Satyajit Mohanty, Scientific Member
Mr. Shib Shankar Mohanty, Legal Expert
Ms. Annie Hans, Social Scientist
Ms. Subhashree Samal, Lay Person
Mr. Deepak Ku. Pradhan, Scientific Member
IEC-SECRETARIAT
Mr. Gouranga Ku. Padhy
Mr. Susant Ku. Raychudamani

Protocol Title: Effect of Focal Muscle Vibration with taping on wrist spasticity and upper extremity function in patient with stroke: A Randomized Controlled Trial

Protocol ID.: ABS-IEC-2025-PHY-046

Subject: Approval for the conduct of the above referenced study

Dear Mr./**Ms.**/Dr **Kabitakrishna Mahanta**
With reference to your Submission letter dated 06/01/2025 the ABSMARI IEC has reviewed and discussed your application for conduct of the study on dated 24/04/2025.

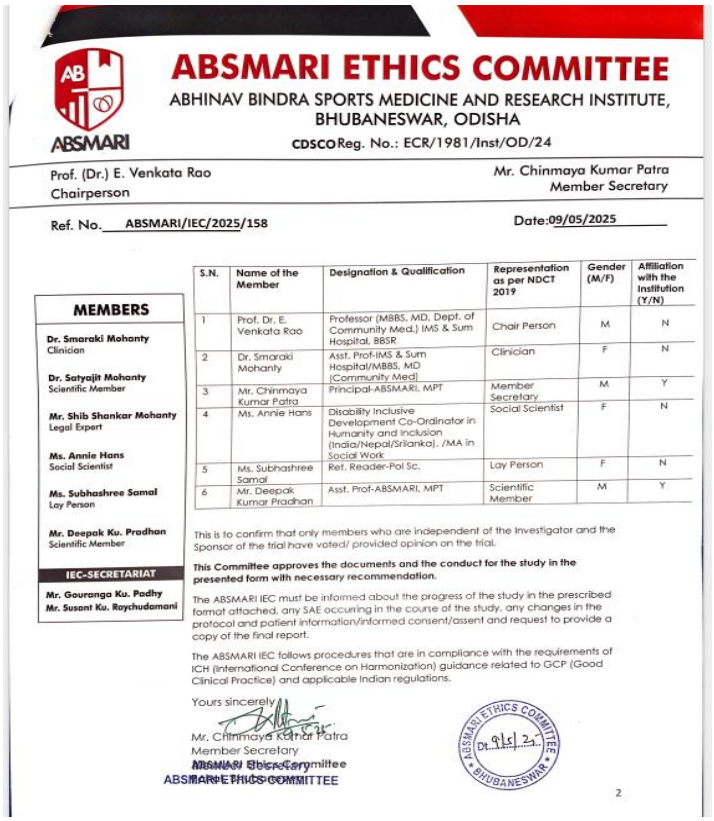
The following documents were reviewed and discussed

S.N.	Documents	Document (Version/Date)
1	IEC Application Form	24/04/2025
2	Informed Consent Form	24/04/2025
3	Undertaking form PI	24/04/2025
4	CRF	24/04/2025
5	COI from the Investigators	24/04/2025

The following members were present at meeting held on 24-04-2025

ABSMARI ETHICS COMMITTEE Dt. 9/5/25 BHUBANESWAR

1



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Member Secretary

Ref. No. ABSMARI/IEC/2025/158 Date:09/05/2025

MEMBERS
Dr. Smaraki Mohanty, Clinician
Dr. Satyajit Mohanty, Scientific Member
Mr. Shib Shankar Mohanty, Legal Expert
Ms. Annie Hans, Social Scientist
Ms. Subhashree Samal, Lay Person
Mr. Deepak Ku. Pradhan, Scientific Member
IEC-SECRETARIAT
Mr. Gouranga Ku. Padhy
Mr. Susant Ku. Raychudamani

S.N.	Name of the Member	Designation & Qualification	Representation as per NDCT 2019	Gender (M/F)	Affiliation with the Institution (Y/N)
1	Prof. Dr. E. Venkata Rao	Professor (MBBS, MD, Dept. of Community Med.) IMS & Sum Hospital, BBSR	Chair Person	M	N
2	Dr. Smaraki Mohanty	Asst. Prof-IMS & Sum Hospital/MBBS, MD (Community Med)	Clinician	F	N
3	Mr. Chinmaya Kumar Patra	Principal-ABSMARI, MPT	Member Secretary	M	Y
4	Ms. Annie Hans	Disability Inclusive Development Co-Ordinator in Humanity and Inclusion (India/Nepal/Srilanka). /MA in Social Work	Social Scientist	F	N
5	Ms. Subhashree Samal	Ret. Reader-Pol Sc.	Lay Person	F	N
6	Mr. Deepak Kumar Pradhan	Asst. Prof-ABSMARI, MPT	Scientific Member	M	Y

This is to confirm that only members who are independent of the Investigator and the Sponsor of the trial have voted/ provided opinion on the trial.

This Committee approves the documents and the conduct for the study in the presented form with necessary recommendation.

The ABSMARI IEC must be informed about the progress of the study in the prescribed format attached, any SAE occurring in the course of the study, any changes in the protocol and patient information/informed consent/assent and request to provide a copy of the final report.

The ABSMARI IEC follows procedures that are in compliance with the requirements of ICH (International Conference on Harmonization) guidance related to GCP (Good Clinical Practice) and applicable Indian regulations.

Yours sincerely

Mr. Chinmaya Kumar Patra
Member Secretary
ABSMARI Ethics Committee

ABSMARI ETHICS COMMITTEE Dt. 9/5/25 BHUBANESWAR

2

ANNEXURE:XI

PLAGARISM AND AI DETECTION

Kabita Krishna Mahanta

Effect of Focal Muscle Vibration with taping on wrist spasticity and upper extremity function in patient with stroke: A Random...

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Odisha University of Health Sciences

Document Details

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9 Pages

3,194 Words

19,548 Characters

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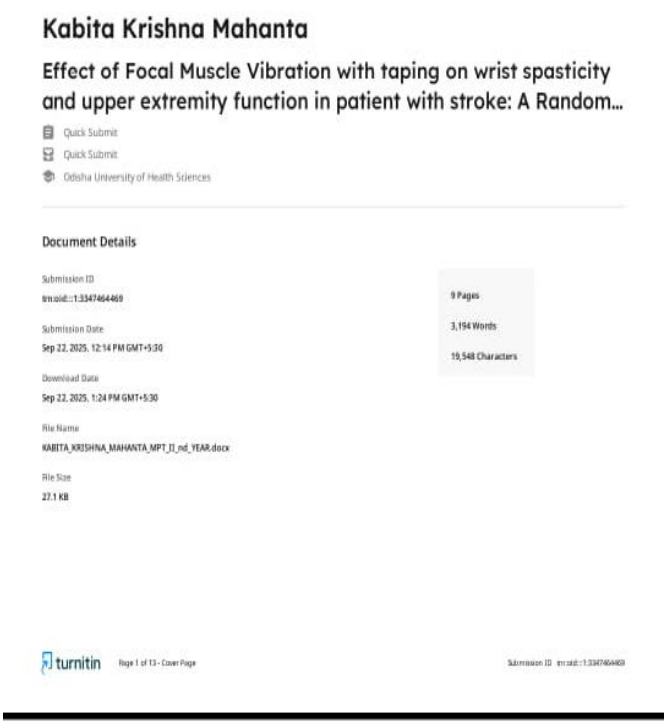
False positives (incorrectly flagging human-written text as AI-generated) are a possibility in AI models.

AI detection scores under 20%, which we do not surface in new reports, have a higher likelihood of false positives. To reduce the likelihood of misinterpretation, no score or highlights are attributed and are indicated with an asterisk in the report (*%).

The AI writing percentage should not be the sole basis to determine whether misconduct has occurred. The reviewer/instructor should use the percentage as a means to start a formative conversation with their student and/or use it to examine the submitted assignment in accordance with their school's policies.

What does 'qualifying text' mean?
Our model only processes qualifying text in the form of long-form writing. Long-form writing means individual sentences contained in paragraphs that make up a longer piece of written work, such as an essay, a dissertation, or an article, etc. Qualifying text that has been determined to be likely AI-generated will be highlighted in cyan in the submission, and likely AI-generated and then likely AI-paraphrased will be highlighted purple.

Non-qualifying text, such as bullet points, annotated bibliographies, etc., will not be processed and can create disparity between the submission highlights and the percentage shown.



Kabita Krishna Mahanta

Effect of Focal Muscle Vibration with taping on wrist spasticity and upper extremity function in patient with stroke: A Random...

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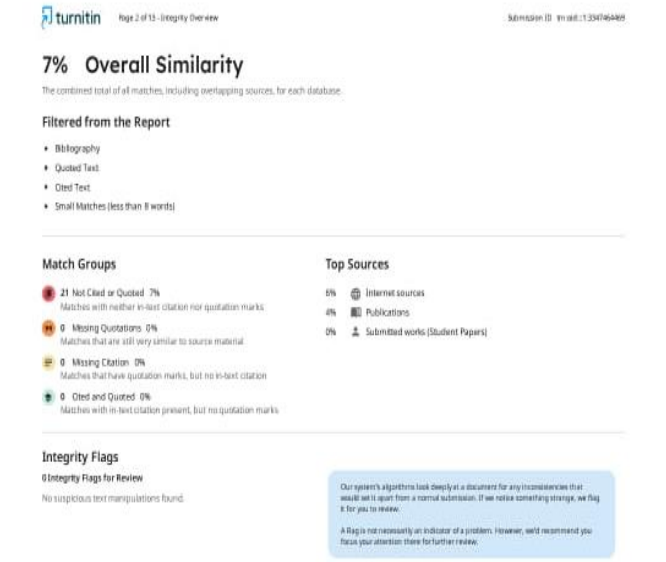

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