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A Comparative Study Of Aarom Exercise With Icing And Aarom Exercise With Prolonged Stretching To Reduce Spasticity In Spastic Cerebral Palsy

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ABSTRACT

Introduction-Increased muscular tone and resistance to movement, which restricts functional mobility and independence, are hallmarks of spastic cerebral palsy (CP). The goals of several therapy approaches are to lessen stiffness and enhance motor results in people with spastic cerebral palsy. The effectiveness of Active-Assisted Range of Motion (AAROM) exercises combined with icing versus AAROM exercises paired with extended stretching in reducing spasticity in patients with spastic cerebral palsy is examined in this study.

Objectives of the Study: The objectives of this comparative study is to find out the effectiveness between the two intervention groups (AAROM with icing vs. AAROM with prolonged stretching) on muscle tone, joint flexibility, and spasticity reduction in calf region using the MAS,ROM,VAS.

Method: The research here is purely experimental. According to the study's inclusion and exclusion criteria, a total of 30 individuals were included, with the age range ranging from 5 to 15 years. The participants were split into two groups. One group was given AAROM exercises with ice, while the other group received AAROM activities with extended stretching for plantarflexors. Both groups were given these exercises three times a week for 45 minutes, and the results were measured after six weeks. Pre- and post-treatment assessments were conducted using ROM, MAS, and VAS.

Result: We used paired and unpaired t-tests as well as an independent t-test for ROM, MAS, and VAS to examine the results. Both groups experience notable improvements, however the control group (GROUP B) that underwent AAROM exercise with extended stretching showed even more remarkable improvements in the value of the outcome measures (MAS score and VAS score) than the experimental group.

Conclusion: This study concludes that both the protocol reduces reduces pain, discomfort, improve mobility and reduces spasticity.But the results suggest that AAROM exercises with prolonged stretching is a more sustainable approach for managing spasticity and have given better effects than Group A.

KEYWORDS: Spasticity; Icing; Stretching; Mobility; Plantar flexor; Cerebral Palsy

INTRODUCTION

Cerebral palsy (CP) is "a group of permanent disorders of the development of movement and posture, causing activity limitation." As a result of non-progressive brain abnormalities in the growing fetus or infant, it manifests. Along with movement deficits, cerebral palsy is often accompanied with seizures and secondary musculoskeletal problems, as well as problems with sensation, perception, cognition, communication, and conduct. In the general population, the estimated prevalence is 2/1000. Activity limits necessitate lifelong individual rehabilitation.[1]

Children who suffer from spastic cerebral palsy (CP) often have white matter lesions.

Nomenclature and classification surveys for cerebral palsy demonstrate that members of the American Academy for Cerebral Palsy desire to adopt a motor classification, with separate categories such as spasticity, athetoid, rigidity, ataxic, atonic, and mixed.[2]

Diplegic spastic CP is the most prevalent kind of cerebral palsy in children born prematurely is cerebral palsy.[3]

Spasticity- Spasticity is a motor disorder characterized by hyperexcitability of the stretch reflex, which causes excessive tendon jerks and a velocity-dependent increase in tonic stretch reflexes.[4]In spasticity, the resistance increases with the speed at which the muscle is stretched. Spasticity results in function impairment and activity limitation.[5]

A neuronal activity imbalance brought on by lesions in the descending motor pathways might result in both good and negative outcomes. One beneficial phenomenon that arises in upper motor neuron syndromes including multiple sclerosis, stroke, and brain injury is spasticity.[3]

Spasticity is characterized by a lack of control over one's motions, aberrant postures, and a generalized reluctance to movement. Muscle length alterations, which may cause contractures and deformities, are a secondary concern that can develop as a consequence of these symptoms.[5]

The balance of inputs from reticulospinal and other descending pathways to the spinal cord's motor and interneural circuits is altered, leading to spasticity.

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NEED OF THE STUDY

Infants with cerebral palsy that are born prematurely most often have spastic diplegic cerebral palsy (Spastic Diplegic Cp). The purpose of this research is to determine if applying ice to AAROM exercises or doing them with extended stretching produces better results in reducing the spasticity of the lower limb's plantar flexor.While AAROM exercises, icing, and prolonged stretching are each used individually in clinical practice, there is limited research on their combined or comparative effects, especially in the context of spastic diplegic cerebral palsy. Therefore, it is important to investigate the specific benefits of two distinct approaches. The purpose of this research was to determine if there is a correlation between the use of ice and extended stretching for the treatment of spasticity and improvements in the child's mobility and quality of life.

AIM OF THE STUDY

This research aims to examine the efficacy of two types of Active Assisted Range of Motion (AAROM) exercises in decreasing spasticity in patients with spastic diplegic cerebral palsy (CP). One kind of exercise uses continuous stretching, while the other uses icing.

STATEMENT OF PROBLEMS

The problem is to determine which combination—AAROM exercises with icing or AAROM exercises with prolonged stretching—is more effective in reducing spasticity, improving mobility, and enhancing the quality of life for individuals with spastic diplegic cerebral palsy. The lack of conclusive evidence makes it challenging for healthcare providers to choose the most appropriate and effective treatment approach, leading to suboptimal therapeutic outcomes. The overarching purpose of this research is to aid clinical practice in the treatment of spasticity in spastic diplegic cerebral palsy by comparing the efficacy of two popular therapy approaches.

OBJECTIVES

Objectives of the Study:
The primary objectives of this comparative study are to:

1. To Compare the impact on range of motion (ROM) and flexibility in the affected muscles in lower limb between the two intervention groups (AAROM with icing vs. AAROM with prolonged stretching).
2. To evaluate effects of AAROM exercises with icing and AAROM exercises with prolonged stretching on muscle tone, joint flexibility, and spasticity reduction in calf region using the Modified Ashworth Scale
3. To provide evidence based recommendations for managing calf spasticity in spastic Diplegic Cp.

HYPOTHESIS

NULL HYPOTHESIS (H_0):

There is no significant difference in the reduction of spasticity, improvement in range of motion between AAROM exercises combined with icing and AAROM exercises combined with prolonged stretching in individuals with spastic diplegic cerebral palsy.

ALTERNATIVE HYPOTHESIS (H_1):

There is a significant difference in the reduction of spasticity, improvement in range of motion between AAROM exercises combined with icing and AAROM exercises combined with prolonged stretching in individuals with spastic diplegic cerebral palsy.

OPERATIONAL DEFINITION

1. **AAROM (Active Assisted Range of Motion) Exercises:**

A type of exercise where the patient actively performs joint movements, but with some assistance from a therapist or equipment, to achieve a greater range of motion. This helps to address joint stiffness and muscle weakness associated with spasticity in cerebral palsy.[9]

2. **Icing (Cryotherapy):**

The application of cold, typically using ice packs, to reduce muscle spasticity and pain. Icing works by constricting blood vessels, reducing inflammation, and temporarily numbing the area, leading to decreased spasticity.[10]

3. **Prolonged Stretching:**

A technique in which a muscle is stretched for an extended period (typically between 30-60 minutes) to promote flexibility and reduce muscle tightness. This approach aims to reduce spasticity by lengthening muscles over time and improving joint range of motion.[11]

4. **Spasticity:**

An abnormal increase in muscle tone resulting in muscle stiffness and tightness. This condition affects the normal movement patterns, causing difficulties in coordination and functional abilities, particularly in individuals with cerebral palsy.[12]

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5. **Spastic Diplegic Cerebral Palsy:**

A form of cerebral palsy where the lower limbs are primarily affected by spasticity, causing difficulty in walking, balance, and coordination. It is characterized by muscle stiffness in the legs, which impacts daily functioning.[13]

6. **Range of Motion (ROM):**

The extent to which a joint can move in various directions, usually measured in degrees. Spasticity can limit ROM in individuals with cerebral palsy, affecting their functional mobility[14]

7. **Modified Ashworth Scale (MAS) -**

People with neurological problems, such cerebral palsy, stroke, or multiple sclerosis, may have their muscular stiffness evaluated using the Modified Ashworth Scale (MAS). A person's level of spasticity or muscle tone may be determined by the amount of resistance they face while passively stretching their muscles. There are a number of levels on the scale that show modest to moderate improvements in muscle tone, ranging from 0 (no increase) to 4 (rigid, fixed contraction).[15]

STUDY DESIGN

This is a Pre and Post-test experimental study to compare AAROM exercise with Icing vs AAROM exercises with prolonged stretching to reduce spasticity in spastic Diplegic Cp."

STUDY SETTING

The max Neurological Rehabilitation facility served as the site of the research.

TARGET POPULATION

The target population are the individuals diagnosed with spastic cerebral palsy (CP) who experience spasticity in lower-limb.Age ranging from 5– 15years.

SELECTION CRITERIA

INCLUSION CRITERIA

- Cerebral palsy child with age: 5 to 15 years of age.
- Male and female child with CP is included.
- Only spastic Diplegic child is included in the study.
- Diagnosed with spasticity in plantarflexors.
- Included the subjects with Modified Ashworth Scale (MAS) Score≥ 2
- The parents approval for consistency in the treatment.

EXCLUSION CRITERIA

- Cp child above 15 years of age will not be included in the study
- MAS scale above 3 Grade will not be included in the study.
- The child with mental retardation, deformity of lower-limb will not be included.
- Severe medical complications, including fracture or recent surgeries.
- Recent surgeries or medication to reduce spasticity

Result

Within Group comparison

(5.1.1) This table shows age distribution within the groups.

GROUPS Table;1	Experimental Group (mean±S.D)	Control group(mean±SD)	TOTAL mean difference±SD
Age(5 To 15 Years)	7.3±2.27	7.1±2.03	0.2±O.24
Standard Error	0.59	0.52	
n	15	15	
t-Value	±2.048		
p Value	0.254		
Result	Not significant		

(5.1.2)Graphs shows age distribution within the group.

Mean value of Pre and Post reading of **ROM** within the group A was 34.80±39.93 and the obtained p value <0.01 is which is highly significant, and group B was 31.720± 35.160 and the obtained p value 0.01 is which is significant respectively.

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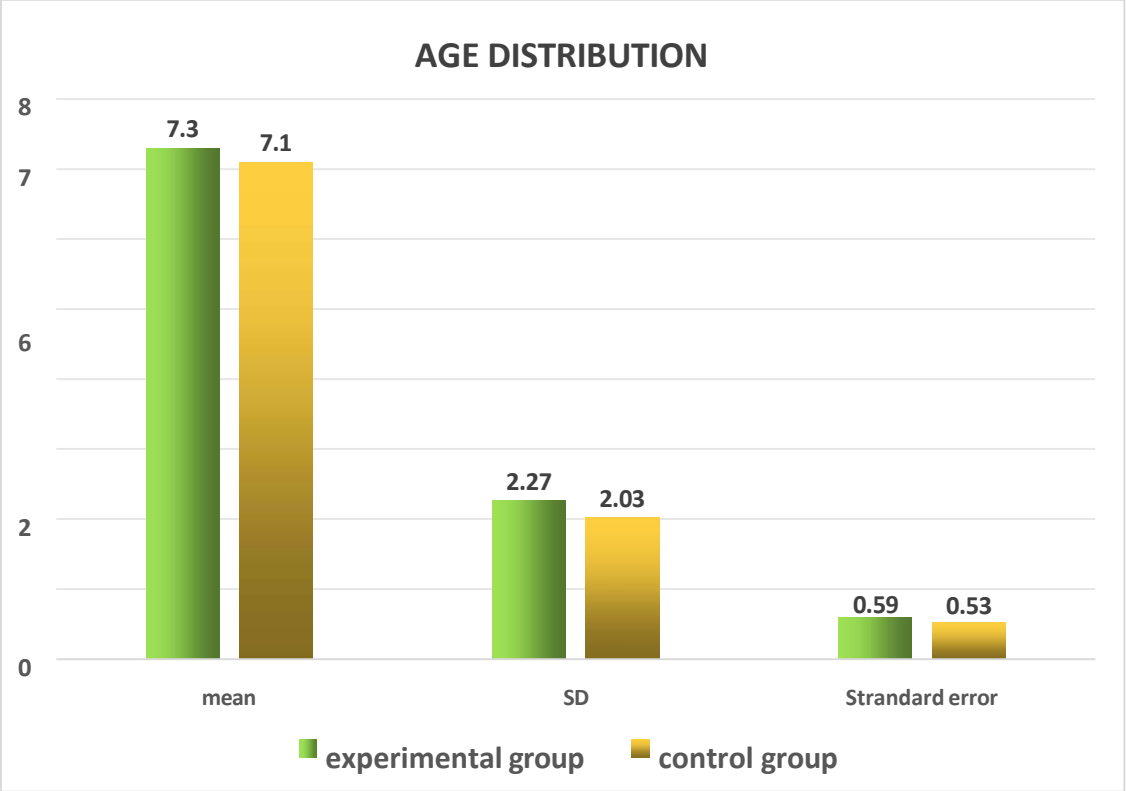
Mean value of Pre and Post reading of **MAS** within the group A 1.67±1.20 was and the obtained p value 0.036 is which is significant, and group B was 1.67± 0.80 and the obtained p value 0.05 is which is significant respectively.

Mean value of Pre and Post reading of **VAS** within the group A was 6.13±2.07 and the obtained p value <0.01 is which is highly significant, and group B was
6.47± 1.60and the obtained p value 0.01 is which is significant respectively.



DISCUSSION

The purpose of this experimental investigation is to determine whether AAROM exercises with icing or extended stretching are more successful in reducing spasticity in patients with spasticity-related diplegia.
It has been observed that AAROM exercises with icing has
shown that positive effects, the value of ROM, MAS, VAS score shown positive changes. Whereas the AAROM exercises with Prolonged stretching shows more positive changes and a better effect and shows significant value<0.01.
Spasticity in CP arises from impaired motor pathways, necessitating interventions targeting neuromuscular control. Musculoskeletal problems might develop in people with CP 22 because spasticity hinders functioning. Elevated muscular tone and hyperactive reflexes are the results of an imbalance in the inhibitory control of higher motor neurons. Of all the muscles, the plantar flexors are the most often afflicted. [23,24,25].

AAROM exercises are foundational in maintaining joint mobility and reducing stiffness. Icing, a cryotherapeutic technique, temporarily reduces spasticity by decreasing nerve conduction velocity and muscle spindle activity. Prolonged stretching, on the other hand, promotes sustained muscle elongation, reducing spastic hyperactivity. While both techniques have physiological bases for reducing spasticity, their comparative effects remain underexplored.

This study's findings align with existing literature suggesting that adjunctive techniques enhance the effectiveness of therapeutic exercises. For example, Farmer et al. (2020) reported that cryotherapy reduces spasticity in short-term interventions, while Bakheit et al. (2018) emphasized the importance of sustained muscle stretching. However, the absence of significant differences between the groups in this study highlights the individualized nature of spasticity management. Factors such as baseline spasticity levels, age, and adherence to therapy likely influence outcomes. Future research should consider these variables and explore longer intervention durations and larger sample sizes.

CONCLUSION

Both AAROM exercises with icing and those with prolonged stretching are effective in managing spasticity in spastic CP patients. While no significant difference was observed between the interventions, both approaches offer valuable

strategies for reducing spasticity and improving functional outcomes.But the results suggest that prolonged stretching is a more sustainable approach for managing spasticity.

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