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The effect of therapeutic massage and stretching exercises on ankle joint flexibility in patients with spastic cerebral palsy

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ABSTRACT

The study aimed to identify the impact of the proposed therapeutic massage and stretching exercises program on the flexibility of the ankle joint among patients with spastic cerebral palsy (SCP). A total of eight females with SCP, aged 10-14 years, underwent the program of exercises through 8 weeks, with 3 sessions per week. The proposed program included therapeutic massage applied to the back, pelvis, legs, and feet in each treatment session for 45 minutes, followed by stretching exercises for the back, pelvis, legs, and feet immediately after the therapeutic massage for a period of 15 minutes. A goniometer was used to measure the flexibility of the ankle joint. The results showed statistically significant differences between the pre- and post-measurements of the sample, in favor of the post-measurements for the study outcome ($p<0.05$). The use of therapeutic massage and stretching exercises for patients with spastic cerebral palsy within a standardized program helps to increase the flexibility of the muscles of the lower extremities and the flexibility of the ankle joint, which improves the functional efficiency of the patient.

KEYWORDS

Therapeutic Massage; Stretching Exercises; Spastic Cerebral Palsy

1. INTRODUCTION

Children with cerebral palsy suffer from movement disorders because of the defect in the brain. This leads to limited movement, imbalance, walking problems and difficulty in carrying out the requirements of daily life. Cerebral palsy (CP) is the most common cause of physical disabilities in children, affecting about 2 per 1,000 births. Spastic cerebral palsy (SCP) is one of the most common movement disorders, as it limits children's ability to walk and their motor efficiency by 80%.

Many medical methods are used for therapeutic purposes, including drug treatment or surgical treatment, in addition to the use of various physiotherapy methods in order to limit the development of the disease, its recovery and rehabilitation Physiotherapy is the most positive way to improve the condition of patients with CP, especially SCP.

Glew et al. (2010) showed that 80% of children with CP have undergone a physical therapy session at some point in their lives. This reduces muscle pain and improves their quality of life. Pointing out the importance of these patients undergoing physical therapy on an ongoing basis. Moreover, Malila et al. (2015) indicate that massage, especially on the back and lower extremities, helps to reduce muscle spasms and thus improve the ability of people with spastic cerebral palsy to carry out the requirements of their daily lives. Liu (2012) add that a significant improvement of (37.40%) for 106 cases of SC, by doing massage for a period of 30 days.

In addition to the effect of physical exercises, especially stretching exercises, on people with CP in relieving muscle pain and helping to improve flexibility, these exercises also prepare them to produce greater strength, which improves their functional performance. The study aims to **i**dentify the impact of the proposed therapeutic massage and stretching exercises program on the flexibility of the ankle joint among patients with SCP.

2. METHODS

2.1. Participants

The study sample consisted of 8 female volunteer patients with lower limb spastic cerebral palsy (between 10-14 years old). Patients with other types of cerebral palsy (such us Athetoid CP, Ataxic CP, and mixed CP) excluded for not meeting the sample requirements, so as not to affect the study results.

2.2. Procedure

Before applying the program, the measurements of ankle joint dorsiflexion were taken positively (without pressure on the foot) and negatively (with pressure on the foot) from a prone position with the knee bent at an angle of 90 degrees. Then, patients individually followed the proposed

program for 8 weeks, with three sessions per week conducted in their homes. It included therapeutic massage applied to the back, pelvis, legs, and feet in each treatment session for 45 minutes, followed by stretching exercises for the back, pelvis, legs, and feet immediately after the therapeutic massage for a period of 15 minutes. Post-measurements were taken after the eighth week, three days after the last session.

Parents were informed about the study procedures, and written informed consent was obtained (ethics approval), after reviewing their medical history.

2.3. Statistical Analysis

Statistical analyses were performed using the SPSS software version 21.0. The variables were investigated using visual (histograms, probability plots) and analytical methods (Kolmogorov-Simirnov/Shapiro-Wilk's test) to determine whether they are normally distributed. Descriptive analyses were presented using means and standard deviations for normally distributed variables. The similarity between the groups in terms of age, weight, height, and dorsiflexion score was assessed using the Paired Samples t test. A p-value less than 0.05 was considered to show a statistically significant result.

3. RESULTS AND DISCUSSION

The following table shows the differences between pre and post measurements of the flexibility of the ankle joint in patients with SCP as a value expressing the effect of the therapeutic massage program (Table 1).

Table 1. T test between pre and post measurements of the flexibility of the ankle joint in patients with SCP

DORSIFLEXION	MEASUREMENTS	N	MEAN	STD	T	P	
LEFT ANKLE JOINT (FREE)	pre	8	147.50	5.55	15.71	0.000	-5.75
	post	8	141.75	5.20			
LEFT ANKLE JOINT (RESISTANCE)	pre	8	141.50	5.13	11.96	0.000	-12.87
	post	8	128.63	5.90			
RIGHT ANKLE JOINT (FREE)	Pre	8	149.00	4.84	12.80	0.000	-6.37
	post	8	142.63	3.89			
RIGHT ANKLE JOINT (RESISTANCE)	pre	8	141.25	4.23	17.89	0.000	-12.62
	post	8	128.63	4.34			

The results presented in the table indicate that the calculated *t* value for the angle of the right ankle joint during free adduction and abduction movement reached 15.71 degrees, with a significance level of 0.000. The calculated *t* value for the angle of the right ankle joint during resisted adduction

and abduction movement reached 11.96 degrees, with a significance level of 0.000. Additionally, the calculated *t* value for the angle of the left ankle joint during free adduction and abduction movement reached 12.80 degrees, with a significance level of 0.000, while the calculated *t* value for the angle of the left ankle joint during resisted adduction and abduction movement reached 17.89 degrees, with a significance level of 0.000. These results demonstrate that there was a significant effect of the program on the post-measurements of ankle joint flexibility in patients with SCP. In other words, statistically significant differences were observed between the pre- and post-measurements of ankle joint flexibility in patients with spastic cerebral palsy, in favor of the post-measurements. The arithmetic mean values indicated better outcomes after the intervention, as shown in Table 1. The greatest difference was observed in the angle of the left ankle joint during free adduction and abduction movement (12.62 degrees), while the smallest difference was observed in the angle of the right ankle joint during free adduction and abduction movement (5.57 degrees).

It should be noted here that the negative sign indicates the largest difference in the range of motion between the position of the foot while its obtuse, that is, in the direction far from the leg relative to its initial position, that make the patient able to perform the movement towards the leg, thus reducing the angle that was large due to the divergence at the beginning of the program.

The researchers believe that the improvement in the sample members in terms of ankle joint flexibility is due to the use of the therapeutic program with all its components, in terms of therapeutic massage and stretching exercises, As the therapeutic massage increases endorphins which is considered a natural sedative, and helps to relax the muscles and their tendons. In addition, massage leads to increase blood circulation and thus an increase in metabolic processes, which leads to an increase in muscle temperature and thus improving its suppleness and relaxation. Also, the improvement of muscle suppleness leads to an improvement in joint flexibility, as one of the factors affecting joint flexibility is the condition of the muscles working on it, so the improvement of its suppleness increases joint flexibility as shown in the results of MacGregor (2009); Hernandez-Reif et al. (2005); Gwen et al. (2010).

In addition, the use of stretching exercises on the back, pelvis, legs and feet led to the dissolution of adhesions between muscles in one area. which led to improving their flexibility, and thus relieving pressure on the nerves between the muscles, which increased their efficiency and functional capabilities, specifically the conduction of nerve signals to and from region. All the above, led to a clear improvement in the study variable as shown in the results of Hanna et al. (2009); Zhao et al. (2009).

4. CONCLUSIONS

In conclusion, the use of therapeutic massage and stretching exercises for patients with spastic cerebral palsy within a standardized program helps to increase the flexibility of the muscles of the lower extremities and the flexibility of the ankle joint, which improves the functional efficiency of the patient. Researchers recommend to use of massage and stretching exercises for patients SCP to improve their functional efficiency

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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