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EXTENDED ABSTRACT

Effect of Proprioceptive Neuromuscular Facilitation on Flexibility Performance Among Male University-Level Handball Players

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I. Introduction

Flexibility is vital for handball athletes to achieve optimal performance and prevent injuries, yet current training approaches often neglect specialized methods. This study investigates the effect of proprioceptive neuromuscular facilitation (PNF) compared to traditional static stretching on flexibility among male university handball players, focusing on shoulders and hamstrings. Addressing limited research on sport-specific flexibility enhancement, the work aims to provide evidence-based recommendations for targeted flexibility training in handball.

II. Methods

Sixteen male handball athletes (18–25 years, injury-free, ≥6 months experience) were divided into groups for a six-week program with three sessions weekly. Each session included a five-minute warm-up, 10–15 minutes of PNF stretching using contract-relax and contract-relax antagonist-contract techniques targeting shoulders and hamstrings, and a five-minute cool-down. Flexibility was assessed pre- and post-intervention using a goniometer and the sit-and-reach test.

III. Results and Discussion

A. Objective 1:

Baseline flexibility measurements showed an overall good range among athletes. The PNF group exhibited slightly higher mean shoulder flexion (174° vs. 171°) and abduction (169° vs. 163°) than the static group. Hamstring sit-and-reach averages were 24.3 cm (PNF) and 21.2 cm (Static). These findings highlight variability in baseline flexibility, particularly in the shoulders. Table 1 below shows the data collected.

B. Objective 2:

After six weeks, only shoulder abduction improved significantly under PNF ($p = 0.021$, $d = 0.725$), while flexion and hamstring measures showed no significant differences between methods. This suggests PNF stretching provides targeted benefits for certain joint motions, likely due to neuromuscular facilitation effects, whereas traditional static stretching yields comparable results for other flexibility measures.

TABLE I
DESCRIPTIVE STATISTICS FOR FLEXIBILITY

Variable	Group	Flexion	Abduction	Sit and reach
N	PNF	16	16	16
	STATIC	16	16	16
Mean	PNF	174	169	24.3
	STATIC	171	163	21.2
Median	PNF	175	169	24.6
	STATIC	171	164	21.1
Standard Deviation	PNF	3.79	6.04	2.64
	STATIC	2.52	2.68	1.12

IV. Conclusions

PNF stretching demonstrated significant improvement in shoulder abduction flexibility compared to static stretching, while other measures showed no clear advantage. These findings suggest integrating PNF into training can selectively enhance joint mobility crucial for handball performance, supporting evidence-based flexibility programs tailored to specific movement demands.

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