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EXTENDED ABSTRACT

Acute Effect of a Combined Warm-up and Kinesio Tape Application for Muscle Flexibility Among Amateur Badminton Players

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I. INTRODUCTION

Flexibility is one of the critical factors in sports performance, particularly in dynamic and multidirectional sports such as badminton. Increased flexibility affects to increases the range of motion (ROM), reduces muscle stiffness, and avoids injury through sudden, repetitive movements [1]. Among these various aids used to enhance flexibility, warm-up exercises and Kinesio Taping (KT) are globally used by athletes and sports professionals.

Dynamic and sport-specific warm-up has been known to increase muscle temperature, enhance neuromuscular efficiency, and enhance temporary joint mobility [2]. Specifically, dynamic warm-up exercises entail active mobilization of the muscle that is similar to sport-specific actions, which have been known to contribute greater muscle flexibility improvements than static stretching [2]. This is particularly so in badminton, where agility and quick movement are paramount.

Kinesio Tape, however, is claimed to increase blood flow, proprioception, and facilitate activation of the muscle, thus assisting with improved functional performance and range of motion [3]. KT interventions can prevent muscle soreness, enhance joint mobility, and enhance general physical preparedness when applied in the correct manner [3]. While KT alone has been unclear as a record highlighting improvement in flexibility, its application with warm-up exercises may record greater enhancements by maintaining muscle readiness and proprioceptive stimulation throughout exercise [4].

The combined effect of KT and warm-up on muscle flexibility remains unclear. This research investigates their combined effect of specific and dynamic warm-up on muscle flexibility among amateur badminton players to optimize pre-performance strategies.

II. METHODS

A. Subjects

The study involved twelve amateur badminton players (*N* = 12) from UiTM and the badminton community around Seremban 2. Participants were randomly assigned to two intervention groups. The experimental groups: Dynamic warm-up with KT (Dwu) and specific warm-up with KT (Swu). Both groups will perform the research procedure on separate days. Before participation, written informed consent was obtained from all participants, ensuring voluntary involvement in the study. The inclusion criteria are that all participants must have engaged in badminton activity at least twice a week and absence of upper and lower extremities injuries in the six months preceding the study.

B. Instrumentation

Muscle flexibility was assessed by the sit and reach test procedure, a validated tool for measuring hamstring and lower back flexibility [1]. Kinesio Tape (KT) was applied to the shoulder following the standardized taping method suggested by the physiotherapist regarding the KT protocols.

C. Procedure

Participants were randomly assigned to either a dynamic or specific warm-up group. Both groups received a Kinesio Tape (KT) that was applied to the shoulder region following standardized taping techniques and needed to complete a Sit and Reach Test procedure for pre-muscle flexibility measurement, followed by the warm-up routine based on their own respective group. After completing the assigned test and warm-up, participants engaged in a brief match simulation to maintain elevated muscle temperature. The post-test flexibility was reassessed using the sit and reach test.

D. Statistical Analysis

A quasi-experimental design was used to compare the effects of a combined warm-up and kinesio tape application for muscle flexibility among amateur badminton players from the UiTM student and the badminton community around Seremban 2. Performance data were collected using the sit and reach test.

Before analysis, the dataset was screened for missing or inconsistent values, and basic data cleaning procedures were performed. Statistical analysis was conducted using Jamovi 2.3.28. Within-group changes in Sit-and-Reach scores were examined with paired-samples t-tests to compare different changes of pre- and post-test in the group, and the between-group post-test differences were assessed with independent-samples t-tests to compare the differences in changes between groups.

III. RESULTS

The results revealed a significant effect of both the pre- and post-warm-up intervention on muscle flexibility. According to Table 1, the dynamic warm-up group showed a 4.2 cm improvement in flexibility (M= 37.7 to M= 41.9), indicating a statistically significant effect (p = 0.015). The combination of dynamic warm-up and kinesio tape likely enhanced muscle temperature, proprioception, and elasticity.

Furthermore, Table 2 demonstrated a slightly greater gain of 4.4 cm (M = 41.9 to M = 46.3), with very strong statistical significance (p < 0.001). This suggests that targeted, sport-specific exercises, when combined with kinesio tape, more effectively activate key muscle groups, enhancing flexibility and neuromuscular readiness relevant to badminton performance.

In contrast, Table 3 revealed that the dynamic warm-up group had a higher post-test mean score (M = 46.3) than the specific group (M = 41.9). However, the specific group had much higher variability (SD = 6.28), while the dynamic group was more consistent (SD = 2.36). Although the specific group outperformed the dynamic group slightly, the difference (p = 0.135) was not statistically significant revealed that the study failed to reject the null hypothesis; the difference in post-test flexibility between the two warm-up types is not large enough to be considered statistically meaningful.

TABLE I
PRE AND POST TEST MUSCLE FLEXIBILITY SCORES FOR THE DYNAMIC WARM-UP GROUP

Variables	N	Mean	SD	*p* value
Pre-Muscle Flexibility	6	37.7	6.44	0.015
Post Muscle Flexibility	6	41.9	6.28	

TABLE II
PRE AND POST TEST MUSCLE FLEXIBILITY SCORES FOR THE STATIC WARM-UP GROUP

Variables	N	Mean	SD	*p* value
Pre-Muscle Flexibility	6	41.9	2.13	0.001
Post Muscle Flexibility	6	46.3	2.36	

TABLE III
COMPARISON BETWEEN THE DYNAMIC AND SPECIFIC WARM-UP GROUPS

	Group	N	Mean	SD	*p* value
Post Muscle Flexibility	Dynamic	6	46.3	2.36	0.0135
	Specific	6	41.9	6.28	

IV. DISCUSSION

This study revealed that both dynamic and specific warm-ups combined with kinesio tape significantly improved muscle flexibility, with specific warm-up showing slightly greater gains. The improvement observed in the dynamic warm-up group may be explained by increased muscle temperature and blood flow, which enhance elasticity and joint range of motion [5]. When combined with kinesio tape, which stimulates skin receptors and improves muscle tone and elasticity [6], the result is a synergistic effect promoting flexibility.

The specific warm-up group achieved a larger improvement, consistent with findings that task-specific warm-ups activate neuromuscular pathways more effectively [1]. Kinesio taping may further amplify this response by facilitating targeted muscle engagement and reducing movement resistance [7]. Although the between-group difference was not statistically significant, the practical gains suggest that warm-ups tailored to sport-specific demands can enhance the flexibility effects of kinesio taping.

V. CONCLUSION

Both dynamic and specific warm-ups combined with kinesio tape significantly improved muscle flexibility in amateur badminton players. Although specific warm-up showed slightly greater gains, the difference was not statistically significant. These findings support kinesio taping and warm-up routines as effective, low-cost strategies for flexibility enhancement before play.

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