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THE EFFECT OF KNEE SLEEVE USE ON THE AGILITY OF UNIVERSITY MARTIAL ARTS CLUB STUDENTS

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Abstract

Background: The Health Polytechnic of the Ministry of Health Surakarta provides extracurricular programs to support students' non-academic development, including the Martial Arts Student Activity Unit. Kicking techniques are the dominant component in martial arts and require high agility, defined as the ability to rapidly change direction to evade attacks and execute effective counterattacks. These movements involve repetitive loading of the knee joint, increasing the risk of overuse injury and decreased functional performance. Knee sleeves, made of elastic materials, provide compression and thermal support that may enhance joint function. Previous studies report benefits such as pain reduction, improved proprioception, and increased knee stability.
Aims: To determine the effect of knee sleeve use on agility among students participating in the Martial Arts Student Activity Unit.
Methods: A true-experimental study using a pre-test and pot-test control group design, in which participants were randomly allocated to groups, with a randomized controlled trial design was conducted involving 32 students, divided into experimental and control groups (n=16 each). Agility was measured using the T-Test. Data were analyzed using paired-sample t-tests to assess within-group pre-post changes and independent-sample t-tests to compare the experimental and control groups.
Results: Agility improved in both groups after the intervention, but the improvement was significantly greater in the knee sleeve group than in the knee sock (control) group (p= 0.031), indicating that knee sleeve use provides an additional benefit for agility beyond that of standard knee socks.
Conclusion: Knee sleeve use has a significant effect on improving agility and may help reduce the risk of overuse injuries during martial arts training.

Keywords: Knee sleeve; Agility; Kicking

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Introduction

Martial arts are a tradition inherited from the ancestors of the Indonesian people and developed to defend against threats to safety and survival. As a martial art discipline that originated and developed within Indonesian social life, it has greatly influenced the philosophy, culture, and personality of the Indonesian people. At present, martial arts are used as an educational tool for the younger generation, with extensive experience in physical training (Nopiyanto & Dimyati, 2018). A player's cognitive ability and performance affect their overall physical condition. One component of physical condition is skill, which reflects a player's efficiency and ability. Therefore, this aspect of physical fitness must be improved to support athletic performance (Khalissyarif & Himawan, 2021).

There are various types of martial arts training methods, particularly at the Poltekkes Surakarta Martial Arts Student Activity Unit (UKM Bela Diri), which implements high-intensity interval training and frequently involves intensive use of the knee joints, surrounding soft tissues, and adjacent muscles. Excessive load on the knee causes tension, and repeated stress can lead to injury (Bhatia et al., 2013). High-intensity exercise results in elevated lactic acid levels in the body, which contribute to fatigue and require time to clear. Slow lactate removal can lead to overuse syndrome in athletes, increasing the risk of injury that may result in temporary or permanent disability (Hidayah, 2018).

Based on the researcher's observations at the Poltekkes Surakarta Martial Arts UKM, a student training facility, the most common knee injuries are overuse injuries. Overuse is defined as a microtraumatic injury to bones, muscles, or tendons caused by repetitive strain without sufficient time for healing or natural repair processes. Symptoms of overuse injuries vary and commonly include pain, difficulty in knee movement, swelling, tenderness, tingling, and numbness, among others. Martial arts athletes, in particular, require continuous training involving repetitive movements, a major cause of overuse injuries. Therefore, during training, many students use knee sleeves (knee pads, knee wraps, etc.) to prevent overuse, similar to athletes in other sports disciplines. This reflects the use of protective equipment to prevent sports injuries (Aicale et al., 2018).

Students use flexible knee sleeves to relieve pain, increase blood circulation during training, and help prevent overuse injuries. Several studies examining knee sleeves and agility have been conducted, with varied results, including those reported in the study; however, no previous research has specifically investigated the relationship between knee sleeve use and agility (Mortaza et al., 2012).

Methods

The study employed a true-experimental pre-test and post-test design. The research was conducted at the Poltekkes Surakarta Martial Arts Student Activity Unit (UKM Bela Diri) in September 2024. The study population consisted of 32 students who were members of the UKM Martial Arts at Poltekkes Surakarta. Participants were selected using a randomized controlled trial (RCT) design, with 16 students assigned to the intervention group and 16 to the control group.

In this study, agility was measured before and after the application of a knee sleeve. The research involved two groups: the intervention group, which used knee sleeves, and the control group, which used knee socks. The research instrument used to measure agility was the T-Test (TPS). Data analysis included a simple paired t-test to assess within-group differences and an independent t-test to compare outcomes between groups.

This study received ethical approval from the Health Research Ethics Committee of Poltekkes Kemenkes Semarang, as indicated by approval number No. 1369/EA/KEPK/2023.

Results

a. Normality Analysis

The Shapiro-Wilk test demonstrated that all variables were normally distributed, with p-values greater than 0.05. Therefore, the assumptions required for parametric statistical analyses were met,

and paired-samples t-tests and independent-samples t-tests were subsequently performed. The results for each variable are presented in table 1.

Table 1. Normality Analysis

Cat	Kolmogorov-Smirnov	Shapiro-Wilk
	Sig.	Sig.
Pre eksperiment	,200	,369
Post eksperiment	,200	,558
Pre control	,200	,686
Post control	,200	,082

Source: Personal Data (2023)

The Shapiro-Wilk test indicated that all four distributions (pre- and post-test scores for both the experimental and control groups) satisfied the assumption of normality, with significance values ranging from 0.082 to 0.686, all exceeding the 0.05 threshold. Because none of the distributions deviated significantly from normality, parametric statistical procedures, namely the paired-sample t-test for within-group comparisons and the independent-sample t-test for between-group comparisons, were considered appropriate and were therefore used in the subsequent analyses.

b. Correlation Test

Based on the normality analysis, which indicated the data were normally distributed, a paired-samples t-test was used for statistical analysis. Paired-samples t-tests demonstrated significant improvements in agility scores between pre- and post-intervention measurements in both groups.

Table 2. Paired Samples T-Test

	N	Correlation	Sig.
Pre eksperiment & Post eksperiment	16	,771	,000
Pre control & Post control	16	,792	,000

Source: Personal Data (2023)

A strong, statistically significant correlation was found between pre- and post-test agility scores in both the experimental group ($r = 0.771$, $n = 16$, $p < 0.001$) and the control group ($r = 0.792$, $n = 16$, $p < 0.001$). The comparable magnitude of the correlation coefficients in both groups suggests that the relative ranking of participants' agility performance remained stable from pre- to post-test, regardless of intervention type. This consistency supports the reliability of the T-Test (TPS) instrument as a measure of agility within this sample and provides a sound basis for proceeding with the paired-sample t-test to evaluate within-group change over time.

c. Homogeneity Analysis

Homogeneity analysis was conducted to confirm that the differences observed in the parametric statistical tests were attributable to between-group differences. A significance value greater than 0.05 indicated that the sample data were homogeneous. The results of the homogeneity analysis are presented in Table 3.

Table 3. Homogeneity Analysis

	Sig.
Based on mean	,448
Based on median	,434
Based on median and with adjusted df	,434
Based on trimmed mean	,429

Source: Personal Data (2023)

Levene's test results showed non-significant values across all four computation methods (based on mean, median, median with adjusted df, and trimmed mean), ranging from 0.429 to 0.448, all well above the 0.05 threshold. This confirms that the variance in agility scores was statistically equal between the experimental and control groups. Satisfying this assumption is methodologically important, as it indicates that any between-group difference identified in the subsequent comparative test can be attributed to the intervention itself rather than to unequal variability or dispersion in the underlying data.

d. Changes in Agility Performance Following the Intervention

As shown in Table 4, both groups demonstrated significant improvements in agility performance following the intervention period. However, the experimental group using knee sleeves showed a larger effect size than the control group, suggesting a greater practical benefit of knee sleeve use.

Table 4. Pre Test – Post Test Analysis

Group	Pre-test Mean ± SD	Post-test Mean ± SD	Mean Difference	p-value	Cohen's d
Control Group	1375.13 ± SD	1107.25 ± SD	267.88	0.018	0.66
Knee Sleeve Group	1502.38 ± SD	1313.50 ± SD	188.88	<0.001	1.36

Source: Personal Data (2023)

The control group demonstrated a significant improvement in agility performance following the intervention period. The mean agility score decreased from 1375.13 at pre-test to 1107.25 at post-test ($p = 0.018$), with a moderate effect size (Cohen's d = 0.66). Similarly, the experimental group that used knee sleeves showed a significant improvement in agility performance. The mean agility score decreased from 1502.38 at pre-test to 1313.50 at post-test ($p < 0.001$). The magnitude of change was large, with a Cohen's d value of 1.36, indicating a substantial practical effect of knee sleeve use on agility performance. These findings suggest that both training interventions improved agility; however, the magnitude of improvement in the knee sleeve group was considerably greater than in the control group.

e. Comparative Test

Comparative analysis was performed using an independent t-test because the sample data were homogeneous. This test was essential to determine differences in the effects of knee sleeves versus knee socks on agility. The results of the comparative test, shown in Table 4, indicate a significant difference in agility between the experimental group using knee sleeves and the control group using knee socks ($p = 0.031$; $p < 0.05$).

Table. 5 Comparative Test

	Sig. (2-tailed)
Equal variances assumed	,031
Equal variances not assumed	,031

Source: Personal Data (2023)

The independent-samples t-test indicated a statistically significant difference in agility improvement between the experimental group, which used knee sleeves, and the control group, which used knee socks, under both the equal-variances-assumed and equal-variances-not-assumed conditions ($p = 0.031$; $p < 0.05$). Because the homogeneity assumption was met, the equal-variances-assumed result is the primary reference for interpretation, and the convergence of both test conditions strengthens confidence in the finding. This between-group difference directly addresses the study's aim: the greater agility gain observed in the knee sleeve group cannot be explained by training exposure alone, since both groups completed an identical training program, but is instead specifically associated with knee sleeve use. This finding is consistent with the premise underlying this study's research gap, namely that the compression and proprioceptive support provided by knee sleeves confer an additional agility benefit beyond what conventional knee socks or training alone can achieve.

Discussion

The present study demonstrated that the use of knee sleeves significantly improved agility among students participating in the Poltekkes Surakarta Martial Arts Student Activity Unit. Statistical analysis showed a significant difference between the experimental and control groups, indicating that the use of knee sleeves contributed positively to agility performance during martial arts activities.

The findings of this study are supported by the large effect size observed in the experimental group (Cohen's d = 1.36), suggesting that the intervention had not only statistical significance but also practical and clinical importance. Although both groups improved agility performance, the greater improvement in the knee sleeve group suggests that knee sleeves may provide additional benefits beyond routine training alone. Several mechanisms may explain these findings. Biomechanically, knee sleeves provide circumferential compression around the knee joint, thereby stimulating cutaneous mechanoreceptors and enhancing proprioceptive feedback. Improved proprioception may enhance joint position awareness, neuromuscular control, and movement efficiency during dynamic activities that involve rapid directional changes and repetitive kicking. These mechanisms are particularly important in martial arts, where agility is essential for both offensive and defensive techniques.

The present findings are consistent with the review by Dzidotor et al. (2024), which concluded that knee sleeve orthoses improve functional performance by enhancing joint stability and sensorimotor control. Likewise, Sharif et al. (2017) reported that knee sleeves improve functional outcomes by increasing proprioceptive input and balance control. Together, these findings suggest that the compression and thermal effects provided by knee sleeves may positively influence movement quality and physical performance. The findings of the present study are also partially supported by Mortaza et al. (2012), who investigated the effects of prophylactic knee braces and neoprene knee sleeves in healthy athletes. Although the authors reported no significant changes in certain physical performance parameters, they suggested that knee sleeves may improve movement perception and provide psychological confidence during sports activities. Enhanced confidence and increased joint awareness may contribute to improved agility performance during high-intensity movements. Furthermore, Moon et al. (2018) demonstrated that wearing a knee sleeve can modify knee biomechanics by reducing excessive knee flexion and abduction during landing activities. Although their study did not directly evaluate agility, improved joint control and reduced unnecessary movements may contribute to greater movement efficiency and potentially reduce the risk of overuse injuries among athletes.

Agility is a multifactorial component of physical fitness that depends on muscular strength, balance, coordination, reaction time, and neuromuscular control. Therefore, the improvement

observed in the experimental group is likely attributable to a combination of training-induced physiological adaptations and the additional sensorimotor benefits of knee sleeve use. From a clinical and practical perspective, knee sleeves may serve as an inexpensive and easily accessible supportive intervention for martial arts athletes. Their use during repetitive, high-intensity training may improve agility performance while simultaneously supporting knee joint stability and potentially reducing the risk of overuse injuries.

Nevertheless, this study has several limitations. The relatively small sample size and short intervention period limit the generalizability of the findings. Future studies should include larger sample sizes, longer follow-up periods, and objective biomechanical assessments, such as electromyography, motion analysis, or proprioceptive testing, to further clarify the mechanisms underlying the beneficial effects of knee sleeve use.

Conclusion and Recommendation

This study demonstrates that the use of knee sleeves significantly improves agility among students in the Poltekkes Surakarta Martial Arts Student Activity Unit. Statistical analysis showed a significant difference in agility between the intervention group using knee sleeves and the control group using knee socks ($p = 0.031$; $p < 0.05$). These findings confirm that the use of knee sleeves positively contributes to agility performance during martial arts training.

The improvement in agility is likely associated with the biomechanical and neuromuscular effects of knee sleeves, including compression, enhanced proprioceptive feedback, and increased joint awareness. These effects may support improved movement control, balance, and efficiency during rapid directional changes, which are critical components of agility in martial arts. Therefore, knee sleeves can be considered a practical supportive device that may enhance physical performance and potentially reduce the risk of overuse injuries among martial arts practitioners.

Based on the findings of this study, knee sleeves are recommended as a supportive intervention during martial arts training, particularly for activities that involve repetitive knee movements and high-intensity actions. Their use may help improve agility performance and support knee joint function among student-athletes.

Future research should involve larger sample sizes and longer intervention periods to further investigate the long-term effects of knee sleeve use. Additionally, future studies may compare different types, materials, or compression levels of knee sleeves and examine their effects on other physical performance components, such as balance, speed, strength, and injury-prevention outcomes. Incorporating biomechanical or neuromuscular measurements would also strengthen the understanding of the underlying mechanisms associated with knee sleeve use.

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