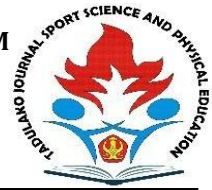




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THE EFFECT OF PAIRED VARIATION EXERCISES ON IMPROVE PASSING ACCURACY AND COORDINATION IN FOOTBALL

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ABSTRAK

The objective of this study is to investigate the effectiveness of paired variation exercises on the accuracy and coordination of passing football among pupils of primary schools. One-group pretest-posttest research design was applied for this study. For the purpose of the study, 30 pupils from elementary school grades 4 and 5 were selected using purposive sampling technique. Tests utilized in this study include short passing accuracy test and passing coordination test. Paired variation exercises made up the treatment done for twelve sessions. Data collected were subjected to statistical analysis by applying normality and homogeneity tests, paired samples t-tests and coefficient of determination. Significant improvements were observed with regards to passing accuracy and passing coordination after the exercise. This was determined by observing the results of paired samples t-test whose significance value was less than 0.05 in both cases. Therefore, it can be concluded that paired variation exercises have statistically significant effects on the passing abilities of students playing football. Furthermore, paired variation exercises are significantly effective in improving passing coordination with coefficient of determination of 82.7%.

Keyword: *Football, Exercises, Paired Variation, Passing Accuracy, and Passing Coordination,*

INTRODUCTION

Football is one of the most popular sports among primary school pupils and is widely taught in PE lessons because it helps to develop fundamental movement skills, particularly manipulative motor skills such as kicking, controlling and passing the ball. At this level, passing skills are important because they form the basis for maintaining possession of the ball, fostering teamwork, and facilitating decision-making during games. According to (Lengkana et al., 2017) mastering fundamental motor skills during childhood is important for children's physical development and future participation in sports. In football, passing is considered one of the main techniques that must be mastered, as it influences the flow and effectiveness of the game (Soniawan & Irawan, 2018). Therefore, passing techniques need to be taught to elementary school students through training methods appropriate to their motor development.

In Sumedang, many elementary school students are interested in football, but struggle to master basic passing techniques. Initial observations conducted at SDN Rancakalong revealed

that some students struggled to direct the ball accurately, adjust their kicking force and coordinate their body movements when passing. Consequently, the ball often failed to reach teammates or deviated from the intended target. These problems are closely related to children's motor coordination, which is still developing (Fauzi et al., 2023). In addition, football learning activities in schools still frequently rely on conventional instructional methods and repetitive drills, in which students perform the same movements repeatedly without engaging in meaningful gameplay. According to (Education, 2014) a lack of variation in repetitive technical drills may reduce students' motivation and active involvement in learning activities. Consequently, students' passing accuracy and coordination skills may not develop optimally.

The limitations of conventional football teaching methods highlight the need for more innovative and student-centred pedagogical approaches in physical education. Elementary school students tend to learn movement skills more effectively through active, enjoyable and varied learning experiences. Recent studies have shown that game-based and student-centred learning approaches can improve motor skill development, student engagement and tactical understanding more effectively than traditional technique-based instruction (Greve et al., 2022) explained that interactive and game-based learning approaches can improve students' technical skills, participation and tactical understanding in sports learning. In addition, varied learning activities help students to stay motivated and reduce boredom during practice sessions. Therefore, football training requires methods that emphasise not only repetitive technical exercises, but also the creation of dynamic learning situations that resemble real game conditions. From the perspective of contemporary sports pedagogy, peer interaction and feedback are considered important learning components because they encourage active engagement, self-reflection, and collaborative problem-solving during physical activities. (Casey et al., 2018) argue that student-centred learning approaches involving peer communication and shared decision-making can enhance technical skill acquisition and learning motivation in physical education contexts. Implementing passing exercises with targets, triangle passing, passing with obstacles, one-touch passing and small-sided games allows students to improve their coordination, concentration and adaptability during football matches. These varied activities are expected to make learning more enjoyable and effective for primary school pupils.

Several previous studies have examined football passing training using different approaches. For example, research conducted by Irawan et al. (2019) found that drill methods significantly improved the ability to pass using the inside foot, outside foot and instep techniques. (Reiza & Sumartiningsih, 2024) also reported that back-pass training methods improved short passing accuracy among football school players. Furthermore, (Wicaksana et al., 2021) demonstrated that rondo games and give-and-go passing drills enhance passing accuracy among young football players. Other studies have also emphasised the significant contribution of eye-foot coordination to passing performance in football (Fahrizqi et al., 2018). However, most previous studies have focused on drill training methods, tactical game approaches or adolescent football players. Research specifically examining the effect of paired variation exercises on passing accuracy and coordination among primary school students is limited. Therefore, this study aims to analyse the effect of paired variation exercises on improving passing accuracy and coordination in football games among elementary school students at SDN Rancakalong in Sumedang.

METHOD

In the above investigation, the research methodology used was quantitative, which had a single group experiment using a pretest-posttest method. The study was about the effect of paired variations exercises on accuracy and coordination among footballers at primary schools. The treatment consisted of 12 sessions of paired variation exercises. The subjects of this research were 30 children enrolled in grade 4 and 5 in SDN Rancakalong, Sumedang, who were selected

by purposive sampling method based on the criteria as follows: (1) actively involved in physical education, (2) physical health status in order to participate in football training, and (3) basic skills in playing football, especially passing skill. There were 18 male students and 12 female students; their age ranged from 9 to 11 years old.

The data were gathered using passing accuracy and passing coordination test. For passing accuracy test, a short passing test which is adapted from (Persiwu & Jatiyoso, n.d.) was used. The test involved making students kick the ball to the targeted goal at an allocated distance. Students were given four trials where each trial involved kicking the ball using their strong leg to the targeted goal and scored 15 points for successful kicks otherwise zero points for non-successful attempts. Passing coordination was tested by the David Lee Soccer Test, which is designed by the Australian Soccer Federation (Löwe et al., 2022). This test involves doing various exercises including juggling the ball, dribbling between cones, short passing and finishing all as fast as possible. The coordination measuring tool had high validity values of 0.963 to 0.998, along with Cronbach's alpha reliability value of 0.989.

Training Type	Sets	Repetitions	Rest Interval	Duration
Paired Passing & Target Passing	3	10 reps	60 sec	60 min
Triangle Passing & Obstacle Passing	3	12 reps	60 sec	60 min
One-touch Passing	4	10 reps	45 sec	60 min
Small-sided Games (3v3 & 4v4)	4	8 mins/game	2 mins	60 min

Table. 1 Paired Variation Exercise Programme Conducted During the Intervention Sessions.

Statistical analysis of data gathered was done using SPSS software. Normality and homogeneity testing were conducted followed by paired samples t-test which is used to find out the significance of the effect of intervention while R-square coefficients were used to measure the contribution of paired variations exercises to increased accuracy of passing and coordination. Coordination in passing was assessed using the David Lee Soccer Test designed by the Australian Soccer Federation. This test involved several tasks such as ball juggling, dribbling between eight cones, short passes, long passes and ball control tasks prior to arrival in the finish zone. Participants were judged based on the shortest time taken during performance of the test recorded in seconds. Two attempts per participant were conducted and best results selected.

Categories	Performance
Excellent	< 34.81 seconds
Good	40.78-34.81 seconds
Enough	46.76-40.79 seconds
Less	52.73-46.77 seconds
Less than once	> 52.73 seconds

Table. 2 David Lee Proficiency Test Development Assessment Scale

Sources: (Irianto et al., 2024)

Analysis of the collected data was done using IBM SPSS Statistics version 26. The statistical tool of choice to analyse and describe the data was descriptive statistics. This entailed computing the mean and standard deviation of the data. Before carrying out the hypotheses testing, necessary tests were run to verify whether the data fit the conditions required to carry out parametric testing. In this case, these preliminary tests included the Shapiro-Wilk normality test and homogeneity test. Paired samples t-test was used to conduct hypotheses testing in order to test the differences in pre-test and post-test. The value of significance chosen for testing was set to less than $p = 0.05$.

RESULTS

There was an increase in passing accuracy and coordination among the students after engaging in the paired variation exercise program. For the passing accuracy variable, the mean pre-test score was less compared to the mean post-test score, which shows improvement on the part of the students on directing the ball to its target after the intervention. Furthermore, for the passing coordination variable, the mean post-test score performed better compared to the pre-test score, demonstrating improvement on the part of the students in terms of coordinating the passing in football.

According to the Shapiro-Wilk normality test, the pre-test and post-test scores of the variables of passing accuracy and coordination were normally distributed since the significance value was more than 0.05. On the other hand, according to the result of the homogeneity test, the data variance was homogeneous. From the results of paired-samples t-test, it is clear that there is a significant influence of paired variation exercises on passing accuracy. It is shown that the significance level was $p < 0.001$, which suggests that there was a meaningful difference between the pre-test and post-test scores. In addition, the contribution of paired variation exercises in the improvement of passing accuracy through coefficient of determination was found to be 68.7%. In connection with passing coordination, it is evident from the paired-samples t-test results that there was a significant improvement in passing coordination through paired variation exercises. This is because the obtained significance level was $p < 0.001$, suggesting that there was a significant difference in passing coordination in the pre-test and post-test scores of students.

Passing accuracy

Passing accuracy is a fundamental football skill because it is closely related to ball possession and teamwork. In this study, passing accuracy was measured before and after the intervention to determine improvement in students' abilities.

Description	Pre-test	Post-test
N	30	30
Mean	3.7667	12.6333
Std. Deviation	1.33089	1.40156
Kolmogorov-Smirnov Z	1.192	0.930
Sig.	0.116	0.352

Table 3. Normality Test of Passing Accuracy

Based on the Kolmogorov-Smirnov normality test results, the significance values for the pre-test and post-test passing accuracy data were 0.116 and 0.352, respectively. Since both significance values were higher than 0.05, the data were normally distributed. Therefore, the paired-samples t-test was considered appropriate for hypothesis testing.

Mean Difference	t	df	Sig.	R Square
-8.86667	-27.052	29	0.000	0.19

Table 4. Passing Accuracy Hypothesis Test

Based on the results of the paired-samples t-test, a significance value of 0.000 ($p < 0.05$) was obtained, indicating a statistically significant difference in passing accuracy scores between the pre-test and post-test. Therefore, it can be concluded that the paired variation exercise programme significantly improved students' passing accuracy. The mean difference value of -8.86667 indicates that post-test scores were higher than pre-test scores following the intervention programme. The negative value reflects the direction of improvement between the two measurements. Furthermore, the calculated t-value of -27.052 demonstrates that the

improvement in passing accuracy was highly statistically significant. The mean post-test scores were significantly higher than the mean pre-test scores. The margin of error representing the standard deviation also showed a consistent increase in passing accuracy among students who participated in the training program.

Passing coordination

Passing coordination is the ability to integrate body movements, particularly the coordination between visual control and foot movements, when passing. This ability is important in football because it supports effective and accurate passing during the game.

Variable	N	Sig.
Pre-test	30	0.114
Post-test	30	0.380

Table 5. Normality Test of Passing Coordination

Based on the results of the normality test, the significance values for the pre-test and post-test were 0.114 and 0.380, respectively. As both values were greater than 0.05, it can be concluded that the passing coordination data were normally distributed. Therefore, the data met the assumptions required for parametric statistical analysis.

Mean Difference	t	df	Sig. (2-tailed)
-3.10000	-9.820	29	0.000

Table 6. Paired-Samples T-Test of Passing Coordination

The results of the paired-samples t-test showed a significance value of 0.000 ($p < 0.05$), indicating a significant difference in passing coordination between the pre-test and post-test scores. These findings demonstrate that paired variation exercises significantly improved students' passing coordination. A mean difference value of -3.10000 indicates that the post-test score was lower than the pre-test score. In the David Lee Soccer Test, lower completion times indicate better coordination performance. Therefore, the decrease in scores after the exercises were implemented reflects an improvement in students' coordination abilities. Furthermore, the calculated t-value of -9.820 showed that the difference between the pre- and post-test scores was statistically significant. The results of the coefficient of determination analysis showed an R-square value of 0.827, indicating that 82.7% of the improvement in passing coordination was influenced by the paired variation exercise programme, while the remaining 17.3% was influenced by factors outside the scope of the study. Additionally, the correlation coefficient ($R = 0.909$) revealed a strong positive relationship between the exercises and improvements in passing coordination.

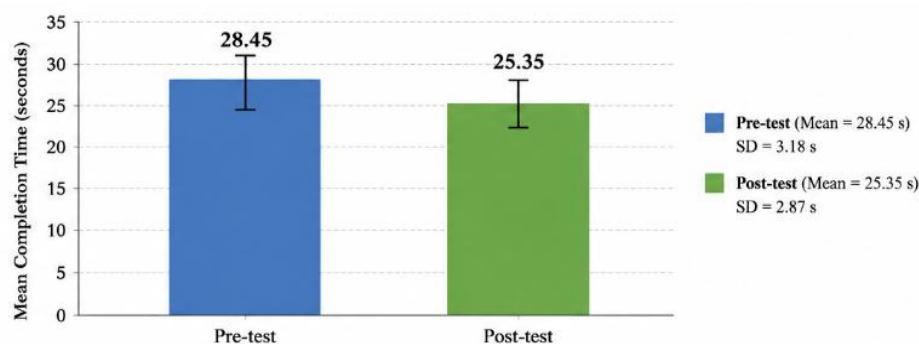


Figure 1. Comparison of Pre-test and Post-test Mean Completion Time in the David Lee Soccer Test (Lower Time Indicates Better Performance)
Error bars represent standard deviation (SD).

DISCUSSION

The findings of this study suggest that paired variation exercises effectively improved passing accuracy and coordination among primary school students. This improvement occurred because the exercises created a more active, varied and interactive learning environment than conventional, repetitive drills. Throughout the learning process, students were continuously involved in cooperative, focused and quick decision-making activities while interacting directly with their partners. These conditions encouraged students to participate more actively in football activities and provided broader opportunities for repeated movement experiences in various game situations. Recent studies in sports pedagogy suggest that game-based, student-centred learning approaches are more effective in developing motor skills, tactical understanding, and student engagement than traditional, technique-based instruction (Greve et al., 2022). Furthermore, primary school students tend to learn movement skills more effectively through enjoyable, meaningful and interactive learning experiences than through monotonous technical repetition.

According to contemporary motor learning theory, skill acquisition is more effective when learners practise movements in environments that are both variable and representative of actual game situations (Davids et al., 2021). Such variable practice enables learners to adapt their movements continuously according to changing task demands, thereby improving the accuracy of their movements and their decision-making abilities during football activities. In this study, students not only repeated passing movements, but also practised passing in different situations such as passing with targets, one-touch passing, triangle passing and passing during small-sided games. These variations in movement allowed students to continuously adjust force control, passing direction, body balance and timing during practice. Consequently, students gradually developed better passing precision and ball control.

The findings also showed that passing coordination improved significantly following the introduction of paired variation exercises. This suggests that paired activities effectively stimulate the integration of visual control, foot movement, and body balance when learning football. Recent studies suggest that coordination skills develop most effectively through structured, game-based movement activities that encourage perceptual-motor adaptation, balance control, and movement efficiency in children (Giuriato et al., 2021). Furthermore, motor coordination is considered an essential foundation for developing more complex, sport-specific skills during childhood and adolescence. In the context of football learning among elementary school students, coordination development generally occurs more rapidly than movement accuracy because coordination primarily involves gross motor control, whereas passing accuracy necessitates a higher level of movement precision and motor control adjustment (Logan et al., 2018). Therefore, it is reasonable that paired variation exercises contributed more to coordination improvement than to passing accuracy.

The implementation of paired variation exercises also supported the development of perceptual-motor abilities among students. During these activities, students had to observe their partners' movements, estimate the direction of the ball, and respond quickly to changing situations. This process simultaneously trains eye-foot coordination, reaction speed and movement synchronisation. Exercises such as one-touch passing and small-sided games encouraged students to make faster decisions while maintaining control of their movements. According to (Jones et al., 2016), training activities involving interaction, decision-making and movement adaptation are more effective in acquiring motor skills among young football players than isolated technical drills. This suggests that interaction during paired exercises plays an important role in improving students' passing coordination.

Another important finding of this study is that varied exercises helped to reduce boredom and increase motivation among students during learning activities. Elementary school students generally have shorter attention spans and become disengaged more easily when learning

activities are repetitive and monotonous. By carrying out different paired exercises, the students experienced various movement challenges and game situations at each meeting, which made the learning activities more enjoyable and engaging. This is important because enjoyable learning experiences can increase students' intrinsic motivation to participate in physical education activities (Koordinasi et al., 2018). In the long term, varied and enjoyable exercises may also help to prevent psychological burnout and training fatigue among young athletes, as they do not perform the same repetitive movements continuously during practice sessions.

Findings from this research have also been echoed by various other previous national studies. For instance, in the research conducted by (Widaningsih et al., 2024), it was established that diverse football exercises enhanced motor skills and active involvement in physical education among students. In addition, the study by (Gulo et al., 2024) concluded that a game-based learning technique in football was superior to traditional practice techniques in enhancing football skills among students. Finally, the study by (Pangestoe et al., 2023) indicated that the use of diverse movements helped students develop a better understanding of the techniques in game situations. In terms of application, from the results of this study, it can be concluded that it would be possible to use variation paired exercise as another way of teaching in physical education in primary school, especially when it comes to football training. Varied paired exercises are useful in developing technical skills and contribute to better development of coordination, cooperation, concentration, and active involvement of pupils. Moreover, such a learning process creates a more pleasant atmosphere, which is essential in keeping pupils interested in physical activity.

CONCLUSION

From the findings obtained from the above-stated study, one may conclude that paired variation exercises were successful in enhancing the passing accuracy and coordination amongst primary school children. It was evident that significant enhancement of the passing capabilities of the participants was observed after they underwent the training program. The passing exercises helped the children to acquire relevant movement experiences by varying their activities which assisted in the development of the essential skills for playing football. It was noted that the impact of paired variation exercises on the passing coordination was more pronounced compared to that on passing accuracy. It implies that the use of varied paired activities is more influential in enhancing passing coordination, especially the coordination between visual control, foot action, and body balance.

On a practical basis, the use of variation exercises in pairs can be advised as a different approach to learning football in physical education, especially among elementary school learners. Through the introduction of various paired exercises including target passing, one touch passing, triangle passing, and small-sided games, the process can assist teachers in developing active learning situations and enhance the development of football skills among students. There are many limitations associated with this study. First, the study was conducted using a one-group pre-test post-test research design without the inclusion of a control group. This means that it was not possible to conduct any comparative analysis of the results obtained with those from other training techniques. Second, the sample size used was only primary school children from one school. Therefore, it is recommended that further research involving larger samples, among others, should be conducted.

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