



The Effect of a Game-Based Run-and-Set Activity on Students' Agility

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Abstrac: This study investigated the effectiveness of a game-based Run and Set activity in improving students' agility in Physical Education, Sports, and Health (PJOK). A quasi-experimental one-group pretest-posttest design was employed. The participants were 31 eighth-grade students selected through purposive sampling. Agility was assessed using the shuttle run test administered before and after the intervention. Data analysis was conducted using the Shapiro-Wilk test for normality and a paired-samples t-test with SPSS. The results demonstrated a significant improvement in students' agility, as indicated by higher posttest performance compared to pretest results. Statistical analysis confirmed a significant difference ($p = 0.000 < 0.05$), indicating that the Run and Set game had a statistically significant effect on agility development. These findings suggest that game-based learning strategies can serve as an effective pedagogical approach for enhancing physical fitness components, particularly agility, in school-based physical education contexts.

Keyword: Agility, Physical Education, Quasi-Experimental Study, Run and Set, Students

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INTRODUCTION

Physical Education, Sports, and Health (PJOK) plays an important role in promoting students' physical fitness, motor competence, and overall physical development. As an integral component of the Indonesian educational system, PJOK provides students with opportunities to develop fundamental movement skills and physical fitness components that support lifelong participation in physical activity (Alfyanti et al., 2024). Through well-structured learning activities, PJOK contributes not only to physical development but also to cognitive, social, and emotional growth (Usher, 2019). Among the various components of physical fitness, agility is considered a critical attribute because it enables individuals to change direction quickly and efficiently while maintaining balance and body control (Tarnichkova & Petrova, 2020).

Agility is particularly important for junior high school students because it supports performance in various physical activities and sports commonly implemented in PJOK learning. Students with good agility tend to demonstrate better movement coordination, reaction time, and motor performance during physical activities (Govenda et al., 2020). Previous studies have shown that agility can be improved through structured physical activity programs and game-based learning approaches that encourage active participation and repeated movement practice (Misbahul et al., 2024). Furthermore, agility development has been associated with increased physical literacy, sports participation, and overall physical activity levels among adolescents (Usher, 2019). Therefore, innovative and engaging learning models are needed to enhance students' agility and maximize learning outcomes in PJOK.

Sports not only serve as a means of improving health and physical fitness, but also contribute to the development of students' motor skills. One of the important components of physical fitness that needs to be developed in students is agility, as this ability supports various movement activities that require rapid and accurate changes in direction (Purnomo et al., 2024). Agility is commonly defined as the ability to rapidly change body position or direction while maintaining balance, control, and movement efficiency (Sheppard & Young, 2019). This physical capacity is essential in many sports and physical activities that require quick reactions to dynamic situations. Agility is not solely determined by movement speed; it also involves coordination, balance, muscular strength, and perceptual decision-making abilities. Students with higher agility levels are generally better able to perform movement transitions, respond to environmental stimuli, and execute motor tasks efficiently. Conversely, inadequate agility may limit motor skill performance and reduce active participation during physical education activities (Ismaryati, 2019). The development of agility is closely associated with the mastery of fundamental movement skills such as running, jumping, throwing, and locomotor coordination. These skills provide the foundation for more complex motor performances and contribute to the development of physical literacy throughout childhood and adolescence (Gallahue & Donnelly, 2018). Therefore, physical education programs should incorporate learning experiences that simultaneously enhance movement competence and maintain students' motivation to participate actively.

Despite its importance, many schools continue to face challenges in delivering effective physical education instruction. Traditional teaching approaches often emphasize repetitive drills and teacher-centered activities, which may reduce student engagement and limit opportunities for meaningful movement experiences. Previous studies have suggested that the quality of instructional materials and learning strategies significantly influences the effectiveness of physical education programs (Noor et al., 2023). Consequently, innovative and student-centered approaches are required to create more engaging learning environments and optimize physical development outcomes.

Preliminary observations conducted at SMP Negeri 5 Banjarbaru revealed that several students experienced difficulties when performing activities involving rapid directional changes. Common problems included delayed responses to movement instructions, poor balance control, and limited coordination during movement transitions. These findings indicate that students' agility levels require further improvement through learning activities specifically designed to stimulate agility-related physical components.

Game-based learning has emerged as a promising instructional approach for enhancing students' physical performance and engagement in physical education settings. By integrating physical activity with enjoyable and meaningful experiences, game-based learning encourages active participation and repeated movement practice without creating excessive physical or psychological pressure. One activity that may contribute to agility development is the *Run and Set* game. This game requires participants to run, stop abruptly, change direction, and respond quickly to situational cues, thereby engaging key determinants of agility, including reaction speed, coordination, balance, and body control (Nurlaily et al., 2024).

Previous studies have consistently demonstrated that structured physical activities and movement-based training can improve agility among children and adolescents. Erliana and Arisman (2017) reported that cone-drill exercises involving repeated directional changes significantly enhanced agility performance. Similarly, Govenda et al. (2020) found that sprint-based training and A-movement exercises effectively improved students' speed and agility. Subekti et al. (2021) also showed that speed, agility, and quickness (SAQ) training contributed positively to students' physical fitness and movement performance, and revealed that various exercise methods, including sand-surface and water-surface training, significantly improved agility among adolescent athletes. More recently, Misbahul et al. (2024) reported that ladder-drill training effectively enhanced agility and movement skills in students participating in extracurricular sports activities. In addition, Syamsudin et al. (2026) found that short-interval training improved agility among elementary school students during physical education lessons.

Although these studies provide evidence of the effectiveness of exercise-based interventions for agility development, most of them focused on structured training programs, drills, or sport-specific exercises. Limited attention has been given to game-based learning approaches that integrate physical fitness development with enjoyable and interactive learning experiences in PJOK classes. In particular, empirical evidence regarding the use of the *Run and Set* game as an instructional strategy for improving agility among junior high school students remains scarce.

Therefore, this study addresses an important gap in the literature by examining the effectiveness of a game-based *Run and Set* activity in improving students' agility within the context of PJOK learning. Unlike previous studies that primarily emphasized training-oriented interventions, the present study combines agility development with an engaging learning approach designed to increase students' participation, motivation, and enjoyment. This integration of physical fitness enhancement and game-based pedagogy constitutes the novelty of the current research. This study aims to examine the effect of the *Run and Set* game on students' agility at SMP Negeri 5 Banjarbaru. The findings are expected to contribute to the growing body of knowledge on game-based learning in physical education and provide practical recommendations for developing more engaging and effective instructional strategies to enhance students' motor performance.

METHOD

Research Design

This study employed a quantitative approach using a quasi-experimental research design to examine the effect of the *Run and Set* game on students' agility. A quantitative approach was selected because it enables objective measurement of changes in physical performance through statistical analysis. Specifically, the study adopted a One-Group Pretest–Posttest Design, in which a single group of participants was assessed before and after receiving an intervention. This design allowed the researchers to evaluate changes in agility performance attributable to the treatment by comparing participants' pretest and posttest scores.

Participants

The study was conducted at SMP Negeri 5 Banjarbaru, Indonesia. The participants consisted of 28 eighth-grade students from Class VIII-E, including 14 male and 14 female students. Participants were selected using a purposive sampling technique based on characteristics relevant to the objectives of the study. This sampling method was considered

appropriate because the selected class demonstrated relatively homogeneous learning characteristics and regularly participated in physical education activities, enabling the intervention to be implemented consistently throughout the research period.

Instrument

The independent variable in this study was the implementation of the Run and Set game, while the dependent variable was students' agility. Agility refers to the ability to rapidly change body position and direction while maintaining balance, coordination, and movement control. Students' agility was measured using the 10-meter shuttle run test, a commonly used field-based assessment for evaluating acceleration, deceleration, and directional change abilities. Test results were recorded in seconds, with lower completion times indicating better agility performance.

Data Collection

Data collection involved both testing and observational procedures. The agility test was administered twice: before the intervention (pretest) and after the intervention (posttest). The pretest was conducted to determine students' baseline agility levels. Following the pretest, participants engaged in a series of learning sessions using the Run and Set game as the primary instructional activity. The intervention emphasized repeated movements involving running, sudden stopping, directional changes, and rapid responses to movement cues. These activities were designed to stimulate agility-related components, including reaction speed, dynamic balance, coordination, and neuromuscular control.

In addition to the agility test, systematic observations were conducted throughout the intervention sessions to document students' participation, engagement, and responsiveness to the learning activities. The observational data provided contextual information to support the interpretation of the quantitative findings.

Data Analysis

Data were analyzed using descriptive and inferential statistical techniques. Descriptive statistics were used to summarize the data, including the mean, standard deviation, minimum score, and maximum score for both pretest and posttest results. Before hypothesis testing, data normality was assessed using the Shapiro–Wilk test, which is appropriate for relatively small sample sizes. Data were considered normally distributed when the significance value exceeded 0.05. After confirming that the normality assumption was satisfied, hypothesis testing was performed using a Paired-Samples t-test at a significance level of 0.05. This test was selected because it is suitable for comparing two related sets of scores obtained from the same participants before and after an intervention. All statistical analyses were conducted using IBM SPSS Statistics software. A p-value less than 0.05 indicated a statistically significant difference between pretest and posttest scores, demonstrating the effectiveness of the Run and Set game in improving students' agility.

RESULT

Descriptive Statistics

Table 1. Descriptive Statistics of Agility Test Results

Group	N	Mean (Seconds)	Standard Deviation	Minimum	Maximum
Male Pretest	14	19.76	1.86	16.57	21.98
Male Posttest	14	17.09	0.66	15.64	17.82
Female Pretest	14	22.73	1.67	18.67	24.61
Female Posttest	14	19.42	0.78	18.16	20.90

Table 1 presents the descriptive statistics of students' agility performance before and after the implementation of the *Run and Set* game. The results indicate a noticeable improvement in agility among both male and female students following the intervention. For the male group ($n = 14$), the mean agility test time decreased from 19.76 seconds during the pretest to 17.09 seconds in the posttest. This reduction of 2.67 seconds suggests a substantial enhancement in

agility performance after participation in the *Run and Set* activities. Furthermore, the standard deviation decreased from 1.86 to 0.66, indicating that students' post-intervention performances became more consistent and less dispersed around the mean. The minimum score improved from 16.57 seconds to 15.64 seconds, while the maximum score decreased from 21.98 seconds to 17.82 seconds, demonstrating overall performance gains across the group.

A similar trend was observed among female students ($n = 14$). The average agility test time decreased from 22.73 seconds at the pretest stage to 19.42 seconds at the posttest stage, representing an improvement of 3.31 seconds. This finding indicates that the intervention contributed positively to the enhancement of agility among female participants. In addition, the standard deviation declined from 1.67 to 0.78, suggesting a more homogeneous distribution of posttest scores and a more uniform improvement among participants. The minimum score improved from 18.67 seconds to 18.16 seconds, while the maximum score decreased from 24.61 seconds to 20.90 seconds, further supporting the effectiveness of the intervention.

Overall, the descriptive findings demonstrate that students exhibited better agility performance following participation in the *Run and Set* game. The reduction in mean completion times across both groups, accompanied by lower standard deviation values, indicates not only an improvement in agility but also a greater consistency of performance among participants after the intervention.

Table 2. Frequency Distribution of Agility Performance Categories

Category	Male Pretest (%)	Male Posttest (%)	Female Pretest (%)	Female Posttest (%)
Poor	10 (71.4)	3 (21.4)	13 (92.9)	9 (64.3)
Fair	4 (28.6)	7 (50.0)	1 (7.1)	4 (28.6)
Good	0 (0.0)	3 (21.4)	0 (0.0)	1 (7.1)
Excellent	0 (0.0)	1 (7.1)	0 (0.0)	0 (0.0)

The frequency distribution analysis revealed a positive shift in agility performance categories following the implementation of the *Run and Set* game. Among male students, the proportion classified in the poor category decreased substantially from 71.4% during the pretest to 21.4% in the posttest. At the same time, the good and excellent categories, which were absent before the intervention, emerged after the treatment period. These findings indicate a meaningful improvement in agility performance among male participants.

A comparable trend was observed among female students. The percentage of participants categorized as poor declined from 92.9% to 64.3%, while the proportion classified as fair increased from 7.1% to 28.6%. Additionally, one participant (7.1%) achieved the good category during the posttest. Although the overall improvement among female students was evident, the majority of participants remained within the lower performance categories, suggesting that further training may be required to achieve higher levels of agility.

Table 3. Shapiro-Wilk Normality Test Results

Variable	N	Shapiro-Wilk Statistic	Sig.
Male Pretest	14	0.893	0.088
Male Posttest	14	0.892	0.086
Female Pretest	14	0.888	0.075
Female Posttest	14	0.900	0.114

Prior to hypothesis testing, a normality assessment was conducted using the Shapiro-Wilk test, which is recommended for relatively small sample sizes ($n < 50$). The results indicated that all variables produced significance values greater than the predetermined alpha level of 0.05. Specifically, the significance values were 0.088 for the male pretest, 0.086 for the male posttest, 0.075 for the female pretest, and 0.114 for the female posttest.

Since all significance values exceeded 0.05, the null hypothesis of normal distribution could not be rejected. Therefore, the dataset was considered normally distributed, satisfying one of the primary assumptions required for the application of parametric statistical procedures.

Consequently, the Paired Sample t-test was deemed appropriate for evaluating differences between pretest and posttest scores.

Table 4. Results of the Paired Sample t-Test

Group	Mean Pretest	Mean Posttest	Mean Difference	t-value	df	Sig. (2-tailed)
Male	19.76	17.09	2.68	7.252	13	0.000
Female	22.73	19.42	3.31	8.648	13	0.000

The Paired Sample t-test was employed to determine whether statistically significant differences existed between agility scores measured before and after the implementation of the *Run and Set* game. This analysis was performed after confirming that all data met the normality assumption. As shown in Table 4, the male group produced a t-value of 7.252 with a significance level of 0.000. Because the p-value was lower than the established significance threshold of 0.05, a statistically significant difference was identified between pretest and posttest scores. This result indicates that participation in the *Run and Set* game contributed significantly to the improvement of agility among male students.

Similarly, the female group demonstrated a t-value of 8.648 with a significance value of 0.000. Since this value was also below 0.05, a statistically significant improvement in agility was observed following the intervention. These findings suggest that the *Run and Set* game had a positive effect on enhancing agility performance among female students. When comparing both groups, the female participants exhibited a higher t-value than the male participants (8.648 versus 7.252), indicating a relatively greater magnitude of change between pretest and posttest performance. Nevertheless, both groups experienced statistically significant improvements in agility after completing the intervention program.

Overall, the findings of the Paired Sample t-test provide strong evidence that the *Run and Set* game is an effective instructional strategy for improving students' agility. The statistically significant results observed in both groups support the research hypothesis, which proposed that participation in the *Run and Set* game would positively influence agility performance. Therefore, the implementation of this game-based learning activity over five instructional sessions successfully enhanced the agility of both male and female students at SMP Negeri 5 Banjarbaru.

DISCUSSION

The significant improvement in students' agility following the implementation of the *Run and Set* game can be explained through principles of motor learning and neuromuscular adaptation. Agility is not merely a physical capacity but a complex motor skill that integrates speed, balance, coordination, and decision-making abilities (Sheppard & Young, 2018). The repeated execution of acceleration, deceleration, and directional change within the *Run and Set* game likely stimulated neuromuscular coordination and improved movement efficiency, which contributed to the observed reduction in shuttle run performance times.

From a motor learning perspective, the improvement can also be associated with the principle of repetition and variability of practice. Schmidt and Lee (2019) explain that repeated exposure to movement patterns in variable contexts strengthens motor schema, enabling individuals to execute movements more efficiently in dynamic conditions. The game-based structure of *Run and Set* provided such variability, as students were required to respond to unpredictable movement cues, which likely enhanced their adaptive motor responses (Kurniawan & Hanief, 2022).

In addition, the findings of this study are consistent with previous empirical studies. Lee et al. (2021) reported that school-based physical activity programs significantly improve flexibility and overall physical fitness in adolescents through structured movement exposure. Arifin et al. (2025) found that rhythmic and structured physical activities enhance postural control and motor coordination, which are closely related to agility performance. Tunrayo et al. (2021) further emphasized that instructional aids in physical education improve physical performance by increasing student engagement and facilitating movement comprehension.

These findings collectively support the present study, indicating that instructional design plays a critical role in physical fitness development.

The present findings are also in line with [Reynaldy et al. \(2024\)](#), who demonstrated that shuttle-run-based training improves agility through repetitive directional movement practice. However, the current study extends previous research by demonstrating that similar physiological and motor benefits can be achieved through a game-based learning model rather than traditional drill-based training. This highlights that agility development is not solely dependent on training intensity but is also influenced by pedagogical approach and student engagement. Moreover, according to Self-Determination Theory ([Reynaldy et al., 2024](#)), intrinsic motivation plays a key role in sustaining participation in physical activities. The interactive and enjoyable nature of the Run and Set game likely enhanced students' motivation, leading to higher engagement levels and more consistent movement practice. This motivational factor may explain why significant improvements were observed in both male and female students ([Deci & Ryan, 2017](#)).

Therefore, the findings of this study do not contradict previous research but rather extend it by demonstrating that game-based physical education approaches can be as effective as traditional training methods in improving agility. This positions the Run and Set game as a pedagogically effective alternative for PJOK teachers in developing students' physical fitness in an engaging learning environment.

CONCLUSION

The findings of this study demonstrate that the Run and Set game is an effective learning strategy for improving students' agility. The effectiveness of the intervention was evidenced by the reduction in shuttle run completion times observed in both male and female students during the posttest compared with the pretest. Furthermore, the results of the Paired Sample t-test revealed statistically significant differences between pretest and posttest scores, further confirm the positive impact of the Run and Setgame on agility development. These findings suggest that incorporating game-based learning activities into physical education classes can effectively enhance students' agility while simultaneously increasing their engagement and participation in the learning process. The dynamic nature of the Run and Setgame provides students with opportunities to practice rapid directional changes, coordination, balance, and movement control in an enjoyable learning environment.

Based on the results of this study, physical education teachers are encouraged to integrate the Run and Set game into their instructional practices as an alternative teaching strategy to promote agility development and active participation among students. In addition, students are encouraged to engage consistently in structured physical activities that involve multidirectional movements and agility-related exercises to further improve their physical fitness and motor performance. Future studies may explore the effectiveness of the Run and Set game with larger samples, different educational levels, or comparisons with other game-based learning approaches to strengthen the existing evidence regarding its benefits in physical education settings.

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