

Research article

# The Effects of Small Side Games and Game Experience Learning on the Technical and Physical Skills of Soccer Players Aged 13-14

Mahmuddin<sup>1</sup>, Abdul Hasan Saragih<sup>1</sup>, Albadi Sinulingga<sup>1</sup>, Khozi Indra Waskita<sup>1</sup>, Bessy Sitorus Pane<sup>1</sup>, Syahputra Manik<sup>1</sup>, Imam Marsudi<sup>2</sup> and Dewangga Yudhistira<sup>2</sup>

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1 Universitas Negeri Medan;  
2 Universitas Negeri Surabaya

\* Correspondence: mahmuddin@unimed.ac.id

**Abstract:** The purpose of this study was to examine small side games (SSGs), game experience learning (GEL), and conventional training techniques for technical and physical abilities. Materials and Methods: This study used three-group pretest-posttest design. Participants were 60 13-14 year old male football players from one club, divided into 20 players for each intervention group. The research instruments involved passing and dribbling, while physical measurements included a 30-meter sprint, vertical jump, and a multistage fitness test. Data collection techniques include observational and field tests, as well as descriptive analysis, prerequisite tests, and one-way ANOVA tests assisted by SPSS version 23. Results: The findings of this study revealed that the significance values of passing were  $0.530 > 0.05$ , dribbling  $0.259 > 0.05$ , speed  $0.339 > 0.05$ , jump height  $0.620 > 0.05$ , and aerobic endurance  $0.606 > 0.05$ . Conclusions: No substantial influence on technical and physical abilities was identified, with all three methods providing the same improvement. The limitations of this study include the duration, subject, and control group. Further research using a 10-week training duration is needed to achieve more optimal results. Nevertheless, this research still has practical usefulness if adapted to the training objectives; Trainers should combine different strategies alternatively to provide more effective stimulus.

**Keywords:** Game experience learning (GEL), small side games (SSG), soccer players, age 13-14 years.

## 1. Introduction

The goal of football is to score goals against the other team's goal. However, in order to play beautifully and win the game, technical and physical qualities must be developed through the right methods. In this sense, young football players must improve their technical skills using innovative techniques [1], [2]. In addition, comprehensive physical training methods, such as technical training and teamwork, are required, [3], [4]

Today, trainers prefer integrated training to training that focuses on only one topic. Gaming experience learning (GEL) training methods have recently been introduced to young soccer players, including physical features, basic technique, teamwork, and respect. Scientific evidence suggests that the intervention group using the GEL method improved more than the control group in terms of physical ability, technique, cooperation, and discipline. Further evidence confirms the advantages of the GEL training approach over the control group. This is an interesting study that shows how the GEL method can be used as a holistic training approach. (Sulistiyono, Akhiruyanto, et al., 2021)

(Yudanto et al., 2022)

Another popular training method is small side play (SSG). This training method involves technical training in a smaller and modified field with special rules that improve cooperation, dribbling, and passing skills, and integrate them into physical training [5]. This method has been shown to improve ball sense and physical condition, especially aerobic endurance [6], [7]. Another study by Sarmento et al. found that small side play had a positive impact on aerobic technique and endurance. A recent study found that applying SSG training for 16 sessions reduced body composition and improved physical fitness, offering a more enjoyable approach compared to conventional training (Sarmento et al., 2021) [8]. This is in line with other studies showing that a modified 3 x 3 SSG with a 15 x 25 metre pitch is effective in improving technical ability and aerobic endurance in young football players [9]. Other research shows that the 3 x 3 and 4 x 4 small side game training methods are very successful in improving physical skills in young football players [10], [11].

In this context, the GEL and SSG methods are beneficial to learn as training variations to improve technique and physicality. To the author's knowledge, the GEL method is a new technique that is not yet commonly used with young football players. To date, the study team has summarized studies on GEL and found only two: those conducted by Sulistiyono et al. and Yudanto et al. [12], [13]. The results are significant, especially in the physical and technological aspects. Although some studies have reported considerable benefits, the authors are suspicious of these findings because they only compared them to the standard group, not other forms of intervention. In addition, the SSG training system has been widely used with players ranging from junior to senior levels. Other studies, however, confirm the author's point of view, claiming that information on the implementation of SSG changed by the number of players and the size of the field is still very limited [14].

In terms of empirical research, there are several studies that compare GEL training with other methods. As a result, the authors sought to see if this method outperforms the SSG training method, which has been scientifically proven to be very beneficial in physical and technical development. The author chooses to compare it with the SSG method because it is widely used in clubs, both amateur and professional, and the rules are very basic.

Although the SSG method is often used, there is little research on the GEL method. As a result, the authors believe it is crucial to identify and close the gaps, especially since the GEL method is only compared to conventional procedures, ignoring the efficiency of more popular methods such as SSG. This has hampered our understanding of the advantages of using GEL in modern training settings. This lack of research results in the potential and benefits of GEL being under-recognized. Additionally, given the growing interest in building integrated and diversified training, it is crucial to investigate the extent to which GEL can complement conventional training approaches. As a result, the aim of this study was to compare the physical and technical abilities of players aged 13-14 with that of a typical training group. Research hypothesis (1) there is no significant difference in the technical ability aspect in the three groups, (2) there is no significant difference in the physical aspect in the three groups

## 2. Materials and Methods

### *Research participants.*

The study used a two-group pretest-posttest control design, comparing three group pretest-posttest design. The study involved 60 13-14-year-old soccer players from a football school club, who were randomly divided into three groups

of 20 players each. The first group received a GEL intervention, the second received an SSG intervention, and the third served as a control group. The authors drafted an agreement signed by the soccer players to commit to a six-week training program. The inclusion criteria are being declared healthy by a doctor's certificate, being registered with the club for at least 1 year, being willing to participate in training activities according to the specified schedule, while the exclusion criteria are having an injury, currently participating in training elsewhere, and having a record of indiscipline based on training absences. This research has been approved by the research ethics code at Medan State University.

### **Study organization.**

The stages of this research consist of (1) conducting field observations to see the difference between coaches and football players, and analyzing documents in the form of articles as material for rationalizing problems, (2) compiling research instruments and compiling training programs, (3) collecting pretest data with dribbling and passing technique instruments, physical conditions including vertical jumping, multistage fitness tests, and 30-meter sprints with instruments used in the research previously [12], (4) carry out the intervention for 10 weeks with a frequency of training 3 times per week using a pre-prepared program (table 1), (5) after completing the intervention for 10 weeks, a posttest is carried out as the final data to be examined. Before starting the core exercise, the player is instructed to warm up for 5-10 minutes, then perform the core exercise for 60-90 minutes, followed by guided relaxation for 5-10 minutes.

The exercise program is designed by paying attention to the intensity of the exercise in the range of 60–85% of the maximum pulse, as well as the determination of the volume per session which includes the number of sets, reps, and the duration of the exercise series based on the principle of periodization. Weekly progression is progressively regulated through an increase in load of about 5–10% every two weeks to support physiological adaptation. A break between sets is given for 60–120 seconds, while a break between sets of exercises ranges from 2–3 minutes to ensure optimal recovery. Relative weight was adjusted to individual ability using an RPE (Rating of Perceived Exertion) scale in the range of 13–17 as an indicator of exercise intensity control.

Table 1. SSG, GEL, and Conventional training programs

| SSG                                                                                                                                                                                                            |                                                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Training Materials                                                                                                                                                                                             | Strategy                                                                                                                                                                                                         |
| <ul style="list-style-type: none"> <li>• 3x3, 4x4, or 5x5 players without a goalkeeper.</li> <li>• Training variations: Change the size of the field to adjust the intensity of the training.</li> </ul>       | <ul style="list-style-type: none"> <li>• Emphasizing possession, collaboration, and offensive and defensive strategies</li> <li>• Provide instructions for creating opportunities and utilizing space</li> </ul> |
| GEL                                                                                                                                                                                                            |                                                                                                                                                                                                                  |
| <ul style="list-style-type: none"> <li>• Core 1: Games to develop techniques such as fishing balls, pairing two twos, going back and forth, and dribbling.</li> <li>• Core 2: 7-on-7 soccer players</li> </ul> | <ul style="list-style-type: none"> <li>• Experience learning activities (reflection, play, discovering, and applying)</li> <li>• Guided to respect the rules of the game of small soccer</li> </ul>              |
| Conventional                                                                                                                                                                                                   |                                                                                                                                                                                                                  |
| <ul style="list-style-type: none"> <li>• Dribbling and passing to run in 2-on-2, 3-on-3 groups</li> </ul>                                                                                                      | <ul style="list-style-type: none"> <li>• A variety of dribbling and passing exercises with and without breaks focus on developing technical skills</li> </ul>                                                    |

### Statistical analysis

The data analysis technique used is descriptive analysis, which provides mean values and standard deviations. This is followed by normality and homogeneity testing. After determining that the data is available, a one-way ANOVA hypothesis test with a significance level of  $p < 0.05$  is carried out [15]. SPSS version 23 is used to assist with data analysis.

### 3. Results

The findings section includes descriptive analysis, normality test, homogeneity test, and one-way ANOVA test, which are reported as follows:

Table 2. Results of descriptive analysis of GEL, GSG, and control methods

| Group        | Skill and physical | Pretest |                | Posttest |                |
|--------------|--------------------|---------|----------------|----------|----------------|
|              |                    | Mean    | Std. deviation | Mean     | Std. deviation |
| GEL          | Skip               | 6.26    | 0.76           | 7.84     | 0.58           |
|              | Dribbling          | 24.94   | 1.64           | 22.46    | 1.33           |
|              | Speed              | 5.49    | 0.20           | 5.11     | 0.30           |
|              | Vertical jump      | 31.54   | 4.27           | 36.19    | 3.61           |
| SSG          | MFT                | 34.36   | 4.01           | 36.16    | 2.93           |
|              | Skip               | 6.73    | 0.86           | 7.97     | 0.71           |
|              | Dribbling          | 25.25   | 2.06           | 22.08    | 1.34           |
|              | Speed              | 5.54    | 0.28           | 5.18     | 0.19           |
| Conventional | Vertical jump      | 32.19   | 3.44           | 35.15    | 2.89           |
|              | MFT                | 34.79   | 3.53           | 36.89    | 4.62           |
|              | Skip               | 6.37    | 0.71           | 8.08     | 0.77           |
|              | Dribbling          | 24.16   | 1.54           | 22.81    | 1.45           |
|              | Speed              | 5.43    | 0.30           | 5.07     | 0.24           |
|              | Vertical jump      | 30.05   | 3.40           | 35.77    | 3.48           |
|              | MFT                | 32.90   | 4.88           | 37.30    | 3.10           |

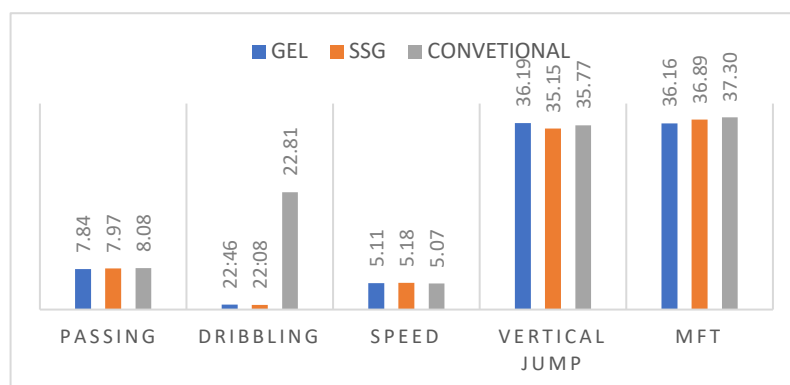


Figure 1. Post-test results diagram for each group

Table 1 and Figure 1 reveal that all technical and physical aspects improved in all three groups, based on the pretest and posttest findings. The average passing score of the GEL group rose from 6.26 to 7.84, and dribbling performance increased, with a decrease in time from 24.94 seconds to 22.46 seconds. The 30-meter run time also increased, dropping from 5.49 seconds to 5.11 seconds. The vertical jump rose from 31.54 to 36.19 cm. Similarly, durability increased from 34.36 to 36.16.

The SSG Group has improved in every aspect. The average passing score increased from 6.73 to 7.97, as did speed, which changed from 5.54 to 5.18. The vertical jump changed from 32.19 centimeters to 35.15 centimeters, and the MFT score increased from 34.79 to 36.89.

Meanwhile, the conventional group showed continuous improvement across all dimensions. The graduation score increased from 6.37 to 8.08. The dribbling time increased from 24.16 to 22.81 seconds, while the speed increased from 5.43 to 5.07 seconds. The vertical jump grew from 30.05 to 35.77 cm. Similarly, the MFT findings rose from 32.90 to 37.30. All data showed that training treatments improved the technical and physical performance of each group.

Table 3. Data normality results

| Group        | Variable      | Test results |             |
|--------------|---------------|--------------|-------------|
|              |               | Sig.         | Description |
| GEL          | Skip          | 0.782        | Usual       |
|              | Dribbling     | 0.484        | Usual       |
|              | Speed         | 0.417        | Usual       |
|              | Vertical jump | 0.102        | Usual       |
|              | MFT           | 0.173        | Usual       |
| SSG          | Skip          | 0.693        | Usual       |
|              | Dribbling     | 0.469        | Usual       |
|              | Speed         | 0.592        | Usual       |
|              | Vertical jump | 0.798        | Usual       |
|              | MFT           | 0.583        | Usual       |
| Conventional | Skip          | 0.239        | Usual       |
|              | Dribbling     | 0.939        | Usual       |
|              | Speed         | 0.492        | Usual       |
|              | Vertical jump | 0.336        | Usual       |
|              | MFT           | 0.095        | Usual       |

According to the results of the Shapiro-Wilk normality test, all data from each group fell into the normal category. This is indicated by the significance value for all variables greater than 0.05. In the GEL group, the significance value for passing was 0.782, dribbling was 0.484, running speed was 0.417, vertical jump was 0.102, and MFT was 0.173. The SSG group has a significant value of more than 0.05 to pass 0.693, dribble 0.469, running speed 0.592, vertical jump 0.798, and MFT 0.583. Similarly, in the conventional group, the significant score for passing is 0.239, dribbling 0.939, running speed 0.492, vertical jump 0.336, and beep test 0.095. Based on these results, we can conclude that the distribution of data for all groups is normal.

Table 4. Data homogeneity test results

| Variable      | Group        | Sig.  | Description |
|---------------|--------------|-------|-------------|
| Skip          | GEL          | 0.241 | Homogeneous |
|               | SSG          |       |             |
|               | Conventional |       |             |
| Dribbling     | GEL          | 0.925 | Homogeneous |
|               | SSG          |       |             |
|               | Conventional |       |             |
| Speed 30m     | GEL          | 0.602 | Homogeneous |
|               | SSG          |       |             |
|               | Conventional |       |             |
| Vertical Jump | GEL          | 0.668 | Homogeneous |
|               | SSG          |       |             |
|               | Conventional |       |             |
| MFT           | GEL          | 0.068 | Homogeneous |
|               | SSG          |       |             |
|               | Conventional |       |             |

According to Table 4, the homogeneity test results show that all variables have a significance level greater than 0.05. Thus, variance between groups is seen as homogeneous. This shows that all three groups have homogeneous data diversity for each variable.

Table 5. One-way ANOVA test results

| Variable               | Group        | Sig.  | Description                         |
|------------------------|--------------|-------|-------------------------------------|
| Posttest Graduates     | GEL          | 0.530 | There is no significant difference  |
|                        | SSG          |       |                                     |
|                        | Conventional |       |                                     |
| Posttest dribble       | GEL          | 0.259 | There was no significant difference |
|                        | SSG          |       |                                     |
|                        | Conventional |       |                                     |
| Posttest Speed         | GEL          | 0.399 | There is no significant difference. |
|                        | SSG          |       |                                     |
|                        | Conventional |       |                                     |
| Posttest Vertical Jump | GEL          | 0.620 | There is no significant difference. |
|                        | SSG          |       |                                     |
|                        | Conventional |       |                                     |
| Posttest MFT           | GEL          | 0.606 | There is no significant difference. |
|                        | SSG          |       |                                     |
|                        | Conventional |       |                                     |

Based on Table 5, the one-way ANOVA test revealed that the significance values of each measure of technical and physical ability ranged from 0.259 to 0.606  $>0.05$ , indicating that there was no significant difference between the GEL, SSG, and conventional groups. However, the interpretation of this data cannot be declared final; There must be a meaning of the data based on the comparison of the average post-test results.

#### 4. Discussion

The purpose of this study is to examine the effectiveness of Game Experience Learning (GEL), Small Side Games (SSG), and conventional training models in improving the technical and physical skills of soccer players aged 13 to 14 years. The analysis involves comparing pretest and posttest data on five key indicators: passing, dribbling, running speed, jump height, and aerobic endurance. The results showed that all three groups improved their performance on all variables, as evidenced by the pretest and posttest average scores.

Hypothesis testing using one-way ANOVA analysis found no significant differences in technical skills and physical condition between the three intervention groups in each posttest, with an overall significance value of  $p>0.05$ . This shows that, despite their different approaches, all three training methods have the same effect on the player's technical and physical skills. This analysis also included an effect measure in the form of eta squared to assess the magnitude of the actual difference between groups even though it was not statistically significant. In addition, a comparison graph of pre-post scores for each variable is also generated using the same analysis command to provide a more comprehensive visualization of changes in the performance of each group. An in-depth study found that the SSG group's post-passing and dribbling ability outperformed the GEL and conventional groups. The GEL group outperforms the SSG and conventional groups in terms of speed and jump height. The durability of SSG groups is superior to GEL and conventional.

According to previous research, SSG is a training method that combines specific movements of moderate to high intensity, promoting enhanced aerobic adaptation [14]. SSG enables simultaneous endurance and technical training, resulting in more effective training stimulus [16]. Another study found that the SSG method was used in the last weeks before a game to maintain and improve aerobic endurance [17]. In such a way, the physical and technical features of the SSG technique far outperform conventional GEL and group methods.

However, the authors highlight one physical aspect: the GEL group is better than the SSG and conventional group. Although the difference is not statistically significant,

the authors believe it is because GEL's training program includes exercises that promote speed-based techniques such as passing and ball control in addition to running, small team building, and continuous running and passing without pause. This is an indirect example of speed-based training. Interestingly, additional research complements this, suggesting that speed training for young people should be integrated into technique-based coordination to indirectly improve speed [18]. In addition, GEL emphasizes an interactive and enjoyable training experience, resulting in the development of a diverse range of game-based physical and technical abilities [12]. This demonstrates the value of diverse training in developing holistic qualities such as motivation, social engagement, and physical elements [4], [19], [20]

In addition, the study shows that the GEL and SSG approaches promote improvements in both physical and technical aspects compared to conventional methods, which focus only on technical training without including physical training. The SSG and GEL approaches result in a more dynamic training experience that offers overall benefits. These findings imply that the GEL and SSG methods may be innovative methods that prioritize diverse and innovative training. Varied means providing a variety of methods to increase player enthusiasm, while innovative coaches can provide new insights to modify both methods to come up with more precise methods [21], [22], [23]

In response, the author discovers something new. First, the study compared three methods, practices that were rarely applied in previous studies. As a result, the study provides more specific information about the strengths and weaknesses of each method. Second, these findings provide trainers with practical guidance to choose the most appropriate and successful training methods to develop technique and physique systematically and holistically. Third, the study provides new insights into the effectiveness and effects of relatively new training models in youth soccer settings.

In addition, evaluating the findings of this study shows that the efficiency of training is determined not only by the training method, but also by the training dose, especially the intensity and volume. This is consistent with Yudhistira's dissertation, which claims that excessive training doses lead to overtraining, while inadequate training doses do not produce ideal results. As a result, the training dose should be delivered using progressive and personalized principles [24]. According to various previous studies, training should emphasize regularity, individuality, and training load [25], [26], [27] Therefore, Measured intensity, volume per session adjusted to the athlete's capacity, systematic weekly load development, adequate recovery breaks between sessions, and relative weight setting based on each individual's fitness level and adaptive response.

Small differences between groups are also affected by the training period, which may be inadequate. In addition, player parameters such as age, training level, and innate physical condition, as well as further individual training outside of the intervention, player recovery rate, and nutritional health, are also considered. Furthermore, the function of intrinsic motivation and adherence to instructions are variables that cannot be completely controlled.

In general, this research adds to our understanding of the training approaches used to obtain optimal physical and technical performance. While none of them are ideal, they have practical applications when matched to training objectives. In this context, trainers should consider integrating the two methods interchangeably to achieve optimal stimulus variation

## 5. Conclusions

Based on the research results and discussion, it was concluded that the small-sided game (SSG), game experience learning (GEL) and conventional methods with hypothesis testing in the technical and physical ability aspects had no significant effect, the three methods provided equivalent improvements. There are limitations to the study for further research, namely the need to extend the training intervention for 10 weeks, use an experimental design with strict controls, and expand the research participants to obtain better results.

**Informed Consent Statement:** Written consent was obtained from all research participants.

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### Conflicts of Interest:

All authors declare no conflict of interest.

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