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Comparison of the Effects of Teaching Games for Understanding (TGFU), Sport Education (SE), and Combined Approaches on Skill Performance in Football among 10 to 12-Year-Old Students

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A B S T R A C T

Purpose: The focus on introducing new teaching methods that are both highly effective and enjoyable for children has attracted the attention of many researchers. This study aimed to examine the impact of the Teaching Games for Understanding (TGfU) approach, Sport Education (SE), and Combined Approach on skill performance in children's football.

Methodology: The statistical population included all 10 to 12-year-old boys attending schools in Tehran. From this population, 60 students were purposefully selected from a non-profit school and randomly assigned to three groups: TGfU, SE, and Combined Approach (each consisting of 20 students). All participants completed a pre-test, which involved a 4v4 football game on a small pitch measuring 25x35 meters, recorded by a camera. Each group then received their respective training for 5 weeks, with 3 sessions per week (totaling 15 sessions). After the interventions, a post-test, identical to the pre-test, was conducted. Performance was evaluated using the G-PET tool and relevant forms, with recorded videos reviewed by an experienced coach to score performance, including the frequency of sporting behaviors.

Findings: The results indicated that all three approaches—TGfU, SE, and the Combined Approach—significantly improved football performance in both correct and incorrect situations ($P \leq 0.05$). Furthermore, comparisons among the three groups revealed that the TGfU group performed the best, followed by the Combined Approach group, and then the SE group.

Conclusion: The findings suggest that the TGfU and Combined Approach are more effective than traditional Sport Education. Therefore, it is recommended that these methods be utilized in teaching football to children.

Keywords: *Teaching Games for Understanding (TGfU), Sport Education (SE), football performance, students.*

1. Introduction

Football is one of the most popular and widely played sports globally, with approximately 265 million people playing it worldwide, according to reports by FIFA (Zhen-Rong, 2021). Football is not only popular globally but is also extensively played in schools and universities to promote sports and health among students (Smith, 2009). In addition to the mentioned benefits, the physical and psychological health effects of football for students can enhance social interactions and improve academic performance. From an ethical perspective, football can also promote sports values such as competition, cooperation, courage, discipline, respect, and order. These values can help students perform better in their personal and professional lives (Serra-Olivares et al., 2015).

It is crucial to teach football to students in ways that yield the best results. If students do not perceive improvements in their skills and tactics during games, they may feel that the educational content is meaningless (Hastie & Curtner-Smith, 2006). To address this issue and increase students' understanding of games, efforts have been made to challenge students and push their thinking beyond mere repetition of skills and techniques (Hastie & Casey, 2014).

The Sport Education (SE) model is based on democratic and inclusive teaching, which emerged from the desire to provide richer and more authentic sports experiences for adolescents (Hastie & Casey, 2014). The SE model transfers key features of institutionalized sports (such as seasons, affiliation, formal competition, culminating events, record-keeping, and celebration) into the educational environment in three ways: (a) participation conditions (all students play throughout the season); (b) appropriate competition (modified games and equipment); and (c) students take on roles other than players (such as coach and referee) with the aim of developing competent, literate, and enthusiastic athletes (Dyson et al., 2004).

Bunker and Thorpe (1982) proposed Teaching Games for Understanding (TGfU) as a game-centered approach that links tactics and skills within game situations, with a special focus on enhancing students' game performance and understanding (Mandigo et al., 2019). A game-centered approach considers learners' understanding of the game as the primary organizational feature of the lesson (Barba-Martín et al., 2020). In traditional sports teaching methods, which are technique-based approaches, teachers and coaches viewed the teaching-learning process as making players proficient in a specific sport skill and conducting tests to assess their skill acquisition (Harvey & Jarrett, 2014). However, new game-centered approaches go beyond this and argue that specific motor skills should be taught in real and game-like situations. This teaching method helps learners understand what to do, when to do it, and how to do it. The learning of motor skills occurs through the interaction of the individual, environment, and task. This interaction in players' motor coordination reflects the equal importance of cognitive and motor components in developing sports performance (Chow et al., 2009; Gil-Arias et al., 2021).

Game-centered approaches are based on four pedagogical principles: sampling, tactical complexity, representation, and exaggerated movement. These principles are used to teach skill and tactical awareness through games on small fields. Such games create a creative learning environment to enhance learners' knowledge and skills (Holt et al., 2002). Since the interaction between the performer and the environment allows the learner to adjust their movements to environmental information through practice, and by empowering the "information-movement coupling," it guides their behavior (Serra-Olivares et al., 2015). A game-centered approach considers learners' understanding of the game as the primary organizational feature of the lesson (Dyson et al., 2004). Through the use of TGfU, the cognitive domain is prioritized (Harvey & Jarrett, 2014), and the required elements (i.e., decision-making or strategies) are considered before the "how" (i.e., skill execution) (Rocamora et al., 2019).

Although SE and TGfU challenge traditional teacher-centered approaches, they do not neglect skill teaching. However, they examine the concept of "technique" from different perspectives. In SE, techniques should be taught first and quickly transferred and contextualized into various tactical situations in modified games. In contrast, in TGfU, the development of techniques arises from the problems that students encounter during modified games and is usually associated with the failure to execute skills in specific aspects of the game (Rocamora et al., 2019). In the combined SE-TGfU version, the organizational framework is provided by SE, while TGfU offers the primary pedagogical approach (Dyson et al., 2004).

Given the above, each of the teaching methods, TGfU and SE, may be helpful in enhancing skill performance (Dyson et al., 2004). However, in motor learning and physical education, researchers seek a method that can produce the best results (Rocamora et al., 2019). Therefore, new teaching methods are continually proposed, and recent studies have shown that combining TGfU and SE is more effective than using either approach alone. In this regard, Gil-Arias and colleagues (2017) demonstrated the positive impact of combining TGfU and SE on children's motivation (Gil-Arias et al., 2021). Additionally, Zhen-Rong and colleagues (2021) showed that the combination of TGfU and SE had a better impact on cognitive performance and motor skills than when these methods were used separately (Zhen-Rong, 2021). This study aims to investigate the effectiveness of a period of SE, TGfU, and the combined use of SE and TGfU in enhancing football skill performance. It seeks to gain a deeper understanding of what might happen with fourth and fifth-grade students when using SE, TGfU, and SE-TGfU units. Therefore, the researcher intends to address the question of whether there is a difference in the impact of the TGfU, SE, and combined approaches on football skill performance in 10 to 12-year-old students.

2. Methods and Materials

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2.1. Study Design and Participants

The present study is a quasi-experimental research with a pre-test-post-test design without a control group. The statistical population included all 10 to 12-year-old boys in Tehran who were in the fourth to sixth grades of elementary school. Due to the limitations in conducting the training sessions, a non-profit boys' school in District 2, equipped with large outdoor spaces suitable for conducting football sessions, was purposefully selected. The inclusion criteria for selecting the sample included: age range of 10 to 12 years, no prior consistent football training experience, male gender, and being enrolled in the selected school. Based on previous studies, a sample size of 20 students per group was determined (TGfU=SE=Combined=20 students), who were selected through convenience sampling and randomly assigned to three groups of 20 students each.

After the proposal was approved by the Faculty of Physical Education and Sport Sciences at Islamic Azad University, Tehran Central Branch, negotiations were conducted with the Tehran Education Department and the counseling office of this organization to gain approval and cooperation for the study. Subsequently, a non-profit boys' school in District 2, which was well-equipped for conducting football sessions, was selected, and meetings were held with students and school officials to introduce the study, its potential effects, benefits, risks, and possible outcomes. Interested students were asked to take the consent form home to be completed by their parents. Based on the inclusion and exclusion criteria and similar studies, 60 boys aged 10 to 12 were conveniently selected and randomly assigned to three groups of 20 students each (TGfU=SE=Combined=20 students).

2.2. Measures

2.2.1. G-PET

The G-PET tool assesses game performance from a tactical perspective, coding decisions and executions based on the tactical problems that the player must solve. This tool evaluates two roles of the player: attacks with the ball and attacks without the ball. It separates the cognitive components of decision-making from the motor components of skill performance. The usual sequence of football performance for the player is support, decision-making, and execution. Actions are coded as follows: (a) Near one's own goal. In this situation, if the player has the ball and the number of defenders and attackers is equal or not, and the attack is risky, the action is coded as ball retention. (b) Near the opponent's goal. In this case, if the player has the ball, the action is coded as an attack, even if there is a risk of losing possession. Successful ball control, successful decision-making, and successful executions are coded as 1, while unsuccessful ball control, unsuccessful decisions, and unsuccessful executions are coded as 0. For example, a successful forward movement with the ball is coded as 1, recorded as a correct score. Losing ball control is coded as 0 and recorded as an incorrect score. A shot at the goal beyond the goalkeeper's reach is coded as 1, while a shot off-target is coded as 0. At this level, passing, dribbling, and shooting are evaluated. The games were recorded using an iPhone 13 smartphone camera with a 12-megapixel ultra-wide lens and 2.5x zoom capability.

2.3. Interventions

2.3.1. Sport Education (SE)

The SE course plan for lessons 1 to 7 focused on football skills (such as dribbling, passing, shooting, or man-to-man marking) and tactics (e.g., moving to a position where the ball can be received), with the teacher (researcher) emphasizing the main features of SE (seasons, peak events, affiliation, record-keeping, formal competition, and celebration). The teaching method up to lesson 7 in the SE class followed the SE method, and students selected their team name and color. The initial lessons were taught by the teacher, and as the course progressed, students took on more responsibilities. In each class, one student was appointed as a coach. The remaining roles (referee, fitness coach, captain, and equipment manager) were selected by the students through negotiation, under the supervision of the researcher. Record-keeping was maintained throughout the season, and teams earned points in various ways, which influenced the playoff stage.

Table 1

SE Training Plan

Week/Lesson	SE Processes	Main Focus and Objective	Main Game Forms
Week 1/Lessons 1-3	SE concepts: Roles, affiliation, competition format, fair play, and record-keeping./ Team responsibilities/ Team practice	Passing, receiving, and positioning./ Objective: Maintaining ball possession.	1v1, 2v1, 3v2, 2v2
Week 2/Lessons 4-6	Team responsibilities/ Team practice	Passing, receiving, dribbling, movement, and defense./ Objective: Maintaining ball possession/tackling. Scoring/Defensive space and goalkeeping; starting and restarting play	1v1, 2v1, 3v2, 2v2
Week 3/Lessons 7-9	Team responsibilities/ Team practice/ Playing/ Friendly refereeing/ Competition	All content and objectives were applied	2v2 + 1, 4v4 competitions
Week 4/Lessons 10-12	Team responsibilities/ Team practice/ Playing/ Refereeing competitive games	All content and objectives were applied	2v2 + 1, 4v4 competitions
Week 5/Lessons 13-15	Team responsibilities/ Team practice/ Playing/ Refereeing competitive games./ Awards ceremony/ Peak event	All content and objectives were applied	2v2 + 1, 4v4 competitions

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2.3.2. *Teaching Games for Understanding*

In this method, simple tasks were first practiced in the form of games, and then skills were integrated into games so that the child spent all their time in gameplay. The training program for the TGfU group was designed using the extended TGfU model (Holt et al., 2002). According to the extended model, in the game stage, the principles of sampling and modification-representation were used. In the understanding stage, the principle of modification-exaggeration was applied. In the tactical awareness stage, the principles of modification-representation and modification-exaggeration were utilized. In the decision-making stage, the principles of modification-representation and modification-exaggeration were employed, and in the skill execution stage, the principle of modification-representation was used (Holt et al., 2002). Gradual increases in tactical complexity were observed in all stages.

Table 2

Sample TGfU Group Training Exercises

Session	Stage	Sample Exercise	Specific Objectives	Exercise Variables
1-2	Game	Tag/Breaker/Corner ball/Eliminator/Pass to open space	Positioning and dodging, changing speed while running, maintaining distance, coordination, and team decision-making, passing	Gradually limiting the playing area, playing while dribbling, maintaining and controlling the ball, positioning stationary or moving blockers, increasing the number of blockers, disallowing verbal communication to strengthen eye contact and sign language
3-4	Game Understanding	Using games from previous sessions	Gradual familiarity with football rules such as field dimensions, time constraints, fouls, and penalties, applying secondary rules to emphasize specific aspects of the game	Changing the scoring system, players identifying their own fouls or penalties
5-7	Tactical Awareness	Middle Bear game, Passing Circle, Challenge, Zone Defense	Awareness of game rules, deception and passing, using non-verbal strategies, man-to-man defense, creating space, using peripheral vision, familiarity with concepts related to counterattacks, passing from different areas, continuous passing	2v1, 3v2, 4v4 game situations, applying time and space constraints for quick decision-making, changing the number of attackers and defenders, using zone defense
8-10	Decision-Making	Modified games and restricted games	Developing skills related to anticipating attack timing, defense, maintaining ball possession and switching play, improving problem-solving, participating in discussions about appropriate attack and defense techniques in various game situations	Restricted and modified games that simulate real football game situations, such as 1v1, 2v1, 2v2, 3v1, 3v2, 3v3
11-14	Skill Execution	Applying skills from simple to complex challenging situations	Controlling and mastering the ball, dribbling and feinting, changing direction, passing in the direction of the attacker, receiving, shooting, volleying, shooting with the instep	Standing practice, gradually incorporating multiple restrictions like performing the skill while moving and creating fixed and moving obstacles, reviewing and applying skills in challenging situations like 1v1, 1v2, 2v2
13-14	Performance	Restricted games, gradually increasing tactical complexity	Applying technical and tactical skills appropriate to restricted game situations	Restricted games with full game rules applied in 2v2, 3v3, and 4v4 situations
15	Game	Modified game	Applying technical and tactical skills in situations similar to 11v11 games	2-2-1 zone defense practice, examining the vulnerable areas of the defensive formation, practicing attack systems, defenders standing, walking, and finally moving quickly once fully familiar

2.3.3. *Combined Training*

In the combined SE-TGfU version, the organizational framework is provided by SE, while TGfU offers the primary teaching approach (Dyson et al., 2004). The teacher's (researcher's) role is to provide individual and team feedback, observe tactical issues, and use guided questions to help students identify tactical or technical problems. Students' roles include taking on a specific SE role (in addition to being a player) and responding to the researcher's questions about tactical issues and participating in discussions about possible solutions to such problems. In the SE-TGfU course, in addition to SE characteristics, Harvey and Jarrett's (2014) recommendations on GCAs (e.g., course length and assessment in an environment) were applied (Harvey & Jarrett, 2014).

Table 3

Sample Combined Training Group Exercises

Main Game Forms	Main Focus and Objective	SE-TGFU Processes	Week/Lesson
1v1, 2v1, 3v2, 2v2	Passing, receiving, and positioning/ Objective: Maintaining ball possession	SE concepts: Roles, affiliation, competition format, fair play, and record-keeping. Team responsibilities, team practice, open play	Week 1/Lessons 1-3
1v1, 2v1, 3v2, 2v2	Passing, receiving, dribbling, movement, and defense./ Objective: Maintaining ball possession/tackling.	Team responsibilities, team practice, open play, challenge and reinforcement of learning through a new game, Q&A	Week 2/Lessons 4-6

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	Scoring/Defensive space and goalkeeping; starting and restarting play		
2v2 + 1, 4v4 competitions	All content and objectives were applied	Team responsibilities, team practice, playing/refereeing friendly games/competition, open play situations, asking questions and stopping play, challenge, reinforcing learning through practice complexity, final discussion, technical timeout	Week 3/Lessons 7-9
2v2 + 1, 4v4 competitions	All content and objectives were applied	Team responsibilities, team practice, playing/refereeing competitive games, open play situations, asking questions, stopping play, challenge and reinforcing learning through a new game, progress through practice complexity, technical timeout	Week 4/Lessons 10-12
2v2 + 1, 4v4 competitions	All content and objectives were applied	Team responsibilities, team practice, playing/refereeing competitive games. Awards ceremony/peak event, challenge and reinforcing learning, restricted games, increasing tactical complexity, technical timeout	Week 5/Lessons 13-15

2.4. Data Analysis

For data analysis, paired t-tests were used for within-group changes, and one-way ANOVA was used for between-group comparisons. To determine the location of differences, LSD post-hoc tests were employed. All analyses were conducted using SPSS version 25 at a significance level of $P \leq 0.05$.

Findings and Results

As shown in Table 4, the age, height, and weight status of the participants in each group are presented separately. The data indicates that the minimum age was 10 years, and the maximum age was 12 years. Additionally, the shortest height was 139 cm, and the tallest individual was 155 cm. In terms of weight, the lightest participant weighed 30 kg, and the heaviest weighed 45 kg.

Table 4

Mean and Standard Deviation of Age, Height, and Weight of Participants in the Teaching Games for Understanding, Sport Education, and Combined Approach Groups

Group	Variable	Mean	Standard Deviation	Minimum	Maximum
Teaching Games for Understanding (TGfU)	Age (years)	10.85	0.745	10	12
	Height (cm)	145.75	3.94	140	154
	Weight (kg)	35.95	4.07	30	44
Sport Education (SE)	Age (years)	10.80	0.768	10	12
	Height (cm)	145.80	4.18	139	155
	Weight (kg)	38.70	3.40	33	45
Combined Approach	Age (years)	10.80	0.768	10	12
	Height (cm)	147.35	3.80	142	155
	Weight (kg)	37.20	3.66	31	45

According to the results obtained from the Kolmogorov-Smirnov statistical test, it was found that the distribution in all three groups—Teaching Games for Understanding, Sport Education, and Combined Approach—was normal in both the pre-test and post-test phases; therefore, parametric statistics were used.

As shown in Table 5, the comparison between the pre-test and post-test in the Combined, Sport Education, and Teaching Games for Understanding groups revealed significant differences in football performance. Therefore, it can be concluded that the intervention approaches (Combined, Sport Education, and Teaching Games for Understanding) had a significant effect on football performance in children aged 10 to 12.

Table 5

Determining the Effect of Intervention Approaches on Football Skill Performance

Group	Condition	df	T	P
Combined Approach	Correct	19	-12.053	0.001
	Incorrect	19	11.815	0.001
Sport Education (SE)	Correct	19	-11.032	0.001
	Incorrect	19	7.982	0.001
Teaching Games for Understanding (TGfU)	Correct	19	-31.288	0.001
	Incorrect	19	9.778	0.001

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A one-way ANOVA was conducted to compare the differences between the three groups (Teaching Games for Understanding, Sport Education, and Combined Approach) in football performance in the post-test phase. The results indicated a significant difference between the three groups ($P \leq 0.05$).

Subsequently, to determine the location of the differences, the LSD post-hoc test was used (Table 6). As shown in Table 6, the pairwise comparison of the groups revealed that there were significant differences in football performance between the Teaching Games for Understanding group and the Sport Education and Combined groups, as well as between the Sport Education and Combined groups, in both correct and incorrect conditions.

Table 6

Determining the Location of Differences Between the Three Groups in Football Performance in the Post-Test Phase Using the LSD Post-Hoc Test

Variable	Group (I)	Group (J)	Condition	Mean Difference (I-J)	SE	P
Performance	Teaching Games for Understanding	Sport Education	Correct	12.200	0.818	0.001
			Incorrect	-3.800	0.560	0.001
	Teaching Games for Understanding	Combined Approach	Correct	10	0.818	0.001
			Incorrect	-1.750	0.560	0.003
	Sport Education	Combined Approach	Correct	-2.200	0.818	0.009
			Incorrect	2.050	0.560	0.001

3. Discussion and Conclusion

The results from the analysis and comparison of means using ANOVA in the three groups (Combined Approach, Sport Education, and Teaching Games for Understanding) during the post-test phase indicated significant differences in their effectiveness on both correct and incorrect performance conditions. This means that the effectiveness of each training approach varied. To identify the location of the differences, the LSD post-hoc test was employed, and the pairwise comparisons revealed significant differences between the TGfU and SE groups in both correct and incorrect performance conditions. The mean comparisons also showed that the TGfU approach was superior to the SE approach. A comparison between the TGfU and Combined approaches also indicated significant differences in both correct and incorrect performance conditions, with TGfU outperforming the Combined approach. Finally, the comparison between the SE and Combined approaches showed significant differences in both correct and incorrect conditions, with the Combined approach outperforming SE.

These findings suggest that there are significant differences between the three approaches—TGfU, SE, and Combined—in their effectiveness on football performance, with TGfU having the greatest impact, followed by the Combined and SE approaches. Based on the results, it can be concluded that the differences in the effectiveness of the Combined, Sport Education, and Teaching Games for Understanding approaches on football performance in 10 to 12-year-old boys in Tehran are confirmed. These findings support the hypothesis that there are significant differences between the three approaches in their impact on support, decision-making, and execution in football performance, with TGfU, Combined, and SE approaches being the most effective, respectively.

A similar study by Gil-Arias et al. (2017) examined the effectiveness of three approaches on certain cognitive and psychological factors in children playing futsal. They found that for variables such as creative actions, group creativity, motivation, perceived motor competence, and motor mastery, the TGfU, Combined, SE, and linear groups showed the most progress, respectively, attributing this to the training and gameplay methods in TGfU (Gil-Arias et al., 2021). Zhen-Rong et al. (2021) reported similar findings, showing that for creative and original actions as well as team creativity, the TGfU, Combined, Sport Education, and linear groups had the most progress and effectiveness, with significant differences between TGfU and linear, and Combined and linear approaches (Zhen-Rong, 2021). Their research highlighted that TGfU and Combined approaches have a relative and significant advantage over Sport Education and linear methods, suggesting these approaches could be beneficial in schools and kindergartens for teaching sports skills.

No opposing studies were found in this review. The studies indicate that there are significant differences in the effects of these three approaches on improving students' sports skills. However, it is important to note that the Teaching Games for Understanding approach generally shows the best performance in enhancing sports skills. This could be because it focuses more on the core skills of the sport, and motor skill improvement requires more freedom of action and the use of more muscles in specific situations. Therefore, placing an individual in an exploratory environment increases their motivation to discover an appropriate pattern. Since they overcome challenges independently, this fosters a sense of autonomy and ultimately the perception of competence.

In contrast, the Sport Education approach generally shows moderate performance because it focuses on the social aspects of sports rather than purely on sports skills. While some advantages, such as giving children roles and celebrating victories, can be crucial for their independence and confidence, this method may be detrimental for the losing team or when a child does not have a role in the game, at least for one session. Since the child's world has its own rules and they live in the present, these moments can affect learning and growth. The Combined approach showed better

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performance than SE but did not match TGfU. It was expected that the Combined approach would show the best performance among the three, as it integrates the benefits of both approaches and simultaneously addresses both skill and social aspects of sports. However, in practice, this did not happen. It seems that the Combined approach, by deeply immersing the students in both the TGfU and SE approaches, may have prevented the individual from forming a cohesive mental philosophy for the training.

Considering that emphasis on play in childhood is more effective than any other type of education, and that in the Teaching Games for Understanding approach, children are placed in an environment designed for play where only the coach is aware of the training goal, whereas in Sport Education, the focus is on winning and losing, this factor could also affect the Combined approach. It is possible that at older ages (youth), due to increased physical and mental capabilities, the Combined approach might be more effective, but among 10 to 12-year-olds, while it has shown good and significant effects on the variables under consideration, it has not achieved the best performance.

The results of the present study indicate that all three approaches—Teaching Games for Understanding, Sport Education, and Combined—can effectively and significantly improve football performance in children aged 10 to 12. In fact, using innovative training methods in teaching various sports, especially for children, can be more effective than traditional methods, while also making the training environment more enjoyable. The comparison between these three approaches also revealed that, in order, Teaching Games for Understanding, Combined, and Sport Education yielded the best results. Therefore, when teaching football to 10 to 12-year-old boys in Tehran, it is advisable to consider these priorities in education.

Authors' Contributions

All authors significantly contributed to this study.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

In this study, to observe ethical considerations, participants were informed about the goals and importance of the research before the start of the interview and participated in the research with informed consent.

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