The Effect of Timorese Traditional Games Siki Doka and Gobak Sodor on the Physical Fitness of Elementary School Students

Timoteus Ajito[1], Made Agus Dharmadi[2], I Ketut Sudiana[3], I Ketut Iwan Swadesi[4]

{ajitotimothy83@gmail.com[1], agus.dharmadi@undiksha.ac.id[2], ketut.sudiana@undiksha.ac.id[3], Iwan.Swadesi@undiksa.ic.id[4]}

Ganesha University, Bali[1,2,3,4]

Abstract. This research was motivated by the decline in physical activity and the decline of traditional games among elementary school students due to the prevalence of gadgets, highlighting the need for innovations in PJOK learning that are both fun and effective in improving physical fitness. The study used a quasi-experimental design for 8 weeks with two treatment groups: Siki doka (n=14) and Gobak Sodor (n=14). The learning intervention was conducted three times a week, lasting 60 minutes at each meeting. Fitness was measured using a 30-meter sprint test (TKJI subtest) in the pre-test and post-test. The results showed that both games improved physical fitness, but Gobak Sodor was more effective. The Gobak Sodor group's running time decreased from 16.14 seconds to 12.93 seconds (a 19.88% increase), while Siki doka decreased from 16.05 seconds to 14.66 seconds (an 8.65% increase). These findings confirm that traditional games can be meaningfully integrated into PJOK to improve students' fitness and active participation.

Keywords: traditional games, Timor, Siki Doka, Gobak Sodor, physical fitness

1 Introduction

Traditional sports games are the result of traditions that originate from a community's culture. To understand them, it's necessary to understand the concept of play [1], [2]. Therefore, games in an educational context can be used as a means of providing information on the importance of physical activity to improve health, physical fitness, social relationships, emotional control, and character [3], [4]. Today, traditional games are fading and sinking into the global tide of modernization. The current generation is increasingly losing the ability and creativity to understand the principles of local wisdom in the era of the 4.0 industrial revolution, especially in traditional sports games. So, physical activities and traditional games are being forgotten and replaced by gadgets [5]. Furthermore, physical fitness is also essential for children to achieve their education and support their health. Successfully achieving the learning objectives of Physical Education, Sports, and Health (PJOK) is not easy. This is due to the very low level of implementation of the physical fitness measurement instrument (TJKI), whose components are a combination of physical fitness related to skills and health [6]. Meanwhile, what students need is improved physical fitness. As educators in this field, we have a significant responsibility. Success in achieving learning objectives is determined by the teacher's ability to plan accordingly. Physical education (PJOK) learning is crucial because it is part of the overall educational process, the goal of which is to improve human performance through physical

ICEHHA 2025, December 11-12, Ruteng, Indonesia
Copyright © 2026 EAI
DOI 10.4108/eai.11-12-2025.2363100

activities to develop and maintain the body. In the context of sports, physical fitness is the primary foundation that must be met before an athlete enters advanced training stages to achieve optimal training quality and maximum performance during competition. Physical fitness encompasses several basic components of motor skills: strength, agility, endurance, flexibility, and speed. All of these components are interconnected and play a role in determining an athlete's readiness to participate in an effective training program. Improving physical fitness also requires the application of systematic, planned, and continuous training principles so that each aspect can develop proportionally [7], [8]. As the era of industrial revolution 4.0 advances, the development of science is also increasing. In line with this, as an educator, one must be able to carry out 21st century learning indicators by: 1. Integrating Strengthening of Character Education, 2. Integrating Literacy Movements, 3. Stimulating the Growth of 6C (Critical Thinking, Collaborative, Creativity, Communicative, Character, and Citizenship), 4. Integrating HOTS (Higher Order Thinking Skill). These indicators aim to make students have character, be competent, and be literate. These objectives can be achieved through the PJOK learning process. According to Law Number 3 of 2005, it is explained that sport is a systematic activity to encourage, foster, and develop physical, spiritual, and social potential [9]. Based on observations and interviews with physical education teachers at elementary schools in Kupang Regency, researchers found that the lack of potential for physical activity and an active lifestyle is a growing problem in education. Physical activity and an active lifestyle are among the most important challenges, as physical fitness is included in the physical education curriculum, aiming to develop a healthy and active lifestyle [10]. So, PJOK learning should be an opportunity for students to achieve a healthy life [11]. Current developments, faced with technological advances such as television, online games, computers, the internet and the emergence of Android smartphones, many children today spend their time playing with gadgets, both the internet and social media, so children need to be able to increase their physical activity through exercise, so that they can reduce the impact of excess weight, individualism and lack of socialization with the surrounding environment [12]. The sophistication of technology and its free use by children without strict parental supervision can affect a child's character. The role of physical education teachers in monitoring the development of students' physical fitness and character is crucial. A common obstacle in elementary school learning is the lack of knowledge of physical education teachers in applying appropriate models in the teaching and learning process, which can seem monotonous and unattractive to students. This is due to a lack of knowledge due to limited references or reading sources on how physical education teachers teach appropriate traditional sports games to support the achievement of desired learning outcomes [13], [14]. In this context, researchers are increasingly confident in innovating by developing traditional Timorese games "Siki doka " and "Gobak Sodor" for the Physical Fitness of Elementary School Students to improve physical fitness with a sportsmanship character, and attract students' attention in learning and increase physical fitness activities [15]. The learning model developed believes that the success of physical education learning begins with students' enjoyment of physical activities [16]. The traditional sports games "Siki doka" and "Gobak Sodor" instill the values of character, sportsmanship, and cooperation in children from elementary school age and can also help increase children's focus [17]. Motor skills learning is one part of physical education learning in schools, developing attitudes, knowledge, and motor skills. Traditional sports games can foster good character values in elementary school-aged children, including the joy children experience when playing with their friends, a strong sense of friendship, democracy, leadership, responsibility, tolerance, self-confidence, honesty,

courage, cooperation, and high sportsmanship [18], [19]. Traditional games can be an activity that can prevent excessive dependence on gadgets, which can make children aggressive and individualistic. The implementation of the traditional games "Siki doka " and "Gobak Sodor" can improve students' physical fitness.

Siki doka is a traditional game of the Kupang Regency community that is structurally identical to engklek. The game begins with the creation of squares on the ground, then each player prepares a gacuk (a small piece of tile or ceramic tile). On each turn, a player throws a keweng (a type of wooden stick) into one of the available squares, with the stipulation that the throw must fall within the square's boundaries. If the throw goes beyond the boundary, the player is declared out, and the turn passes to the next player. Once the keweng lands on a square, that square becomes a forbidden square that cannot be occupied, so the player must jump over it and continue moving to the next square on one foot. Mechanically, Siki doka is dominated by a series of repeated single-leg jumps on a narrow surface, accompanied by a single support phase, controlled landings, and quick posture corrections to avoid touching the square lines. This movement pattern requires explosive contraction of the lower leg muscles during the push-off phase, stabilization of the ankles, knees, and hips during the support phase, and activation of the core muscles to maintain dynamic balance during landings and transitions between squares. In terms of intensity profile, Siki doka is intermittent with short, medium-length activities per turn, characterized by repeated explosive jumps separated by short pauses at turn changes. Therefore, Siki doka tends to place a dominant neuromuscular load on the lower limbs with a relatively prominent contribution from the anaerobic energy system, making it relevant as a stimulus for the development of explosive leg strength and postural control in elementary school-aged children. Gobak Sodor is a traditional team game played on a grid-patterned field and involves direct interaction between the attacking and defending teams. Operationally, the game proceeds through the attacking team's efforts to pass through the guard lines without being touched, while the defending team focuses on blocking and making touches within the boundaries of the lines of movement that apply in the game. The attacker's success is largely determined by the ability to read gaps, manage timing, and coordinate strategies with teammates, while the defender's success is determined by inter-player coordination, positional discipline, and quick response to changes in the attacker's direction.

Mechanically, Gobak Sodor is dominated by repeated short-distance sprints, sudden accelerations, decelerations, changes of direction, and reactions to opponent movements within a relatively limited playing space. This movement pattern demands a combination of agility, spatio-temporal coordination, and quick motor decision-making by both attacking and defending players. In terms of intensity profile, Gobak Sodor is intermittent, with episodes of moderate- and high-intensity work (short sprints, evasive maneuvers, and changes of direction) interspersed with short recovery periods as players wait for opportunities or reposition. Consequently, the game requires alternating aerobic and anaerobic contributions, with the anaerobic system playing a dominant role during sprints and changes of direction, while the aerobic system supports recovery during work periods. In addition to its fitness implications, the team-based nature of the game, with its touch or block rules and the need for strategic coordination, makes Gobak Sodor a potential platform for developing socio-emotional aspects

such as cooperation, communication, and sportsmanship through play situations that demand adherence to rules and collaboration.

The integration of these two games in PJOK learning not only functions as a fun variation of activities but also provides targeted physiological and neuromotor stimuli [20]. This aligns with recent research findings showing that traditional sports games can generate moderate to high levels of physical activity, increase motor engagement, and trigger positive emotional responses and social cooperation in students. In addressing this challenge, various studies have shown that traditional games can be an effective contextual solution. Traditional games are also effective in preventing children's dependence on gadgets, which can trigger individualistic and aggressive behavior. Therefore, the implementation of Siki doka and Gobak Sodor, typical games of East Nusa Tenggara Province, is believed to improve physical fitness while instilling important character values in the development of elementary school-aged students. In this study, a physical education (PJOK) learning model was developed based on local wisdom by integrating the traditional games of Siki doka and Gobak Sodor. These games were chosen not only for their high local cultural value but also for their potential to improve physical fitness, sportsmanship, and social character in elementary school students. This integration was carried out in a quasi-experimental design, which has not been widely used in previous research in eastern Indonesia.

2 Method

This study used a quasi-experimental design with two treatment groups. The research activities were carried out for 8 weeks, starting from the preparation stage to the final data collection. The learning intervention was carried out three times per week, with a duration of 60 minutes at each meeting. The research subjects were 28 elementary school students who were divided equally into two treatment groups, namely the Siki doka group (n = 14) and the Gobak Sodor group (n = 14). The balanced distribution of sample sizes between groups aimed to maintain the comparability of the results in the quasi-experimental design. The measurement instrument used was a 30-meter sprint test, which is one of the sub-tests in the Indonesian Physical Fitness Test (TKJI) for elementary school-age students. Measurements were carried out using a stopwatch, with the test results in the form of travel time (in seconds). Participants ran 30 meters from a standing start position, and the time was stopped when the participants reached the finish line. Data collection was carried out twice, namely in the pre-test before the treatment was given and the post-test after the entire series of interventions was completed. The data obtained were used to analyze changes in students' running speed after participating in traditional game-based learning of Siki doka and Gobak Sodor.

3 Results and Discussion

3.1. Results

This study aims to analyze the effect of traditional games Gobak Sodor and Siki doka on improving the physical fitness of fifth-grade students at Dendeng Public Elementary School, Kupang Regency. Physical fitness measurements were conducted using the Indonesian Physical Fitness Test (TKJI) through a pre-test and post-test design after eight weeks of intervention. The data obtained were analyzed statistically through normality and homogeneity tests as

prerequisites for analysis, then continued with paired t-tests and independent t-tests to identify differences in physical fitness improvement between treatment groups.

Table 1. Normality Test of Physical Fitness Data

Variabel	N	Average ± SB (Before)	P (Before)	Average ± SB (After)	P (After)	Information
Group 1 (Gobak Sodor)	14	16,140 ± 0,736	0,101	12,930 ± 0,716	0,110	Normal
Group 2 (Siki doka)	14	16,055 ± 0,461	0,123	14,666 ± 0,678	0,148	Normal

Table 2. Homogeneity Test of Physical Fitness Data

Measurement Stage	F	p	Information
Before Training	0,210	0,528	Homogen
After Training	0,129	0,722	Homogen

Table 3. Comparison Test of the Effects of Improving Physical Fitness

Stage	n	Group 1 (Gobak Sodor)	Group 2 (Siki Doka)	t	p	Information
Before Training	14	16,14 ± 0,73	16,05 ± 0,46	10,05	0,001	Not significantly different
After Training	14	12,93 ± 0,71	14,66 ± 0,67	12,46	0,001	Significantly different

Table 4. Percentage of Increase in Physical Fitness

Group	Before Training (second)	After Training (second)	Difference (second)	Percentage Increase (%)
Gobak sodor	16,140	12,930	3,210	19,88
Siki doka	16,055	14,666	1,389	8,65

3.2. Discussion

3.2.1. Effectiveness of traditional games on physical fitness

This study shows that the traditional games of Gobak Sodor and Siki doka both contribute to improving the physical fitness of fifth-grade students at Dendeng Public Elementary School, although the magnitude of the effects differs. Fitness measurements using a 30-meter sprint test indicate that the Gobak Sodor group experienced a decrease in time from 16.14 seconds to 12.93 seconds, representing a 19.88% increase in performance. In the Siki doka group, running time decreased from 16.05 seconds to 14.66 seconds, an increase of 8.65%. This difference in performance suggests that the physical activity characteristics of Gobak Sodor produce a stronger training stimulus than Siki doka in the context of improving sprint performance. Physiologically, Gobak Sodor contains dynamic and intermittent movement demands, characterized by repeated accelerations, rapid changes of direction, sudden stops, and responses to opponent movements. This pattern has the potential to increase neuromuscular and metabolic capacity relevant to sprint performance, particularly through strengthening the components of speed, agility, coordination, and explosive power of leg muscles. The complexity of these movements also encourages the involvement of more comprehensive muscle groups and increases the need for motor control in rapidly changing game situations, thereby increasing the opportunity for meaningful functional adaptations.

Siki doka emphasizes locomotor skills involving single-leg support, repetitive stepping patterns, and postural control. These movement characteristics tend to facilitate the development of stability, balance, and coordination through the activation of stabilizer muscles and strengthening of postural control. This relatively specific focus on movement demands makes Sikidoka effective in supporting basic motor skills related to balance and coordination. However, the lower intensity of acceleration and frequency of direction changes compared to Gobak Sodor results in a more limited stimulus for speed-based fitness development. Overall, these findings emphasize that the selection of traditional games in Physical Education (PJOK) learning needs to consider the suitability between the characteristics of the game's movement demands and the physical fitness components being targeted.

3.2.2. Social emotional aspects of cooperation and sportsmanship

The research findings show that the implementation of the traditional games Gobak Sodor and Siki doka not only has an impact on improving students' physical fitness, but also contributes to the development of socio-emotional aspects, especially cooperation and sportsmanship, through social and cooperative learning mechanisms that are developed during the playing process. This framework is in line with the tendency of physical education pedagogy that places games and student-centered learning models as a vehicle for developing dual physical and affective-social goals in authentic learning experiences [21]. From a social learning perspective, prosocial behaviors such as reminding each other of rules, providing support when a friend makes a mistake, and accepting group decisions develop through observation, imitation, and social reinforcement that emerge from peer interactions. This pattern is also consistent with the argument that cooperative strategies in physical education can shape students' emotional regulation and social interaction quality because activities are designed to require attention to others and self-control during movement tasks [22]. In line with the principles of cooperative

learning that emphasize positive interdependence, individual accountability, face-to-face interaction, and social skills, the meaning of cooperation during interventions appears different according to the structure of the game in Gobak Sodor, positive interdependence appears strong because the success of the team is influenced by the coordination of the guard-attack roles, short communication, and collective decision making to secure and seize the game area, this character is in line with the finding that the effectiveness of cooperative learning in physical education is largely determined by theory-based preparation (for example, the formation of heterogeneous groups) and adaptive implementation to the conditions of students [23].

Cooperation in Siki doka develops in the form of social support and turn-taking, which maintains the continuity of the activity. Although the task structure tends to be technically individual, interaction between students is still necessary to maintain the rhythm of the game, ensure adherence to rules, and maintain a conducive classroom climate. This pattern parallels the finding that cooperative learning can be used as a classroom strategy to strengthen social relationships and reduce friction as students learn to negotiate their roles and responsibilities [24]. The aspect of sportsmanship is observed through students' ability to manage minor conflicts, accept mistakes, and agree on solutions without escalation (e.g., repeating a round or accepting a joint decision), which indicates the development of an appreciation for procedural justice and self-control; in physical education literature, the strengthening of this dimension is generally more stable when learning does not stop at normative claims, but is supported by a learning model structure that provides space for practicing values through experience, reflection, and interaction [25].

3.2.3. Pedagogical implications and integration in the PJOK curriculum

Based on a synthesis of quantitative and observational findings, this study confirms that traditional games have comprehensive pedagogical potential in Physical Education (PJOK) learning. Games not only function as a means of improving physical fitness but also as a learning medium that supports integrated social and emotional development. This argument is in line with evidence that game-based approaches and student-centered models in physical education tend to produce multi-domain outcomes, including motivation, participation, and the quality of social interactions, when activities are designed to require decision-making, coordination, and teamwork. The pedagogical value of traditional games is also more likely to be achieved when they are placed as core activities, implemented in a structured manner (dynamic warm-up, core, cool-down), and their intensity is controlled through modifications of area, duration, repetition, and role rotation; within the framework of models-based practice, such arrangements are considered crucial so that learning objectives (physical, social, and personal) are aligned with the learning strategies and experiences experienced by students.

The differences in movement characteristics between Siki doka and Gobak Sodor show opportunities for specific utilization in accordance with the objectives of Physical Education and Health, while also opening up space for differentiation and inclusive participation in heterogeneous classes. Empirical evidence that systematically designed game or movement activities can influence certain motor skills is also shown in movement game-based research

that reports changes in balance components and student movement performance after programmed intervention. On the other hand, strengthening social competencies such as cooperation, communication, and leadership is often more apparent when traditional games are combined with experiential and reflection-based learning approaches. For example, a service-learning program in a traditional sports game course was reported to improve the soft skills (including collaboration) of prospective physical education teachers after eight weeks of implementation [26]. Thus, the integration of Gobak Sodor and Siki doka in PJOK can be positioned not merely as an enrichment activity but as a learning strategy that deliberately targets fitness components while building cooperation and sportsmanship through a game structure that demands social interaction.

4 Conclusion

This study provides empirical evidence that the traditional games Gobak Sodor and Siki doka can be effectively integrated into Physical Education, Sports, and Health (PJOK) learning in elementary schools as a pedagogical approach that is not only oriented towards improving physical fitness, but also supports the development of students' social-emotional aspects. Quantitative findings indicate that both games are able to improve sprint performance as an indicator of physical fitness, although with varying levels of effectiveness. Gobak Sodor produces greater performance improvements than Siki doka, indicating that the dynamic, cooperative movement patterns involving rapid changes of direction provide a stronger physiological stimulus to the speed-based fitness components and explosive power of leg muscles. These movement characteristics encourage more complex neuromuscular involvement and higher metabolic demands, thus potentially accelerating the physical adaptation process.

The Siki doka game demonstrates a more specific contribution to the development of balance, coordination, and motor control. The movement demands that emphasize single-leg support, repetitive step patterns, and postural stability make this game relevant for strengthening basic motor skills related to body control. These activity characteristics encourage the activation of stabilizer muscles and improved neuromuscular control, which play a crucial role in the development of fundamental motor skills in elementary school students. The differences in the movement demands of Gobak Sodor and Siki doka emphasize that traditional games are not homogeneous in their impact but rather possess distinct pedagogical potentials according to the physical fitness learning objectives to be achieved in the context of Physical Education and Health. In addition to the physical aspects, the observational findings of this study indicate that the implementation of Gobak Sodor and Siki doka also contributes to the development of students' social-emotional competencies, particularly cooperation and sportsmanship. In Gobak Sodor, cooperation develops through role coordination, communication between players, and collective decision-making in cooperative-competitive game situations. Group success is largely determined by the contribution of each individual, thus encouraging the emergence of positive interdependence and individual accountability. On the other hand, Siki doka excels in facilitating learning about sportsmanship and self-regulation, as reflected in students' ability to accept rules, manage mistakes, and accept game outcomes without escalating conflict. These

social values develop contextually through interactions during play, in line with the principles of social and cooperative learning in physical education.

This study has several limitations that should be considered when interpreting the results. The relatively limited sample size and short-term intervention duration limit the generalizability of the findings to a broader population and do not allow for analysis of the long-term sustainability of the impact of traditional games. Furthermore, the measurement of socio-emotional aspects relies on observational data during the learning process, thus not fully representing the dynamics of student behavior outside the classroom context or in more diverse social situations. Based on these limitations, further research is recommended involving a larger sample size, a longer intervention duration, and a longitudinal design to assess the stability and sustainability of the impact of traditional games on students' physical fitness and socio-emotional development. Future research could also combine various socio-emotional measurement instruments, such as standardized attitude scales, student and teacher reflections, or a mixed methods approach, to obtain a more comprehensive picture. Exploring the application of traditional games at different educational levels and school contexts is also important to broaden the relevance of the findings. This research strengthens the position of traditional games as an adaptive, contextual, and potentially sustainable approach to physical education (PJOK) learning. Integrating traditional games into PJOK learning is not only relevant to addressing the challenge of declining student physical activity but also offers a holistic pedagogical framework for simultaneously developing students' physical fitness and social character.

Acknowledgments.

The author would like to thank the Faculty of Teacher Training and Education, San Pedro University, for their support and the opportunity to publish. He also confirms that he has no financial interests or conflicts of interest related to the material presented in this manuscript. Furthermore, he expresses his deepest appreciation to the Catholic University of Santo Paulus Ruteng for their facilitation and support in organizing the International Conference on Education, Humanities, Health, and Agriculture, which has served as an important academic platform for the dissemination and development of this research.

References

[1] Irfan, M., Harahap, A.S., Usman, K., Aprial, M.B., Ilham: Development of traditional sports-based through educational tourism model: Edu Ortrad as a sports industry model. International Journal of Human Movement and Sports Sciences 11(2), 411–417 (2023).

[2] Zuhroh, L.L., Oktiningrum, W., Adzimatnur, A., et al.: Integrasi permainan tradisional inovatif GABUL dan GABIL dengan model habituasi sikap anti-bullying bagi siswa sekolah dasar. Indonesian Journal … (2024).

[3] Alcaraz-Muñoz, V., Izquierdo, C.M., García, M.G., et al.: Joy in movement: Traditional sporting games and emotional experience in elementary physical education 11(November), 1–11 (2020).

[4] Luchoro-Parrilla, R., Lavega-Burgués, P., Pic, M.: Teaching sustainability through traditional sporting games. Sustainability 16(13), 5510 (2024).

[5] Dharmadi, M.A., Kanca, I.N., Lanang, I.G., Parwata, A.: The effect of Balinese traditional games “Megoak-goakan” and “Megala-gala” on physical agility in martial arts athletes 10(3), 423–428 (2022).
[6] Kurniawan, E.: Model pembelajaran kebugaran jasmani berbasis modifikasi permainan tradisional Lombok pada siswa kelas atas sekolah dasar (2022).
[7] Arifin, S.: Peran guru pendidikan jasmani dalam pembentukan pendidikan karakter peserta didik. Multilateral Jurnal Pendidikan Jasmani dan Olahraga 16(1) (2017).
[8] Dharmadi, M.A., Spyanawati, N.L.: The effect of 6-week traditional Balinese game of Megoak-goakan on the running speed of junior pencak silat athletes 23(3), 98–105 (2023).
[9] Costantina, Y.C.: Model pengambilan kebijakan sekolah di SDN Grobogan 2 Madiun. Muslim Heritage 2(2), 235 (2018).
[10] Kristanto, W., Hendrowibowo, Citrasukmawati, A., Efendi, T.A.: Traditional games to improve the implementation of kindergarten character education. Contemporary Educational Research Journal 14(1), 47–56 (2024).
[11] Windayani: Pemikiran filosofis pendidikan Islam (rekontruksionisme). Wibawa Jurnal Manajemen Pendidikan 3(1), 63–76 (2023).
[12] Agus Rudiyanto, et al.: Pengaruh permainan olahraga tradisional untuk peningkatan kebugaran jasmani siswa Madrasah Aliyah Manbaul Ulum Bungah Gresik. Jurnal Pendidikan Kesehatan Rekreasi 8(1), 1–6 (2022).
[13] Nubatonis, S.: Melestarikan permainan tradisional Siki Doka, gala asin, dan bola kasti di era revolusi industri 5.0 3(1), 303–309 (2025).
[14] Silva, A.F., Clemente, F.M.: Can motor competence be influenced by the type of training interventions preschool children are exposed to? A randomized experimental study comparing sports games and psychomotricity activities (2024).
[15] Cocca, A., Verdugo, F.E., Tom, L., Cocca, M.: Effect of a game-based physical education program on physical fitness and mental health in elementary school students (2020).
[16] Martínez-Santos, R., Founaud, M.P., Aracama, A., Oiarbide, A.: Sports teaching, traditional games, and understanding in physical education: A tale of two stories. Frontiers in Psychology 11(September) (2020).
[17] Ajito, T., Jenahut, K.S., Maure, O.P.: Development of traditional game model “Etu” to improve physical fitness with sportsmanship in elementary school students in Nagekeo Regency. JOSS: Journal of Social Science 4(11), 719–730 (2025).
[18] Phaik, J., Cheong, G., Hussain, B.: Practicing traditional cultural games skills according to random and game-based practice schedules can improve gross motor skills performance (2024).
[19] Riyanti, A.D., Ernawati, A.: Gotong royong dan prestasi belajar bahasa Indonesia melalui model Team Games Tournament (TGT) berbantuan media pembelajaran permainan tradisional. Pendas Jurnal Ilmiah Pendidikan … (2024).
[20] Zhang, D., Shi, L., Zhu, X., Chen, S., Liu, Y.: Effects of intervention integrating physical literacy into active school recesses on physical fitness and academic achievement in Chinese children. Journal of Exercise Science & Fitness 21(4), 376–384 (2023).
[21] Silva, R., Farias, C., Ramos, A.N.A., Mesquita, I., et al.: Implementation of game-centered approaches in physical education: A systematic review 21(6), 3246–3259 (2021).
[22] Baena-Morales, S., Ferriz-Valero, A., García-Taibo, O.: Influence of cooperative strategies and mindfulness on the perception and control of emotions in primary physical education: A proposal to improve sustainability in the social dimension 22(7), 1590–1598 (2022).

[23] Schulze, C., Huth, M.V.O.N.: Digital survey to detect factors that determine successful implementation of cooperative learning in physical education 23(2), 399–403 (2023).
[24] Bofill-Herrero, A., Baena-Morales, S., García-Taibo, O.: Cooperative learning and SDG 5: An intervention for physical education in secondary schools 22(7), 1570–1580 (2022).
[25] Cereda, F.: Methods and models in the context of physical activity and physical education: Strengths, weaknesses, and gaps 23(5), 1064–1075 (2023).
[26] Nopiyanto YEKO, Pujianto D, Maisarah IRA, Cotton W. Original Article The effect of an 8-week service-learning program on traditional sports games courses on the soft skills of pre-service physical education teachers. 2023;23[12]:3487–94.