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The Effects of Recreational Soccer and Basketball Games on Health-Related Physical Fitness Components among Secondary School Students: A Comparative Study

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Abstract

This research aimed to investigate and compare the level of physical fitness among secondary school students at Fogera Secondary School after participating in recreational soccer and basketball games. This study used a quasi-experimental design. Forty students with an average age of 19.5 years were selected and divided into three groups: soccer, basketball, and control. The recreational soccer group had 14 participants (7 vs. 7), the basketball group had 12 participants (4 teams of 3 vs. 3 on both half courts), and the control group had 14. The soccer and basketball groups participated in 12 weeks of recreational activity, with three 90-minute sessions per week. Paired t-tests and one-way ANOVA followed by post-hoc tests were used for analysis at both pre- and post-intervention stages. Both recreational soccer and basketball programs showed significant improvements in cardiovascular endurance and flexibility. Performance on the 12-minute run test and sit-and-reach test was significantly better in both intervention groups compared to the control group

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Background of the Study

Recreational activities are vital for students' mental and physical development. At the high school level, physical activities are expected to be more structured, such as team sports and resistance training, compared to the play-based activities of younger children. Properly timed and regularly undertaken physical activity enhances fitness and health while reducing risks of mental illness, chronic disease, anxiety, and mood disorders (Fox &Mutrie, 2008). However, schools often limit access to physical activity due to academic demands and time constraints.

Effective implementation of recreational programs is hampered by poor community support, insufficient student knowledge, and the lack of or underutilization of resources (Hall & Kramer, 2009; Lavall, 1984). According to Tsige Anberbir (2014), student participation in recreation in Ethiopia faces barriers such as a lack of facilities, interest, awareness, and financial constraints.

Meckel et al. (2015) define physical fitness as comprising skill-related and health-related components, allowing individuals to perform daily tasks energetically without fatigue. Health-related physical fitness includes cardiorespiratory endurance, muscular strength, muscular endurance, flexibility, and body composition (Blair et al., 1989). Sedentary lifestyles increase susceptibility to illness and premature aging. Soccer and basketball are two popular sports known for their physical benefits. Soccer is especially accessible and equipment-light, enhancing strength, speed, agility, endurance, and flexibility (Hoff &Helgerud, 2004). Small-sided recreational soccer games promote various fitness domains through active and social gameplay (Andersen et al., 2010; Randers et al., 2014). Regular participation improves muscular strength, aerobic capacity, and body composition (AlperAslan & Alpay Guvenc, 2018). Similarly, basketball develops strength, coordination, and cardiovascular health.

Despite its benefits, basketball participation has declined compared to soccer, though interest is increasing locally. Its versatility in play settings still makes basketball a useful tool for youth fitness.

There are few comparative studies evaluating both sports' effects on student health-related fitness. This study examined 12 weeks of recreational soccer and basketball for their impact on male secondary school students' physical fitness, aiming to determine which sport is more effective for productive free-time use and healthy living.

Statement of the Problem

Student engagement in recreational activities is essential for promoting physical education, health, mental clarity, and fitness. Though research supports the physical benefits of soccer and basketball, studies on recreational basketball are limited, particularly regarding motor skills. Alper, Yasar, and Alpay (2019) noted that small-sided recreational soccer

enhances aerobic fitness across various demographics.

In contrast, Anula et al. (2019) found that national soccer players in Sri Lanka had superior VO_2 max, strength, agility, and flexibility compared to basketball players, who outperformed in coordination, balance, and endurance. Pavlo et al. (2018) also observed basketball's advantages for cardiovascular and cognitive functions. However, comparative research between the two in school recreation settings remains lacking.

Yosef Guye (2021) found soccer more effective than volleyball for fitness in local studies and advocated for more comparative studies involving soccer, basketball, and other ball-game sports. Despite the existing literature, empirical evidence on recreational soccer and basketball's unique impacts on Ethiopian students' health-related fitness is scarce. Past research often focused on elite athletes or combined skill- and health-related fitness with unclear methods.

No similar study has been conducted in the local Woreda, and health-related fitness has not been systematically explored.

Objective of the Study

General Objective

The study aimed to compare the effects of twelve weeks of recreational soccer and basketball participation on the health-related physical fitness of secondary school students.

Specific Objectives

1. To examine the effect of recreational soccer participation on students' health-related physical fitness.
2. To assess the effect of recreational basketball participation on students' health-related physical fitness.
3. To compare the effects of recreational soccer and basketball on students' health-related physical fitness.

Hypotheses

1. **Ha_1:** Recreational soccer participation significantly affects students' health-related physical fitness.
2. **Ha_2:** Recreational basketball participation significantly affects students' health-related physical fitness.
3. **Ha_3:** There is a significant difference between recreational soccer and basketball participation in their effects on students' health-related physical fitness.

Research Methods

Design

This study employed an experimental research design to systematically measure, evaluate, and analyze the effects of recreational soccer and basketball on health-related fitness.

Table 1: Training Protocol (12-Week Intervention)

Component	Details
Duration	12 weeks (July 12 – September 29, 2023)
Training Days	Monday, Wednesday, Friday
Time of Day	Afternoon
Intensity	Low to Moderate
Frequency	3 sessions per week
Warm-Up (10 min)	Walking, jogging, running, synchronized arm/leg movement, stretching

Main Activity (45–120 min)	- Soccer: 7v7 on 30–40m × 45–120m field- Basketball: 3v3 in half-court settings
Cool-Down (5 min)	Light movement, breathing, meditation, static stretching
Group Allocation	Random assignment
Recovery Time	5–10 minutes

Population and Sampling Technique

The study was conducted at Fogera Secondary School. The source population consisted of all male students, while the target population included those willing and available to participate during the study period.

Recreational soccer involved 7v7 small-sided games on fields 30–40 meters wide and 45–120 meters long. Recreational basketball was played 3v3 on two half-courts. Forty students were selected using systematic random sampling. They were randomly assigned into three groups: 14 in soccer (ESG), 12 in basketball (EBG), and 14 in the control group (CG).

All students followed the national PE curriculum and were instructed not to engage in additional physical activities outside of the intervention.

Data Collection Instruments

Both primary and secondary data were utilized. Primary data were obtained via pre- and post-intervention fitness tests, including the 12-minute run, 120-second sit-ups, wall-sit, sit-and-reach, body composition, and skinfold tests. Secondary data included books, articles, journals, theses, and online sources. Pre- and post-test results were collected for both experimental and control groups to assess intervention effects.

Data Analysis Methods

After collecting pre- and post-test data on the 12-minute run/walk (cardiorespiratory fitness), 120-second sit-up test (muscular endurance), wall-sit (muscular strength), sit-and-reach (flexibility), and skinfold test (body composition), descriptive statistics were calculated (mean and standard deviation). Paired sample t-tests were used for within-group comparisons, while one-way ANOVA and LSD post hoc tests were used to compare between groups. A significance level of $p = 0.05$ was applied. SPSS version 27 was used for statistical analysis.

Results

Table 2: Student Demographic Information

Characteristics	Sex	ESG (N=14)	EBG (N=12)	CG (N=20)	p-value
Age	Male	18.785 ± 1.311	18.333 ± 1.834	19.975 ± 1.544	0.781
Height (m)	Male	1.1223 ± 0.057	1.1208 ± 0.095	1.1204 ± 0.082	0.7122
Weight (kg)	Male	51.3129 ± 5.133	51.281 ± 12.572	51.2127 ± 7.888	0.999

Table 2 shows the general characteristics of the study participants in terms of age, height, and weight. The mean and standard deviation values for age were 18.785 ± 1.311 (ESG), 18.333 ± 1.834 (EBG), and 19.975 ± 1.544 (CG); for height, 1.1223 ± 0.057 m (ESG), 1.1208 ± 0.095 m (EBG), and 1.1204 ± 0.082 m (CG); and for weight, 51.3129 ± 5.133 kg (ESG), 51.281 ± 12.572 kg (EBG), and 51.2127 ± 7.888

kg (CG). The p-values indicate no statistically significant differences between the groups in age (p = 0.781), height (p = 0.7122), or weight (p = *0.999). All* participants were male. Therefore, the students were relatively similar in age, height, and weight before the start of the 12-week recreational activity.

Table 3: Descriptive Data of Pre-Test and Post-Test Results

Variable	Group	Pre-Test Mean ± SD	Post-Test Mean ± SD	Improvement (Δ Mean)
Cardiorespiratory Endurance (CRE)	ESG	2392.86 ± 307.35	2663.57 ± 285.49	+270.71
	EBG	2412.50 ± 170.84	2620.00 ± 209.79	+207.50
	CG	2404.25 ± 244.50	2311.75 ± 255.38	–92.50
Muscular Strength (MS)	ESG	82.86 ± 27.15	108.43 ± 33.25	+25.57
	EBG	83.17 ± 7.33	92.67 ± 9.18	+9.50
	CG	82.80 ± 31.12	79.55 ± 31.06	–3.25
Muscular Endurance (ME)	ESG	26.43 ± 4.40	27.86 ± 4.26	+1.43
	EBG	26.45 ± 2.88	27.50 ± 2.59	+1.05
	CG	26.45 ± 3.76	25.65 ± 3.53	–0.80
Flexibility (FL)	ESG	3.50 ± 4.86	6.93 ± 4.50	+3.43
	EBG	3.33 ± 4.46	5.17 ± 3.54	+1.83
	CG	3.45 ± 4.52	1.95 ± 3.44	–1.50
Fat Percentage	ESG	4.29 ± 1.92	3.98 ± 1.50	–0.31
	EBG	4.49 ± 1.37	4.30 ± 1.27	–0.19
	CG	4.49 ± 1.56	4.51 ± 1.56	+0.02
Lean Body Mass	ESG	49.03 ± 4.41	48.84 ± 4.49	–0.19
	EBG	48.92 ± 5.73	48.66 ± 5.87	–0.27
	CG	48.96 ± 6.76	49.01 ± 6.75	+0.05

The data in Table 3 indicate that cardiorespiratory endurance (CRE) improved significantly in both experimental groups: by 270.71 meters in ESG and 207.50 meters in EBG, while CG showed a decline of 92.50 meters—demonstrating the effectiveness of structured physical activity in developing aerobic capacity. Muscular strength (MS) increased significantly in ESG (+25.57), moderately in EBG (+9.50), and decreased in CG (–3.25), suggesting that soccer enhances strength development more effectively. Muscular endurance (ME) saw slight improvements in ESG (+1.43) and EBG (+1.05) but declined in CG (–0.80), reflecting marginal benefits. Flexibility (FL) significantly improved in ESG (+3.43), moderately in EBG (+1.83), and decreased in CG (–1.50), indicating that the dynamic and multidirectional movements in both sports positively affected joint flexibility. Fat percentage slightly decreased in ESG (–0.31) and EBG (–0.19), while CG showed a small increase (+0.02). Lean body mass remained nearly unchanged, with slight decreases in ESG and EBG and a minimal increase in CG,

suggesting the training duration and intensity may not have been sufficient to significantly affect muscle mass.

Table 4: ANOVA Summary of Pre-Test and Post-Test Results

Variable	Test Status	Sum of Squares	Df	Mean Square	F	Sig. (p)
CRE	Pre-test	2830.536	2	1415.268	0.022	0.978
	Post-test	1,155,489.196	2	577,744.598	8.487	0.001
MS	Pre-test	0.627	2	0.314	0.000	1.000
	Post-test	6875.663	2	3437.832	3.840	0.031
ME	Pre-test	0.021	2	0.011	0.001	0.999
	Post-test	44.636	2	22.318	1.633	0.209
FL	Pre-test	0.117	2	0.058	0.003	0.997
	Post-test	211.063	2	105.532	7.090	0.002
Fat %	Pre-test	0.352	2	0.176	0.063	0.939
	Post-test	2.376	2	1.188	0.524	0.597
Lean Body Mass	Pre-test	0.062	2	0.031	0.001	0.999
	Post-test	0.652	2	0.326	0.009	0.991

The ANOVA results in the pre-test phase showed no significant differences between ESG, EBG, and CG across all health-related fitness variables. The p-values for CRE (0.978), MS (1.000), ME (0.999), FL (0.997), Fat% % (0.939), and Lean Body Mass (0.999) confirm group homogeneity before the intervention. Post-test results, however, showed significant differences in CRE ($F = 8.487$, $p = 0.001$), MS ($F = 3.840$, $p = 0.031$), and FL ($F = 7.090$, $p = 0.002$), indicating that the 12-week recreational soccer and basketball interventions had a statistically significant effect on these components. No significant differences were found for ME, Fat %, or Lean Body Mass in the post-test results, suggesting these variables were less responsive to the intervention.

Table 5: LSD Post Hoc Test Results for Significant Variables (Post-Test)

Variable	Group Comparison	Mean Difference	Sig. (p)
CRE	Soccer vs Control	351.82	0.000
	Basketball vs Control	308.25	0.015
	Soccer vs Basketball	43.57	0.734
MS	Soccer vs Control	28.88	0.009
	Basketball vs Control	13.11	0.352
	Soccer vs Basketball	15.71	0.287
FLX	Soccer vs Control	4.98	0.001
	Basketball vs Control	3.21	0.081
	Soccer vs Basketball	1.71	0.355

Table 5 demonstrates that the soccer group outperformed the control group in all three significantly different variables. In cardiorespiratory endurance (CRE), soccer outperformed control (mean difference = 351.82, $p < 0.001$), and basketball also showed a significant improvement over control (mean difference = 308.25, $p = 0.015$), though no significant difference existed between soccer and basketball ($p = 0.734$). In muscular

strength (MS), soccer was significantly better than control ($p = 0.009$), while basketball was not ($p = 0.352$); the difference between soccer and basketball was also not significant ($p = 0.287$). In flexibility (FLX), soccer again outperformed control ($p = 0.001$), basketball showed a non-significant improvement ($p = 0.081$), and the difference between the sports was not significant ($p = 0.355$). These findings confirm soccer's superior effects compared to control and show basketball's limited statistical impact.

Discussion

The aim of this study was to examine the effects of student participation in recreational soccer and basketball on health-related physical fitness and to compare the respective outcomes. The hypotheses were as follows:

Ha.1 – Recreational soccer participation significantly affects students' health-related physical fitness.

Ha.2 – Recreational basketball participation significantly affects students' health-related physical fitness.

Ha.3 – There is a significant difference between recreational soccer and basketball participation on students' health-related physical fitness.

Effects of Recreational Soccer Participation on Physical Fitness

The findings strongly support **Ha.1**, confirming that recreational soccer leads to significant improvements in several components of health-related physical fitness. Participants in the soccer group (ESG) demonstrated greater gains in cardiorespiratory endurance, muscular strength, and flexibility compared to the control group. Notably, improvements were statistically significant for cardio respiratory endurance ($p = 0.001$), muscular strength ($p = 0.031$), and flexibility ($p = 0.002$). These findings align with previous studies highlighting soccer as an effective aerobic and anaerobic sport that enhances cardiovascular health, muscular strength, and joint mobility (Bangsbo et al., 2006; Krustrup et al., 2010). However, the 12-week intervention had minimal effects on muscular endurance, fat percentage, and lean body mass, suggesting the program primarily influenced cardiovascular and strength-related variables rather than body composition.

Effects of Recreational Basketball Participation on Physical Fitness

In support of **Ha.2**, the basketball group (EBG) showed significant improvements in cardiorespiratory endurance ($p = 0.015$) compared to the control group. This reinforces the idea that basketball, through its intermittent high-intensity movements, is beneficial for cardiovascular fitness (McInnes et al., 1995). However, the gains in muscular strength and flexibility were not statistically significant. This may be due to basketball's emphasis on agility, coordination, and skill-based movement rather than prolonged strength or flexibility training. This result is consistent with earlier studies suggesting basketball has a moderate impact on strength and flexibility (Saez-Saez de Villarreal et al., 2015).

Comparative Effects of Soccer and Basketball on Physical Fitness

The third hypothesis (**Ha.3**) was only partially supported. While the soccer group showed numerically greater improvements in muscular strength and flexibility than the basketball group, these differences were not statistically significant. Both sports contributed positively to cardiorespiratory endurance with no significant difference between them. These findings indicate that while both soccer and basketball are effective for improving cardiovascular fitness, soccer may offer slight advantages in building muscular strength and flexibility due to the dynamic and sustained nature of the movements involved (Krustrup et al., 2010). Nevertheless, the lack of significant differences suggests that both recreational sports can be used effectively to promote physical fitness among students.

Summary

The purpose of the study was to evaluate how 12 weeks of recreational soccer and basketball training affected health-related physical fitness among secondary school students. The findings indicated that both soccer and basketball led to significant improvements in cardio respiratory endurance, while soccer also significantly improved muscular strength and flexibility. Basketball participation enhanced cardiovascular fitness but did not result in statistically significant gains in strength or flexibility. Although soccer showed a slight edge in strength and flexibility, no statistically significant differences were found between the two sports across all fitness variables. Therefore, both sports proved beneficial in promoting selected health-related physical fitness components in adolescents.

Conclusion

Based on the study results, it can be concluded that 12 weeks of recreational soccer and basketball training positively affect health-related physical fitness in secondary school students. Soccer was shown to significantly improve cardiorespiratory endurance, muscular strength, and flexibility, whereas basketball contributed mainly to cardiorespiratory endurance. Although some differences favored soccer, no statistically significant differences were observed between the two sports in muscular strength and flexibility. Both activities were effective in enhancing cardiovascular fitness and overall muscular conditioning. However, the intervention did not significantly affect muscular endurance, fat percentage, or lean body mass, likely due to the program's duration, intensity, and unmonitored dietary habits.

Recommendations

- Schools should regularly incorporate soccer and basketball into the curriculum to support cardiovascular and muscular development in students.
- Schools should complement soccer and basketball programs with additional training focused on muscular endurance and flexibility to achieve holistic fitness outcomes.
- Especially in basketball, integrating structured strength and flexibility components can enhance its overall fitness benefits, making it more effective in

developing well-rounded athleticism in students.

- Future interventions should consider longer training durations to enable measurable changes in muscular endurance and body composition. Diet should also be monitored.
- Future research should involve female students and larger, more diverse samples to enhance generalizability and ensure equitable health benefits across demographics.

Ethics Statement

The study was conducted according to the recommendations of APA ethical guidelines, and informed consent was obtained from students and the school as per the Declaration of Helsinki.

Conflict of Interest

The authors of this study state that there is no conflict of interest.

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