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Health benefits of mixed recreational team games on untrained males in post COVID-19 scenario

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ABSTRACT

Objective of the study was to examine the effect of small-side mixed recreational games on physical characteristics of university youth. *Methods:* Twenty-six male chosen and divided randomly into experimental (n=16) and control group (n=9). Experimental group was offered mixed recreational games thrice a week for 12 weeks. Mixed games included small sided football, basketball and handball. Training was given for 30 minutes. Independent T-test was used to check group differences at start and post intervention. Product Moment Correlation was used to check correlation between aerobic capacity and body fat. *Results:* Body fat percent (t23= -2.123, P= 0.045), aerobic capacity (t23= 2.220, P= 0.037), oxygen saturation (t23 = 2.182, P = 0.040) and resting heart rate (t23= 2.123, P= 0.045). Significant relationship between body fat and aerobic capacity was seen in the intervention group (r= -0.675, n=16, p= 0.004). *Conclusions:* It can be concluded that mixed recreational games are effective and should be promoted among youth for better health. Unstructured and supervised recreational games are effective in promoting physical health and are enjoyed by young participants.

Keywords: Recreational Games, Oxygen Saturation, COVID-19

1. INTRODUCTION

Importance of exercise has been understood and realized during COVID-19. Recreational sports now have been unarguably accepted as means of health and physical fitness. Especially post COVID-19, it is inevitable to remain active and recreational team sports can be very useful in maintaining general well-being of person. Data from World Health Organization suggest that physical inactivity is the 4th main cause of global mortality risk (World Health Organization). Sedentary life style makes person inactive and reduces his physical fitness levels.

In today's world, reduced or low physical fitness is important risk factors for disease that are related to cardiovascular system (Booth et al., 2017; Thorp et al., 2011). Regular participation in physical activities has been beneficial for

health. In order to prevent and treat lifestyle related diseases, supervised training programmes plays an important role (Kiens et al., 2007; Pedersen and Saltin, 2015). Although physical exercises are important and beneficial for an overall health and fitness, yet adherence to them is challenging. Therefore, a long-term adherence to structured physical activities is usually poor and is a matter of great concern (Middleton et al., 2013). If we look at recreational football, in last one decade it has shown a path to utilize team sports to be alternate mode of exercise for treating & preventing lifestyle related disease (Krustrup et al., 2010).

It is well established that regular activity improves health and fitness (Goodpaster et al., 2003; Menshikova et al., 2005; Ross and Janssen, 2001; Tjønna et al., 2008). The problem is sticking to such type of exercise regimes, which is usually quite less (Robison and Rogers, 1994). The lack of adherence to long duration exercise is an area of concern. These endurance-based exercises could not motivate people for regular participations (Silva et al., 2008; Teixeira et al., 2006). Contrary to the traditional endurance activities, participation in recreational games emphasizes more on play than on training. Participation in such activities is more fun to people as it happens in social environment. At present it is unclear whether sports as pass time or recreation can be beneficial to improve fitness & health (Edgett et al., 2013).

Sports like basketball, ice hockey along with football are considered as vigorous-intensity exercise (Ainsworth et al., 2000). Basketball further is considered sports of very high intensity compare to other games. Basketball can improve cardiovascular endurance and other metabolic parameters if used as means of intervention (Edgett et al., 2013). University students prefer to take part in exercises regime which is more socializing and not with in structured exercise settings, when compare to structured exercise programmes (Burke et al., 2005). Basketball can influence the self-concept with individual performance being more important than team outcome to those who have athletic ability (Hines and Groves, 1989).

We assume and believe that small sided games will be effective in attracting and motivating young population to get actively involved in physical exercise post COVID-19 in Saudi Arabia. We examined the benefits of small-side mixed recreational team games on body fat, resting heart rate, oxygen saturation, aerobic capacity and blood pressure in young male students. We also examined the relationship of aerobic capacity and body fat in untrained male.

2. METHODS

Participants

Participants in the present study were 26 male undergraduate students from King Fahd University of Petroleum and Minerals. We used exclusion criteria to filter the participants according to the requirement of present research. Before enrolling in the study, all participants signed a written statement and were fully informed of the study. Research Committee of King Fahd University of Petroleum and Minerals approved this study (Ethical Approval Code SB201004, March 31, 2021). This study was completed on 1st October 2022. We excluded participants who were doing regular exercise and playing football, basketball and handball games on regular basis. We also excluded participants who were obese and were on any form of medications or cardiovascular diseases.

Study Design and Intervention

Study was carried for 12-week period. A supervised 4 a side recreation football, basketball and handball were offered to the participants. Each participant was allotted one of the following groups; the experimental group with 16 participants and control with 10 participants. After assigning to the groups, all participants were then tested at the beginning of intervention period and then again after a period of 12 weeks. We recorded daily attendance to maintain regularity. We presume that the diet, exercise and the lifestyle routine were nearly same, as all the participants reside in the university campus. Participants in the experimental group were offered to play 4 a side supervised recreational football, basketball and handball for the period of 12 weeks. Training sessions were organized thrice a week with 30 minutes session duration. Games were offered on alternate day basis. Different game was offered on each day of week. In each week, on first day, we offered 4 a side recreational football, second day 4 a side recreational basketball and on 3rd day 4 a side recreational handball was offered to participants. Four teams were constituted with 4 players in each. Football and handball games were played on artificial court (40x30m). Basketball was played on full court (28x15m). There was no break during sessions. We kept enough balls to minimize the break during games. Since these games were recreational focus was more on fun and enjoyment, then training or skills. Therefore, no coaching instructions were provided. Heart rate was measured continuously to check and maintain the intensity of activity.

Measurements and Testing Protocols

Body fat in the participants was measured by Omron body fat analyzer. After 20 minutes of rest, the oxygen saturation, blood pressure and resting heart rate were measured. Omron Blood Pressure Device was used to take measurements of blood pressure

and resting heart rate. Oxygen saturation was recorded using Breuer pulse oximeter. VO_2max was measured by treadmill walking test (Ebbeling et al., 1991).

Statistical Analysis

Means and standard deviations were used to present the data in the current study. Normality of data was checked by using Shapiro Wilks test. Any difference in the group was checked at the baseline using independent T-test. The difference between delta values (posttest minus pretest) of experimental and control group was tested by T-Test. The relationship between VO2max and body fat was tested using the Pearson product moment correlation. The P-value was set at 0.05 to indicate statistical significance.

3. RESULTS

Participant's mean age was 18.62±0.88 years in the intervention group and 18.60±0.81 years in the control group. No adverse complications were reported during study period in intervention group. Both experimental and control groups were similar as there was no significant difference on variables at bassline (Table 1).

Table 1 Comparison of Variables at Baseline between Study Groups

Characteristics	Experimental Group (n=16)		Control Group (n=9)		P Value
	0 week	12 Week	0 week	12 Week	
Body Fat	24.30±11.61	24.12±11.25	23.63±6.80	24.79±3.30	0.876
Systolic Blood Pressure	117.37±6.83	115.81±10.23	121.11±3.44	122.55±6.10	0.141
Diastolic Blood Pressure	73.31±6.73	72.62±7.89	74.00±4.66	76.00±4.62	0.789
Oxygen Saturation	98.00±0.89	98.68±0.94	98.66±1.00	98.22±0.66	0.100
Resting Heart Rate	76.62±6.45	73.12±7.77	72.11±9.29	73.22±6.53	0.166
VO_2Max	28.67±8.54	29.99±8.18	27.23±5.22	25.59±4.58	0.650

Data shown as Mean ± SD, *P value significant 0.05, (Independent T-Test)

Mixed Games Sessions (Football, Volleyball and Handball)

There was no withdrawal of participants from the experimental group during the mixed games sessions. However, from the control group one participant withdrew from study without citing any reasons. Students in the experimental group played vigorously in the training sessions (mean average heart rate was 167.91±9.15 beats/ minute). The mean session duration of play was 28.24±2.34 minutes. Most of the participants attended all the sessions regularly (mean attendance 92.69%). High percentage of attendance reflects the interest of participants in recreational games offered to them (Table 2).

Table 2 Participants Characteristics

	Experimental Group (n=16)	Control Group (n=9)
Age (years)	18.62±0.88	18.60±0.81
Body Height (meters)	1.72±0.04	1.72±0.04
Body Mass (kg)	75.99±21.69	73.98±8.37
BMI (kg/m^2)	25.55±6.83	24.49±3.43
Average Heart Rate (b/m)	167.91±9.15	
Heart Rate Maximum (b/m)	191.43±6.24	
Average Duration of Play (min)	28.24±2.34	
Average Attendance During Sessions (%)	92.69	

Data, mean ± SD and %

Aerobic Capacity and Body Fat Percent

We observed improvement in VO2max after 12 weeks of mixed recreational games between two groups (t23 = 2.220, P = 0.037), where mean VO2max was 29.99±8.18 and 25.29±4.58 in experimental and control group respectively (Table 3) (Figure 1). After analyzing the data, significant difference was seen in body fat (t23 = -2.123, P = 0.045), mean fat percent 24.12±11.25 (experimental group) and 24.79±3.30 (control group) (Table 3, Figure 1 and 2).

Table 3 Comparison of Variables Post 12 weeks of Mixed Small Side Recreational (Posttest minus Pretest Values, Independent T-Test)

Characteristics	Experimental Group (n=16)	Control Group (n=9)	*p* Value
Body Fat	-0.18±1.29	0.88±1.02	0.045*
Systolic Blood Pressure	-0.25±5.87	1.44±5.31	0.482
Diastolic Blood Pressure	-0.68±5.49	2.11±2.47	0.164
Oxygen Saturation	0.68±1.40	-0.44±0.88	0.040*
Resting Heart Rate	-3.5±4.7	1.11±6.05	0.045*
VO_2Max	1.31±2.97	-1.6±3.56	0.037*

Data, mean ± SD, p value significant at .05 level

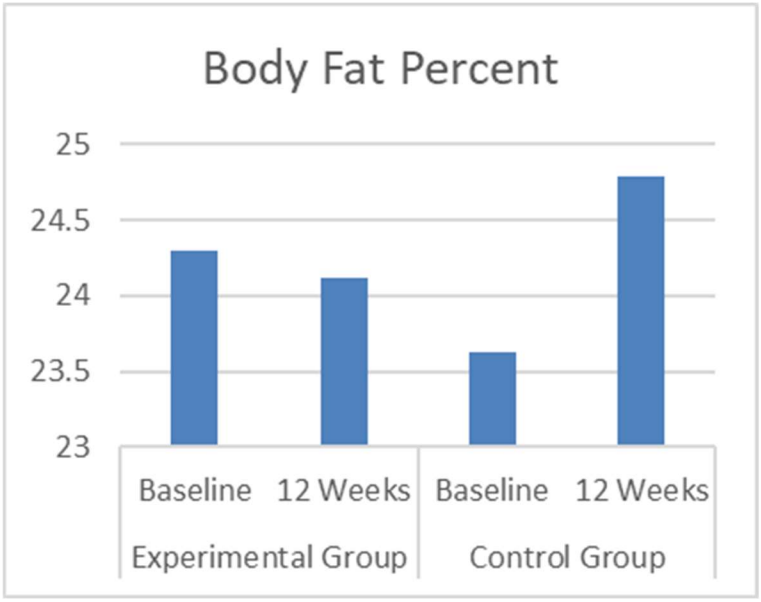

Figure 1 Body Fat Percent Post Intervention

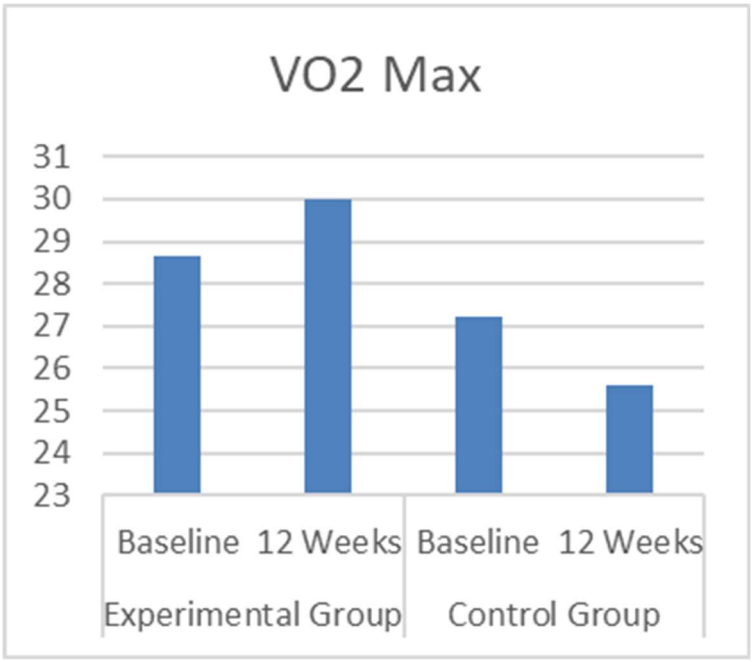

Figure 2 VO2max Post Intervention

Blood Pressure and Resting Heart Rate

Analysis of data did not reveal any significant change in systolic blood pressure (t23 = -0.715, P = 0.482), with mean systolic blood pressure reported 115.81±10.23 and 122.55±6.10 after 12 weeks of mixed small sided recreational games in experimental and control group respectively. No significant change was seen in diastolic pressure (t23 = -1.437, P = 0.164), with mean diastolic blood pressure reported 72.62±7.89 and 76±4.62 in experimental and control group respectively. However, an improvement was seen in resting heart rate (t23 = 2.123, P = 0.045), with mean resting heart rate reported 73.12±7.77 and 73.22±6.53 after 12 weeks of mixed small sided recreational games in experimental and control group respectively (Table 3).

Oxygen Saturation

There was significant change in oxygen saturation levels compare to control group post intervention (t23 = 2.182, P = 0.040), where oxygen saturation post 12 week was 98.68±0.94 and 98.22±0.66 in experimental and control group respectively (Table 3) (Figure 3).

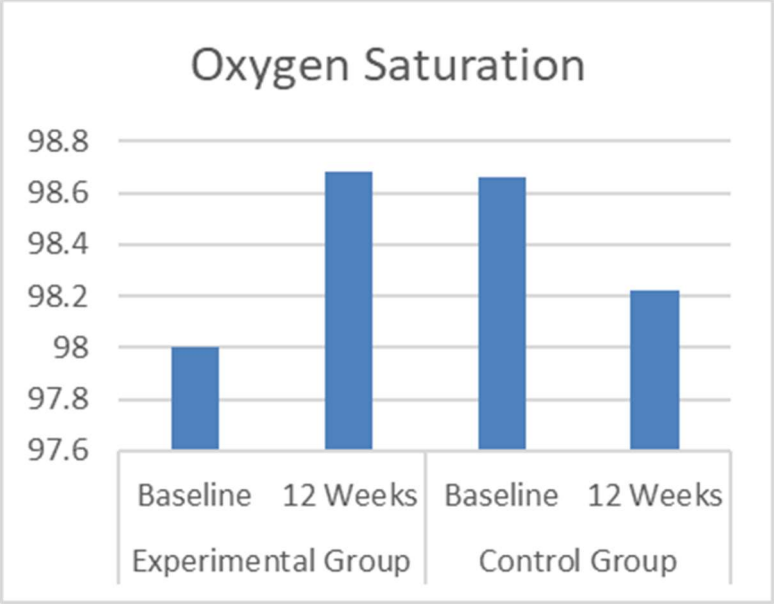

Figure 3 Oxygen Saturation Post Intervention

Relation of Body Fat and Aerobic Capacity

Correlation was found between body fat and aerobic capacity (r= -0.675, n=16, p= 0.004) in experimental group after 12 weeks of mixed small sided recreational games. On the other hand, no such relation exists in the control group (r= -0.279, n=9, p= 0.467) (Table 4).

Table 4 Relationship of Body Fat and VO_2Max

Physical Variables	VO2 Max (Means ± SD)	Body Fat (Means ± SD)	*p* Value
Experimental Group	29.99±8.18	24.12±11.25	0.004*
Control Group	25.59±4.58	24.52±6.90	0.467

*Significant at the 0.05 level

4. DISCUSSION

In this study we investigated the effects of 12 weeks of mixed small sided recreational games on various parameters of physical and psychological in untrained males. Participants played a mixed small sided recreational game namely; football, basketball and handball once in each week during the study period. This study was done one year after COVID-19 outbreak. One of the aims was to see how individuals respond to physical exercise post COVID-19 scenario. Post intervention body fat was reduced in experimental group. Similar results on body fat were observed by another study on 3 a side basketball (Tomar and Antony, 2019), handball (Tomar and Allen, 2021) and football (Randers et al., 2010). In another study done on half-court basketball, body fat was reduced significantly after three months of intervention (Randers et al., 2018). A study on small sided recreational soccer also found

reduction in body fat percent after 16 weeks of soccer training (Tomar and Antony, 2019a). We have observed high attendance percentage (94.64%) during the study period which could be the one the reason of positive outcomes and also reflect enthusiasm among participants. In previous studies also, attendance was similar to that of our study (Tomar and Antony, 2019; Tomar and Allen, 2021; Tomar and Antony, 2019). In universities, students like activities which are not structured and are social in nature (Burke et al., 2005). It appears that they like to participate and attend such activities.

We also observed significant increase in aerobic capacity in experimental group. It is important to mention here that frequency of mixed games sessions was only two times in a week, which is similar to other studies done on small sided recreational games (Tomar and Antony, 2019; Tomar and Allen, 2021). A study conducted on 3-sided basketball games in untrained males has reported improvement in the aerobic capacity (Tomar and Antony, 2019). Another study also found improvement in maximum oxygen uptake during half-court basketball intervention (Randers et al., 2018). Previously, numbers of studies have been conducted on small sided recreational soccer. All these studies have reported improvement in aerobic capacity after intervention period (Tomar and Antony, 2019; Bangsbo et al., 2010; Krustrup et al., 2009; Krustrup et al., 2010a). However, our results are not in sync with study where no significant change observed in VO2max (Tomar and Allen, 2021).

Despite improvement in body fat, aerobic capacity and resting heart rate, present data does not reveal any significant improvement in blood pressure. Another study done on small sided basketball revealed similar results, where there was no significant in change blood pressure after intervention (Randers et al., 2018). Previous study did not saw any positive results on blood pressure (Tomar and Antony, 2019). However, a study on soccer revealed significant reduction in blood pressure after 16 weeks of recreational soccer (Tomar and Antony, 2019). The resting heart rate did improve in our study. Resting heart rates were improved in previous study on 3 a side basketball (Randers et al., 2018) and small sided reaction soccer (Tomar and Antony, 2019).

In present study intensity of the recreation sessions was quite high, 83.5% of maximum heart rate (MHR). Intensity in our study resembles to great extent with previous studies done on small side games; 3 a side basketball (88% of MHR) (Tomar and Antony, 2019), 6 a side recreational soccer, (86.8% of MHR) (Tomar and Antony, 2019). Other studies conducted on healthy adults also observed high intensities similar to present study; 82% of MHR (Krustrup et al., 2009), 83% of MHR (Bangsbo et al., 2010).

There was an inverse relationship of aerobic capacity and body fat in the current study, which means that body fat decreased with increase in aerobic capacity. Our results were similar to a study where negative relation was observed between VO2max and body fat (Pribis et al., 2010). Two previous studies have also revealed a negative relationship between body weight and VO2max per unit of body weight (Vanderburgh and Katch, 1996; Nevill et al., 1992).

5. CONCLUSIONS

The small side games which are recreational in nature should be encouraged to promote health in young untrained male population. The unstructured and supervised recreational games are effective and enjoyed by the young participants. Present study concludes body fat can be reduced by mixing the small sided games of football, handball, and basketball for 12 weeks duration. These small sided games have a positive impact on aerobic capacity, resting heart rate and oxygen saturation. We have also observed a significant relationship in aerobic capacity and body fat.

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Authors' Contribution

Rakesh Tomar: Principal Investigator, Study Design, Data Collection, Statistical Analysis, Manuscript Preparation
Jhalukpreya Surujlal: Statistical Analysis, Manuscript Preparation
John Ainsworth Allen: Study Design, Data Collection

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Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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