The Effectiveness of Zumba and HIIT Intervention through Peer Group Online Class on Physical Fitness and Waist Circumference of Youth

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Abstract

Peer support is effective in improving physical activity and reducing sedentary behavior in adolescent. Zumba exercise is a popular physical sport, but it has a mild influence on fitness indicators. Meanwhile, HIIT has a big influence on fitness. The aim of this study was to compare the effect of online Zumba classes with and without HITT among peer group on physical fitness and waist circumference. There were three group: 1) control, 2) zumba, and 3) zumba and HIIT. Each group consists of 30 subjects who are members of peer group. The physical exercise intervention was carried out for seven weeks with three sessions per week. The duration of Zumba and HITT workouts is 30 minutes and 7 minutes per season, respectively. The control group did not receive physical exercise treatment. The entire group received an online fitness nutrition education class via zoom meeting using power point media. The fitness component measured include cardiorespiratory fitness, muscle endurance, and muscle strength. Subjects in both treatment groups (Zumba, Zumba+HITT) experienced significant increases in cardiorespiratory fitness (p-value < 0.01and p-value 0.03), muscle endurance (p-value < 0.01), and muscle strength (p-value < 0.01) compared to before intervention. Subjects in the Zumba+HIIT group also experienced a decrease in waist circumference (p-value < 0.01). Research data also shows that there are significant differences in cardiorespiratory fitness and muscle endurance at posttest in the two treatment groups compared to controls (p-value < 0.01). In conclusion, teenagers who want to improve their cardiorespiratory fitness and muscle endurance can do Zumba exercises or a combination of Zumba+HITT regularly. The combination of Zumba+HIIT is a better choice to reduce waist circumference.

Keywords: *HIIT, physical fitness, waist circumference, youth, zumba*

Abstrak

Dukungan teman sebaya efektif meningkatkan aktivitas fisik dan mengurangi kebiasan perilaku *sedentary* pada remaja. Senam zumba merupakan latihan fisik yang popular, namun memiliki efek yang ringan terhadap indikator kebugaran. Sementara itu, HIIT memiliki efek yang besar terhadap kebugaran. Tujuan penelitian ini adalah membandingkan efek kelas zumba *online* bersama teman sebaya baik dengan atau tanpa HIIT terhadap tingkat kebugaran dan lingkar pinggang pada remaja. Ada tiga kelompok: 1) kontrol, 2) zumba, dan 3) zumba + HIIT. Masing-masing kelompok terdiri atas 30 subjek yang tergabung dalam satu kelompok teman sebaya. Intervensi latihan fisik dilakukan selama tujuh minggu dengan tiga sesi per minggu. Durasi senam zumba dan HIIT masing-masing 30 menit dan 7 menit per sesi. Kelompok kontrol tidak menerima perlakuan latihan fisik. Semua kelompok menerima kelas edukasi gizi kebugaran secara online melalui *zoom meeting* dengan media power point. Komponen kebugaran yang diukur meliputi kebugaran kardiorespiratori, daya tahan otot, dan kekuatan otot. Subjek pada kedua kelompok perlakuan (zumba, zumba dan HIIT) mengalami peningkatan signifikan kebugaran kardiorespiratori (p-*value* <0.01 dan p-*value* 0.03), daya tahan otot (p-*value* <0.01), dan kekuatan otot (p-*value* <0.01) dibandingkan sebelum dilakukan intervensi. Subjek pada kelompok zumba + HIIT juga mengalami penurunan lingkar pinggang (p-*value*<0.01). Data penelitian juga menunjukkan perbedaan signifikan kebugaran kardiorespiratori dan daya tahan otot saat *posttest* pada kedua kelompok perlakuan dibandingkan kontrol (p-*value* <0.01). Kesimpulannya, remaja yang ingin meningkatkan kebugaran kardiorespiratori dan daya tahan otot dapat melakukan latihan zumba atau kombinasi zumba + HIIT secara rutin. Kombinasi zumba + HIIT menjadi pilihan yang lebih baik dalam menurunkan lingkar pinggang

Kata Kunci: HIIT, kebugaran, lingkar pinggang, remaja, zumba

Introduction

Physical fitness is ability to execute daily activities with optimal performance, endurance, and strength with the management of disease, fatigue, stress and reduced sedentary behavior. There are many components of physical fitness such as cardiorespiratory endurance, muscular endurance, and muscular strength which is related with health. People with good cardiorespiratory endurance will be able to perform low to moderate intensity exercise for prolonged and rapid recovery. People who have strong muscles permit amount of

external force that a muscle can exert in a single effort. People with good muscular endurance permit muscle groups to exert external force for many repetitions or successive exertions (1). Most of Indonesian youth (79.1%) have poor & fair cardiorespiratory endurance (2). It's almost half of urban adolescent (48.7%) had low muscular strength (3). Even though adolescents who are going through puberty have a critical period for developing physical fitness due to great change in hormonal level and body composition. Low physical fitness in adolescents have strong relation with productivity, academic achievement and mental health (4,5). Low health related fitness level in youth also leading to premature cardiovascular diseases (CVD) and another noncommunicable diseases (NCDs) (6). Not only low physical fitness level, but also abdominal obesity is also a major risk of some NCDs such as cardiovascular diseases, diabetes mellitus, and hypertension (7). Abdominal obesity is defined waist circumference more than 80 cm for women and more than 90 cm for men. People with abdominal obesity have higher visceral fat. Excess visceral adiposity leading higher production of C-reactive protein (CRP) which is associated with some NCDs (8). However, in Indonesia, the national prevalence of abdominal obesity is still high (31%) (9).

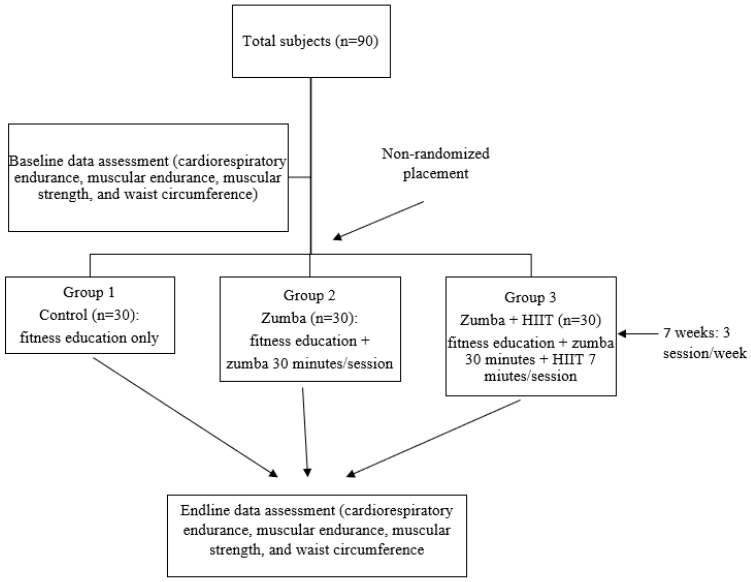
People with low physical activity level or sedentary lifestyle have more risk to get low fitness level and abdominal obesity. During covid-19 pandemic, social activities were restricted. People worked from home and students were also school from home. Most of them just sitting in front of laptop for hours. Stay at home condition reduced physical activity and tend to sedentary lifestyle (10). Based of multinational survey in 14 countries, moderate to vigorous physical activity declined by 41%. Youngest participant (18-29 years old) had the higher reduction (11). Regular physical exercise is good to improve physical fitness and prevent abdominal obesity. Physical activity also improve mental health. But, its's hard to do during covid-19 pandemic especially for people with sedentary lifestyle and never doing physical exercise (12). Even though physical exercise can be done simply at home. Peer support is an effective mediator for promoting physical activity and reducing sedentary behavior in children and adolescent (13). To increase interest to do physical exercise, we need form of physical training that appeals to many people. Now, zumba dance is one of popular exercise. It's interested to do online zumba training with peer group. There were limited studies about effect of online zumba. Most studies were about effect of offline zumba dance which showed light effect on physical fitness and waist circumference. So, it's important to combine with high intensity interval training (HIIT). HIIT had great effect in improving physical fitness among adolescents and decreasing waist circumference (14,15). The purpose of this study was to compare physical fitness (cardiorespiratory fitness, muscular strength, and muscular endurance) and waist circumference effect of peer group online zumba dance, with or without HIIT intervention. .

Methods

This research used pretest posttest control group design without randomized. There was 3 group: 1) control group, 2) zumba dance group, and 3) zumba and HIIT group. Each group consists of 30 people who are members of peer group. There was no drop out subject. Subjects in control group had to follow their normal daily activities. Intervention exercise training was doing for 7 weeks. There were three sessions exercise every week. So, there were 21 session exercise intervention. Duration for zumba dance was 30 minutes and HIIT was 7 minutes per session. Exercise intervention have done via zoom cloud meeting which was separated every peer group. All of group also received online class about fitness nutrition education. 90 youth of metropolitan city in Indonesia aged 17-20 years old participated in this study. There were inclusion criteria: 1) no regular exercise habit; 2) no history of cardiorespiratory and cardiovascular problem; 3) no present muscular, bone, or nerve problem. Exclusion criteria were: 1) following medication or supplement to gain or lose body weight; 2) following special diet (high energy diet, low energy diet, ketogenic diet, and vegetarian diet).

Cardiorespiratory fitness, muscular endurance, and muscular strength were physical fitness component which had been assessed. Cardiorespiratory endurance was assessed using Balke field test, following standardized protocol. Subjects were run for 15 minutes and the distances was assessed (16). Run tracker application was used to measure how far she/he run. Muscular strength was assessed using 1-minute full sit-up test, how many repetition in one minute. Muscular endurance was assessed using prone plank test, how long the participants can maintain right prone plank position. Physical fitness was assessed at baseline and endline after 7 weeks intervention. Waist circumference was measured following standardized protocol

from WHO. The subjects were standing with arms at the sides and closed together feet positioned. The measurement had done at the approximate midpoint between the lower margin of the last palpable rib and the top of the iliac crest. The tape should be snug around the body, but not pulled so tight that it is constricting (17).



Picture 1. Diagram of study design

Statistical analysis was performed with SPSS Version 21. Descriptive statistics are presented as mean ± SD. Saphiro Wilk test was used for normality sampling distribution. The differences between baseline and endline were analyzed with paired sample t-test for normal distribution data and Wilcoxon test for unnormal distribution data. The differences among group were analyzed with Kruskall Wallis and continued Mann-Whitney post hoc test if any significant differences.

Results and Discussion

There were no significant differences all of variable at baseline data. There was significant decrease on VO_2max and significant increase in waist circumference between baseline and endline in control group. There were also significant differences VO_2max between intervention groups and control group (Table 1). Either Zumba or Zumba +HIIT improved cardiorespiratory endurance (Table 2). Studies which analyzed effect of Zumba in cardiorespiratory endurance in youth is still limited in Indonesia. Previous study showed that improvement on estimated VO_2max was found in participants who has followed Zumba exercise intervention with or without muscular strength training after 16 weeks of the intervention period in adults. Difference effects intragroup among Zumba group also showed in that study which was estimated VO_2max post intervention higher than baseline data (18). Most studies that showed significant changes in VO_2max have done in range 8 weeks until 16 weeks with minimum exercise 45 minutes per session (19). In this study, duration of intervention and duration of each session out of that range, but it's still showed significant improvement in cardiorespiratory endurance.

Significant differences between baseline and endline also was found on cardiorespiratory endurance in intervention groups both Zumba group and Zumba + HIIT group. Duration of prone plank after intervention in both intervention groups were higher than control group (Table 1). Based on Table 2, Zumba and Zumba + HIIT intervention improved muscular endurance significantly compared than control. However, Zumba exercise intervention without HIIT showed significant better improvement than Zumba + HIIT intervention. Regard to muscular endurance, plank which was used in this study is reliable and valid method to assess global core muscle endurance. But there was no study have found analyzed effect of Zumba exercise to muscular endurance through plank test. There was analyzed effect of Zumba on motor fitness through one leg stand test which also can determine muscular endurance. In that study, Zumba dance

intervention significant longer seconds of one leg stand about 13.53 seconds (18). That's change was not far from finding in this study which showed Zumba dance intervention significant longer seconds of prone plank about 14.07 seconds.

Table 1. Changes in Physical Fitness and Waist Circumference

Variables	Group	Baseline (Mean ± SD)	Endline (Mean ± SD)	Differences within group (p-*value*)	Endline differences among group (p-*value*)
Cardiorespiratory Endurance: VO_2max (ml/kg/min)	Control (n=30)	24.48 ± 4.41[a]	21.72 ± 3.90[a]	<0.01*	<0.01*
	Zumba (n=30)	23.05 ± 2.93[a]	26.34 ± 4.23[b]	<0.01*	
	Zumba + HIIT (n=30)	24.09 ± 4.12[a]	25.95 ± 4.06[b]	0.03*	
Muscular Endurance: Duration of prone plank	Control	40.53 ± 19.20[a]	38.43 ± 17.6a	0.35	<0.01*
	Zumba	37.79 ± 13.65[a]	51.87 ± 12.71[b]	<0.01	
	Zumba + HIIT	44.93 ± 21.04[a]	53.17 ± 25.43[b]	<0.01	
Muscular strength: RM of 1 minute sit-up (number)	Control	15.37 ± 6.15[a]	15.93 ± 6.5[a]	0.62	0.16
	Zumba	16.47 ± 7.46[a]	19.00 ± 6.77[a]	<0.01*	
	Zumba + HIIT	14.77 ± 7.42[a]	19.93 ± 9.95[a]	<0.01*	
Waist circumference (cm)	Control	76.4 ± 8.81[a]	77.37 ± 8.16[a]	0.03*	0.04*
	Zumba	76.40 ± 9.01[a]	74.93 ± 8.25[ab]	0.06	
	Zumba + HIIT	74.17 ± 9.58[a]	72.42 ± 9.53[b]	<0.01*	

*statistically significant
Different superscript showed significant differences among groups

Initially, we hypothesized that when Zumba combined with HIIT, the effect of Zumba dance show greater improvement on all of variables including cardiorespiratory endurance and muscular endurance. But the finding showed that effect of Zumba exercise without HIIT was greater on aerobic capacity (cardiorespiratory and muscular endurance) than combination of Zumba + HIIT. The increase in VO_2max was greater in Zumba group than Zumba + HIIT group although not significantly. The increase in seconds of plank in Zumba group was greater significantly than Zumba + HIIT group. Whereas a meta-analysis study showed HIIT has greater improvements on cardiorespiratory fitness when compared with endurance training among untrained children and adults (14). The other previous study also showed both running HIIT and functional HIIT were improve VO2max and some muscular endurance indicator significantly (20). Participants in this study were untrained youth, they didn't have regular exercise before. They had low aerobic endurance and they easy to feel fatigue after Zumba exercise. So, maybe they were not all out when doing HIIT. Heart rate was not controlled in this study. Therefor changed on aerobic capacity in Zumba + HIIT group were not greater than Zumba group. But it's still showed significant improvement when compared with control.

The significant difference between muscle strength in baseline and endline was found in all intervention groups. But there was no significant difference in endline muscular strength between both intervention groups and control (table 1). But if we look at the change from baseline to endline, a significant change in muscle strength compared to control was only found in Zumba + HIIT. Most study which analyzed effect of Zumba intervention on muscular strength showed no significant improvements (21). But

there is previous study showed Zumba exercise intervention improved muscular strength especially on neck and trunk strength after 3 months intervention (22). Zumba intervention with or without muscle strength intervention significant improved number of dynamic sit-up and handgrip strength after 16 weeks intervention period (18). We could hypothesize that duration of intervention in current study is insufficient to improve muscular strength. HIIT have significant support in change on muscular strength. This finding is in line with previous study which was showed significant improvement on leg muscle power after 6 sessions of short-term HIIT in active young. Most of muscle strength in previous studies were observed used handgrip strength indicator. 8 weeks battling rope HIIT intervention showed 7.3% increase in upper-body anaerobic power (23). Significant effect on waist circumference between baseline and endline just reported in Zumba + HIIT group. Zumba alone without HIIT didn't bring significant change in waist circumference.

Regarding to waist circumference, the significant difference between baseline and endline was found only in Zumba + HIIT group. The waist circumference endline data of Zumba group wasn't significant different with control and Zumba + HIIT group. But those Zumba + HIIT group endline was significant different with control (table 1). Significant decrease on waist circumference was just observed in Zumba + HIIT group. Zumba alone without HIIT didn't bring significant change in waist circumference (table 2). Previous study which observed effect of Zumba training on waist circumference showed significant effect in adult (24).

Table 2. Difference effect of intervention

Variables	Group	Mean ± SD	Min - Max	p-*value*
Δ Cardiorespiratory Endurance (VO_2max)	Control	-2.76 ± 3.4[a]	-(16.62) – 0.12	<0.01*
	Zumba	3.29 ± 3.99[b]	-(1.62) – 15.50	
	Zumba + HIIT	1.85 ± 3.15[b]	-(2.00) – 13.12	
Δ Muscular Endurance (Seconds of plank)	Control	-2.10 ± 12.00[a]	-(40) – 22	<0.01*
	Zumba	14.07 ± 12.71[c]	-(1.00) – 49.00	
	Zumba + HIIT	8.23 ± 9.21[b]	-(2.00) – 40.00	
Δ Muscular strength (RM of 1 minute sit-up)	Control	0.57 ± 6.24[a]	-(18) – 21	<0.01*
	Zumba	2.53 ± 5.10[a]	-(5.00) – 17.00	
	Zumba + HIIT	5.17 ± 5.89[b]	-(4.00) – 25.00	
Δ Waist circumference (cm)	Control	-0.97 ± 2.30[a]	-(10) – 1.00	<0.01*
	Zumba	-1.47 ± 3.99 [a]	-(13.00) – 12.00	
	Zumba + HIIT	-1.75 ± 2.20[b]	(-3.00) – 9.00	

*statistically significant
Different superscript showed significant differences among groups

Conclusions

Both Zumba and Zumba + HIIT intervention showed significant effect in improving cardiorespiratory and muscular endurance although Zumba only without HIIT showed better improvement on muscular endurance. But Zumba without HIIT had no effect on muscular strength and waist circumference. The significant improvement on waist circumference just observed in Zumba + HIIT group.

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