



## ENHANCING THE GENERAL PHYSICAL FITNESS BY USING POPULAR MUSIC FOR FEMALE STUDENTS PARTICIPATING IN BASKETBALL COURSES

<sup>1,\*</sup>Tuan, Tran Minh and <sup>2</sup>Hanh, Le Thi My

<sup>1</sup>Faculty of National Defense - Security & Physical Education, Saigon University, Hochiminh City, 70000, Vietnam

<sup>2</sup>Institute of Sport Science, Hochiminh University of Sports, Hochiminh City, 70000, Vietnam

Received 29<sup>th</sup> April 2022; Accepted 25<sup>th</sup> May 2022; Published online 16<sup>th</sup> June 2022

### Abstract

The purpose of this study was to enhance the general physical fitness of female students after participating in basketball courses by using popular music at Saigon University. 70 healthy female students were chosen and divided into three groups, of which 23 female students were in the 15-week experimental group (15e), another 23 female students were in the 7-week experimental group (7e), and the 24 female students remaining were in 15-week training without music (C). The music tempos were classified into three parts of a training session, i.e., the warm-up (90-120 bpm), training (120-150 bpm), and cool-down (60-90 bpm). Six fitness tests, such as 30 seconds sit-up test (evaluated the core strength), 30m sprint test (speed), 4x10m Shuttle run test (agility), standing long jump test (the explosive power of the legs), handgrip strength test (strength of the hand), 5 minutes running field test (maximal aerobic speed-MAS) were used to evaluate the physical fitness for female students. The rating of perceived exertion (RPE) was used to identify the intensity of training sessions among three groups. The results indicated that the application of music improved the explosive power of the legs, agility, and decreased RPE value when compared between the use of popular music and no music (15e, 7e vs. C); However, it showed unchanged in the core strength, speed, MAS, and strength of the hand. In short, music had a positive impact on improving the general physical fitness of female students after participating in basketball courses at Saigon University.

**Keywords:** Female students, Basketball courses, Popular music, General physical fitness, Music tempos.

### INTRODUCTION

Music has positive effects on sports activities to enhance sports performance and optimize mobility (Meeks & Herdegen, 2002; Rendí *et al.*, 2008; Birnbaum *et al.*, 2009; Terry *et al.*, 2012; Parker, 2019). There were many varieties of matters paying attention to concerning the influence of the individual's level of fitness on the effectiveness of music and whether music had any impact on participants' physical fitness during training or not. Besides, music might be used as a tool to help individuals who are not yet determined enough to complete the intensity of work-out (Mohammadzadeh *et al.*, 2008). According to Simpson & Karageorghis (2006), coaches, sports psychologists, trainers, and instructors need to pay attention to the use of music to match the nature of the training session and the type of the music. Moreover, studies on the long-term effects of music were lacking in scientific evidence to support its positive impact, as shown in the short term (Terry *et al.*, 2020). Thus, more studies are needed to evaluate the influence of music on practitioners in a relatively long-term experimental period and may conduct on the actual training ground. The aim of the Physical Education (PE) program was to improve health care, basic movement, and sports skills, to develop students' physical fitness and mental well-being in the new age of industrialization. However, the intensity (pressure) of exercises was relatively heavy for students (amateur athletes), as well as the teaching methods were pedagogical and achievement-oriented, the boring repetition of exercises, etc, in basketball courses (as part of the Physical Education program) at Saigon University, which might lead them certain boredom and afraid to practice in students, especially in females (Tuan, 2019).

It was caused by many problems such as rareness activity, fear of exercise, poor physical fitness, not having a partner to play with, teachers being too demanding, etc. Benham (2014) suggested that teachers and instructors who want to enhance the feeling of joy and excitement in practice (especially in PE program), should include music in any activities, but it was necessary to make adjustments according to the type of exercise and the specificity of the training session. Therefore, it required a "mental stimulation dose" as the application of popular music for female students to stimulate them back to practice and enhance their interest, which was our rationale for this study.

### MATERIALS AND METHODS

Two weeks before the basketball courses began, each participant answered a brief questionnaire about their personal information, health status, sport-related injury history, etc. Any problems of participants showed in a brief will be excluded in this study. Besides, all of the participants were introduced to the fitness tests and how to implement them. One week after that, all participants came to examine their fitness before the PE program began (the first-time testing). Six tests were used to identify physical fitness for female students, such as 30 seconds sit-up test (evaluated the core strength), 30m sprint test (speed), 4x10m Shuttle run test (agility), standing long jump test (the explosive power of the legs), handgrip strength test (maximum isometric strength of the hand), and 5 minutes running field test (maximal aerobic speed-MAS). These tests were suitable to evaluate the fitness of amateur athletes (Ministry of Education & Training, 2008), and also suited to evaluate general physical fitness in basketball courses at Saigon University (Tuan & Son, 2017), with high validity and reliability. Besides, the rating of perceived exertion (RPE)

\*Corresponding Author: Tuan, Tran Minh

Faculty of National Defense - Security & Physical Education, Saigon University, Hochiminh City, 70000, Vietnam

scale by Borg (1982) was used to evaluate the intensity of training sessions such as warm-up, training, and cool-down. After that, all participants underwent the 15-week training program in Physical Education course with the same condition, time for studying and facility use, etc. PE course took part in the morning (from 9.00 to 10.40 am) on Monday, Tuesday, and Wednesday corresponding to each group as 15e, 7e, and C, respectively (one time per week). The reason for using music after the 7-week was the mid-term exam time. While the time at the 15-week was the final exam time. The software used to check the tempo of songs (beats per minute - bpm) was the "Metronome" application (which would take free download for Mac or Windows). The type of song in this study was popular music (also called light music, pop music, etc.). All songs were chosen with a vibrant beat, joyful rhythms, and creating excitement in listeners. The plan of using music was applied to each part of the one-day training (100 minutes each lesson), which was shown in Table 1. Therefore, the tempo of the music would range from 90-120 bpm in the "warm-up music", 120-150 bpm in the "training music", and 70-90 bpm in the "cool-down music" (described in Table 1). All of the popular music was selected for non-profit purposes, did not advertise or recommend these songs for any reason, and was used for the purpose of this study.

**Table 1. The application of popular music in 100 mins in basketball course**

No.	Activities	Times	Applied popular music
1	Class announcement, checking attendance	5 mins	X
2	Warm-up	15 mins	Warm-up music
3	Short break	5 mins	X
4	Physical fitness training <sup>1</sup>	20 mins	Training music
5	Long break	10 mins	X
6	Physical fitness training <sup>1</sup>	25 mins	Training music
7	Short break	5 mins	X
8	Cool-down	10 mins	Cool-down music
9	Evaluation after training	5 mins	X
Summary		100 minutes	70 minutes

<sup>1</sup> Physical fitness training – for examples: aerobic training, sprint exercises, jumping rope, exercises with bare hands and/or with sticks, agility training, resistance training with or without heavy weights.

In this study, the authors tried to apply popular music in all kinds of PE activities, except the time for checking attendance, breaks, and evaluation after training. Music was played through the speakers (JBL Party box 300). Popular music was played randomly, but with an increasing orientation in the tempo of the song. Besides, it met the increasing intensity of exercises due to the differences in training activity (warm-up, training, or cool-down). Some examples of the popular song in this study such as How long-Charlie Puth (110 bpm), Lights-Ellie Goulding (120 bpm), Nimus into the wild-Nokyo (110 bpm), The subway song-Delacey (108 bpm) in the warm-up song; Everytime we touch-Cascada (142 bpm), Firework-Katy Perry (125 bpm), Higher ground-Remady (130 bpm), I like to move it-Cardio workout (135 bpm) in the training song; Not easy-Ambassadors (84 bpm), Stitches-Shawn Mendes (75 bpm), Treat you better-Shawn Mendes (83 bpm), Winding road-Bonnie Somerville (81 bpm). At the end of the 15-week training, all participants took an examination about their fitness level one more time as in the first-time testing.

### Statistical analysis

All data are expressed as mean and standard deviation values (mean±SD). Data collections were analyzed by using SPSS for

Windows version 20. Descriptive analysis was used to identify the subject characteristics. One-way ANOVA was used to identify the differences among 3 groups (15e, 7e, and C) before and after the experimental process. A pair sample t-test was used to evaluate the differences before and after the experiment in three groups as mentioned above. The level of statistical significance was set at  $p < .05$ .

### RESULTS

Some participants were excluded from the experiment caused the drop-out, health, and personal problems. Therefore, 73 female students remaining among 3 groups (15e, 7e, and C) continued the experiment until the end of the 15-week training in PE course at Saigon University. The average age, height, and weight in group C (n=25) were 18.32±0.48 years, 156.44±4.63 cm, and 48.36±3.68 kg respectively; while in group 7e (n=24) were 18.21±0.41 years, 156.58±6.36 cm, and 47.21±7.34 kg respectively, as well as in group 15e (n=24) were 18.33±0.48 years, 158.42±5.17 cm, and 49.14±6.83 kg respectively (shown in Table 2).

**Table 2. Participants' characteristics (n=73)**

Group	Age (years)	Height (cm)	Weight (kg)
C (n=24)	20.04±0.36	158.33±4.32	49.83±6.71
7e (n=23)	19.91±0.29	159.61±4.43	51.02±10.99
15e (n=23)	20.22±0.52	158.17±5.41	46.52±6.18

Besides, mean differences in female students' fitness in 3 groups before the application of popular music are presented in Table 3.

Results in Table 3 showed that there were no significant differences in all fitness tests. It means that the level of fitness in the 3 groups (15e, 7e, and C) is quite similar. Therefore, it was a good condition for authors to apply music in training and its impact on female students when participating in basketball courses.

Mean differences in female students' fitness before and after the application of popular music are presented in Table 4. Results in Table 4 showed that there were significant differences between before and after the experiment in all fitness testing and both in 3 groups (15e, 7e, and C). This indirectly showed that our PE program was suitable for female students at Saigon University to enhance their fitness after training. Besides, the percentage of change (shown in Figure 2) had the highest rate in the 5-min running field test among three groups (from 11.78% to 12.83%), while the lowest one was at 30m sprint test in group 15e (3.1%), group 7e (3.23%), and at standing long jump test in group C (2.26%).

Mean differences in female students' fitness after the application of popular music are presented in Table 5. There were significant differences in the power of leg (standing long jump test) and agility (4x10m shuttle run test), except for the strength of the hand (handgrip strength test), speed (30m sprint test), MAS (5 mins running field test), the core strength (30 seconds sit-up test) between two groups using popular music (7e and 15e) and the group with no music (C). However, there were no significant differences in fitness between 15e and 7e (two groups with music). The remaining tests showed no statistically significant differences.

**Table 3. Mean differences in female students' fitness in 3 groups before the application of popular music**

Test	Groups			F	p	Pairwise comparisons		
	C	7e	15e			C-7e	C-15e	7e-15e
1	26.58±2.51	26.63±2.45	26.82±2.52	0.060	.942	ns	ns	ns
2	14.42±1.41	14.39±1.31	14.43±1.27	0.006	.994	ns	ns	ns
3	156.96±6.29	156.65±11.34	155.57±12.07	0.12	.888	ns	ns	ns
4	5.91±0.41	5.9±0.43	5.91±0.42	0.004	.996	ns	ns	ns
5	12.9±0.44	12.86±0.53	12.84±0.52	0.086	.086	ns	ns	ns
6	732.08±60.58	740.43±59.27	735.65±53.92	0.122	.885	ns	ns	ns

Notes: 1: Handgrip strength (kg), 2: 30s sit-up (times), 3: Standing long jump (cm), 4: 30m sprint (s), 5: 4x10m Shuttle run (s), 6: 5-min running field (m), ns: no significant difference.

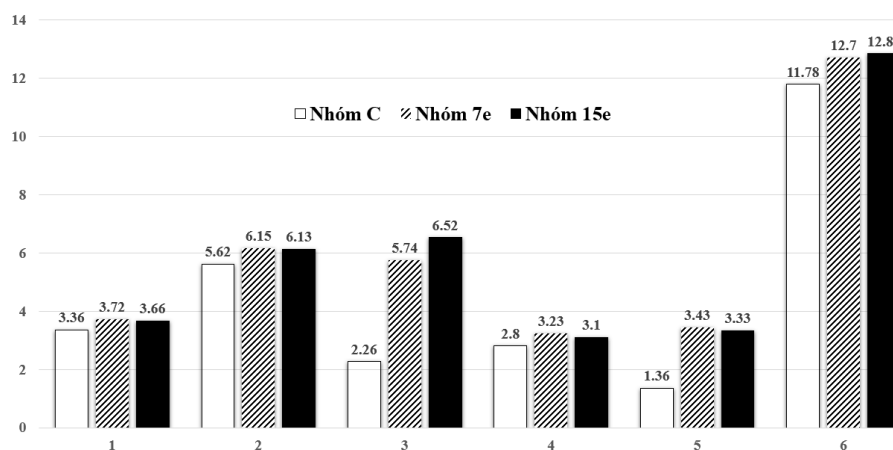
**Table 4. Mean differences in female students' fitness before and after the application of popular music**

df=23	mean±SD	t	%C	df=22	mean±SD	t	%C			
C	1	B	26.58±2.51	-5.589 <sup>(*)</sup>	7e	1	B	26.63±2.45	-7.378 <sup>(*)</sup>	3.72
		A	27.49±2.33			A	27.64±2.47			
	2	B	14.42±1.41	-5.001 <sup>(*)</sup>	2	B	14.39±1.31	-5.524 <sup>(*)</sup>	6.15	
		A	15.25±1.33			A	15.3±1.46			
	3	B	156.96±6.29	-5.678 <sup>(*)</sup>	3	B	156.65±11.34	-13.38 <sup>(*)</sup>	5.74	
		A	160.54±5.32			A	165.91±9.03			
	4	B	5.91±0.41	8.395 <sup>(*)</sup>	4	B	5.9±0.43	10.98 <sup>(*)</sup>	3.23	
		A	5.75±0.44			A	5.71±0.41			
	5	B	12.9±0.44	7.289 <sup>(*)</sup>	5	B	12.86±0.53	12.83 <sup>(*)</sup>	3.43	
		A	12.73±0.48			A	12.43±0.44			
	6	B	732.08±60.58	-10.77 <sup>(*)</sup>	6	B	740.43±59.27	-11.29 <sup>(*)</sup>	12.7	
		A	823.75±46.9			A	840.87±63.8			
	df=22	mean±SD	t	%C	Notes:					
	15e	1	B	26.82±2.52	-8.407 <sup>(*)</sup>	1: Handgrip strength test (kg), 2: 30s sit-up test (times), 3: Standing long jump test (cm),				
			A	27.82±2.38		4: 30m sprint test (s), 5: 4x10m running test (s), 6: 5-min running field test (m).				
		2	B	14.43±1.27	-6.552 <sup>(*)</sup>	B: Before the experiment, A: After the experiment.				
			A	15.35±1.34		df: Degree of freedom, SD: Standard Deviation.				
		3	B	155.57±12.07	-15.97 <sup>(*)</sup>	%C: Percentage of change.				
A			166.04±10.6		*: significant differences at the level of 0.01.					
4		B	5.91±0.42	10.35 <sup>(*)</sup>						
		A	5.73±0.43							
5		B	12.84±0.52	16.14 <sup>(*)</sup>						
		A	12.42±0.5							
6		B	735.65±53.92	-13.47 <sup>(*)</sup>						
		A	836.52±63							

**Table 5. Mean differences in female students' fitness in 3 groups after the application of popular music**

Test	Groups			F	p	Pairwise comparisons		
	C	7e	15e			C-7e	C-15e	7e-15e
1	27.49±2.33	27.64±2.47	27.82±2.38	0.112	.894	ns	ns	ns
2	15.25±1.33	15.3±1.46	15.35±1.34	0.03	.971	ns	ns	ns
3	160.54±5.32	165.91±9.03	166.04±10.6	4.493	.017	*	*	ns
4	5.75±0.44	5.71±0.41	5.73±0.43	0.039	.962	ns	ns	ns
5	12.73±0.48	12.43±0.44	12.42±0.5	3.204	.047	*	*	ns
6	823.75±46.9	840.87±63.8	836.52±63	0.55	.579	ns	ns	ns

Notes: 1: Handgrip strength (kg), 2: 30s sit-up (times), 3: Standing long jump (cm), 4: 30m sprint (s), 5: 4x10m Shuttle run (s), 6: 5-min running field (m), ns: no significant difference, \*: Significant differences at level of 0.05.



Notes: 1: Handgrip strength (kg), 2: 30s sit-up (times), 3: Standing long jump (cm), 4: 30m sprint (s), 5: 4x10m Shuttle run (s), 6: 5-min running field (m). Values are presented in percentage (%).

**Figure 1. Percentage of change in female students' fitness in 3 groups (15e, 7e and C)**

Moreover, mean differences in RPE of female students after the experiment are presented in Table 6. There were statistically significant differences in RPE between two groups using popular music (7e and 15e) and the control group (no music). However, there were no significant differences in RPE between two groups with music (15e and 7e).

**Table 6. Mean differences in RPE in 3 groups after the application of popular music**

Types of activity	Groups			Pairwise comparisons		
	C	7e	15e	C-7e	C-15e	7e-15e
Warm-up	14.29±0.91	12.57±0.59	12.48±0.85	**	**	ns
Training	19.13±0.74	18.3±0.82	18.87±1.63	*	*	ns
Cool-down	11.79±0.72	11.17±0.83	11.26±0.86	*	*	ns

Notes: ns: no significant differences; \*\*, \*\*\*: Significant differences at the level of 0.05, 0.01.

## DISCUSSION

Our results indicated that the application of popular songs showed an improvement in the power of leg and agility in female students at Saigon University after participating basketball course. Listening to music made exercise more enjoyable and motivates the practitioner to reach their goals more easily (Digelidis *et al.*, 2014). Therapeutic use of high tempo and stimulating music might affect central nervous system reflexes, and produce physiological arousal responses, along with stimulation from the intensity of physical activity (Karageorghis & Jones, 2014). Karageorghis & Terry (2009) indicated that music can be applied during training and even sports competition in many different ways. One of the proven benefits of applying music during exercise was that it improved the mood of the practitioner in a positive way, such as increasing interest in exercise and improving mental state. Therefore, the music group had a higher exercise heart rate and longer running time on the treadmill than those with no music (Rasteiro *et al.*, 2020). A meta-analytical study by Terry *et al.* (2020) also gave similar results about the use of music in sports activities to be effective in improving the perception of practitioners (RPE), optimizing physical fitness, and enhancing the oxygen uptake. Music actually enhanced endurance and duration of activity when performing exercises (Bucket *et al.*, 2002; Ghaderi *et al.*, 2009; etc.). In our study, the power of legs and agility indexes increased causing the demand for training in the basketball course and the impact of music. However, our result showed no significant differences in the strength of the hand, speed, MAS, and the core strength between the using music groups (15e and 7e) and no music (C). The explanation of these unchanged was the types of exercises in basketball courses. The training program focused on basketball techniques such as footwork, ball handling, and shooting, including the laws, balanced lifestyle, and health. This compulsory program did not have any exercises related to endurance, speed, and core strength throughout the process of studying. Besides, many previous studies on amateur athletes at college and universities classified music in different tempos, i.e., fast music (higher 140 bpm) and slow music (lower 90 bpm) (Meeks & Herdegen, 2002; Birnbaum *et al.*, 2009; Barwood *et al.*, 2009; Clark *et al.*, 2016), the result has pointed out that fast music group had an increase significantly in term of achievement when compared to slow music and no music groups. A study by Rendi *et al.* (2008) also suggested that music applied to sports context should probably focus on the specific sport and the types of movement. In our study, the

tempo of songs was divided into 3 parts of the training session (90-120 bpm for warm-up, 120-150 bpm for training, and 70-90 bpm for cool-down). Thus, this classification showed that there was suitability for female students and the specific movement in basketball courses at Saigon University, which might enhance the power of legs, agility, and decrease the RPE index in all parts of training sessions. It means that the application of music actually had a positive effect on the perception of female students. Mohammadzadeh *et al.* (2008) indicated that listening to music during exercise tended to reduce the perception of exercise intensity, which in turn reduced exercise stress. Research by Nakamura *et al.* (2010) conducted an experiment using music on a group of cyclists, it showed a significant increase in distance and a decrease in RPE. Many studies also gave a similar result in the decreased RPE when compared with not using music group in many different types of exercise as running on the treadmill (Young *et al.*, 2009), running until exhausted at 80-85%  $VO_{2max}$  (Ghaderi *et al.*, 2009), intensity exercise in 20 minutes (Potteiger *et al.*, 2009), self-regulated exercise (Connon & Scott, 2011), etc. The reason might come from the increased interest in the practitioner and distract the nervous system central about the feeling of fatigue (Thakur & Yardi, 2013).

Moreover, Hutchinson & Karageorghis (2013) showed that the attention of participants influenced the way the application of music at different exercise intensities. In high-intensity exercise, they had to have maximum concentration on the task of work-out, which required synchronization of music tempo with each specific type of activity (personalization of music tempo). In theory, when the song's melody rang out, it tended to attract individual attention in many different ways. Thereby, it might reduce the RPE value, no matter how intense the training and how fast or slow the music tempo was. It is necessary to have in-depth research on the ability of the participants to concentrate on future studies to explain the impact of music on the RPE value, which requires an assessment of participants' motivation, along with the problem of optimizing the actual conditions during exercise.

In addition, many studies have focused on the use of music during a training session and/or in a laboratory with short-term experiment planning to assess the impact of music on participants. In our study, the authors tried to evaluate the effectiveness of popular songs for non-sports students who participated in basketball courses for a relatively long time (experimental in 15 weeks, one time per week, 70 minutes of music experiment in 100-min PE session). Although the results on healthy female adults showed that the impact of music was not affected by the time of use (7 weeks and 15 weeks). However, music can be used as a tool to help female students feel more interested in PE courses (if used appropriately), and meet the physical development needs of students and the PE program request at Saigon University. According to Gibbons (2009), if females did not find value in PE courses (i.e., met their training purposes, improved physical fitness, and/or took more excitement in training, etc.), they would drop out as soon as possible or take a coping way to complete the course. In our study, participants were female students, not experienced daily exercise, and participated in basketball courses. Most of them attended the PE program because it was one of the required modules in the studying curriculum. However, the application of popular songs in basketball courses did enhance their achievement in the power of legs, agility, and reduce the stress of exercise during studying. Future studies should implement

the use of music in all elective sports at Saigon, such as soccer, volleyball, badminton, etc., to evaluate the effect of music on many different kinds of exercise. Moreover, there should be studies on the classification of input students, an assessment of the students' auditory ability, and the development of an appropriate exercise (especially the gender differences) in the application of music.

## Conclusion

In short, the results of this study indicated that music improved the power of legs, agility, and decreased the rating of perceived exertion in female students, except for the strength of the hand, speed, MAS, and the core strength after participating in basketball courses between the group using music and no music. However, the impact of music was not affected by long-term use (7 weeks vs. 15 weeks). Future studies should evaluate the influence of music on many different kinds of exercise in PE courses and the concentration of participants during the experiment.

**Funding:** This study received no financial support.

**Competing interests:** Authors declare that there are no conflicts of interests regarding the publication of this paper.

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