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SPORT

The Effects of Music on Activity Rates, Time in Activity, and Levels of Enjoyment in Junior High School Basketball

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Abstract

Music is a tool physical education (PE) teachers can use to help motivate students to greater physical activity (PA) rates during class activities. Music research in the PE context has found music to increase PA rates in the junior high school context (Brewer et al., 2016), that music increases the enjoyment of the PE experience for students (Barney et al., 2016) and can serve as a distraction during certain workouts (Higginson et al., 2019). This study aimed to examine the effects of music on physical activity rates (steps taken and time in activity) via pedometers of junior high school students in basketball gameplay. For this study, 270 junior high school students (157 males and 113 females) from eight intact seventh-, eighth-, and ninth-grade classes participated. The male and female participants attended different schools. Generally, it was found that the female participants were more active than their male counterparts when music was playing.

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These results and others illustrate music's effect on junior high school student PA rates.

Introduction

Music can be a powerful tool for increasing a person's physical activity. For example, college students' who listened to their personal music devices perceived that they worked harder and worked out longer (Barney et al., 2012). Similarly, Rendi et al. (2008) suggest that music enhances one's endurance and helps 'color' how a person interprets their perceptions of fatigue (Karageorghis & Lee-Priest, 2012). With the growing number of research studies investigating music's use and effect on physical activity, a conceptual framework provides support to the research. Karageorghis et al. (2006) proposed a conceptual framework of four factors relative to the effect of music on a person participating in physical activity; they are (a) rhythm response, (b) musicality, (c) cultural impact, and (d) association. Rhythm response refers to the musical rhythm, most notably the tempo or speed of the music as measured in beats per minute. Musicality denotes to the response to pitch-related elements, such as harmony and melody. The cultural impact indicates the pervasiveness of the music within society. And association pertains to the extramural association music may evoke. The factors exhibit a hierarchical structure (i.e., rhythm response), which is the most important contributor to the motivational quotient of a piece of music (Barney et al., 2020).

In addition to research investigating music's impact on physical activity, a growing number of studies have investigated music in a K-12 physical education (PE) setting. In the elementary PE setting, Barney et. al. (2016) examined the effects of music on fourth-grade students' enjoyment of two activities (tossing/catching and hula hoops) during PE lessons. Fourth-grade students participated in two classes, one with music and the other class with no music for both activities. At the end of the lessons, the students were surveyed regarding their experiences. Also, six students were randomly selected and interviewed regarding their experiences during the study. Results suggested fourth-grade students enjoyed the PE lessons more with music and perceived they worked harder when the music

was popular, familiar songs. Students reported having more energy when music was playing during the lesson.

A second study in the K-12 setting investigated the effects of music in junior high school PE classes (Brewer et al., 2016). For this study junior high school students participated in two lessons in volleyball and basketball. One lesson used music, the other used music, and the other had no music for each activity. Significant differences were noted between gender and activities. The lessons with music had higher step counts for both volleyball and basketball suggesting that music does play a role in increasing the physical activity engagement of students in PE class. Another study in the high school setting produced results similar to those conducted in the elementary and junior high schools. Higginson et al. (2019) studied the effects of distractions of watching a video, listening to music, and having no distractions on students in a spin indoor cycling unit. Students reported their rate of perceived exertion and enjoyment throughout the lesson. During the six-day cycling unit, the students received three conditions: two days of no distractions, two days of music playing, and two days of video. The lessons consisted of a five-minute warm-up and a 20-minute ride. As students pedaled, they were prompted to record their enjoyment level and perceived exertion rate via iClickers. The music component from the study served as a distraction for the students to work through the ride they had to perform.

Finally, there is research dealing with music in physical activity classes at the college and university levels. Barney et. al. (2020) studied the effects of music on physical activity rates (step counts and time in activity) via pedometers of college-aged students in basketball. For this study, college students were enrolled in intermediate basketball classes. Two classes played basketball while music played, and two other classes played basketball with no music playing. All participants wore pedometers as they played basketball to measure their activity. All lessons were 30 minutes in length of gameplay. The findings from this study indicated that when music was played during basketball game play in a college physical activity class, students took more steps and were in activity for more time. The research in the K-12 PE setting and the college and university setting concur that music is a positive tool for PE teachers to implement in their les-

sons and activities. With these types of results, there are still opportunities to strengthen the literature regarding music's impact on PE classes. Thus, this study aimed to examine music's effects on physical activity rates (steps taken and time in activity) via pedometers of junior high school students in basketball gameplay.

Methods

Participants and Setting

Participants for this study were 270 junior high school students (157 males and 113 females) from eight intact seventh-, eighth-, and ninth-grade classes. The male and female participants attended different schools. Both school's classes ran on the block schedule, A-day/B-day, with classes lasting approximately 80 minutes from bell to bell. The female PE teacher's school participants had a student population of 68% Caucasian and 25% Hispanic (USA School Info, 2022). The male PE teachers' school had a student population of 73% Caucasian and 21% Hispanic (USA School Info, 2022). The three teachers (one male & two females) who participated in this study averaged six years of teaching junior high school PE.

The setting in which this study took place consisted of two separate gymnasiums. The female PE teacher's gymnasium consisted of a single gymnasium with four drop-down basketball hoops. The class size for each female class was between 30 to 35 students. The male PE teachers' gymnasium consisted of a single gymnasium with six drop-down basketball hoops. The class sizes for each class were between 40 to 45 students.

Procedures and Data Collection

The university institutional review board (IRB) and the school district approved of the study. Parental and student consent was also secured. Researchers instructed PE teachers on how to wear, use, and read the pedometer properly to ensure reliable data collection. Students were instructed that upon entering the gymnasium, they were to get a pedometer and secure it to the waistband of their shorts. Students were further instructed that after warm-up activities, they were to reset their pedometers back to zero for basketball gameplay for data collection purposes. Then at the conclusion of gameplay, the students were to record their number of steps, time in activity, and

level of enjoyment during the lesson on the student record sheet. A student record sheet was created for each student. Students have a place to record their number of steps, time in activity, and level of enjoyment on their record sheet. The researchers created one statement on the student record sheet to rate their level of enjoyment during the activities on a scale of 1 to 5 (1=lowest level of enjoyment, 5=highest level of enjoyment).

The music selection used for this study consisted of popular, upbeat tempo (120 to 160 beats per minute) songs suggested by the PE teachers (Karageorghis et al., 2006; Priest et al., 2004). The researchers, along with the PE teachers, compiled a list of 40 songs, and then the researchers listened to the songs and narrowed them down to songs they felt were appropriate to play during basketball gameplay. The songs that fit the requirement were made into a playlist and played over a sound system in the gymnasium.

Pedometer Instrument

The Yamax Digi-Walker LS 2525 was the pedometer used to collect student step counts and time in activity. The pedometer model records step counts, distance covered, calories burned, and students' activity time. The pedometer also has a clock that runs when the student is in movement and stops when the student is not moving (standing). Time in activity is recorded in hours, minutes, and seconds. This pedometer was found to be reliable from previous research (Barney et al., 2008).

Results

Data Analysis

Data were analyzed via SPSS (version 28, IBM, 2021). All data were checked for input accuracy. Demographic variables included grade level (seventh, eighth, and ninth) and gender (males and females). Response variables included step counts via pedometry, time in activity, and level of enjoyment (1 = Not Enjoyable, 2 = Mostly Not Enjoyable, 3 = Neither or Not Enjoyable, 4 = Somewhat Enjoyable, and 5 = Very Enjoyable). Descriptive statistics for means (M) and standard deviations (SD)were calculated for both genders and across all grade levels. Tests for indications of multivariate normality were conducted, and adjustments were made as indicated.

Correlational analysis was conducted on variables of interest. A two-way MANOVA with follow-up comparison tests was conducted to examine between grade and gender and within treatment conditions treatment groups. Interaction effects were also examined.

Descriptive statistics (*M*, *SD*, and *Eta2*) are found in Table 1. Significant Shapiro-Wilk tests were not significant for steps with or without music but significant for time in activity with no music (TIA $_{\text{no music}}$ $p < .001$), steps with no music (steps $_{\text{no music}}$ $p < .001$), and time in activity with music (TIA $_{\text{music}}$ $p < .001$), steps with music (steps $_{\text{music}}$ $p < .001$). Further, the Mahalanobis *D* exceeded 22.46 for six response variables. Therefore, assumptions of multivariate normality could not be supported, and a Pillais-Trace adjustment was used.

Inspection of means by gender and grade level showed an unusual outcome with respect to gender. In this study, females were significantly higher than males in both steps and TIA (Female$_{M\text{steps}}$ = 2109, Males $_{M\text{steps}}$ = 1495; Female$_{M\text{TIA}}$ = 21.0, Males $_{M\text{TIA}}$ = 14.35). There was no gender effect for measures of enjoyment.

Conclusions

This study aimed to examine the effects of music on physical activity rates (steps taken and time in activity) via pedometers of junior high school students in basketball gameplay. From this study, the data revealed that the female participants were more active than their male counterparts. This means that the female participants took more steps and had more time for activities while playing basketball. It must be noted that when the researchers saw the data results, they went back to ensure the data was correctly input into the statistical package (SPSS). After confirming that the data were correctly entered, the results revealed that the female participants had more steps and more time in activity across all grades than the male participants. The literature has overwhelmingly shown that males are more active than females (Scruggs, 2007; Trost, 2002). To add to this thought, males also have been found to be more active in all grades (Barney et al., 2014).

These results are exciting for the fact that the female participants were more active than the male participants and that music positively affected both the male and female participants to higher rates of physical activity. These results concur with other research investigating music's effects on K-12 PE students' physical activity

Table 1
Means, Standard Deviations, and Effect Sizes

	7th grade $n = 91$				8th grade $n = 100$				9th grade $n = 79$				Partial *Eta*^{2}
	Male $n = 61$		Female $n = 30$		Male $n = 65$		Female $n = 35$		Male $n = 31$		Female $n = 48$		*Eta*$^2_{gender} = 0.39$
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	
Steps $_{music}$	2113	478.9	2743	704.3	1815	528.6	2530	496.8	1712	520.7	2369	696.7	0.24
Steps $_{no\ music}$	1619**$_{(1V3)}$	476.7	1938	405.0	1356***$_{(2V3)}$	579.1	2059	423.5	1543	502.1	2252	576.9	0.23
TIA $_{music}$	18.6	5.1	24.8	5.5	16.5	4.4	23.8	3.6	15.5	5.2	22.6	5.4	0.32
TIA $_{no\ music}$	15.4	4.7	20.0	4.8	13.5***$_{(2V3)}$	4.8	22.1	5.1	14.0	4.2	22.1	5.1	0.31
Enjoy $_{music}$	4.6	0.5	4.1	0.7	4.2	1.1	4.6	0.9	4.5	0.8	4.5	0.7	0.00
Enjoy $_{no\ music}$	3.8	1.1	3.6	0.7	3.6	0.9	3.7	1.0	3.5	1.1	3.9	.85	0.00

	7th grade $n = 91$		8th grade $n = 100$		9th grade $n = 79$		*Eta*$^2_{grade} = 0.07$
	M	*SD*	*M*	*SD*	*M*	*SD*	
Steps	2259	998	2702	1309	2823	1207	
Cohen's d_{grade}	$d_{7v8} = 0.38$		$d_{8v9} = 0.10$		$d_{7v9} = 0.51$		
Total Wt.	1745	881	2286	1101	2466	1083	
Cohen's d_{grade}	$d_{7v8} = 0.54$		$d_{8v9} = 0.16$		$d_{7v9} = 0.74$		

	Total $n = 201$		
	M	*SD*	Cohen's *d*
Steps $_{music}$	2165***	40.1	
Steps $_{no\ music}$	1752	36.8	$d_{steps} = 10.73$
TIA $_{music}$	19.8***	0.36	
TIA $_{no\ music}$	17.1	0.35	$d_{TotWt} = 7.60$
Enjoy $_{music}$	4.4	0.05	
Enjoy $_{no\ music}$	3.7	0.6	

Note: * = p ≤ .05, ** = p ≤ .01, and *** = p ≤. 001. Effect size indices: (a) Cohen's $d = (M1 - M2)/SD_{pooled}$ is a measure of the magnitude of the effect and is interpreted as follows: ç = small effect size (0.2 – 0.4), çç = moderate effect size (0.41 - 0.7), and ççç = large effect size (> 0.70); (b) *Eta*^{2} is the percentage of variance accounted for due to the effect.

rates. For this study, both males and females and grade levels took more steps, were in activity longer, and had higher levels of enjoyment when music was playing during gameplay. From the literature, Brewer et al. (2016) studied the effects of music/no music on junior high school PE students while they participated in volleyball and basketball games. On average, male students had 41 more steps during volleyball and 220 more steps during basketball while music was playing. Female students had 380 more steps during volleyball gameplay and 345 more steps during basketball with music playing. Barney and Prusak (2015) similarly studied music's effect on elementary-aged (third, fourth, and fifth) PE students. The students participated in walking and Frisbee activities. The results revealed that elementary-aged students took over 350 more steps when music was playing during their walking activities. During the Frisbee activities, elementary-aged students took over 460 more steps when music was playing.

A second point of discussion deals with class size in PE classes. When talking about class size, this deals with the number of students in each class. As mentioned earlier, for this study, the female PE classes averaged 30 to 35 students, and the male PE classes averaged 40-45 students. From the literature regarding class size in the PE setting, Bevan et al. (2010) studied PE resources, classroom management, and student physical activity levels. The researchers concluded that a low number of PE students significantly increased student activity levels. More specifically, with a lower number of students in PE class, the PE teacher spent less time in classroom management, thus increasing physical activity for the students. From this study the researchers feel that the smaller female PE classes allowed for the students to have more room to move around the gymnasium while playing basketball, compared to the male participants. Burson et al. (2021) have stated that the subject of PE in K-12 education is marginalized compared to other content areas. One of the ways PE is marginalized is by having PE classes of 45 or more students in each PE class. PE teachers must work closely with the school academic counselors or others who schedule student classes to change this. In terms of public health, it is important that students accumulate at least the minimal amounts of suggested physical activity across

Table 2
Bivariate Correlations

	Year	Gender	Steps $_{music}$	Total Wt. $_{music}$	Steps $_{no\ music}$	Total Wt. $_{no\ music}$
Year		-.084	.204**	.302**	.167*	.252**
Gender			-.345**	-.458**	-.361**	-.402**
Steps $_{music}$				.542**	.706**	.542**
Total Wt. $_{music}$					.481**	.872**
Steps $_{no\ music}$						.569**
Total Wt. $_{no\ music}$						

Note: * = $p < .05$, ** = $p < .01$

the school day. The authors suggest that similar to other subjects, PE classes should not exceed 30 to 35 students.

Implications of the Study

The results of this study should inform PE teachers of the importance of advocating for their students, particularly in relation to class size. The PE teacher should effectively communicate with their administrators and/or counselors that create the students' class schedule to keep the class size to manageable numbers. Beven et al. (2010) learned from their research that fewer students allow proper and beneficial physical activity for students in PE class activities. The female participants' results support the idea that smaller class sizes give students the space to move as they play basketball.

Another implication of this study was that the female participants had more steps than the male participants. The literature has overwhelmingly reported that males are typically more physically active than their female counterparts (Barney et al., 2012; Deutsch & Hetland, 2012). The results from this study can inform PE teachers that female students are just as capable as male students of being highly physically active. Also, the results of this study once again show that music has an impact on students' increased movement when music is present during class activities. PE teachers need to take advantage of music's effect on student movement.

Limitations

This study examined the effects of music on the physical activity rates of junior high school students in basketball gameplay. This study has noted limitations. The participants came from two schools, findings cannot be generalized or reflective of junior high school students in other junior high schools in other geographic areas.

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PHYSICAL ACTIVITY

Comprehensive School Physical Activity Programming in Dubai International Schools: A Mixed Methods Study

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Abstract

The purpose of this study was to examine comprehensive school physical activity program (CSPAP) policies and practices in international schools in Dubai, the United Arab Emirates. Following an explanatory-sequential mixed-methods research design, the researchers employed the Comprehensive School Physical Activity Program Policies and Practices Questionnaire (CSPAP-Q) and follow-up interviews to describe CSPAP implementation and explore implementation enablers and challenges. A convenience sample of physical education teachers (N=18) participated in the questionnaire, and seven of these teachers participated in individual interviews. Teachers' responses to the questionnaire indicated considerable heterogeneity and numerous gaps in existing school-based physical activity opportunities and promotion

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