


PHYSICAL FITNESS

Sixth-Grade Hispanic Boys' and Girls' Performances and Preferences in Cardiovascular Fitness Testing: A Comparison Between the 1-Mile Run and the PACER

Grant M. Hill and Nicholas Meko

Abstract

The purposes of this study were to determine the performance of primarily Hispanic sixth-grade students for the PACER and the 1-mile run, which cardiovascular test they perceived to require more effort, and what they liked and disliked about both cardiovascular tests. Participants included 103 males and 97 females ages 10 to 12. Each participant completed a multiple-choice survey and was encouraged to provide specific reasons for cardiovascular test preference. Results indicated that higher percentages of both girls and boys achieved passing scores in the PACER and preferred the PACER (72%) to the 1-mile run (28%). Respondents provided strong support for allowing students in this age group to choose between the 1-mile run and the PACER when performing cardiovascular fitness testing.

Grant M. Hill , Department of Kinesiology, California State University, Long Beach.
Nicholas Meko, Los Angeles Unified School District, Los Angeles, California. Please send
author correspondence to grant.hill@csulb.edu

Cardiovascular (CV) fitness is extremely important for school-aged children. Because heart disease is a major factor in early mortality, Ratey (2009), a fitness expert, strongly advocates incorporating multiple aerobic activity sessions per week. To help students track their CV fitness progress, and to hopefully motivate them to set goals and also make connections between lifestyle decisions and test scores, The Cooper Institute created both the FitnessGram and the ActivityGram. Periodic FitnessGram CV testing provides for feedback to both students and parents and reinforces the importance of lifelong health and fitness (Meredith & Welk, 2017).

The FitnessGram aerobic capacity test, which is required in many states, measures CV fitness by using either the 1-mile run or the Progressive Aerobic Cardiovascular Endurance Run (PACER) test. These two tests are the most valid and reliable methods for the assessment of CV fitness of school-aged youth in a field setting (Beets & Pitetti, 2004).

While the 1-mile run is a good CV test for students who are motivated and enjoy running, the PACER may be a better alternative CV test for those who do not enjoy running laps around a track (Scott et al., 2013). Wilkinson et al. (2012) found that a majority of junior high girls preferred the PACER over the 1-mile run. For an increase in student motivation, a number of researchers have recommended students be given a choice of either the 1-mile run and or the PACER for the best possible testing environment (Prusak et al., 2004; Lonsdale et al., 2009; Jaakkola et al., 2013). Providing students with choices in their physical activities has been found to increase student motivation and engagement (Bennie et al., 2016).

Given the importance of aerobic fitness on overall physiological health, including cognitive functioning, physical educators need to provide the best testing procedures possible for students. Specifically, students may be more motivated to try to achieve a higher level of CV fitness if they have a choice of different CV tests because they may prefer certain CV activities over others (Saint Onge & Krueger, 2011). Helping students to enjoy and be more engaged in CV testing appears to be important; multiple studies have found a significant positive correlation between CV performance and academic performance (Chang et al., 2015; Donnelly & Lambourne, 2011; Kalantari & Esmaeilzadeh, 2016) and between CV performance and self-

efficacy and expectancy-value (Kane et al., 2013; Liu & Dai, 2017; Zhu & Chen, 2014). This study is also important because sixth grade is a time when many children are decreasing their daily physical activity levels (Reilly, 2016). Consequently, for the provision of a more enjoyable and engaging CV testing process, it appears important to determine whether students prefer the PACER or the 1-mile run, reasons why they try harder on either test, and their likes and dislikes associated with both CV tests.

Method

Participants were enrolled in five sixth-grade general physical education classes at one public urban middle school located in a Southwestern state. Permission was granted by the school district IRB representative. Of the 200 participants in the study, 103 (51.5%) were male and 97 (48.5%) were female. Participant ages ranged from 10 to 12 years. The published ethnicity of the students in this school was Hispanic (93.3%), African American (5.2%), and no ethnicity declared (1.5%). In this school, 97.2% of the students were classified as socioeconomically disadvantaged and 30.4% were English language learners.

This study used a validated questionnaire to determine students' perceptions of the 1-mile run and the PACER (Wilkinson et al., 2012). The survey included 13 multiple-choice questions and space was provided for students to enter comments for each item. Students completed the on-line survey using Qualtrics the day after completing both the 1-mile run and the PACER. Students were asked which test they preferred. They also selected the test in which they exerted the most effort and indicated specific reasons for doing so (see Tables 1 to 4 for specific survey questions). After PACER scores and 1-mile run times were recorded for each student, the researcher determined the percentages of males and females who achieved scores in the FitnessGram Healthy Zone for each test.

Data Collection Procedure

Students in all five classes completed the 1-mile run during the first week of the semester, followed by the PACER during the second week. This gave the students an opportunity to practice pacing themselves in each test. During the fifth week of the semester, three randomly selected classes completed the 1-mile run and the

other two classes completed the PACER. The next week students performed neither test. In the following week (Week 7), those who started with the 1-mile run performed the PACER and those who started with the PACER performed the 1-mile run. For the PACER, one half of the class completed the test at a time with a partner filling out the FitnessGram score sheet. The researcher also utilized an assistant to record when each student stopped running, to provide a cross-check of scores to ensure accurate reporting. The day following the second test, all students filled out the electronic questionnaire, stating their perceptions of both CV fitness tests. All students were informed their responses to the questionnaire items were confidential and had no effect on their physical education grade.

Results

Table 1 shows the CV test preferences among boys and girls. Of the 200 participants, 144 (72%) indicated they prefer to perform the PACER, whereas 56 (28%) chose the 1-mile run. For the females, 76.2% preferred running the PACER, whereas 23.7% chose the 1-mile run. For the males, 67.9% preferred the PACER, whereas 33.0% preferred the 1-mile run.

Table 1
Cardiovascular Endurance Test Preferences of Boys and Girls in Required Physical Education Classes

Test	Males		Females		Total	
	N	%	N	%	N	%
PACER	70	67.9	74	76.3	144	72.0
1-mile run	33	32.0	23	23.7	56	28.0

The most frequent reasons boys and girls gave for trying harder on the PACER were trying to beat their previous score (35.0%), not having the opportunity to rest or walk while performing the test (26.5%), and having no stopping point (20.0%; see Table 2). The most frequent reasons boys and girls gave for trying harder on the 1-mile run were to beat their previous time (26.5%), because they got to set their own pace (10.5%), and because they knew they had to finish a required distance (7.0%; see Table 3).

Table 2*Boys' and Girls' Reasons for Trying Harder in the PACER Test*

Reasons	Males		Females		Total	
	%	N	%	N	%	N
Tried to beat previous score	33.0	(34)	37.1	(36)	35.0	(70)
Prefer the 1-mile run	33.0	(34)	37.1	(36)	35.0	(70)
Can't walk or rest	25.2	(26)	27.8	(27)	26.5	(53)
More difficult to score in the Healthy Fitness Zone	20.4	(21)	20.6	(20)	20.5	(41)
No set stopping point	17.5	(18)	22.7	(22)	20.0	(40)

Note. Participants were permitted to select more than one reason for why they try harder on the PACER test.

Table 3*Boys' and Girls' Reasons for Trying Harder in the 1-Mile Run*

Reasons	Males		Females		Total	
	%	N	%	N	%	N
I tried to beat my previous time	27.2	(28)	25.8	(25)	26.5	(53)
I got to set my own pace	14.6	(15)	6.2	(6)	10.5	(21)
I had to finish a required distance	9.7	(10)	4.1	(4)	7.0	(14)
More difficult to score in Healthy Fitness Zone	3.9	(4)	7.2	(7)	5.5	(11)

Note. Participants were permitted to select more than one reason for why they try harder on the 1-mile run.

For the PACER test, 85.0% of the students scored in the Healthy Fitness Zone (HFZ). In contrast, only 67.5% scored in the HFZ for the 1-mile run. A higher percentage of females had scores in the HFZ for the PACER (95.9%) when compared to males (74.6%). A higher percentage of females (73.2%) also had scores in the HFZ for the 1-mile run when compared to males (62.1%; see Table 4).

Table 4

Percentage of Students Who Scored in the FitnessGram Healthy Fitness Zone When Completing the 1-Mile Run and PACER Tests

Test	Males		Females		Total	
	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>
PACER	74.8	(77)	95.9	(93)	85.0	(170)
1-mile run	62.1	(64)	73.2	(71)	67.5	(135)

Discussion

Similar to the participants in Wilkinson et al. (2012), a strong majority of the participants favored the PACER over the 1-mile run. These results are also consistent with the results of Constantinou et al. (2009), who suggested the conditions of a testing environment may impact test preference. Just over half (54.5%) of the participants reported they tried harder on the PACER test, whereas just under half (45.5%) indicated they tried harder on the 1-mile run. These results support the contention of Lonsdale et al. (2009) that physical educators should consider either giving students a choice of the two CV tests or having them perform both tests and use the better score.

The most frequently cited reason students disliked the PACER was that spacing between runners was too crowded. The PACER was performed in the gymnasium with half of the class running at a time (approximately 20 to 30 students). Because class time was limited, it was necessary to test one half of the class at a time (i.e., rather than smaller groups of students). Apparently some of the students did not have a clear lane when they ran the PACER test, in contrast to the outdoor 1-mile run. As a result, students had to focus not only on running fast enough to complete each lap ahead of the beep but also on avoiding bumping into those who were running next to them. Being able to both walk and run was the students' most frequently mentioned reason regarding what they liked about the 1-mile run. Evidently, some students did not believe they were capable of running the entire mile without walking. Consequently, the task of completing the mile may seem more manageable for some participants because they can insert some walking breaks during their test.

Some students felt the 1-mile run provides a better measurement of their level of CV fitness. Others found their mile time to be more meaningful than a number of PACER laps and enjoyed trying to steadily lower their total time. Others felt the self-pacing requirement of the 1-mile run to be valuable, whereas others felt it was a better exercise to improve their long-term health.

Some students disliked the physically challenging nature of the 1-mile run. This is not surprising, because most of the students did not have BMIs in the FitnessGram HFZ and were likely not engaging in moderate to vigorous exercise on a regular basis. Some students in these classes appeared to have little experience in running a mile, and physical fatigue undoubtedly took them out of their comfort zones. In addition, the 1-mile distance may have psychologically overwhelmed them so that they felt they were incapable of finishing the test in a timely manner.

Less than 15% of the students provided one or more comments on the survey. Some of those students felt it was easier to score in the HFZ for the PACER than for the 1-mile run. This may be because the PACER has pacing and rest built into the test, compared to the mile, which requires a consistent pace. The PACER, on the other hand, dictates how fast students complete each lap and does not tend to fatigue participants as quickly. Additionally, the total distance required to score in the HFZ for the PACER is significantly less than the 1-mile run. The claim that the participants believed it is easier to score in the HFZ for the PACER was supported with 85% of the students scoring in the HFZ for the PACER test versus 67.5% for the 1-mile run. Participants also liked the unique test procedures of the PACER. The PACER was performed inside and had accompanying music and beep sounds that signified each lap. Others indicated they found the 1-mile run to be boring. Because the participants were collected through a convenience sample (five classes from one teacher), the results may not be generalizable to other populations. The online survey was taken on one day at school; however, some students were absent during the PACER or 1-mile run, so they were not represented in the final results of the study. Low effort by some of the students during the 1-mile run may also have affected the findings.

Given that approximately 93% of the participants were Hispanic, the findings may be compared with similar or dissimilar ethnic

groups of middle school students, because ethnicity has been shown to influence physical activity choices (Saint Onge & Krueger, 2011). In addition, the results should be of interest to those who are assessing physical activity disparities among underserved Hispanic children (Zhang et al., 2020).

The results provide additional support to the notion that physical educators should consider either giving students a choice of CV test or giving them both tests (Jaakkola et al., 2013; Lonsdale et al., 2009; Prusak et al., 2004). Because higher percentages of both males and females achieved scores in the HFZ of the FitnessGram for the PACER, the best strategy might be to have students work to pass the PACER first and later transition to the 1-mile run. Because partners were utilized to score the PACER (i.e., using the FitnessGram PACER scoresheet), the use of partners to score the 1-mile run (i.e., provide lap times and encouragement) might also be beneficial. Students could add their scores and then set goals and work together to improve their combined scores during the school year.

Researchers should consider replicating this study using a range of age groups as well as urban and rural communities with different ethnic backgrounds and socioeconomic status. In addition, it would be interesting for studies to incorporate upbeat music during the 1-mile run to see how it affects both performance and preferences (Priest & Karageorghis, 2008). Finally, researchers should try testing the 1-mile run and the PACER both inside and outside to determine the effects of those settings on student choice.

References

- Beets, M., & Pitetti, K. (2004). A comparison of shuttle-run performance between Midwestern youth and their national and international counterparts. *Pediatric Exercise Science, 16*(2), 94–112. <https://doi.org/10.1123/pes.16.2.94>
- Bennie, A., Peralta, L., Gibbons, S., Lubans, D., & Rosenkranz, R. (2016). Physical education teachers' perceptions about the effectiveness and acceptability of strategies used to increase relevance and choice for students in physical education classes. *Asia-Pacific Journal of Teacher Education, 45*(3), 302–319. <https://doi.org/10.1080/1359866X.2016.1207059>

- Chang, Y., Chu, C., Wang, C., & Song, T. (2015). Effect of acute exercise and cardiovascular fitness on cognitive function: An event-related cortical desynchronization study. *Society for Psychophysiological Research, 52*(3), 342–351. <https://doi.org/10.1111/psyp.12364>
- Constantinou, P., Manson, M., & Silverman, S. (2009). Female students' perceptions about gender-role stereotypes and their influence on attitude toward physical education. *Physical Educator, 66*(2), 85–96.
- Donnelly, J. E., & Lambourne, K. (2011). Classroom-based physical activity, cognition, and academic achievement. *Preventive Medicine, 52*(Suppl.), S536–S542. <https://doi.org/10.1016/j.ypmed.2011.01.021>
- Jaakkola, T. T., Saakslähti, A., Yli-Piipari, S., Manninen, M., Watt, A., & Liukkonen, J. (2013). Student motivation associated with fitness testing in the physical education context. *Journal of Teaching in Physical Education, 32*(3), 270–286. <https://doi.org/10.1123/jtpe.32.3.270>
- Kalantari, H., & Esmaeilzadeh, S. (2016). Association between academic achievement and physical status including physical activity, aerobic, and muscular fitness tests in adolescent boys. *Environmental Health and Preventive Medicine, 21*(1), 27–33. <https://doi.org/10.1007/s12199-015-0495-x>
- Kane, I., Robertson, R. J., Fertman, C. I., Nagle, E. F., Mcconnaha, W. R., & Rabin, B. S. (2013). Self-efficacy and enjoyment of middle school children performing the progressive aerobic cardiovascular endurance run (Pacer). *Perceptual and Motor Skills, 117*(2), 470–483. <https://doi.org/10.2466/29.25.PMS.117x23z3>
- Liu, H., & Dai, X. (2017). Correlation between physical activity and self-efficacy in Chinese university students. *Journal of Sport Psychology, 26*(4), 110–114.
- Lonsdale, C., Sebiston, C. M., Raedeke, T. D., Ha, A. S. C., Sum, R. K. W. (2009). Self-determined motivation and students' physical activity during structured physical education lessons and free choice periods. *Preventive Medicine, 48*(1), 69–73. <https://doi.org/10.1016/j.ypmed.2008.09.013>
- Priest, D., & Karageorghis, C. (2008). A qualitative investigation into the characteristics and effects of music accompanying exercise. *European Physical Education Review, 14*(3), 347–366. <https://doi.org/10.1177%2F1356336X08095670>

- Meredith, M. D., & Welk, G. J. (2017). *FitnessGram test administration manual* (5th ed.). Cooper Institute for Aerobics Research.
- Prusak, K. A., Treasure, D. C., Darst, P. W., & Pangrazi, R. (2004). The effects of choice on the motivation of adolescent girls in physical education. *Journal of Teaching in Physical Education*, 23(1), 19–29. <https://doi.org/10.1123/jtpe.23.1.19>
- Ratey, J. (2009). *SPARK: The revolutionary new science of exercise and the brain*. Little, Brown and Company.
- Reilly, J. J. (2016). When does it all go wrong? Longitudinal studies of changes in moderate-to-vigorous-intensity physical activity across childhood and adolescence. *Journal of Exercise Science & Fitness*, 14(1), 1–6. <https://doi.org/10.1016/j.jesf.2016.05.002>
- Saint Onge, J. M., & Krueger, P. M. (2011). Education and racial-ethnic differences in types of exercise in the United States. *Journal of Health and Social Behavior*, 52(2), 197–211. <https://doi.org/10.1177/0022146510394862>
- Scott, S. N., Thompson, D. L., & Coe, D. P. (2013). The ability of the PACER to elicit peak exercise response in youth. *Medicine & Science in Sports & Exercise*, 45(6), 1139–1143. <https://doi.org/10.1249/MSS.0b013e318281e4a8>
- Wilkinson, C., Brown, L., Graser, & Pennington, T. (2012). Adolescent girls' preferences pertaining to cardiovascular fitness testing: A comparison between the one-mile run and PACER tests. *Physical Educator*, 69(1), 52–70.
- Zhang, T., Lee, J., Chu, T. L., Chen, C., & Gu, X. (2020). Accessing physical activity and health disparities among underserved Hispanic children: The role of actual and perceived motor competence. *International Journal of Environmental Research and Public Health*, 17(9), Art. 3013. <https://doi.org/10.3390/ijerph17093013>
- Zhu, X., & Chen, S. (2014). The impact of adolescent beliefs in performing a cardiorespiratory fitness test. *International Journal of Sport and Exercise Psychology*, 13(2), 182–192. <https://doi.org/10.1080/1612197X.2014.946945>