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# Review of the PE Metrics cognitive assessment tool for fifth grade students

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## Summary

*Study aim*: this study examined the item difficulty and item discrimination scores for the HRFK PE Metrics cognitive assessment tool for 5th-grade students.

*Materials and methods*: ten elementary physical education teachers volunteered to participate. Based on convenience, participating teachers selected two 5th grade physical education classes. Teachers then gave students (N = 633) a 28-question paper and pencil HRFK exam using PE Metrics Standards 3 and 4. Item difficulty and discrimination analysis and Rasch Modeling were used data to determine underperforming items.

*Results*: analysis suggests that at least three items are problematic. The Rasch Model confirmed this result and identified similar items with high outfit mean square values and low Point Biserial correlation values.

*Conclusions*: teachers are in need of valid and reliable HRFK assessment tools. Without the removal of three items in the PE Metrics HRFK exam for 5th-grade students, complete use of the exam could offer incorrect conclusions.

Key words: PE Metrics – Assessment – Cognitive – Exam – Health-related

## Introduction

The National Health and Nutrition Examination Survey and National Youth Fitness Survey in 2012 found that only 24.8% of U.S. youth aged 12–15 years engaged in moderate-to-vigorous physical activity for at least 60 minutes each day [9]. Inactivity and poor dietary habits have been considered to be two main contributors to the rise of obesity in U.S. youth population [5]. Consequently, many researchers and local school district health professionals have called for the examination of cost-effective methods and implementation efforts for increasing healthy and active behaviors in children. For example, McKenzie and colleagues [18] developed and implemented the CATCH curriculum, which serves as a comprehensive model for raising students' physical activity and healthy behaviors, and Michelle Obama's "Let's Move!" campaign aimed to get kids active for at least 60 minutes a day. Other researchers have examined the determinants to getting healthy and active or the associated motivational factors. For example, DiLorenzo and colleagues [6] conducted a two-phase longitudinal study on sixth and later ninth grade students discovering a range of determinants to physical activity (e.g., enjoyment, parental modeling, self-efficacy). One primary factor found during Phase 2 was students' health-related fitness knowledge (HRFK) among ninth grade boys and girls. Researchers indicated that only HRFK was the only factor for boys' engagement in leisure-time physical activity [6]. Interestingly enough, Society of Health and Physical Education (SHAPE) recommends health related fitness knowledge (HRFK) as an area of instruction. However, the validity of HRFK PE Metrics on the 5th-grade students remains less explored.

The positive effects of HRFK acquisition on leisure time physical activity have been documented in previous research [4, 25, 27]. Thompson and Hannon [27] examined high school students' physical activity fitness levels using Physical Activity Questionnaire for Adolescences (PAQ-A) and a designed HRFK assessment tool. A moderate positive Pearson correlation coefficient between HRFK test scores and PAQ-A scores ($r = 0.438$, $p<0.001$) indicated a moderate positive relationship between healthy behavior knowledge and self-reported physical activity. The researchers also found a significant HRFK test score difference among the low active and moderately and high

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active groups ($p<0.001$), concluding that students who were more fit also had higher HRFK scores [26]. Pearman and colleagues [21] found similar effects on college alumni as they examined students who took a course on selected HRFK concepts. The effects on their health-related behaviors (e.g., aware of blood pressure, healthy eating habits, and smoking) were found to be enhanced by the alumni who had taken the college course, and more likely to engage in aerobic exercise and less likely to smoke, and have lower intakes of dietary fat. Knowledge may not be enough to change behaviors [8], however improving and offering quality HRFK instruction could possibly provide positive healthy behavior outcomes.

Researchers found drastically low levels of HRFK among students of all ages [12, 13, 22]. Elementary [1, 15], secondary [14, 24], and college-aged students [17] are documenting poor scores on HRFK assessments. Although the reason for this is undetermined, one can speculate that this could be a cause of physical education teachers' misconceptions on HRFK [2] or a lack of inclusion in physical education curriculum. Nonetheless, generalization of students' documented levels of HRFK should be used with caution as many of these studies have utilized self-designed HRFK assessment tools and lack the appropriate testing validity [13]. For example, early researchers Stradtman and Cureton [25] designed the first documented fitness knowledge test, which contained a 100-question exam used for assessing secondary students. Content validity of the measures and test-retest reliability of (0.95) were obtained, however no further validation occurred. In the early 1970's, Mood [19] designed a test to measure college physical education majors' knowledge of fitness. However, the two separate 60-question forms confirmed content validity and test-retest reliability only at a rate of (0.75). Heart Smart [20], another developed assessment tool also lacked proper validation and was used multiple times in elementary school studies.

The U.S. National Association of Sport and Physical Education (NASPE), (now SHAPE America) endorses only two HRFK exams, FitSmart [29] and PE Metrics [23]. FitSmart, a comprehensive test for secondary students contains 50 standardized multiple-choice items from a variety of health categories. This assessment endured an extensive validation process, identifying and measuring the major concepts necessary for understanding and maintaining physical fitness and healthy lifestyles. During this process, three leading experts were asked to evaluate the content areas and identify which portions of the test appropriately measured student HRFK. The authors conducted pilot tests among various subpopulations, and many versions of the test were administered and modified before reaching the final standardized questions [29]. The only other NASPE endorsed tool is known as PE Metrics [30]. PE Metrics offers practitioners assessment methods for assessing students psychomotor (e.g., skills) and cognitive (e.g., knowledge) domain. However, the 28-item paper and pencil HRFK exam for fifth grade students does not provide practitioners or researchers with the necessary psychometrics, raising concern for the exams' legitimacy.

SHAPE America suggests HRFK instruction to be included in the physical education curriculum and offered to students of all ages. In order to teach HRFK effectively, elementary and secondary teachers are in need of valid and reliable assessment tools as empirical evidence has shown very few quality assessments exist. Therefore, due to the lack of cross-validity on the NASPE endorsed fifth grade PE Metrics HRFK assessment tool, we examined both item difficulty and item discrimination factors aiming to confirm the validity and offer teachers with a working exam that can be confidently implemented immediately into school settings.

## Materials and methods

### Participants and setting

This study was conducted in one large suburban school district, in the Southwestern U.S. Teachers ($N = 10$) were recruited via email, phone, or in-person, and volunteered to participate. Participating teachers' teaching experience ranged from 5 to 27 years ($M = 11.83$, $SD = 6.56$) and nine of the 10 teachers identified their ethnicity as Caucasian, and the other self-identified as Hispanic. Based on teacher convenience, two fifth grade classes were selected, accumulating ($N = 633$; $n = 310$ boys and $n = 323$ girls) students. Demographics of participating students were proportional and can be seen in Table 1.

In this district, physical education is provided to students twice every sixth school day, lasting 30 minutes each. Instruction was either provided to students indoors (e.g., multi-purpose room, gymnasium) or outdoors (e.g., blacktop, playing field). Institutional Review Board approval was obtained on September 10, 2012 through the University and participating School District (Protocol #1207008017). Parents and teachers consent and students assent was gathered before commencement of the study.

### PE Metrics

Developed by a task group of experts, PE Metrics provides teaching professionals with a myriad of instruments that assess cognitive and psychomotor learning domains of students in both elementary and middle school settings. Despite the inability to retrieve any information, the authors explain that this assessment underwent a detailed validation process following: (a) pre-pilot, (b) pilot, and (c) national data collection [29]. Authors [23] explain that after many exam iterations and removal of problematic questions, the final exam was complete and

**Table 1.** Students' ethnicity separated by participating teachers

| Intervention Teachers | Caucasian | Hispanic | African American | Asian American |
|---|---|---|---|---|
| Brad | 35.7 | 42.9 | 12.5 | 7.1 |
| Mike | 58.2 | 17.9 | 16.4 | 6.0 |
| Ruth | 53.8 | 21.8 | 9.2 | 21.0 |
| Jessica | 78.1 | 9.4 | 0.0 | 12.5 |
| Gabby | 47.4 | 29.8 | 7.0 | 14.0 |
| Larry | 63.6 | 13.6 | 15.9 | 2.3 |
| Abby | 49.2 | 16.4 | 21.3 | 9.8 |
| Jessie | 63.8 | 8.5 | 10.7 | 10.06 |
| Jillian | 0.00 | 87.1 | 11.4 | 0.00 |
| Steven | 63.7 | 15.1 | 11.3 | 6.3 |

Note: All values are in percentages

ready for use. The exam consists of 28-items organized into eight 'performance descriptors': (a) chooses to be physically active outside of school, (b) describes personal responses to physical activity, (c) describes characteristics of health-enhancing physical activity, (d) achieves criterion-reference standards, (e) identifies personal health-related weaknesses/strengths, (f) describes how to improve personal fitness, (g) identifies the principles (guidelines) associated with improving physical fitness, and (h) identifies specific benefits associated with each component of health-related physical fitness. One sample item from the PE Metrics under the performance descriptor, "describes personal responses to physical activity" states, "when you exercise vigorously" with the response options of: (a) you start to breathe more slowly, (b) your heart keeps a slow, steady rhythm, (c) it is more difficult to find your pulse, or (d) you increase your pulse.

Researchers administrated the exam at the start of the class period. A specific protocol for administering the exam was followed (e.g., providing pencils to all students, reading each question aloud twice, and offering students 30 seconds to complete their answer before moving onto the next). Once all questions were read and completed, researchers collected the exam and documented the results, keeping records in the primary researchers locked file cabinet.

**Data analysis**

Data were entered electronically and managed using Microsoft Excel and SAS 9.3 for Windows [22]. Item Difficulties and Item Discrimination statistics were conducted. Item difficulty measures the proportion of respondents who answered the question correctly, with plausible values ranging from zero to one [7]. Item discrimination compares the top scoring 27% of respondents to the bottom 27%, with the higher performing respondents having a greater probability of answering the item correctly. Plausible values range from –1 to 1, with desired values being greater than 0.39 [7]. Rasch Modeling was also performed using WINSTEPS 3.51 [28] and internal consistency coefficients were done using SAS [21].

## Results

Results from the analysis were conclusive with many problematic questions discovered. Item difficulty and discrimination indices are reported in Table 2, with difficulty values below 0.25 or above 0.80, and discrimination indices below 0.20 suggestive of potential problems [7]. It can be seen that items 10, 11, and 25 from the PE Metrics 28-question exam for fifth grades obtain a low item difficulty indices (0.04, 0.08, 0.20, respectively) and low discrimination indices (0.01, 0.01, 0.07, respectively). The Rasch Model identified these same items 10, 11 and 25, with high outfit mean square values (1.85, 1.85, 1.41, respectively) and low Point Biserial correlation values (–0.01, 0.00, 0.08, respectively). Researchers continued and conducted internal consistency measures using Cronbach's alpha, discovering a 0.67 for the 28-item HRFK test, and a 0.69 with the three questionable items deleted.

## Discussion

According to Fox and Biddle [11], HRFK provides individuals with a foundation for intelligent decision-making. The possible effects of HRFK acquisition have been examined and in some cases found to have a positive impact on physical activity levels (e.g., 3, 4, 6, 16, 21, 27). However, it has been well documented that school-aged children lack

**Table 2.** Item difficulty and discrimination scores from PE Metrics assessment

| Item | Item difficulty | Item discrimination |
|---|---|---|
| 1 | 0.49 | 0.27 |
| 2 | 0.86 | 0.22 |
| 3 | 0.73 | 0.47 |
| 4 | 0.53 | 0.47 |
| 5 | 0.64 | 0.23 |
| 6 | 0.31 | 0.50 |
| 7 | 0.88 | 0.37 |
| 8 | 0.66 | 0.32 |
| 9 | 0.33 | 0.34 |
| 10 | 0.04 | 0.01 |
| 11 | 0.08 | 0.01 |
| 12 | 0.71 | 0.50 |
| 13 | 0.82 | 0.34 |
| 14 | 0.61 | 0.36 |
| 15 | 0.71 | 0.44 |
| 16 | 0.56 | 0.30 |
| 17 | 0.38 | 0.37 |
| 18 | 0.25 | 0.25 |
| 19 | 0.75 | 0.46 |
| 20 | 0.45 | 0.35 |
| 21 | 0.31 | 0.29 |
| 22 | 0.36 | 0.27 |
| 23 | 0.68 | 0.37 |
| 24 | 0.48 | 0.32 |
| 25 | 0.20 | 0.07 |
| 26 | 0.47 | 0.30 |
| 27 | 0.51 | 0.30 |
| 28 | 0.62 | 0.20 |

*Note.* Item difficulty values below 0.25 or above 0.80 and item discrimination indices below 0.20 are suggestive of potential problems.

a sufficient level of HRFK [1, 12, 13, 14, 15], calling practitioners to incorporate effective HRFK instruction in their classes. It is important to note the aforementioned studies should be carefully disseminated as many have used HRFK assessments that have not been previously validated. Similarly, many practitioners reported using their own HRFK test to assess students' knowledge. Therefore, it was the researchers objective to provide practitioners with a tool that offers valid and reliable scores that can confidently be implement into their physical education classes.

Therefore, we conducted analysis on the PE Metrics aiming to support our practitioners with a valid HRFK assessment tool. Based on our findings the item difficulty and discrimination suggest that at least three items are problematic (#10, 11, 25), as the difficulty index indicated that a small proportion of students answered these items correctly. These questions are: "Which of the following is a weight-bearing activity", "Softball is a good:", and "When you want to become stronger, you should:", respectively. This could be due to ineffectual distractors. Similarly, these items were not able to discriminate between high and low performing students, again suggesting problems with the wording of the question or distractors. It is interesting to note these items are also the same three items that are flagged as having extreme mean squared values from Rasch Modeling, indicating they did not fit within that model. The strength of this study is that our data represents a large population-based sample from a suburban area. To our knowledge, this is the first study to investigate the item difficulty and item discrimination of the PE Metrics exam for 5$^{th}$-grade boys and girls. Further studies are needed to confirm our findings across different race, grade, countries, and gender subpopulations or groups.

Upon examination of the validity results, the Cronbach's alpha score of 0.67 from the initial analysis does reflect a questionable level of internal consistency, suggesting there may be weak inter-relatedness of some items for this sample [26]. Further, it appeared that a few performance descriptors within the PE Metrics instrument only contained one item, potentially reducing the internal consistency statistic. The Cronbach's alpha score increased to 0.69 when computed with the three low-performing items deleted, suggesting the deleted items were not strongly related to the other items. This moves closer to an "acceptable" value of 0.70 [7], however, the overall Cronbach's alpha score is representative of the aggregate relationship of test items and may not reflect inter-relatedness of items within performance descriptors. Given these results, the PE Metrics test can produce valid and reliable scores; however, some modification to the items or the overall test questions may improve test performance.

A comprehensive physical education curriculum should be sequential and contain learning objectives that are appropriately aligned with standards-based activities. Objectives should be properly assessed with formative and summative assessments to confirm and provide evidence of student learning. However, empirical evidence shows that most assessments available to practitioners lack legitimacy and reliability. Based on our findings, practitioners should consider the PE Metrics tool to be a valid and reliable tool in assessing HRFK in fifth-grade students after the removal of items 10, 11, and 25 due to low item performance characteristics.

Therefore, if practitioners were to use the PE Metrics as a complete tool, incorrect conclusions could occur. Lower test scores may be due in part to poor item design

and low item performance, and not necessarily a lack of student content knowledge. Thus, any public recommendations for the current PE metrics HRFK Standards 3 and 4 5th-grade exam will require more careful consideration.

## References


1. Brusseau T.A., P.H. Kulinna, D.J. Cothran (2011) Physical activity content knowledge of Native American children. *Phys. Edu.,* 68: 66-77.
2. Castelli D., L. Williams (2007) Health-related fitness physical education teachers' content knowledge. *J. Teach. Phys. Edu.,* 26: 3-19.
3. Dale D., C.B. Corbin (2000) Physical activity participation of High School graduates following exposure to conceptual or traditional Physical Education. *Res. Q. Exerc. Sport,* 71: 61-68.
4. Dale D., C.B. Corbin, T.F. Cuddihy (1998) Can conceptual Physical Education promote physical active lifestyles? *Pediatr, Exerc, Sci,,* 10: 97-109.
5. Dietz W.H. (2001) The obesity epidemic in young children. Reduce television viewing and promote playing. *Br. Med. J.,* 322: 313-314.
6. DiLorenzo T.M., R.C. Stucky-Ropp, J.S. Vander Wal, H.J. Gotham (1998) Determinants of exercise among children: A longitudinal analysis. *Prevent. Med.,* 27: 470-477.
7. Ebel R.L., D.A. Frisbie, (1991) Essentials of educational measurement. Englewood Cliffs, N.J: Prentice Hall.
8. Ennis C.D. (2007) Defining learning as conceptual change in physical education and physical activity settings. *Res. Q. Exerc. Sport,* 78: 138-150.
9. Fakhouri T.H., J.P. Hughes, V.L. Burt, M. Song, J.E. Fulton, C.L. Ogden (2014) Physical activity in U.S. youth aged 12–15 years, 2012. *National Center for Health Statistics Data Brief,* 1: 1-8.
10. Fissette J.L., D.M. Franck (2012) How teachers can use PE Metrics for formative assessment. *J. Phys. Edu., Recreation and Dance,* 83: 23-34.
11. Fox K.R., S.J. Biddle (1988). The use of fitness tests: Educational and psychological considerations. *J. Phys. Edu., Recreation and Dance,* 59: 47-53.
12. Hopple C., G. Graham (1995) What children think, feel, and know about physical fitness testing. *J. Teach. Phys. Edu.*, 14: 408-417.
13. Keating X.D., L. Jr. Harrison, L. Chen, P. Xiang, D. Lambdin, B. Dauenhaurer, J. Castro Pinero (2009) An analysis of research on students health-related fitness knowledge in K-16 Physical Education programs. *J. Teach. Phys. Edu.,* 28: 333-349.
14. Keating X.D., L. Chen, J. Guan, L. Jr. Harrison, B. Dauenhauer (2009) Urban minority ninth-grade students' health-related fitness knowledge. *Res. Q. Exerc. Sport,* 80: 747-755.
15. Kulinna P.H. (2004) Physical activity and fitness knowledge: How much do 1–6 grade students know? *Int. J. Phys. Edu.n,* 41: 111-121.
16. Liang M.T., H.T. Dombrowski, T.W. Allen, C.O. Chang, J. Andriulli, M. Bastianelli, S.D. Norris (1993) Do medical students' knowledge and attitudes about health and exercise affect their physical fitness? *J. Amer. Osteopathic Association,* 93: 1020-1024.
17. Losch S.H., B. Strand, (2004) An analysis of the knowledge and fitness levels of physical education teacher education majors. *Res. Q. Exerc. Sport*, 75, A-73.
18. McKenzie T.L., E.J. Stone, H.A. Feldman, J.N. Epping, M. Yang, P.K. Strikmiller, G.S. Parcel (2001) Effects of CATCH Physical Education Intervention. *American Journal of Preventative Medicine,* 21: 101-109.
19. Mood D. (1971) Test of physical fitness knowledge: Construction, administration and norms. *Res. Q.,* 42*:* 423-430.
20. Oaks J., B. Warren, D. Harsha (1987) Cardiovasucalr health knowledge of children and school personnel in Louisiana public schools. *J. Scholar. Health,* 57: 23-27.
21. Pearman S.N. III, R.F. Valois, R.G. Sargent, R.P. Saunders, J.W. Drane, C.A. Macera (1997) The impact of a required college health and Physical Education course on the health status of alumni. *J. Am. College Health*, 46: 77-85.
22. SAS Institute Inc., SAS, Version 8. Cary, NC: *SAS Institute Inc.,* 2000.
23. Society of Health and Physical Education (SHAPE) (2010) *PE Metrics: Assessing National Standards 1–6 in Elementary School-2nd Edition.* Champaign, IL: Human Kinetics.
24. Stewart S., M. Mitchell, (2003) Instructional variables and student knowledge and conceptions of fitness. *J. Teach. Phys. Edu.*, 22, 533-551.
25. Stradtman A.D., T.K. Cureton (1950) A physical fitness knowledge test for secondary school boys and girls. *Res. Q.,* 21: 53-57.
26. Tavakol M., R. Dennick (2011) Making sense of Cronbach's alpha. *Int. J. Med. Edu.*, 2: 53–55. DOI:10.5116/ijme.4dfb.8dfd
27. Thompson A., J.C. Hannon (2012) Health-related fitness knowledge and physical activity of high school students. *Phys. Edu.,* 69: 71-88.
28. WINSTEPS. (Version 3.90.0). Linacre J.M. (2015) [Computer Software]. Beaverton, Oregon.
29. Zhu W., M. Safarit, A. Cohen (1999) *The national health-related physical fitness knowledge test: FitSmart test user manual (high school edition).* Champaign, IL: Human Kinetics.


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## Appendix A

### PE Metrics fifth grade physical education activity test

**Performance Descriptor: Chooses to be physically active outside of school**

1. The best choice for a vigorous physical activity after school is:
   A. Shooting baskets.
   B. Throwing and catching with a friend.
   C. Riding a bike.
   D. Going for a long walk.

2. Jane wants to do something after school to help her be good on the soccer team. She should:
   A. Ride her bike for 30 minutes.
   B. Play a soccer video game for 30 minutes without stopping.
   C. Practice dribbling a soccer ball at a fast pace around the yard for 30 minutes.
   D. Play on the trampoline for 30 minutes.

**Performance Descriptor: Describes personal responses to physical activity**

3. When you exercise vigorously:
   A. You start to breathe more slowly.
   B. Your heart keeps a slow, steady rhythm.
   C. It is more difficult to find your pulse.
   D. You increase your pulse.

**Performance Descriptor: Describes characteristics of health-enhancing physical activity**

4. Bill likes to run, which is called a/an _____ activity:
   A. Flexibility.
   B. Aerobic.
   C. Competitive.
   D. Sport.

5. Which of the following is the most vigorous activity?
   A. Playing kickball.
   B. Running.
   C. Riding a bike.
   D. Playing softball.

6. Soccer and swimming both require a lot of:
   A. Flexibility.
   B. Muscle strength.
   C. Teamwork.
   D. Aerobic endurance.

7. If Jane can pass a flexibility test, she is more likely to:
   A. Participate in a long-distance race.
   B. Lift a heavy weight.
   C. Do well in gymnastics.
   D. Lift light weights many times.

8. What will best improve your aerobic fitness?
   A. Kickball.
   B. Dodgeball.
   C. Golf.
   D. Soccer.

9. Which of the following is a moderate physical activity?
   A. Running.
   B. Walking briskly.
   C. Inline skating.
   D. Playing soccer.

10. Which of the following is a weight-bearing activity?
    A. Riding your bicycle.
    B. Walking.
    C. Doing curl-ups.
    D. Swimming.

11. Softball is a good:
    A. Flexibility-improving activity.
    B. Vigorous activity.
    C. Weight-bearing activity.
    D. Aerobic activity.

**Performance Descriptor: Achieves criterion-referenced standards**

12. When you measure the distance that you can stretch you are testing:
    A. Muscle strength.
    B. Flexibility.
    C. Muscle endurance.
    D. Strength in your arms.

13. A good score on a health-related fitness test tells you that:
    A. You can perform skills at a high level.
    B. You are not sick.
    C. You have a healthy level of fitness.
    D. You are an athlete.

**Performance Descriptor: Identifies personal health-related weaknesses/strengths**

14. If you are fit, you:
    A. Are good at many skills,
    B. Are good at running but are not flexible,
    C. Have more choices to be physically active.
    D. Are bigger than everyone else your age.

15. Fitness tests are good because they:
    A. Identify areas of fitness that need improvement.
    B. Identify the fit person in the class.
    C. Tell you what activity that you need to join.
    D. Give you a lot of activity when you take them.

16. Your heart beat creates your pulse, which is best checked at your:
    A. Wrist.
    B. Ankle.
    C. Chest.
    D. Thumb.

**Performance Descriptor: Describes how to improve personal fitness**

17. If you score low on an aerobic endurance test, you should:
    A. Increase the number of push-ups you do.
    B. Increase the amount of time resting.
    C. Participate more in strength-building activities.
    D. Increase the amount of vigorous activity you get.

18. To keep a good body-composition score:
    A. Do stretching exercises every day.
    B. Sleep 8 to 10 hours each day.
    C. Eat and burn the same number of calories every day.
    D. Do push-ups and sit-ups each week.

19. If Juan wants to become more flexible, he should:
    A. Decrease the amount of stretching he does.
    B. Exercise a muscle until it starts to feel tired.
    C. Increase the amount of stretching he does.
    D. Work through the pain stage of an exercise.

20. Which of the following will benefit your heart the most?
    A. Stretching your chest after exercise.
    B. Drinking lots of water.
    C. Eating lots of fruits and vegetables.
    D. Daily physical activity.

**Performance Descriptor: Identifies the principles (guidelines) associated with improving physical fitness.**

21. To lift a weight many times, you need:
    A. Muscle endurance.
    B. Aerobic endurance.
    C. Muscle strength.
    D. Cardiovascular endurance.

22. In the fitness test, running a mile is used to determine:
    A. How fast you are.
    B. The fitness of your heart.
    C. The coordination of your legs and arms.
    D. How much effort you can demonstrate.

23. The amount of muscle, bone and fat you have in your body determines your:
    A. Aerobic endurance.
    B. Muscle endurance.
    C. Flexibility.
    D. Body composition.

24. If Sara passes all five components of a health-related fitness test, she should:
    A. Keep the same goals and continue what she is doing.
    B. Set new goals and continue what she is doing.
    C. Set new goals to maintain or improve her fitness level.
    D. Keep the same goals and increase what she is doing.

25. When you want to become stronger, you should:
    A. Overload your muscles.
    B. Make sure that your exercise is aerobic.
    C. Flex your muscles as you watch TV.
    D. Avoid stretching the muscle.

**Performance Descriptor: Identifies specific benefits associated with each component of health-related physical fitness.**

26. People who are physically fit:
    A. Are older than others in the class.
    B. Feel better.
    C. Are underweight.
    D. Spend all their time playing.

27. When your muscles get stronger:
    A. You can stretch further.
    B. You get hungry more often.
    C. You will lose weight.
    D. You can throw farther.

28. You should participate in weight-bearing activities because they help:
    A. Strengthen your bones.
    B. Improve your flexibility.
    C. Improve your appetite.
    D. Control how much you weigh.