EVERETT PUBLIC SCHOOLS

Fitness Performance Assessment

A Model for Conducting Fitness Performance Assessments
(Taken from OSPI Fitness Performance Assessment, 2003)

Introduction

Fitness assessments encompass a variety of measures designed to provide individualized feedback regarding one's overall fitness status and/or physiological responses to physical effort. Fitness assessments can and should be developmentally appropriate.

Fitness assessments may include "traditional" assessments such as those of VO_2 max with the one-mile walking test, or more simplistic assessments of basic physiological responses such as heart rate during moderate physical activity. The purpose of fitness assessments is not solely to rate an individual's fitness. In fact, an education assessment might provide physiological feedback regarding a process that can then be used to explain and illustrate fundamental fitness principles. A simple measure of resting heart rate, followed by a determination of heart rate during exercise, followed by an assessment of recovery heart rate can constitute a broad interpretation of what fitness assessments represent in an educational setting. Such an assessment:

- provides physiological feedback for the student, and
- can be used to illustrate important concepts regarding how heart rate responses vary dependent upon cardiovascular fitness level.

Although fitness assessments provide some "concrete" information, they are not without flaws and concerns. Fitness assessments should not be used without careful consideration of the benefits and ramifications they might bring to a learning environment. The following is a short list of what fitness assessments can do and a list of what they cannot do.

Fitness assessments should be used in the curriculum to:

- provide an opportunity to teach and reinforce essential concepts related to the benefits and importance of choosing to live a healthy lifestyle now and in the future
- provide an opportunity to teach students how to self-assess their own health-related fitness throughout their lives
- provide students with confidential baseline information from which accurate and reasonable short-term and long-term fitness and activity goals can be established

- provide a forum for teaching students the theory, rationale, accuracy and appropriate use of fitness assessments throughout their lives, and
- provide an opportunity to critically reflect on how individual differences, including genetic and maturity levels and/or goal setting and personal programming accuracies or errors, might have impacted perceived or expected fitness progress.

Fitness assessments should not be used in the curriculum to:

- evaluate the effectiveness of a curriculum in physical education, health, or fitness
- evaluate the effectiveness of teaching
- determine to any degree student grades in physical education, health, or fitness
- make blind assumptions regarding student physical activity levels
- prove student health status, or
- provide a basis for punishment or rewards.

Specific Issues and Special Concerns in Conducting Fitness Assessments of Children and Youth

Developmental and Physiological Considerations—A Brief Synopsis

Issues in Cardiorespiratory Functioning

Aerobic function expressed as a relative measure of oxygen consumption (VO_2 peak in ml/kg/min) is similar between children, adolescents, and adults. However, the biomechanical efficiency of movement is considerably compromised in younger children and pre-adolescents. This biomechanical disadvantage makes locomotor skills utilized in most fitness assessments of VO_2 peak more costly in children compared to adults. As such, VO_2 peak represents the physiological functioning of the cardiorespiratory system in children and youth but fails to be a strong reflection of cardiorespiratory endurance. In other words, children and youth might be unduly fatigued due to biomechanical disadvantages in movement patterns. As children grow, the movement patterns become more efficient and allow for an "artificial" improvement of VO_2 peak to be achieved (or for VO_2 peak to remain unchanged despite actual reductions in the physiological capacity of the aerobic system). The implication of this is that the tracking of VO_2 measures over time is likely to be positively influenced by naturally occurring improvements in biomechanical movement patterns.

Maximum heart rate is higher in children and adolescents than in adults. Children and adolescents have lower stroke volume, which is partially compensated for by an increase in heart rate. However, total cardiac output remains lower than that of adults until the late teenage years. The implication of this is that predictions of maximum heart rate (such as 220 – age) are less useful for children or early adolescents. This is a critical issue as most field tests of cardiorespiratory endurance use an estimate of maximum heart rate as a fundamental point to which submaximal responses are extrapolated (such extrapolations are the basis for most prediction equations).

Because changes pertaining to the cardiorespiratory system will be dependent upon maturational timing (rather than chronological age), attempting to adjust for changes based solely on chronological age becomes problematic. Early- or late-maturing adolescents will be adversely affected by such adjustments.

Finally, to further complicate the above issues, differences exist between boys and girls with regard to the pattern of change seen over time. For boys, relative measures of VO_2 peak remain largely unchanged between the ages of 8 and 16 before beginning a gradual decline into adulthood. However, girls show a rather constant decline in relative measures of VO_2 peak beginning sometime between the ages of 10 and 12. These changes are due in part to maturational factors including, but not limited to, changes in body composition. The implication of this is that the tracking of relative fitness measures over time might inadvertently benefit boys over girls even when activity levels between both groups are similar.

Issues in Muscular Fitness

Muscle fiber number and type is fixed within the first year of life. As a result, there is a large genetic and uncontrolled factor governing musculoskeletal performance of humans. However, most health-related thresholds are reasonable and can be accomplished by the vast majority of individuals with training. Nerve development, motor unit activation, muscle fiber size, and testosterone are all lower in the child/prepubertal adolescent than in adults. As a result they exhibit less strength, power, and muscular endurance per unit of weight than adults. Due to musculoskeletal immaturity, maximum strength testing should be avoided in children and young adolescents. There are minimal differences in strength measures between boys and girls before puberty. However, during and after puberty, boys increase muscle mass and girls increase fat mass under the influence of testosterone and estrogen, respectively.[1] The gap in maximal strength measures widens between the sexes as maturity progresses, becoming more evident in upper body versus lower body locations.

The practical implication of these differences suggests that muscular strength and endurance assessments will naturally improve for boys, even without physical activity or effort, and will naturally tend to decrease in girls, even with regular physical activity. As such, assessments of these components must account for these changes. Poor flexibility is typically not an issue for children and adolescents. However, despite popular conceptions, children are not always more flexible than adults, and girls are not always more flexible than boys. Some patterns that have been established with regard to particular muscle groups/joints include:

- Anterior lumbar flexibility decreases during adolescence in both boys and girls, but regains earlier levels of flexibility during adulthood.

- Lateral spinal flexibility increases during adolescence and then declines throughout adulthood.

- Hamstring flexibility (as measured by the Sit-and-Reach) improves consistently in girls ages 5–18, but exhibits a "U-shaped progression" in boys, and the values for girls are generally higher than for boys.

During periods of rapid growth, the musculoskeletal structures become tighter across joints, potentially temporarily impacting performance (and increasing injury risk) on flexibility measures. The practical implications suggest that flexibility as tested by common measures may be somewhat subject to individual differences in maturation and growth rates.

Issues in Body Composition

Body composition is a complex and controversial topic, even without adding in the considerable developmental issues.

Body composition testing in schools should take the following into consideration:

1. There are significant methodological concerns with body composition testing in general, and the most commonly used techniques in schools are fraught with the most potential for error.
2. Interpretation of results is not clear-cut or agreed upon, especially when dealing with the results of children and adolescents.
3. Fatness as an independent risk factor for disease is not without considerable legitimate argument (such as the well-established overriding effects of regular physical activity in attenuating disease risk).
4. Results of tests, accurate or not, can inadvertently reinforce cultural prejudices and may serve to further accentuate obsessions with thinness, feelings of fatness, and related negative health behaviors.

When body composition is conducted in schools, **comprehensive** and **accurate** education about body composition (including genetic influences/individual differences, fat distribution patterning issues, assessment limitations, how to interpret results responsibly and in a greater context of health/fitness, how physical activity and exercise can help to maintain the best body composition for each individual but not the same composition for all individuals, etc.) should be provided and *supplemented* with optional body composition testing. If testing is done, testing procedures and results should be kept confidential.

Common Questions and Answers Regarding Fitness Assessments

What are criterion-referenced standards?

Criterion-referenced standards are predetermined standards of performance tied to specified domains of behavior. Health-related criterion-referenced standards attempt to establish the minimal threshold of a fitness measure that is necessary for the attenuation of disease risk. Criterion-referenced standards are different from norm-referenced standards. Norm-referenced standards compare student performance on a test to the scores of other students having common characteristics. Such standards offer no

comparison to any meaningful health criterion, and often serve to dissuade or discourage children who rank in the lower percentages.

Despite the advantages of using criterion-referenced standards (primarily including the potential for all to succeed and the apparent connection to meaningful health information), it must be noted that most criterion-referenced standards set for children and youth are based on normative scores, empirical evidence, and judgment, not on scientific studies.[2,3] This is understandable given that children and youth do not generally suffer from chronic illness or die from lifestyle-related diseases. Thus, it is impossible to truly establish threshold levels that are scientifically meaningful. Nonetheless, criterion-referenced standards are deemed more appropriate for use in the interpretation of fitness assessments than are norm-referenced standards.

How do fitness assessments, if they aren't good, correlate to health or activity in youth?
Fitness assessments are valuable learning tools and can be used to personalize and reinforce important concepts. They also allow for meaningful and relevant fitness and activity goals to be set that follow the principles of overload and progression. As long as students understand their inherent limitations and use them in the context of comprehensive fitness education, fitness assessments are meaningful and valuable.

Should I grade students based on their scores?
Since fitness assessments are greatly influenced by maturational timing, genetics, gender, body type, body size, and body mechanics, and are less influenced by time or effort spent in physical activity, it is inappropriate to tie fitness assessment scores to student grades.

Is it okay to grade students based on their improvement from the beginning of the semester to the end?
Due to maturation, most students will post improvements in fitness assessments without any effort up through puberty. Following puberty, it is unlikely that time spent in physical education will result in significant gains in fitness for all students. Furthermore, students who are engaged in extracurricular activities will have an advantage over students who are not engaged in extracurricular activities.

Although some might view this as acceptable (or even desirable), it creates unethical and unintentional discrimination against those students who are unable to be active outside of school due to socioeconomical, cultural, or other barriers beyond their personal control. Furthermore, error in the accuracy of prediction equations (the basis for most assessments) can hide or exaggerate true change in unpredictable ways. Finally, students may try to "beat the system" by intentionally performing below their ability on the pretest, in order to assure improvement on the posttest.[4] Therefore, it is probably not wise to use improvement scores as a required component of a student's grade.

How do I make time to do all of these fitness assessments?
Testing students in a "pull out" is time-consuming and compromises overall supervision of activities. Having students self-assess or peer-assess fitness can be a viable and defensible way to save time and achieve learning objectives. Conducting mass testing,

establishing a testing circuit, or using partners for testing are recognized strategies. However, if peer assessments are used, it is critical that students be permitted to self-select their partners. Potential inaccuracies from the lack of testing experience must be clearly acknowledged when peer- or self-assessment strategies are employed.

Won't allowing students to self-assess their fitness create even more error?
Yes. Again, what is the purpose of the testing and what is the philosophy and goal of the educational program? Rarely is "accurately assessing the fitness levels of students" a high priority objective within a quality educational program.

Why isn't student improvement a reflection of the curriculum or my teaching?
Student improvement in fitness measures is more closely related to maturational timing, genetics, gender, body type, body size, and body mechanics than to effort or time spent in physical activity. Regardless, excellent teaching implies that learning has occurred. Measures of physical fitness have no established correlation to knowledge or understanding of fitness concepts. On the other hand, assessments that demonstrate a student's ability to apply fitness concepts and principles to real-life situations can be used to evaluate program effectiveness.

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Assessment Activity: The Pacer
Fitness Category: Cardiorespiratory Endurance
Grade Level: 3-5

Testing Procedure:
This activity may take place on a level field or in a gym. There are two lines 20 meters apart, one at each end of the activity area.
The student:

- will start at the first line (a CD or tape will start with an explanation of the test and a countdown to the start of the test)
- will run across the area to the second line when they hear "Go"
- will have nine seconds to reach the second line in the beginning of the test
- who is not at the second line by the sound of the beep will incur a mistake (two mistakes end the test for any student)
- who makes it to the second line in time will turn around and run back to the first line when the beep sounds, but not before the beep.

This will continue for one minute. At that time the students will hear a triple beep. The triple beep means the students should continue, but the time frame to get across the area has just been reduced by a half second. Time will keep decreasing every minute, and the pace will get faster. A partner or the teacher will count the number of lines a student runs.

The student will record his or her time on the individual record form. Norms can be used to help students assess their measurements. Norms and standards have been included in the Appendix.

Assessment Activity: One-Mile Run
Fitness Category: Cardiorespiratory Endurance
Grade Level: 6-12

Testing Procedure:
The teacher selects a one-mile flat course, free of obstacles and safety concerns.

The teacher will use a stopwatch to measure how long it takes a student to complete a one-mile run.

The student will:

- warm up
- start to run on the teacher's call
- pace him- or herself by finding a comfortable pace that is maintainable for the entire mile
- be permitted to walk if he or she can no longer run; however, when walking, the student should try to walk at a fast pace instead of strolling.

The teacher will inform the student of his or her time as he or she crosses the finish line.

The student will record his or her time on the individual record form. Norms can be used to help students assess their measurements. Norms and standards have been included in the Appendix.

Assessment Activity: Push-Ups
Fitness Category: Muscular Endurance
Grade Level: 3-12

Testing Procedure:
The student will:

- lie face-down on a mat with the hands beneath the shoulders and the palms down and elbows up; the legs will be straight and slightly apart, and the toes will be bent forward
- raise the body until the arms are fully extended, and then lower the body until the upper and lower arms form a right angle (the body should be held in a straight line, from head to heels, during each repetition)
- complete one push-up approximately every three seconds. A cadence from a CD will be used to pace the students.
- it is recommended to use a rolled towel, small nerf ball, or some other item to help students determine when they have gone down far enough.

The partner will count the number completed. If the student slows to rest, fails to fully extend the arms, or neglects to lower him- or herself until the 90-degree angle is formed, it is a correction. *The test ends when the student receives two corrections*, and the partner will tell the student how many push-ups were completed.

The student will record his or her number completed on the individual record form. Norms can be used to help students assess their measurements. Norms and standards have been included in the Appendix.

Assessment Activity: Curl-Ups
Fitness Category: Muscular Endurance
Grade Level: 3-12

Testing Procedure:
The student will:

- the teacher will tape two lines on a mat of gym floor. The lines will be 3 inches apart for students in age 5-9 and 4.5 inches apart for all other students.
- lie on his or her back on a gym mat with both feet flat on the floor and the knees bent (a partner will hold the head and count how many curl-ups are completed)
- arms are kept on the sides with palms on the mat/floor with the finger tips on the first tape line closest to the student's head
- pull his or her belly button towards the spine and flatten the lower back against the floor
- slowly contract his or her abdominals, bringing the shoulder blades one to two inches off the floor
- exhale as he or she comes up keeping the neck straight and chin up
- a successful curl-up is counted when the finger tips reach the next line farthest from the student's head.
- return to the starting position.
- complete one push-up approximately every three seconds. A cadence from a CD will be used to pace the students.

There is no time limit for this test. The student's will stop if they reach 75 curl-ups. The partner will tell the student the number of curl-ups completed.

The student will record his or her number completed on the individual record form. Norms can be used to help students assess their measurements. Norms and standards have been included in the Appendix.

Assessment Activity: Sit-and-Reach
Fitness Category: Flexibility
Grade Level: 3-12

Testing Procedure:
Prior to participating in flexibility measurements, students should engage in mild cardiorespiratory activities such as brisk walking or slow jogging to warm up muscle groups.
The student will:

- remove shoes, sit on the floor, and place the bottom of both feet against the interior wall of a modified box

- place one hand on top of the other, palms facing down, and slowly lean forward until he or she feels slight discomfort
- repeat this four times and hold the last one for one second so that the partner can measure and record the reach.

The student will record his or her distances on the individual record form. Norms can be used to help students assess their measurements. Norms and standards have been included in the Appendix.

APPENDIX
Fitnessgram Standards for Healthy Fitness Zone

BOYS

AGE	Grade	One-mile run (Min:Sec)	Pacer (Trips)	Push-ups	Curl-ups	Sit&Reach** (Inches)
9	3			6-15	9-24	8
10	4			7-20	12-24	8
11	5	11:00-8:30		8-20	15-28	8
12	6	10:30-8:00		10-20	18-36	8
13	7	10:00-7:30		12-25	21-40	8
14	8	9:30-7:00		14-30	24-45	8
15	9	9:00-7:00		16-35	24-47	8
16	10	8:30-7:00		18-35	24-47	8
17	11	8:30-7:00		18-35	24-47	8
17+	12	8:30-7:00		18-35	24-47	8

GIRLS

AGE	Grade	One-mile run (Min:Sec)	Pacer (Trips)	Push-ups	Curl-ups	Sit&Reach** (Inches)
9	3			6-15	9-22	9
10	4			7-15	12-26	9
11	5	12:00-9:00		7-15	15-29	10
12	6	12:00-9:00		7-15	18-32	10
13	7	11:30-9:00		7-15	18-32	10
14	8	11:00-8:30		7-15	18-32	10
15	9	10:30-8:00		7-15	18-35	12
16	10	10:00-8:00		7-15	18-35	12
17	11	10:00-8:00		7-15	18-35	12
17+	12	10:00-8:00		7-15	18-35	12

*Number on left is lower end of Healthy Fitness Zone; number on right is upper end of Healthy Fitness Zone.
**Test scored Pass/Fail; must reach this distance to pass.