# Guidelines for Fitness Assessment in Manitoba Schools

## A Resource for Physical Education / Health Education

Manitoba
Building for the Future

# *GUIDELINES FOR FITNESS ASSESSMENT IN MANITOBA SCHOOLS*

*A Resource for Physical Education/Health Education*

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# CONTENTS

**Acknowledgements** *iii*

**Section 1: Introduction** ***1***

Purpose of This Resource *3*

Time for a Change *3*

Physical Inactivity: A Growing Concern *4*

Fitness Management: The Learning Continuum *4*

Document Content and Organization *5*

**Section 2: Principles of Fitness Development** ***7***

Definition of Physical Fitness *9*

Definition of Health-Related Physical Fitness *9*

Determinants of Physical Fitness *9*

Principles of Fitness Development *10*

Physical Activity, Health, and Fitness Relationship *14*

Strategies for Development of Health-Related Fitness Components *14*

**Section 3: Health-Related Fitness Assessment** ***17***

Fitness Assessment: A Positive Approach *19*

Intended Use of Health-Related Fitness Assessment Tasks *20*

Potential Misuse of Health-Related Fitness Assessment Tasks *20*

Criterion-Referenced Versus Norm-Referenced Assessment *21*

Inclusive Fitness Assessment *22*

Administrative Suggestions *22*

**Section 4: Health-Related Fitness Assessment Protocols** *25*

Muscular Strength, Endurance, and Flexibility *27*

Body Composition *37*

Cardiovascular Endurance *43*

**Appendix: Fitness Management Learning Outcomes** ***49***

**References** ***61***

# Section 1:
# Introduction

# SECTION 1: INTRODUCTION

## Purpose of This Resource

This teacher resource provides fitness assessment guidelines that align with the fitness management learning outcomes identified in *Kindergarten to Senior 4 Physical Education/Health Education: Manitoba Curriculum Framework of Outcomes for Active Healthy Lifestyles* (Manitoba Education and Training, 2000). These guidelines focus on health-related fitness components to promote lifelong physical activity and well-being.

## Time for a Change

*Guidelines for Fitness Assessment in Manitoba Schools: A Resource for Physical Education/Health Education* is a revised edition of the original guidelines outlined in *Manitoba Schools Fitness* (Manitoba Education and Training, 1989). The need for an updated edition was identified in *Review of the Literature on Best Practices Related to Fitness Development* (Gannon, Halas, Ng, & Chuchmach, 2002), sponsored by Manitoba Education, Citizenship and Youth.

The revision of these guidelines was undertaken due to the concern that current fitness assessment and teaching practices in Manitoba schools may be out of date and may no longer reflect "best practices." For example, the past use of norm-referenced criteria to assess fitness assessment results may have promoted negative consequences with regard to lifelong fitness development and participation in physical activity. The new guidelines, therefore, discourage the use of norm-referenced evaluation. Best practices now encourage either criterion-referenced interpretation of assessment results or assessment based on change (i.e., improvement) related to personal goal setting. In support of this approach, students should be encouraged to assess themselves and understand that they are not competing against other students or for better grades. Testing methodologies have also changed and these changes are reflected in the revised guidelines.

Fundamentally, these fitness assessment guidelines also support the philosophical change in approach to fitness development, shifting emphasis from fitness score achievement to the achievement of skills that will enable students to manage their own personal fitness over a lifetime of physical activity. This shift from an outcome-oriented approach to a process-oriented approach is well supported by the literature pertaining to physical fitness development (Sallis, 1994; Weiss, 2000; Boreham & Riddoch, 2001). For example, the word "test," which denotes an outcome, has been replaced by the word "task," which better reflects a process.

The ultimate goal of this resource is to help teachers establish positive attitudes and lifestyle habits in their students that are conducive to "healthy, active living." Teachers are encouraged to emphasize and teach toward long-term benefits of total fitness.

## Physical Inactivity: A Growing Concern

Various changes in society have created the opportunity for children and youth to lead a more sedentary lifestyle and consume foods that are high in calories. Since the publication of the original *Manitoba Schools Fitness* guidelines (1989), the prevalence of obesity in Canadian children has doubled (Tremblay & Willms, 2000), a statistic that is supported by other developed nations (Reilly, Dorosty, & Emmett, 1999; Ogden, Flegal, Carroll, & Johnson, 2002). Over the same period of time, the amount of daily physical activity in children/youth has reached alarmingly low levels. Cycling and walking to school have become less usual behaviours and playing in the street has been curtailed by safety concerns (Boreham & Riddoch, 2001). In 2003, three out four Canadian children/youth did not meet the minimum recommended level of daily physical activity. These statistics have led to the growing concern that the current behaviour patterns of children and youth may accelerate the likelihood of developing lifestyle-related diseases in adulthood (e.g., cardiovascular disease, diabetes, osteoporosis, cancer) and result in premature morbidity and mortality.

## Fitness Management: The Learning Continuum

As daily living becomes more sedentary, it is essential that *students demonstrate the ability to develop and follow a personal fitness plan for lifelong physical activity and well-being* (identified as general learning outcome 2 in Manitoba's combined physical education/health education [PE/HE] curriculum). PE/HE should assist students in developing a pattern of daily and/or regular participation in physical activities and an understanding of how to acquire and maintain optimal personal health and fitness.

The ultimate goal is for each student to value physical activity as a key component of health and to manage his or her fitness through regular participation in physical activity. To assist students in reaching this goal, emphasis should be placed on teaching students how to assess their level of physical activity objectively in terms of the FITT principle (frequency, intensity, time, and type of activity), using assessment strategies such as physical activity logs and personal record forms.

Fitness assessment within this resource emphasizes the goal of motivating students to be physically active and to develop fitness management skills. With this approach, students learn to assess their own fitness, indicate their own position on a fitness development continuum, and determine appropriate activities to develop the health-related fitness components. When administering fitness assessments, teachers focus on the use of fitness management skills, monitoring students' personal progress, creating a positive assessment environment, teaching safety precautions, encouraging self-assessment, providing feedback, and reinforcing effort. The results of fitness assessments should not form part of students' marks.

Fitness assessments are to be administered within the context of the following Learning Continuum for Fitness Management (Figure 1).

| Learning Continuum for Fitness Management | | |
|---|---|---|
| **Early Years: Introductory Stage** | **Middle Years: General Acquisition/ Application Stage** | **Senior Years: Specific Acquisition/ Application Stage** |
| During the Early Years (Kindergarten to Grade 4), simple fitness concepts are introduced, with the focus on participation in physical activity. Student learning outcomes related to fitness assessment and analysis of health-related fitness components are not included until Grade 4. Instead, assessment and analysis skills emphasize recording or logging how much time is spent participating in physical activity over a period(s) of time. | During the Middle Years (Grades 5 to 8), health-related fitness components are developed through participation in a variety of physical activities and/or specific fitness activities. Students experience and apply the fitness management skills and strategies to maintain/improve personal fitness. They also show a general understanding of fitness knowledge to guide their level of participation and to make informed choices for personal fitness development. | During the Senior Years (Senior 1 to Senior 4), students apply fitness knowledge and skills to design a balanced, personal fitness plan for the development of health-related and/or skill-related fitness components for a specific goal. Students may choose a goal related to general health, basic fitness, healthy heart, fitness for a specific sport, or specific skill performance. |

**Figure 1.** Learning Continuum for Fitness Management.

The stages of the learning continuum are outlined on page 60 of *Kindergarten to Senior 4 Physical Education/Health Education: Manitoba Curriculum Framework of Outcomes for Active Healthy Lifestyles* (Manitoba Education and Training, 2000).

## Document Content and Organization

*Guidelines for Fitness Assessment in Manitoba Schools* contains the following sections:

- **Section 1: Introduction—**identifies the purpose, background, content, and organization of this teacher resource. It addresses the need for a change in approach to fitness development and presents the learning continuum for fitness management within which fitness assessment is to be administered.
- **Section 2: Principles of Fitness Development—**includes definitions and determinants of physical fitness, outlines the principles of fitness development, and suggests effective strategies for the development of health-related fitness components.
- **Section 3: Health-Related Fitness Assessment—**presents guidelines and administrative suggestions for health-related fitness assessment.
- **Section 4: Health-Related Fitness Assessment Protocols—**provides instructions and protocols for a variety of assessment tasks that can be used to measure the health-related physical fitness components:
  - muscular strength, endurance, and flexibility
  - body composition
  - cardiovascular endurance
- **Appendix: Fitness Management Learning Outcomes—**lists the fitness management learning outcomes identified for Kindergarten to Senior 4 physical education/health education.

## Implementation Documents

Suggestions for instruction and assessment related to the fitness management learning outcomes are provided in the following documents:

- *Kindergarten to Grade 4 Physical Education/Health Education: A Foundation for Implementation* (Manitoba Education, Training and Youth, 2001)
- *Grades 5 to 8 Physical Education/Health Education: A Foundation for Implementation* (Manitoba Education and Youth, 2002)
- *Senior 1 and Senior 2 Physical Education/Health Education: A Foundation for Implementation* (Manitoba Education, Citizenship and Youth, in development)

## Caution

Teachers are advised to treat fitness assessment and analysis of results with sensitivity. The assessment task options outlined in this document serve only as suggested tasks that teachers may use. Ultimately, decisions related to the types of tasks or tests used to measure health-related fitness components are made at the local school/division/district level. When choosing a fitness assessment task, check for reliability, validity, developmental and cultural appropriateness, ease of administration, and safety considerations. Fitness assessment is not recommended prior to Grade 4.

# Section 2:
# Principles of Fitness Development

# SECTION 2: PRINCIPLES OF FITNESS DEVELOPMENT

## Definition of Physical Fitness

There is no universally agreed upon definition of *physical fitness* and of its components. Definitions for physical fitness include the following:

> A set of attributes that people have or achieve that relate to their ability to perform physical activity (Howley & Franks, 2003).
>
> A set of attributes, primarily respiratory and cardiovascular, relating to the ability to perform tasks requiring expenditure of energy (*Stedman's Concise Medical Dictionary for the Health Professions*, 2001).
>
> The ability to perform moderate to vigorous levels of physical activity without undue fatigue and the capability of maintaining such ability throughout life (American College of Sports Medicine, 1998).

Instructors are encouraged to use definitions from their own sources.

## Definition of Health-Related Physical Fitness

More contemporary terminology has defined physical fitness as contributing to either health-related fitness or skill/performance-related fitness. Manitoba's combined PE/HE curriculum emphasizes the health-related components of fitness—that is, the physical and physiological components of fitness that have a more direct impact on health status. *Health-related fitness* may be defined as follows:

> The state of physical and physiological characteristics that define the risk levels for the premature development of diseases or morbid conditions presenting a relationship with a sedentary mode of life (Bouchard & Shephard, 1994).

The health-related fitness components include

- muscular strength, endurance, and flexibility
- body composition
- cardiovascular endurance

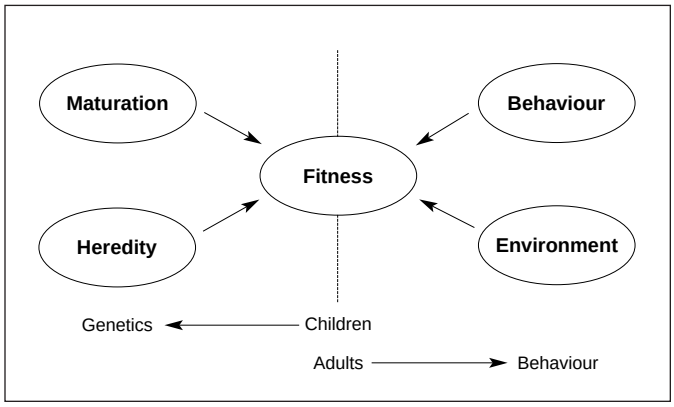
In contrast, skill/performance-related fitness relates to those attributes that are important for performance outcomes in specific sports, movements, or occupations. The skill/performance-related fitness components include agility, balance, coordination, power, reaction time, and speed.

## Determinants of Physical Fitness

Factors that determine the level of an individual's physical fitness are multi-dimensional and hierarchical. In general, the determinants of physical fitness may be classified as

- genetically determined (influenced by maturation and heredity)
- behaviourally determined (influenced by physical activity, diet, and other habits)
- environmentally determined

While all these factors are influential determinants of fitness in children/adolescents, some are more influential than others (Figure 2). For example, while a positive, strong relationship between the amount of physical activity and aerobic fitness exists in the adult population (U.S. Department of Health and Human Services, 1996), this relationship is not as clear for children and adolescents (Armstrong, Williams, Balding, Gentle, & Kirby, 1991; Boreham, Twisk, Savage, Cran, & Strain, 1997; Katzmarzyk, Malina, Song, & Bouchard, 1998; Ekelund, Poortvliet, Nilsson, Yngve, Holmberg, & Sjostrom, 2001). In children and adolescents, factors such as rate of maturation and heredity demonstrate a greater influence on most fitness scores than behaviour and/or environmental factors (Jones, Hitchen, & Stratton, 2000; Pate, Dowda, & Ross, 1990; Malina, 1990). Moreover, because of the strong association between maturation and fitness scores, it has been difficult for researchers to determine the contribution of other factors, such as behaviour (e.g., physical activity and diet) on fitness score development. In fact, it remains somewhat controversial whether children are adaptable to physical training (Rowland, 1992; Payne & Morrow, 1993; Shephard, 1997). Although the cause of the growing incidence in childhood obesity (i.e., body composition) remains largely unknown, behavioural factors such as physical inactivity and diet are likely to play the greatest role (Tremblay & Willms, 2000; Ogden et al., 2002).




Standard fitness scores for children/adolescents are influenced more by maturation and heredity than by behaviour or environmental factors (Pangrazi & Corbin, 2001).

**Figure 2.** Factors That Influence Physical Fitness.

## Principles of Fitness Development

Physical fitness development is a vital component of Manitoba's combined PE/HE curriculum. It is, therefore, important for educators to understand the fundamental principles that govern adaptation to physical activity and ultimately lead to the development of physical fitness. Although these principles are well accepted for the adult population, keep in mind that it is currently unknown how well they conform to the training response of children and youth. Nevertheless, a review of these principles helps educators understand how children may respond to physical activity.

Adaptation to physical activity is governed by a number of general principles that include, but are not limited to, the principles of

- overload
- individuality
- diminishing returns
- specificity
- reversibility

A discussion of each of these principles of fitness development follows.

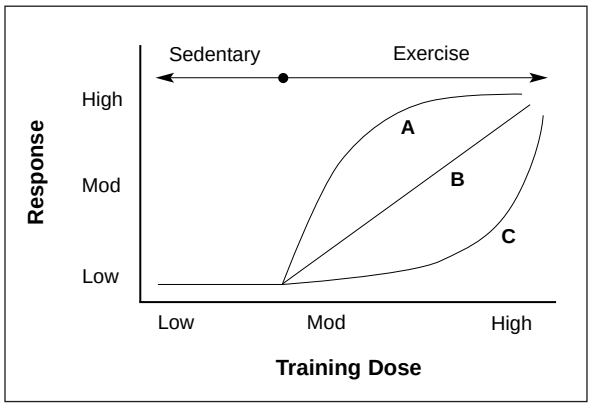
## The Principle of Overload

The principle of overload suggests that in order to see an improvement in fitness (i.e., response), the dose of physical activity must exceed that to which the individual is already accustomed. The dose of physical activity is controlled by the manipulation of frequency, intensity, time, and type of exercise, otherwise known as the FITT principle. This principle suggests that there is a dose-response relationship between physical activity and physical fitness. Furthermore, in order for a response to occur, a specific dose threshold must be surpassed.

This principle raises two important questions:

- What is the nature of the relationship between dose and response (i.e., linear, curvilinear, exponential)?
- What is the dose threshold that must be exceeded for a response to occur?

With regard to children and adolescents, the answers are unknown. In other words, we do not know how much physical activity is enough, or how exactly a child/adolescent will adapt to a specific dose of physical activity (Corbin, Pangrazi, & Welk, 1994; Twisk, 2001). We do know, however, that the dose-response relationship can be generally described by three separate curves (Bouchard, 2001; Kesaniemi, Danforth, Jensen, Kopelman, Lefebvre, & Reeder, 2001), as shown in Figure 3. Curve A suggests that most of the benefits are attained at low to moderate levels of activity. Curve B suggests that more activity leads to greater adaptation, while curve C suggests that the greatest benefits are obtained only when the level of physical activity is rather high.

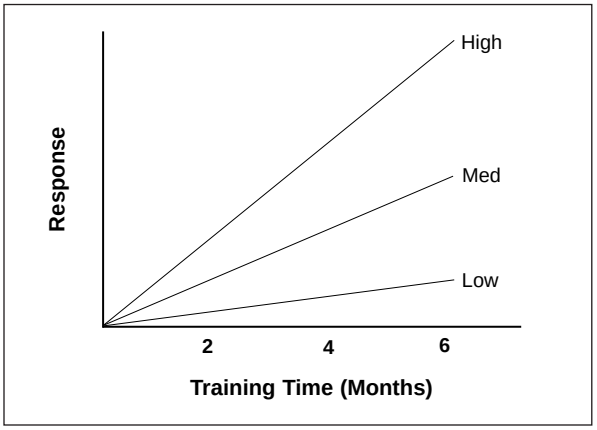



The nature of the relationships between regular physical activity (dose) and most health outcomes (response) generally conform to curve A, B, or C (Bouchard, 2001).

**Figure 3.** Dose-Response Relationship.

## The Principle of Individuality

The principle of individuality suggests that the individual response (i.e., adaptation) to physical activity is highly heterogeneous (Figure 4). No two individuals will respond in exactly the same way to a similar dose of physical activity. Regardless of the physical activity programming being used, some individuals will demonstrate improvement (i.e., responders), while others will not (i.e., non-responders). Therefore, the dose-response relationship is highly individualistic (Bouchard & Rankinen, 2001). It is now recognized that certain individuals are volume-responders (i.e., respond better to a large volume of physical activity), whereas others are intensity-responders. The principle of individuality is strongly influenced by heredity.

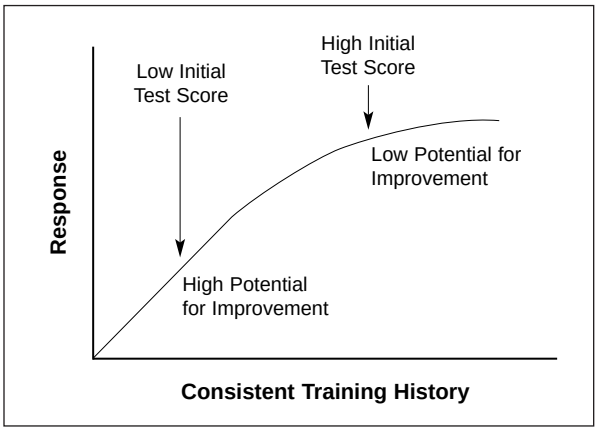



The amount of adaptation in fitness to a standard exercise dose varies widely and is under genetic control (Bouchard & Rankinen, 2001).

**Figure 4.** Heterogeneous Response to Physical Training.

## The Principle of Diminishing Return

The principle of diminishing return suggests that the rate of fitness improvement diminishes over time as fitness approaches its ultimate genetic potential (Figure 5). Simply stated, as fitness improves, "you receive less bang for your buck." Thus, the response to physical activity is not only associated with heredity, but is also highly influenced by an individual's current level of fitness. The fitter individuals are, the less likely they are to improve further.




Recent training history determines an individual's future responsiveness to physical training.

**Figure 5.** Principle of Diminishing Returns.

### The Principle of Specificity

The principle of specificity suggests that improvements in physical fitness are specific to the demands or characteristics (e.g., FITT, speed, angle, acceleration, muscle fibre recruited) imposed by the physical activity. This principle is also known as the SAID principle (specific adaptation to imposed demands).

### The Principle of Reversibility

The principle of reversibility suggests that any improvement in physical fitness due to physical activity is entirely reversible. In other words, "use it or lose it." This principle suggests that regularity and consistency of physical activity are important determinants of both fitness maintenance and continued improvement.

### Summary of Principles

In summary, the principles of fitness development tend to support the process-oriented approach rather than the outcome-oriented approach to fitness development for the following reasons:

- Fitness scores in children/adolescents are highly influenced by heredity and physical maturity, and to a lesser degree by behaviour (i.e., physical activity). Therefore, an outcome-oriented approach (i.e., focusing on fitness score as the determinant of success) could be extremely frustrating for a portion of the student population and could lead to a negative fitness experience for these individuals.
- The dose-response relationship between physical activity and physical fitness is poorly defined for children/adolescents. Therefore, it is unreasonable to focus solely on fitness scores when the most appropriate exercise prescription (i.e., FITT principle) to reach greater fitness levels is poorly defined for this age group.
- The response to physical activity is highly heterogeneous. That is, not everyone in the classroom will adapt at the same rate or in the same way to a particular activity. Therefore, a focus on outcome would favour those students who happen to be natural "responders."
- The response to physical activity is highly dependent on an individual's prior state of fitness. Consequently, students with the highest fitness level have the least chance for improvement. These students would, therefore, be unduly penalized if the instructor took an outcome-oriented approach.

Promoting the "more is better" or outcome-oriented approach may ultimately result in poor health if the individual takes physical fitness/activity to the extreme.

## Physical Activity, Health, and Fitness Relationship

Can one be fit without being healthy? Unfortunately, the answer to this question is yes. For example, many highly fit Olympians have become sick due to the overwhelming physical and psychological demands of high performance training (i.e., overtraining syndrome). This suggests that the motto "more is better" does not hold true when applied to the relationship between physical activity and health. Therefore, this relationship generally conforms to what is described as the "inverted U" relationship (Figure 6). There is a positive relationship between levels of physical activity (i.e., dose) and health up to a particular threshold. Beyond this threshold of activity, health may deteriorate. From a health perspective, this has led to the generality that a little exercise may be useless, a moderate amount is useful, and a large amount may be harmful.

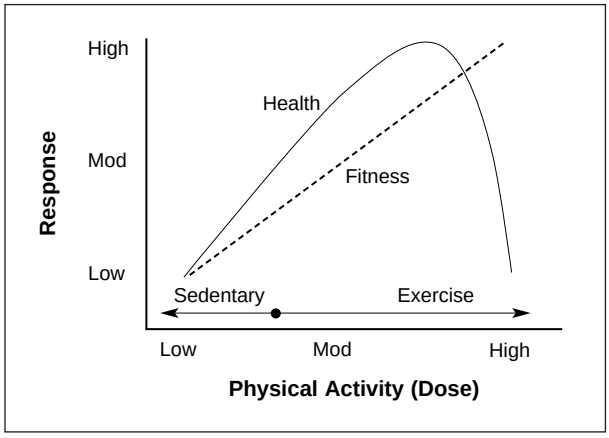



**Figure 6.** Inverted "U" Relationship of Health vs. Activity.

## Strategies for Development of Health-Related Fitness Components

Use a variety of strategies to help students develop and follow a personal fitness plan for lifelong physical activity and well-being. The following guidelines and principles are considered best practices in fitness development (Gannon, Halas, Ng, & Chuchmach, 2002).

### Use Effective Teaching Strategies

To promote lifelong participation in physical activity, physical educators must teach students *how* and *why* to be active. Effective teaching strategies provide students with an understanding of the importance of regular exercise to health, and developmentally appropriate ways to meet physical activity goals (Ratliffe, 2002). Quality physical education meets the needs of students, while nurturing positive attitudes towards physical activity (Chad, Humbert, & Jackson, 1999). In addition, physical educators need to consider students' maturity level, physical makeup, prior experiences, and level of motivation. As these factors can affect students' rates of learning, effective planning for the diverse range of developmental levels will help teachers overcome these barriers (Stirling & Belk, 2002).

### Focus on Physical Activity

There appears to be increasing support towards the promotion of physical activity rather than physical fitness. Corbin (2002) suggests that fitness benefits will likely follow if physical educators incorporate higher levels of physical activity into their lessons. He argues that physical educators actually have less control over their students' fitness parameters than previously thought, as uncontrollable factors such as heredity and maturation play major roles. Moreover, many children become "turned off" when pushed to "get fit" (Corbin, Dale, & Pangrazi, 1999). Thus, encouraging students to do some physical activity, regardless of intensity, may appeal to a larger majority of students.

### Provide Choice, Challenge, Novelty, and Enjoyment

How can physical educators motivate students to become more physically active? Enjoyable and novel activities are most attractive for students and promote physical activity participation. Teachers can refer to various print and electronic sources to obtain ideas for games that are both motivating and challenging in ways that help students develop motor and social skills (Darst, van der Mars, & Cusimano, 1998; Humphries & Ashy, 2000; Humphries, Lovdahl, & Ashy, 2002).

Currently, informal sport and leisure activities, such as mountain biking, rock climbing, and in-line skating, are gaining popularity (Thomson, 2000). Programming that incorporates such activities tends to emphasize small groups and are non-competitive—characteristics that appeal to adolescent girls, a group that has been particularly alienated in traditional physical education programming (Beveridge & Scruggs, 2000; Vail, 1999). In general, simple games that involve few people (e.g., two versus two, three versus three) maximize activity (Humphries et al., 2002).

In addition, choice is believed to be a major influence on students' commitment to physical activity (Condon & Collier, 2002). Involving students in the decision-making process can significantly increase their motivation to participate.

### Teach the Purpose and Relevance of Physical Activity and Fitness Concepts

An instructional behaviour to avoid is asking students to participate in activities without first explaining their purpose or relevance. Meaningless activities are not motivating, and many students have little understanding of why they should exercise (Hopple & Graham, 1995). In the Early Years, fitness concepts can be broken down into less complex pieces of information (Ratliffe, 2002). For example, teachers can ask students to use stethoscopes to listen to their own heart while performing various activities. For the Senior Years, a concepts-based fitness approach is effective. Students take part in classroom instruction and lab experiences, complete homework and assessment tasks, participate in a variety of fitness activities, and learn how to design a personalized training plan that they can take with them when they leave the program (Strand, Scantling, & Johnson, 1998). Some evidence suggests that compared to traditional physical education programming, conceptual physical education may decrease sedentary behaviours later in life (Dale & Corbin, 2000).

## The Teacher's Role in Fitness Promotion

Teachers play a vital role in promoting physical activity. It is believed that teachers with greater habitual physical activity promote fitness more than inactive teachers do (Cardinal, 2001); so it is important for teachers to be active with the class. Also, teachers need to adopt a broader view and understanding of physical activity promotion and their role within it. For example, teachers are encouraged to involve parents in promoting fitness and physical activity (National Center for Chronic Disease Prevention and Health Promotion, 1997).

# Section 3:
# Health-Related Fitness Assessment

# SECTION 3: HEALTH-RELATED FITNESS ASSESSMENT

## Fitness Assessment: A Positive Approach

Physical fitness assessment can be an integral part of a comprehensive physical education program when used as a means to teach fitness concepts and their relationship to health, work, and quality of life. If properly approached, fitness assessment can provide objective information and motivation for students. Assessment of student fitness involves selection of fitness tasks, student preparation, interpretation of results, and follow-up.

### Selection

Although this resource suggests the use of specific fitness tasks, teachers are encouraged to acquaint themselves with alternatives. Discuss alternative tasks with students to allow them some choice as long as the underlying purpose or goal is achieved.

### Preparation

Ensure that students are prepared to participate in fitness assessment and are able to understand the value of fitness assessment tasks.

- Discuss fitness concepts with students, demonstrate assessment procedures, and encourage self-motivation techniques, stressing the importance of doing the best they can as individuals.
- Ensure that students experience progressive activity before administering the fitness task. Teach warm-up, cool-down, and pacing concepts, and provide students with practice opportunities.
- Present students with a time-flexible schedule to allow maximum opportunities for assessment. This will accommodate students who are absent from class, on medication, not feeling well, or wanting to be reassessed.
- Screen students for medical conditions before they participate in the assessment schedule.

### Interpretation

Discuss fitness results immediately after the assessment has been completed. If possible, counsel students with low fitness scores individually. Results should not be used for grading in physical education. Reporting to parents/guardians is desirable.

### Follow-up

Design instructional and intramural programs to help address students' low fitness levels. Personalize fitness plans, where possible, and encourage self-assessment. Schedule periodic assessments in order to review each student's improvement during the year.

## Intended Use of Health-Related Fitness Assessment Tasks

Recent research (Corbin & Pangrazi, 1998; Graham, 2001; Rainey & Murray, 1997; Virgilio, 1997) indicates that fitness assessment or testing should focus on setting and achieving personal goals, developing fitness-management skills, and following a personal fitness plan. Programming needs to emphasize education, prevention, and intervention. Fitness assessment or testing is primarily used to establish personal goals and monitor individual progress rather than to compare one person's results to those of others, as in norm-referenced testing.

### Personal Fitness Assessment

Personal fitness assessment is the main purpose of the fitness assessment tasks. Encourage students to self-administer the task(s) to promote the likelihood that they will continue to assess themselves throughout life. (It is not necessary to assess all the health-related fitness components each time an assessment is done.) Give students opportunities to practise their self-assessment since results for beginning self-assessors are not particularly accurate. As interpretation of the results is essential, spend sufficient time teaching students how to interpret their results clearly. Results should be kept personal if a student desires.

### Teach Fitness Development Concepts

Teachers are encouraged to use the fitness assessment tasks to teach fitness concepts. For example, during the 1600-metre walk, use heart-rate measurement to teach the concepts of exercise intensity, pacing, and/or heart-rate palpation.

## Potential Misuse of Health-Related Fitness Assessment Tasks

When reporting on fitness assessment, communicate results or scores as information separate from the report card mark. Help students to focus on individual progress rather than on individual performance and involve them in setting challenging and realistic goals.

### Using Fitness Scores As a Basis for Student Grading

Teachers are encouraged to assess students on their ability to self-administer fitness assessment tasks and interpret their personal results rather than grading them on fitness scores. When student grades are based on student fitness scores, dishonesty on fitness assessments becomes a problem. Grading based on improvement (i.e., comparison of pre- and post-assessment) is also invalid, as students typically improve regardless of whether they are doing physical activity, just because they are getting older (maturation effect). Furthermore, a higher fitness score is not necessarily "more" desirable if the score is already considered healthy based on criterion-referenced standards. Students who engage in regular physical activity but do not do well on fitness assessments will likely be "turned off" to physical activity when fitness scores determine their grades.

### Using Fitness Scores As a Measure of Physical Activity Outcome or Teaching Effectiveness

Many factors other than activities performed in physical education classes influence fitness scores; therefore, fitness scores do not reflect the time spent doing physical activity. Also, if teaching effectiveness is determined by fitness scores, teachers may have the tendency to become "fitness instructors" rather than physical educators. This may cause students to dislike rather than like physical education.

### Using Fitness Assessment Tasks in the Early Years

The development and teaching of fitness skills and concepts is an important aspect of the Early Years curriculum. However, formal fitness assessment is not recommended prior to Grade 4 for the following reasons:

- Fitness scores are typically unreliable in this age group.
- Young students have little understanding of the meaning of results.
- Administration of the fitness task(s) is difficult, if not impossible.
- Motivation for fitness task assessment is lacking due to short attention spans and a strong play urge.
- Criterion-referenced standards are typically not available for students below the age of 10.

Most of these problems are alleviated after the Early Years, as students are then physically and mentally ready for fitness assessment. They can also score each other and assist in administration. Motivation likewise becomes easier, as students are better able to understand a given task and can focus on it. Most importantly, students gain insight into the value and life benefits of physical fitness.

## Criterion-Referenced Versus Norm-Referenced Assessment

In the past, most of the published fitness assessment results were norm-referenced. Although norm-referenced assessment was popular and easy to interpret, it fell short when defining the health of individuals. For example, a "normal" or "average" (i.e., 50th percentile) score in 2003 might mean an individual is overweight. Criterion-referenced standards attempt to overcome this inadequacy by indicating the score on a selected fitness test that represents desirable and absolute levels needed for good health (Plowman, 1992). In other words, criterion-referenced standards answer the question "How fit is fit enough?"

Although criterion-referenced standards are favoured over norm-referenced standards, most of the existing criterion-referenced standards have been derived exclusively from normative data and expert opinion (Plowman, 1992). Criterion-referenced standards are in the developmental phase and will require much more investigation before scientifically justified standards are available.

## Inclusive Fitness Assessment

Inclusive PE/HE programming can contribute to the development of responsibility, citizenship, community, and personal fitness through physical activity participation. All students, including those with special needs, have opportunities to develop the knowledge, skills, and attitudes required for physically active and healthy lifestyles.

In planning for inclusion, educators need to recognize the inherent value of each student, the right to take risks and make mistakes, the need for independence and self-determination, and the right of choice. Inclusive PE/HE programming

- includes all students
- uses the provincial PE/HE curriculum as a base
- respects the learning needs and interests of individual students
- involves planning and collaboration with others
- provides a range of learning and assessment experiences and supports
- considers the continuum of instructional supports for individualized programming
- personalizes learning activities as necessary
- adapts fitness tasks and assessment to meet individual student needs
- sets realistic, yet challenging expectations
- provides assistance only to the degree required
- respects and fosters a degree of risk and availability of choices

For additional information on planning for inclusion, refer to "Appendix C: Programming for Students with Special Needs" in Manitoba's *Foundation for Implementation* documents for Kindergarten to Grade 4, Grades 5 to 8, and Senior 1 and Senior 2. Also refer to *Individual Education Planning: A Handbook for Developing and Implementing IEPs, Early to Senior Years* (Manitoba Education and Training, 1998). For information on differentiated instruction, see *Success for All Learners: A Handbook on Differentiating Instruction* (Manitoba Education and Training, 1996).

## Administrative Suggestions

Consider the following suggestions when arranging for assistance in administering fitness tasks, scheduling assessment, maximizing use of resources, and creating an atmosphere of motivation.

### Arrange for Assistance

When planning the administration of fitness tasks, consider assistance from

- student leaders (credit option and older students)
- other classroom teachers
- volunteer parents (training may be required)

### Schedule Assessment for Best Use of Time

To make the best use of time, consider scheduling assessment

- during regular physical education classes
- before, after, and/or during the noon hour
- continually during the year so that students may be assisted regularly
- at times appropriate for student self-assessment
- as homework assignments to be completed with the support of parents (best suited to students reluctant to be assessed)

### Plan to Maximize Use of Resources

To maximize use of resources,

- use a circuit approach that allows student rotation
- use larger time blocks and staff assistance (e.g., assess several classrooms at one time, assess the entire school in one day)
- prepare students and provide a “trial” run
- prepare score sheets
- be consistent

### Foster Motivation

To create an atmosphere of motivation,

- be sensitive to issues related to self-esteem, body size, and weight
- provide encouragement
- create a relaxed, friendly environment
- play music
- offer choice in activities whenever possible
- use alternative assessment venues (e.g., multi-purpose room)
- encourage staff to be assessed along with the students

## Notes

# Section 4:
# Health-Related Fitness Assessment Protocols

# SECTION 4: HEALTH-RELATED FITNESS ASSESSMENT PROTOCOLS

Various fitness tasks or tests have traditionally been used to measure health-related physical fitness, which consists of three components:

1. muscular strength, endurance, and flexibility
2. body composition
3. cardiovascular endurance

To ensure thorough measurement of all three health-related fitness components, this resource outlines a variety of fitness assessment task options for each component. The diversity of assessment task options for each fitness component is intended to

- provide students, including those with special needs, the maximum opportunity to participate in fitness assessment
- provide choice, since a different assessment task can be used each time an assessment is done
- teach students that physical fitness cannot be assessed by one specific assessment task alone

Review the fitness assessment task options described on the following pages and select tasks based on their most appropriate use, given the characteristics and needs of a particular student and/or group. When choosing a fitness assessment task, check for reliability, validity, developmental appropriateness, ease of administration, and safety considerations.

Throughout fitness assessment, focus on fitness management and motivation towards participation in physical activity. Comparing student scores and using extrinsic rewards are discouraged. Use fitness testing or assessment as a strategy to help students monitor their own progress and set personal goals. The use of individual goal-setting techniques encourages students to focus on personal improvement and progress towards achieving personal goals rather than on making comparisons.

## Muscular Strength, Endurance, and Flexibility

### Teaching Concepts Related to Muscular Strength, Endurance, and Flexibility

Address the following teaching concepts when administering fitness tasks for muscular strength, endurance, and flexibility.

#### *Definitions*

- **Muscular strength:** The maximum force that can be exerted in a single effort.
- **Muscular endurance:** The ability of a muscle or group of muscles to exert force over an extended period of time.
- **Muscular flexibility:** The ability of a joint to move through a full range of motion.

### *Physiology*

Physiology concepts:

- Ligaments hold bones together at joints.
- Tendons attach muscles to bones.
- Muscles move bones, which produces body movement.
- Muscles are composed of many fibres.
- Muscle fibres are grouped into motor units (neural components).
- When the difficulty of exercise is increased, more motor units are called upon to perform that exercise.
- Regular resistance exercise will enlarge and strengthen muscle fibres, improve neural function, and improve blood supply.
- Flexibility is limited by bones, muscles, ligaments, tendons, and bone joint capsules.

### *Training Guidelines*

Overload:

- To develop strength, increase resistance.
- Increase resistance gradually as strength improves.
- To develop endurance, decrease resistance and gradually increase repetitions.

Specificity:

- To develop strength, muscles must work against a heavy resistance.
- To develop endurance, muscles must work repeatedly against a light/moderate resistance. For example, in calisthenics (e.g., push-ups, pull-ups, dips), personal body weight serves as the resistance.

Progression:

- To develop strength and endurance, add weight, perform more repetitions, and work the muscles more often.

Regularity:

- To develop strength and endurance, exercise every second day.

Flexibility development:

- Flexibility exercises are joint specific.
- Flexibility exercise should be performed daily.
- Slow stretching movements should be performed through a full range of motion, thereby providing for a permanent range of motion in joints.
- Stretching for cool-down develops flexibility.

### *Benefits*

Improved strength and endurance

- increase success in all physical activity
- contribute to good posture
- prevent and alleviate low back pain
- allow daily activities to be conducted with more ease
- allow body weight to be manipulated more efficiently

Improved flexibility

- makes physical movements more efficient and easier to perform
- reduces muscle injury
- relieves muscle soreness
- decreases back problems
- improves posture

### *Implications*

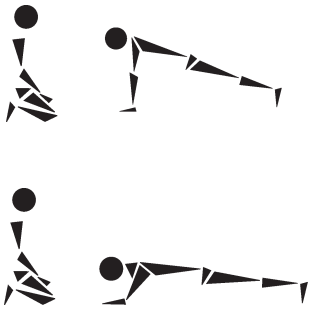
- Use of weights requires adequate preliminary instruction.
- Body weight is the recommended resistance for young children.
- It is important to develop all the muscles and to maintain a balanced development.
- Flexibility is best developed in a relaxed atmosphere.
- Flexibility development is most effective when moving each body part through a full range of motion.
- Slow, sustained movement is better than ballistic (jerking) movements.

## Fitness Assessment Task Options

The fitness assessment task options for developing muscular strength, endurance, and flexibility are described on the following pages.

| Fitness Component | Task Options |
|---|---|
| • Muscular Strength and/or Endurance | – Push-Up<br>– Pull-Up<br>– Modified Pull-Up<br>– Flexed Arm-Hang<br>– Curl-Up |
| • Flexibility | – Modified Sit and Reach<br>– Shoulder Stretch |

## Push-Up



**Purpose**

- To assess upper body strength.

**Target Group**

- Recommended for students in Grade 4 and up.

**Dependent Measure**

- Total number of repetitions performed at a rhythmic pace.

**Required Equipment**

- Metronome (set to beep once every three seconds or 20 times per minute).

**Administrative Suggestions**

- Provide students with an opportunity to experience/practise the correct technique before they start the task.
- Students could be assessed in pairs. One student executes the push-up and the partner counts the repetitions. The partner counts only the push-ups that are demonstrated correctly.
- Partners can check for accuracy of technique by placing both fists (one on top of the other) under the participant's shoulder or chest at a height where elbows attain a 90-degree bend. During the push-up, the participant lowers the body only enough to contact the partner's hand.

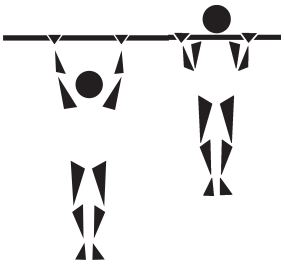
**Protocol**

1. Lie on the floor (face down) with hands placed under the shoulders, fingers pointed forward, and legs straight and together with toes tucked under so that they are in contact with the floor. Then push until the arms are fully extended, keeping legs and back straight. This is the **up position**.
2. Lower the body using the arms, keeping the back in a straight line from head to toes until the elbows reach 90 degrees and the upper arms are parallel to the floor. This is the **down position**.
3. The task begins in the up position. One complete push-up (repetition) is counted when the student completes a cycle of up-down-up at the specified pace.
4. Inability to keep pace with the "beeps" or to maintain the correct form on two consecutive repetitions indicates the task is over.
5. The score is the total number of push-ups (repetitions) performed correctly without stopping.

**Interpretation of Results**

- The push-up has been identified as a good indicator of upper body strength.
- For information related to criterion-referenced standards, please refer to *FITNESSGRAM® Test Kit* (The Cooper Institute for Aerobics Research, 1999).

## Pull-Up



### Purpose

- To assess upper body strength.

### Target Group

- Recommended for students in Grade 4 and up.

### Dependent Measure

- Total number of repetitions performed correctly without rest.

### Required Equipment

- Elevated horizontal bar.

### Administrative Suggestions

- The use of a platform (e.g., wooden box) may help students reach the bar before they start the task.
- Students could be assessed in pairs. One student executes the pull-up and the partner counts the repetitions.

### Protocol

1. **Start position:** With the palms of the hands facing out (overhand grip), grasp the overhead bar with arms straight and the rest of the body hanging vertically.
2. Start immediately, pulling body all the way up (so chin is even with the bar) and then extending all the way back down. This represents one repetition.
3. The score is the total number of pull-ups (repetitions) performed correctly without stopping.

### Interpretation of Results

- The pull-up has been identified as a good indicator of upper body strength.
- For information related to criterion-referenced standards, please refer to *FITNESSGRAM® Test Kit* (The Cooper Institute for Aerobics Research, 1999).

## Modified Pull-Up

**Purpose**

- To assess upper body strength.

**Target Group**

- Recommended for students in Grade 4 and up or students with a physical disability.

**Dependent Measure**

- Total number of repetitions performed correctly without rest.

**Required Equipment**

- Elevated horizontal bar, with an elastic band/string hanging down 17.5 to 20 cm (7 to 8 in.) from the bar.

**Administrative Suggestions**

- Students could be assessed in pairs. One student executes the modified pull-up and the partner counts the repetitions.

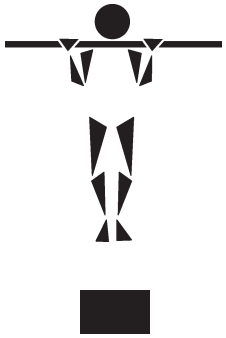
**Protocol**

1. **Start position:** Position the bar 2.5 to 5 cm (1 to 2 in.) above the outstretched hand of participant lying horizontal on the floor. With the palms of the hands facing out (overhand grip), grasp the overhead bar with arms straight, body straight, and heels touching the floor.
2. Pull up and touch the elastic band just below the chin and then return to the straight arm-hanging position. This represents one repetition.
3. The most important part of this task is to keep the body straight and use only the arms.
4. The score is the total number of modified pull-ups performed correctly without rest.
5. As upper body strength increases, the level of the bar can be raised.

**Interpretation of Results**

- The modified pull-up has been identified as a good indicator of upper body strength.
- For information related to criterion-referenced standards, please refer to *FITNESSGRAM® Test Kit* (The Cooper Institute for Aerobics Research, 1999).

## Flexed Arm-Hang



**Purpose**

- To assess upper body strength.

**Target Group**

- Recommended for students in Grade 4 and up.

**Dependent Measure**

- Time (minutes:seconds).

**Required Equipment**

- Elevated horizontal bar.

**Administrative Suggestions**

- Use of a platform (e.g., wooden box) may help students reach the bar before they start the task.
- Students could be assessed in pairs. One student executes the flexed arm-hang and the partner records the time.

**Protocol**

1. **Start position:** Grasp the bar with palms facing out (overhand grip) and with the chin placed at the same level as the bar while the rest of the body is hanging freely off the ground.
2. Hold this position for as long as possible.
3. The score is the total time the position can be held.

**Interpretation of Results**

- The flexed arm-hang is representative of isometric strength.
- For information related to criterion-referenced standards, please refer to *FITNESSGRAM® Test Kit* (The Cooper Institute for Aerobics Research, 1999).

## Curl-Up

**Purpose**

- To assess abdominal strength and endurance.

**Target Group**

- Recommended for students in Grade 4 and up.

**Dependent Measure**

- Total number of repetitions performed at a rhythmic pace.

**Required Equipment**

- Floor mat.
- Metronome (set to beep once every three seconds or 20 times per minute).

**Administrative Suggestions**

- Students could be assessed in pairs. One student executes the curl-up and the partner records the repetitions.

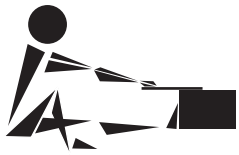
**Protocol**

1. Lie on back with knees flexed, feet flat on the mat, and heels between 30 cm (12 in.) and 45 cm (18 in.) from the buttocks.
2. Cross arms on chest with hands on the opposite shoulders.
3. The partner may hold the participant's feet down, applying only enough pressure to maintain feet contact with the floor.
4. Start on the command, "Ready…? Go."
5. Curl to a sitting position, maintaining hand contact with the shoulders. The curl-up is completed when the elbows touch the thighs.
6. Do not continue the motion beyond 45 degrees (angle between floor and straight back). Do not bounce.
7. Return to the down position until the back contacts the mat.
8. One complete curl-up (repetition) is counted when a cycle of down-up-down at the specified pace is completed.
9. Inability to keep pace with the "beeps" or to maintain the correct form on two consecutive repetitions indicates the assessment is over.
10. The score is the total number of curl-ups (repetitions) performed correctly without stopping to a maximum of 75.

**Interpretation of Results**

- The curl-up is representative of abdominal strength.
- For information related to criterion-referenced standards, please refer to *FITNESSGRAM® Test Kit* (The Cooper Institute for Aerobics Research, 1999).

## Modified Sit and Reach



### Purpose

- To assess flexibility.

### Target Group

- Recommended for students in Grade 4 and up.

### Dependent Measure

- Maximum distance reached.

### Required Equipment

- Flexometer. A sit-and-reach box can be made by placing a measuring stick on top of a box (approximately 30 cm or 12 in. high) so that the 23-cm or 9-in. mark is on the edge of the box facing the participant.

### Administrative Suggestions

- Advise students that jerking, bouncing action is not allowed.
- Place the flexometer against a wall to prevent any movement in the apparatus during the procedure.
- Ensure that participants spend time warming up before performing this task.
- Advise students that the score is not counted if the knee of the extended leg bends.

### Protocol

1. Take off shoes and sit with one leg fully extended. Place the sole of the foot flat against the back portion of the flexometer.
2. Flex (bend) the other leg, with the sole of the foot flat on the floor about 5 to 8 cm from inside of opposite leg.
3. Making sure hands are together (one atop the other, palms facing down), reach forward with arms evenly stretched, without jerking, and push along the measuring scale with the fingertips of both hands together.
4. Pushing as far forward as possible, hold this position for at least two seconds, and then return to the upright position.
5. Repeat the task three times and record the best score. Take the measurement to the nearest centimetre.
6. Repeat for the other leg.

### Interpretation of Results

- The modified sit and reach is representative of flexibility.
- For information related to criterion-referenced standards, please refer to *FITNESSGRAM® Test Kit* (The Cooper Institute for Aerobics Research, 1999).

## Shoulder Stretch

**Purpose**

- To assess shoulder flexibility.

**Target Group**

- Recommended for students in Grade 4 and up.

**Dependent Measure**

- Expectation met or not met.

**Required Equipment**

- None.

**Protocol**

1. Stand with feet slightly apart and arms at the side. Bend knees slightly.
2. Raise one arm, bend it at the elbow, and reach down until the hand is between the shoulder blades of the upper back.
3. With the other arm bent at the elbow, reach behind the back and attempt to touch the fingertips of the other hand, which is down between the shoulder blades.
4. Attempt the same position again, but switch arms. (Most people are more flexible on one side than the other.)

**Interpretation of Results**

- A pass score is equivalent to touching the fingertips together behind the back.

# Body Composition

## Teaching Concepts Related to Body Composition

Address the following teaching concepts when administering fitness tasks related to body composition. Be sensitive to issues related to self-esteem, body size and weight, restricted or specialized diets, availability of or access to healthy foods, and home environments. Provide students with choice of activities and/or venues, where possible.

### *Definition*

- **Body composition:** The relative amounts of muscle, bone, and fat in the body.

### *Physiology*

Distinction between **weight** and **composition**:

- **Body weight** is misleading, as two individuals can have the same weight, and yet only one may be obese.
- **Body composition** refers to relative body fat (i.e., how much of an individual's body is lean tissue and how much is fat tissue).

Distinction between **overweight**, **over fat**, and **obesity**:

- While there is a definite relationship among the three terms, they cannot be used synonymously.
- **Overweight**
  - For adults, overweight is defined by a Body Mass Index (BMI) of 25 or more.
  - For children/youth, a BMI greater than the 85th percentile of Body Mass Index for Age charts is considered "at risk of overweight."
- **Over fat** means that an individual has more fat than he or she should have.
- **Obesity** is a medical disorder associated with being over fat.
  - For adults, obesity is defined by a BMI of 30 or more.
  - For children/youth, a BMI greater than the 95th percentile of Body Mass Index for Age charts is considered "obese."

Relationship of lean mass to body fat:

- Lean mass is found mostly in bones and muscles.
- Most fat is stored in adipose (fatty) tissue found beneath the skin and around body organs.
- Lean mass is denser and weighs more than fat.

Food imbalance:

- Weight gain or weight loss is caused when there is an imbalance of calories consumed and calories expended. For example, 0.45 kg (1 lb.) of body weight is approximately equal to 15,000 kilojoules (3500 calories).
- Calorie intake occurs through the food consumed and calorie expenditure occurs through activity performed.
- If calorie intake is greater then calorie expenditure, the body stores the excess as fat.

### *Training Guidelines*

Methods of decreasing body fat:

- Reduce calorie intake (diet).
- Exercise (physical activity).
- Diet and exercise.

Weight reduction by combining diet and exercise:

- Calorie intake must be reduced more by diet alone than by combining diet and exercise. Weight loss through calorie reduction increases the chance of nutritional deficiency. Exercise prevents the loss of lean tissue. Therefore, there is little need to alter the diet. For example, by diet alone, weight loss is approximately 60% body fat and 40% lean mass. If exercise is included with the diet, the weight loss is almost 100% body fat. In weight reduction, the loss of body fat is desirable.

### *Benefits*

- Many medical disorders (e.g., diabetes, heart disease) related to being over fat or under fat may be avoided by maintaining healthy body composition.
- Optimal levels of body fat enhance the quality of life.

### *Implications*

Obesity in children and youth:

- **Obesity** is a state of being over fat. This condition is common in Canadian children/youth today.
- Obesity is associated with
  - low self-esteem
  - onset of diabetes
  - insulin disorders
  - cardiovascular diseases
  - increased resting heart rate
  - increased blood pressure
  - increased serum cholesterol levels
  - low levels of fitness

Eating disorders:

- **Anorexia nervosa** is an emotional eating disorder in which the individuals are obsessed with “thinness.” They will usually starve themselves until they suffer from malnutrition.
- **Bulimia** is an eating disorder characterized by recurring episodes of binge eating (i.e., the consumption of large amounts of food in short time periods). Other characteristics include attempts of severe diet restrictions, self-induced vomiting, and the use of diuretics.

Desirable levels of body fat:

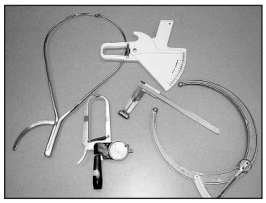
- To be able to assess their health and fitness, students need to be aware of the relationship between inactivity, physical fitness, and being over fat.
- Inform students of appropriate nutritional health practices and proper exercise habits to lose weight. Discourage them from participating in crash diets or unhealthy methods of weight reduction (e.g., caffeine and ephedrine combinations). Help them understand that such practices can contribute to depression, loss of self-esteem, eating disorders, or worse.
- When addressing body composition it is equally important to be aware of the individual who has a high amount of body fat (obesity) and the individual who has a dangerously low amount of body fat (anorexia or bulimia).

### Fitness Assessment Task Options

The fitness assessment task options related to body composition are described on the following pages.

| Fitness Component | Task Options |
|---|---|
| Body Composition | – Two-Site Skinfold<br>– Four-Site Skinfold<br>– Body Mass Index (BMI) |

## Two-Site and Four-Site Skinfold



Skinfold calipers

**Purpose**

- To measure the thickness of site-specific skinfolds using a skinfold caliper.

**Target Group**

- Recommended for students in Grade 4 and up.

**Dependent Measure**

- Skinfold (mm).

**Required Equipment**

- Skinfold calipers.

**Administrative Suggestions**

- Provide training in the use of skinfold calipers for volunteers who are administering the assessment task.
- Instruct participants to wear shorts and T-shirts to allow easy access to skinfold areas.
- If possible, set up more than one station.
- Ensure set-up allows for confidentiality.
- Measure participants separately.

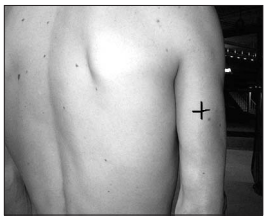
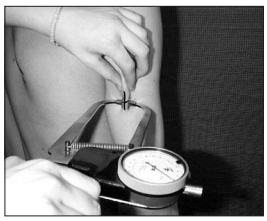
**Protocol**

1. The following procedure standardizes the technique for the total skinfold measurements in both the two-site and four-site methods.
   a. Using the non-dominant hand, firmly grasp the skinfold between the thumb and forefinger. The lifted fold will include the underlying layer of fat.
   b. Place the contact surfaces of the skinfold calipers one centimetre (half an inch) below the finger, with the scale visible and the jaws of the caliper at a right angle to the body surface. The point on the fold where the reading should be taken is midway between the crest and the base of the skinfold.
   c. Close the caliper on the skinfold. Wait approximately two seconds for the indicator to stabilize and read the measurement to the nearest millimetre.
   d. Repeat the measurements (beginning at the first step) until three measurements are taken for each site. Record the median (middle) score for each site.

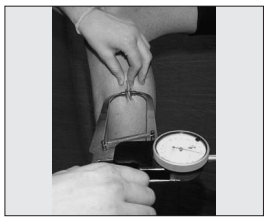
*(continued)*

*(continued)*

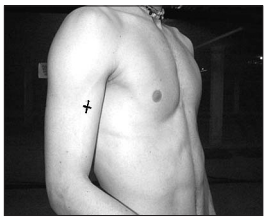
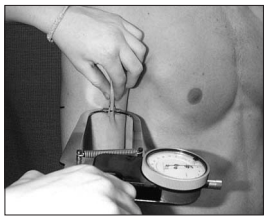
**a. Triceps**

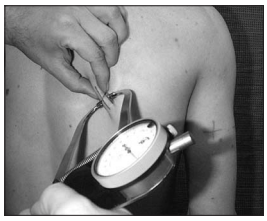
**b. Calf**

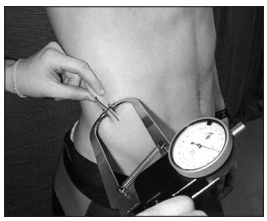
**c. Biceps**

**d. Sub-scapular**

**e. Supra-iliac**

2. The subcutaneous fat measurement sites and measurement techniques are described below.
   a. **Triceps:** Measure the triceps halfway down the right arm between the tip of the acromion and top of the radius, with the fold picked up in a line passing directly up the arm from the tip of the olecranon process. The arms hang relaxed at the side.
   b. **Calf:** Have the participant place the right foot on a bench with the knee slightly flexed when taking the calf measurement. Measure the calf on the inside of the right lower leg at the largest part of the calf girth. With the thumb and index finger, grasp and gently lift up the skin slightly above the level of the largest part of the calf so that the caliper can be placed at the level of the largest part of the calf.
   c. **Biceps:** Lift the skinfold on the front surface of the right upper arm over the prominence and middle of the biceps muscle. The participant's arm should hang relaxed. Lift the skinfold parallel to the long axis of the humerus.
   d. **Sub-scapular:** The skinfold is located just below the angle of the right scapular, the fold being picked up parallel to the natural cleavage line of the skin.
   e. **Supra-iliac:** The skinfold is located immediately above the crest of the right ilium. Lift the fold at a slight angle to the vertical.
3. Summation of skinfold measurement methods:
   - **Two-site method:** Add the median (middle of the three scores) for triceps to the median of the calf scores to obtain a final sum.
   - **Four-site method:** Add the median of the three scores for triceps, biceps, sub-scapular, and sub-iliac to find the sum of the skinfold measurements.

**Interpretation of Results**

- A formula is used to calculate percentage of body fat using skinfold measurements.
- For information related to criterion-referenced standards, please refer to *FITNESSGRAM® Test Kit* (The Cooper Institute for Aerobics Research, 1999).

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## Body Mass Index (BMI)

**Purpose**

- This task indicates a student's weight relative to his or her height.

**Target Group**

- Recommended for students in Grade 4 and up.

**Dependent Measures**

- Height (m).
- Weight (kg).

**Required Equipment**

- Tape measure (metric).
- Scale (metric).

**Administrative Suggestions**

- Due to the sensitivity of body mass (weight) measures, make every effort to preserve the confidentiality of results.
- Have students weigh themselves in a personal setting.

**Protocol**

1. Measure height.
2. Measure body mass (weight).

**Interpretation of Results**

- To calculate Body Mass Index, insert height (m) and weight (kg) measures into the formula: $kg/m^2$. Schools/divisions/districts find BMI measurement to be of lesser concern to parents than skinfold measurement, even though the latter is a more accurate indicator of body composition.
- For information related to criterion-referenced standards, please refer to *FITNESSGRAM® Test Kit* (The Cooper Institute for Aerobics Research, 1999).

## Cardiovascular Endurance

### Teaching Concepts Related to Cardiovascular Endurance

Address the following teaching concepts when administering fitness tasks related to cardiovascular endurance.

#### *Definitions*

- **Cardiovascular endurance:** Represents the combined ability of
  - the pulmonary system to exchange oxygen between the outside air and the blood circulating through capillaries in the lung
  - the cardiovascular system to transport oxygen to the working muscles
  - the muscular system to use oxygen
- Other terms used to describe this component of health-related physical fitness include
  - cardiorespiratory endurance
  - cardiorespiratory fitness
  - cardiovascular fitness
  - aerobic fitness
  - aerobic power
  - aerobic capacity
  - physical work capacity

  For all practical purposes, these terms can be used interchangeably.

#### *Physiology*

Physiology concepts:

- The body requires oxygen to produce energy (adenosine triphosphate [ATP]) during aerobic activity.
- Oxygen requirements increase as activity intensity increases.
- Oxygen requirements and heart rate increase as activity levels increase.
- The cardiovascular system (heart, blood, veins, arteries, lungs) carries food and oxygen to the working muscles and carries wastes away from the working muscles.

#### *Training Guidelines*

Overload:

- Exercise should be sufficiently intense to raise the pulse high enough (intensity 60% to 85% heart rate [HR] maximum) and sustain it long enough (duration 15 to 60 minutes) to get a training effect.
- The following formula is recommended for calculating target heart rate:

  Step 1: 220 – age = HR maximum

  Step 2: HRmax – HRrest = Trainable HR

  Step 3: (Trainable HR x 0.6) + HRrest = Lower Value

  Step 4: (Trainable HR x 0.85) + HRrest = Upper Value

  Step 5: Target HR Range (THRR) = Lower to Upper Values

**Note:** It is not necessary to calculate THRR for Early Years students. Encourage children to move, run, and play.

- The purpose of calculating target heart rate is to help students develop a proper pace instead of focusing on competition. Other methods of calculating target heart rate are available.

Specificity:

- Select exercises that will raise heart rate for a continuous period of time. These exercises include jogging, skating, swimming, cycling, dancing, Nordic skiing, and so on.
- Alternatively, select sports such as basketball, orienteering, lacrosse, soccer, racquet sports, ringette, and so on.

Progression:

- Perform a continuous rhythmic activity.
- Increase time gradually, from 15 to 20 minutes.
- Increase rate gradually. Run 1600 m in 7:45 instead of 8:00 minutes.
- Increase distance gradually. For example, cover four kilometres instead of three.
- Increase frequency from three days per week to five days per week.

Regularity:

- To develop and maintain cardiovascular endurance, follow an overload program of continuous activity at least three to five days per week throughout life.
- If training activities are discontinued, improved cardiovascular function begins to deteriorate.

### *Benefits*

Cardiovascular endurance:

- The benefits of improved cardiovascular endurance include
  - decreased resting heart rate (RHR)
  - increased stroke volume (SV)
  - increased maximum heart rate (MHR)
  - decreased heart rate at sub-maximal workloads
  - decreased recovery time following exercise
  - decreased serum cholesterol levels
  - increased metabolic rate during and after exercise sessions
  - decreased total body fat
  - decreased blood pressure

### *Implications*

Risk factors:

- **Risk factors** are conditions or habits that can increase the chance of developing heart disease.
- The greater the number of risk factors, the greater the chances are of contracting heart disease. Risk factors are cumulative.

Categories of risk factors:

- Uncontrollable
  - sex
  - age
  - heredity
- Controllable
  - high blood pressure
  - serum cholesterol
  - stress
  - diabetes
  - obesity
  - physical activity
  - smoking

To modify risk factors:

- Participate in activities that are enjoyable.
- Attempt to modify one risk factor at a time.
- Keep in mind that everyone has some risk factors. Be aware of the uncontrollable risk factors and modify the controllable ones.

Medical disorders:

- Screen participants of prolonged physical activity for medical disorders.
- Become acquainted with the disorders, their symptoms, and emergency procedures in the event the students experience difficulty.

## Fitness Assessment Task Options

The fitness assessment task options related to cardiovascular endurance are described on the following pages.

| Fitness Component | Task Options |
|---|---|
| Cardiovascular Endurance | – 1600-Metre Run/Walk<br>– 1600-Metre Walk<br>– Léger's 20-Metre Shuttle Run (Also known as Beep-Test, PACER Test) |

## 1600-Metre Run/Walk

### Purpose

- To run/walk 1600 metres (1 mile) in the shortest possible time.

### Target Group

- Recommended for students in Grade 4 and up.

### Dependent Measures

- Time (minutes:seconds).
- Body Mass Index ($kg \cdot m^{-2}$).

### Required Equipment

- Measured track or course. A level, circular 400-m track is the recommended venue; however, a suitable substitute may be created in an open field area using pylons.
- Timing device (e.g., stop watch).

### Administrative Suggestions

- Reinforce the importance of pacing during a run or walk and making an honest personal effort. If possible, address the concept of pacing. Have students practise pacing over 1600 m before the day of assessment.
- Organize participants into pairs. Participant A counts the number of laps and records the finish time for participant B, and vice versa.
- When the runners finish the distance, the instructor calls out the time, while the runners' partners record the time.

### Protocol

1. Do a warm-up exercise to prepare for the task.
2. Start on the command, "Ready…? Go."
3. Run 1600 m as fast as possible using an even pace. (If participants cannot complete the distance by running, then walking is permitted.)
4. Record the finish time to the nearest second.
5. Do a cool-down exercise by walking for three to five minutes.

### Interpretation of Results

- Results can be used to predict $VO_2max$ ($ml \cdot kg^{-1} \cdot min^{-1}$) using the equation established by Cureton, Sloniger, O'Bannon, Black, and McCormack (1995). The equation is based on a sample of 753 males and females, 8 to 25 years of age, and uses age (years), gender (coded F=0, M=1), Body Mass Index (BMI in units of $kg \cdot m^{-2}$), and run time (minutes) for the prediction.
- $VO_2max = 0.21 (Age \times Gender) – 0.84 (BMI) – 8.41 (Time) + 0.34 (Time^2) + 108.94$
- For information related to criterion-referenced standards, please refer to *FITNESSGRAM® Test Kit* (The Cooper Institute for Aerobics Research, 1999).

## 1600-Metre Walk

### Purpose

- To walk 1600 m in the shortest possible time while maintaining a constant walking pace the entire distance.

### Target Group

- Recommended for students in Grade 4 and up.

### Dependent Measure

- Time (minutes:seconds).
- Heart rate (beats per minute) at completion of task.

### Required Equipment

- Measured track or course. A level, circular 400-m track is the recommended venue; however, a suitable substitute may be created in an open field area using pylons.
- Timing device (e.g., stop watch).

### Administrative Suggestions

- Reinforce the importance of pacing a walk and making an honest personal effort. If possible, address the concept of pacing. Have students practise pacing over 1600 m before the day of assessment.
- Organize participants into pairs. Participant A counts the number of laps and records the finish time for participant B, and vice versa.
- When the walkers finish the distance, the instructor calls out the time, while the walker's partner records the time.

### Protocol

1. Do a warm-up exercise to prepare for the assessment task.
2. Start on the command, "Ready…? Go."
3. Walk 1600 m as fast as possible using an even pace.
4. Take heart rate immediately after completing the task.
5. Record the finish time to the nearest second.
6. Do a cool-down exercise by walking for three to five minutes.

### Interpretation of Results

- Results can be used to predict $VO_2$max ($ml \cdot kg^{-1} \cdot min^{-1}$) using the equation established by Kline, Porcari, Hintermeister, Freedson, Ward, McCarron, Ross, and Rippe (1987). The equation is based on a sample of 343 men and women, 30 to 69 years of age, and uses age (years), gender (coded F=0, M=1), weight (lb.), walk time (minutes), and heart rate (bpm) at the end of the walk for the prediction. McSwegin, Plowman, Wolff, and Guttenberg (1998) demonstrated the validity of this equation for high school-age individuals.
- $VO_2$max = 6.315(Gender) – 0.3877(Age) – 0.0769(Weight) – 3.2649(Time) – 0.1565(bpm) + 132.853
- For information related to criterion-referenced standards, please refer to *FITNESSGRAM® Test Kit* (The Cooper Institute for Aerobics Research, 1999).

## Léger's 20-Metre Shuttle Run

**Purpose**

- To run as long as possible, back and forth across a 20-m distance, at a specified pace that gets faster each minute.

**Target Group**

- Recommended for students in Grade 4 and up.

**Dependent Measure**

- Total number of lengths and students' age.

**Required Equipment**

- Measured 20-m course. Most school gymnasiums are appropriate; however, a hard outdoor surface may also be used.
- Two markers (cones/tape).
- Pre-recorded CD that plays music for pacing.

**Administrative Suggestions**

- Reinforce the importance of making an honest personal effort.
- Organize participants into pairs. Participant A records the finish time for participant B, and vice versa.
- Measure the 20-m distance and mark it clearly with cones/tape.

**Protocol**

1. Do a warm-up by running and stretching before the start of the task.
2. Listen carefully to the music and the instructions.
3. The CD will emit a single beep at various intervals. Try to be at the opposite end of the 20-m course by the time the next beep sounds. After each minute, the time interval between beeps decreases and running speed has to increase correspondingly.
4. Place one foot on or behind the 20-m mark at the sound of each beep. Students who do not reach the line at the sound of the beep receive a warning that they will be eliminated if they are not at the opposite end of the 20-m course at the sound of the next beep.
5. When near exhaustion, students falling short of the 20-m line twice in succession have their task terminated and their score recorded.
6. After completing the task, cool down by walking, followed by stretching.

**Interpretation of Results**

- Results can be used to predict $VO_2$max ($ml \cdot kg^{-1} \cdot min^{-1}$) using the equation established by Léger, Mercier, Gadoury, and Lambert (1988). The equation is based on a sample of 188 boys and girls, 8 to 19 years of age. The equation uses the highest speed (km/h) attained on the task, age (yr.), and the speed x age interaction for the prediction.
- $VO_2$max = 0.1536 (Max Speed x Age) – 3.238 (Max Speed) – 3.248 (Age) + 31.025
- For information related to criterion-referenced standards, please refer to *FITNESSGRAM® Test Kit* (The Cooper Institute for Aerobics Research, 1999).

# Appendix:
# Fitness Management Learning Outcomes

**General Learning Outcome 2:** The student will demonstrate the ability to develop and follow a personal fitness plan for lifelong physical activity and well-being.

## Fitness Management Outcomes: Kindergarten

### Knowledge

❑ **K.2.K.B.1 Discuss the fact that daily physical activity makes muscles strong, including the heart.**

### Skills

❑ **S.2.K.A.1a Participate in a wide variety of physical activities that contribute to skill/fitness development and enjoyment.**

❑ **S.2.K.A.1b Sustain participation in moderate to vigorous activity for short periods of time, based on functional capacity.**

## Fitness Management Outcomes: Grade 1

❑ **K.2.1.B.1 Recognize that vigorous physical activity is important for health and fitness development** (i.e., vigorous aerobic activity makes the heart, muscles, bones stronger).

❑ **K.2.1.C.1a Show an understanding of the location of main internal body parts affected by exercise** (i.e., heart, lungs, bones, muscles).

❑ **K.2.1.C.1b Recognize the physical changes in the body during physical activity** (i.e., heart beats faster, body gets warmer, breathing accelerates, perspiration increases).

❑ **S.2.1.A.1a Participate in a wide variety of physical activities using basic movement skills** (i.e., transport, manipulation, balance) **that contribute to skill/fitness development and enjoyment.**

❑ **S.2.1.A.1b Sustain participation in moderate to vigorous activity to experience physical changes in the body.**

## Fitness Management Outcomes: Grade 2

❑ **K.2.1.C.1a ➠ Show an understanding of the location of main internal body parts affected by exercise** (i.e., heart, lungs, bones, muscles).

❑ **K.2.1.C.1b ➠ Recognize the physical changes in the body during physical activity** (i.e., heart beats faster, body gets warmer, breathing accelerates, perspiration increases).

❑ **K.2.2.C.3 Recognize that proper warm-up activities** (i.e., light aerobic activity, stretching exercises) **prepare muscles for vigorous activities** (e.g., warm-up activities increase blood circulation and elasticity of muscles and ligaments...).

❑ **S.2.2.A.1a Participate in cooperative and/or low competitive-type physical activities** (e.g., with partners, in small groups...) **that contribute to skill/fitness development and enjoyment.**

❑ **S.2.2.A.1b Sustain participation in moderate to vigorous activity, using basic movement skills.**

❑ **S.2.2.A.2 Determine own degree of exertion through simple methods** (e.g., put hand on chest to feel increase in heart rate, "talk test"...) **while participating in physical activities.**

### Attitude Indicators

2.1 Show an interest in and responsibility for personal fitness.

2.2 Appreciate the role and contribution of regular participation in physical activity for health and fitness.

2.3 Show respect and acceptance for physical and performance limitations of self and others.

**Note:** Fitness assessment is not recommended prior to Grade 4.

# Fitness Management Outcomes: Grade 3

## Knowledge

❑ **K.2.3.A.1 Discuss exercises and physical activities associated with health-related fitness components** (e.g., running develops endurance of the heart, jumping activities develop muscular strength and endurance of the leg muscles...).

❑ **K.2.3.B.1 Recognize that the body needs sustained or intermittent vigorous physical activity to improve the strength of the heart and lungs** (e.g., running, skipping, cycling, swimming, soccer to accumulate at least 10 to 15 minutes of vigorous activity each day...).

❑ **K.2.3.C.1a Show an understanding of the location, size, and function of the heart** (e.g., in the chest area, size of a fist, pumps blood...).

❑ **K.2.3.C.1b Identify short-term effects of exercise/physical activity on the body** (e.g., pulse rate increases, shortness of breath, body temperature increases, perspiration occurs, fatigue sets in...).

❑ **K.2.2.C.3 ➠ Recognize that proper warm-up activities** (i.e., light aerobic activity, stretching exercises) **prepare muscles for vigorous activities** (e.g., warm-up activities increase blood circulation and elasticity of muscles and ligaments...).

❑ **K.2.3.C.4 Identify personal factors** (e.g., interests, personal success, previous experiences, type of activities, developmental rates...) **that influence physical activity participation and build self-confidence.**

## Skills

❑ **S.2.3.A.1a Participate in exercises/activities that increase flexibility, muscular strength, and muscular endurance.**

❑ **S.2.3.A.1b Maintain participation in moderate to vigorous activity that contributes to aerobic capacity for short** (e.g., intermittent...) **and longer periods of time** (e.g., sustained...).

❑ **S.2.2.A.2 ➠ Determine own degree of exertion through simple methods** (e.g., put hand on chest to feel increase in heart rate, "talk test"...) **while participating in physical activities.**

❑ **S.2.3.A.3a Record participation in daily physical activities** (e.g., at home, at school, in the community...) **over a period of time** (e.g., a week, a day...) **to determine level of physical activity participation.**

## Attitude Indicators

2.1 Show an interest in and responsibility for personal fitness.

2.2 Appreciate the role and contribution of regular participation in physical activity for health and fitness.

2.3 Show respect and acceptance for physical and performance limitations of self and others.

**Note:** Fitness assessment is not recommended prior to Grade 4.

# Fitness Management Outcomes: Grade 4

## Knowledge

❑ **K.2.4.A.1 Recognize the health-related fitness components** (e.g., cardiovascular endurance, muscular strength, muscular endurance, flexibility...).

❑ **K.2.3.C.1a ➠ Show an understanding of the location, size, and function of the heart** (e.g., in the chest area, size of a fist, pumps blood...).

❑ **K.2.3.C.1b ➠ Identify short-term effects of exercise/physical activity on the body** (e.g., pulse rate increases, shortness of breath, body temperature increases, perspiration occurs, fatigue sets in...).

❑ **K.2.4.C.3 Recognize the importance of light aerobic activities and stretching as part of cool-down following a vigorous activity** (e.g., decrease blood flow and body temperature gradually...).

❑ **K.2.4.C.4 Discuss how setting realistic goals and developing strategies** (e.g., positive thinking, regular practice, participating with others...) **can contribute to personal achievement** (e.g., sense of enjoyment, self-confidence...).

## Skills

❑ **S.2.4.A.1a Participate regularly in a variety of purposeful and individually challenging fitness activities that develop health-related and/or skill-related fitness components** (e.g., activities that increase heart rate, lung capacity, strength, muscular endurance, flexibility, coordination...).

❑ **S.2.4.A.1b Maintain continuous aerobic activity for a set period of time, based on functional capacity.**

❑ **S.2.4.A.2 Demonstrate efficient ways** (e.g., pulse point location and proper finger positions on wrist and neck, use of heart monitors...) **to determine heart rate before and after exercise.**

❑ **S.2.4.A.3a Determine own performance level for health-related fitness components** (i.e., cardiovascular endurance, muscular strength, muscular endurance, flexibility)**, using simple tests or tasks** (e.g., sit and reach, modified curl-up, 1600-metre run...).

❑ **S.2.4.A.3b Record own fitness results and physical activity participation over a period of time** (e.g., beginning, middle, end of school year...) **for personal progress.**

## Attitude Indicators

2.1 Show an interest in and responsibility for personal fitness.

2.2 Appreciate the role and contribution of regular participation in physical activity for health and fitness.

2.3 Show respect and acceptance for physical and performance limitations of self and others.

# Fitness Management Outcomes: Grade 5

## Knowledge

❑ **K.2.5.A.1 Identify health-related fitness components** (e.g., cardiovascular endurance, muscular endurance, muscular strength, flexibility, body composition...) **and one example of an appropriate exercise/activity for each component** (e.g., skip rope for cardiovascular endurance development...).

❑ **K.2.5.B.1 Identify the fitness benefits** (i.e., muscle and bone development, decreased susceptibility to stress, positive self-esteem, faster heart-rate recovery) **of moderate to vigorous fitness-type activities over time.**

❑ **K.2.5.C.1a Recognize the terms associated with the function of the cardiovascular system** (i.e., resting heart rate, maximum heart rate, target heart rate, blood pressure, recovery heart rate) **in the context of exercise and physical activity.**

❑ **K.2.5.C.1b Describe the effects of aerobic activities and inactivity on the cardiovascular system** (i.e., lower/raised resting heart rate, increased/decreased heart size, increased/decreased stroke volume).

❑ **K.2.5.C.2 Show an understanding of the factors** (e.g., planning, regular participation, effort, adequate information, motivation, commitment, regular monitoring...) **affecting personal fitness development.**

❑ **K.2.5.C.3 Show an understanding that stretching exercises for the major muscle groups should be held for a minimum length of time to be effective** (e.g., as long as a stretch feels comfortable, which is usually 10 to 30 seconds with three to five repetitions...).

❑ **K.2.5.C.4 Determine the intrinsic** (e.g., enjoyment, enhanced health, level of success, increased energy level, affiliation...) **and extrinsic** (e.g., awards, media, sport heroes, family, peers...) **factors that motivate participation for fitness development.**

## Skills

❑ **S.2.5.A.1a Demonstrate correct execution of exercises** (e.g., keeping body straight for push-ups, keeping legs bent for curl-ups...) **designed to improve and maintain personal fitness associated with health-related fitness components.**

❑ **S.2.5.A.1b Participate in continuous aerobic activity for a sustained period of time, while maintaining the target heart rate.**

❑ **S.2.5.A.2 Demonstrate use of short-cut methods** (e.g., 6-second count x 10; 10-second count x 6...) **and/or technology** (e.g., heart-rate monitors...) **for monitoring heart-rate counts before, during, and after activities, and relate to target heart-rate zones** (e.g., general health, basic fitness, healthy heart...).

❑ **S.2.4.A.3a ➠ S.2.5.A.3a Determine own performance level for health-related fitness components** (i.e., cardiovascular endurance, muscular strength, muscular endurance, flexibility), **using simple tests or tasks** (e.g., sit and reach, modified curl-up, 1600-metre run...).

❑ **S.2.5.A.3b Compare own fitness results and physical activity participation over a period of time** (e.g., beginning, middle, end of school year...) **to check and revise personal goals.**

## Attitude Indicators

2.1 Show an interest in and responsibility for personal fitness.

2.2 Appreciate the role and contribution of regular participation in physical activity for health and fitness.

2.3 Show respect and acceptance for physical and performance limitations of self and others.

# Fitness Management Outcomes: Grade 6

## Knowledge

❑ **K.2.6.A.1 Recognize the health- and skill-related fitness components** (e.g., agility, power, reaction time, speed, coordination…) **that contribute to skill development.**

❑ **K.2.6.C.1a Identify the names of the main bones** (e.g., humerus, ulna, radius, femur, tibia, fibula, scapula, clavicle, ribs, pelvis, skull...) **and function** (i.e., shape, support, protection) **of the human skeletal system in the context of exercise and physical activity.**

❑ **K.2.6.C.1b Describe the effects of exercise and inactivity on the human skeletal system** (i.e., increased/decreased bone density, increased/decreased bone mass).

❑ **K.2.5.C.2 ➠ K.2.6.C.2 Show an understanding of the factors** (e.g., planning, regular participation, effort, adequate information, motivation, commitment, regular monitoring...) **affecting personal fitness development.**

❑ **K.2.6.C.3 Identify the proper techniques** (e.g., slow and sustained, within comfort zone, focusing on target muscles and minimizing other body parts, stretching to the limit of the movement, slow and rhythmical breathing...) **and harmful techniques** (e.g., bouncing, swinging, stretching too hard...) **in stretching exercises.**

❑ **K.2.6.C.4 Review behaviours** (e.g., make positive remarks, cheer for others, make encouraging gestures...) **that encourage effort and participation of others.**

## Skills

❑ **S.2.6.A.1a Participate in exercises/activities** (e.g., juggling for developing coordination, moving through obstacle course for agility...) **designed to improve and maintain personal fitness associated with health-related and skill-related fitness components.**

❑ **S.2.6.A.1b Demonstrate proper technique** (i.e., pacing) **while participating in continuous aerobic activity for a sustained period of time, while maintaining target heart rate.**

❑ **S.2.6.A.2 Compare own heart rate during aerobic activity to the general target heart-rate zones** (e.g., general health, basic fitness, healthy heart...).

❑ **S.2.6.A.3a Demonstrate the use of assessment strategies** (e.g., activity log, activity calendar, stopwatch, computer database program, heart-rate monitor...) **to determine, organize, and record fitness results and physical activity participation.**

❑ **S.2.5.A.3b ➠ S.2.6.A.3b Compare own fitness results and physical activity participation over a period of time** (e.g., beginning, middle, end of school year...) **to check and revise personal goals.**

## Attitude Indicators

2.1 Show an interest in and responsibility for personal fitness.

2.2 Appreciate the role and contribution of regular participation in physical activity for health and fitness.

2.3 Show respect and acceptance for physical and performance limitations of self and others.

# Fitness Management Outcomes: Grade 7

## Knowledge

❑ **K.2.7.A.1 Sort and classify physical activities/exercises** (e.g., jogging, cycling, weight training, gymnastics...) **that are best suited to developing each of the health-related fitness components** (e.g., cardiovascular endurance, muscular endurance, muscular strength, flexibility, body composition…).

❑ **K.2.7.B.1 Promote the benefits of physical activity** (e.g., greater work capacity, performance enhancement, healthy weight, prevention of injuries, prevention of disease such as cardiovascular and type II diabetes, prevention of depression...) **for optimal health and fitness.**

❑ **K.2.7.C.1a Identify the names and locations of the major muscle groups** (e.g., biceps, triceps, pectorals, abdominals, quadriceps, hamstrings...) **in the context of exercise and physical activity.**

❑ **K.2.7.C.1b Describe the effects of exercise and inactivity** (i.e., increased/decreased strength, hypertrophy/atrophy, increased/decreased lean muscle, increased/decreased elasticity, increased/decreased muscle tone) **on the muscular system.**

❑ **K.2.7.C.2 Identify and explain the FITT principle** (i.e., frequency, intensity, time, and type of activity).

❑ **K.2.7.C.3 Describe the purpose of a warm-up** (e.g., increased circulation, increased body temperature, mental preparation, increased focus on task, prevention of injuries, improved performance...) **and a cool-down** (e.g., gradual lowering of heart rate, prevention of dizziness/blood pooling, minimized muscle stiffness/soreness...) **for physical activity participation.**

❑ **K.2.7.C.4 Identify personal factors and preferences for choosing physical activities** (e.g., personal interests, influence of friends, appreciation of the outdoors, affiliation, competition, cooperation, fun...) **for fitness and health.**

## Skills

❑ **S.2.7.A.1a Demonstrate behaviours** (e.g., regular participation, correct and safe execution, appropriate intensity level, self-monitoring, self-discipline...) **for personal fitness-goal attainment.**

❑ **S.2.7.A.1b Participate in continuous aerobic activity for a sustained period of time related to rate of perceived exertion and general target heart-rate zones.**

❑ **S.2.7.A.2 Determine the relationship between the rate of perceived exertion and the general target heart-rate zones** (e.g., the level of exertion is somewhat difficult but the ability to talk remains while exercising in a healthy heart zone...).

❑ **S.2.6.A.3a ➠ S.2.7.A.3a Demonstrate the use of assessment strategies** (e.g., activity log, activity calendar, stopwatch, computer database program, heart-rate monitor...) **to determine, organize, and record fitness results and physical activity participation.**

❑ **S.2.7.A.3b Chart own fitness results** (e.g., using information technology...) **throughout the year to determine effects of activity participation and/or specific training on personal progress.**

## Attitude Indicators

2.1 Show an interest in and responsibility for personal fitness.

2.2 Appreciate the role and contribution of regular participation in physical activity for health and fitness.

2.3 Show respect and acceptance for physical and performance limitations of self and others.

# Fitness Management Outcomes: Grade 8

## Knowledge

❑ **K.2.8.A.1 Identify the five health-related fitness components** (e.g., cardiovascular endurance, muscular endurance, muscular strength, flexibility, body composition…) **and their importance to a balanced fitness plan.**

❑ **K.2.8.C.1a Identify the names of muscle groups and specific muscles** (i.e., biceps, triceps, pectorals, abdominals, quadriceps, deltoids, trapezius, latissimus dorsi, hamstrings, hip flexors) **and primary action** (i.e., flexion, extension, abduction, adduction, rotation) **across the various joints** (e.g., knee, elbow, hip...).

❑ **K.2.8.C.1b Explain the effects of exercise on use** (i.e., increased size and strength of muscles, ligaments, and tendons; increased muscular capillary action; hypertrophy) **and overuse** (i.e., fatigue, injury, muscle soreness) **of muscles.**

❑ **K.2.8.C.2 Describe ways to apply the FITT principle** (i.e., frequency, intensity, time, and type of activity) **to health-related fitness components** (e.g., cardiovascular endurance, muscular strength, muscular endurance, flexibility, body composition…).

❑ **K.2.8.C.3 Identify three stages** (i.e., indirect, direct, identical) **of activity-specific warm-ups and examples of each stage for specific physical activities** (e.g., a soccer warm-up could include light running, specific leg-stretching exercises, easy dribbling/passing drills...).

❑ **K.2.7.C.4 ➠ K.2.8.C.4 Identify personal factors and preferences for choosing physical activities** (e.g., personal interests, influence of friends, appreciation of the outdoors, affiliation, competition, cooperation, fun...) **for fitness and health.**

## Skills

❑ **S.2.8.A.1a Participate in fitness activities that use the FITT principle and contribute to personal health-related fitness goals.**

❑ **S.2.8.A.1b Participate in continuous aerobic activity related to personal target heart-rate zones.**

❑ **S.2.8.A.2 Determine personal target heart-rate zone, using simple methods** (e.g., Karvonen formula, software programs...).

❑ **S.2.8.A.3a Assess the level of ability in one or more health-related fitness components** (i.e., cardiovascular endurance, muscular endurance, muscular strength, flexibility) **of physical fitness.**

❑ **S.2.7.A.3b ➠ S.2.8.A.3b Chart own fitness results** (e.g., using information technology...) **throughout the year to determine effects of activity participation and/or specific training on personal progress.**

## Attitude Indicators

2.1 Show an interest in and responsibility for personal fitness.

2.2 Appreciate the role and contribution of regular participation in physical activity for health and fitness.

2.3 Show respect and acceptance for physical and performance limitations of self and others.

# Fitness Management Outcomes: Senior 1

## Knowledge

❑ **K.2.S1.A.1 Identify the skill-related fitness components** (e.g., balance, agility, power, reaction time, speed, coordination...) **and relate their importance to sport/physical activity performance** (e.g., reaction time in goalkeeping...).

❑ **K.2.S1.B.1 Differentiate between the benefits of active living and physical fitness development, based on a health and fitness continuum** (e.g., mild activity for health benefits, moderate to vigorous activity for fitness benefits...).

❑ **K.2.S1.C.1a Explain the structure of skeletal muscle** (i.e., belly, bundle, fibre, myofibril) **as it relates to muscular development.**

❑ **K.2.S1.C.1b Explain the structure of fibre types** (i.e., slow-twitch, fast-twitch) **as they relate to muscular development.**

❑ **K.2.S1.C.1c Identify types of strength exercises** (i.e., isometric, dynamic) **and stretching exercises** (i.e., static, ballistic, passive) **for personal fitness development** (i.e., strength, endurance, range of motion).

❑ **K.2.S1.C.2 Describe the principles of training and conditioning for physical activities** (i.e., progressive overload, specificity, reversibility, regularity, individual variability, starting point).

❑ **K.2.S1.C.3 Design and implement effective warm-up and cool-down routines for specific team-related physical activities** (e.g., volleyball, soccer, rugby...).

❑ **K.2.S1.C.4 Identify the factors related to health and fitness development** (e.g., health benefit, physical attributes, interpersonal interaction, influence of family, availability of facilities/equipment, competition, cooperation, personal success, time management...) **that affect choices of physical activities for self and others.**

## Skills

❑ **S.2.S1.A.1a Participate in physical activities at a level that contributes to the goals of an individualized fitness plan.**

❑ **S.2.S1.A.1b Participate in planned and self-directed activities that maintain heart-rate levels in various zones** (e.g., general health, basic fitness, healthy heart...).

❑ **S.2.S1.A.2 Demonstrate use of heart-rate monitoring** (e.g., pulse points, heart monitors, software programs...) **to compare exertion level in a variety of activities.**

❑ **S.2.S1.A.3a Assess the level of ability in one or more skill-related components** (e.g., balance, agility, power, reaction time, speed, coordination...) **of physical fitness.**

❑ **S.2.S1.A.3b Analyze own fitness test results** (e.g., using information technology...) **to establish personal fitness goals.**

## Attitude Indicators

2.1 Show an interest in and responsibility for personal fitness.

2.2 Appreciate the role and contribution of regular participation in physical activity for health and fitness.

2.3 Show respect and acceptance for physical and performance limitations of self and others.

# Fitness Management Outcomes: Senior 2

## Knowledge

❑ **K.2.S2.A.1 Evaluate the contribution** (i.e., associated fitness component, muscle/muscle groups, type of benefit) **of selected physical activities and/or exercises to physical fitness** (e.g., push-ups can develop muscular strength of arm muscles, which contributes to health-related fitness...).

❑ **K.2.S2.B.1 Investigate the contribution** (e.g., strength, endurance, energy expenditure, elasticity, longevity, healthy weight...) **of exercise/physical activity to optimal health and the prevention of disease** (e.g., cardiovascular disease, breast cancer, type II diabetes, osteoporosis...).

❑ **K.2.S2.C.1a Investigate the body's response** (e.g., stimulation of autonomic nervous system, endocrine response, respiration response, oxygen utilization...) **to increased activity levels.**

❑ **K.2.S2.C.1b Explain how exercise of different intensities** (e.g., mild, moderate, vigorous, intermittent, continuous, aerobic, anaerobic...) **affects the structure and function of the cardiovascular and respiratory systems** (e.g., lowers resting heart rate, blood pressure; increases heart size, stroke volume, blood volume...) **in the context of healthy living and the prevention of disease.**

❑ **K.2.S2.C.2 Explain and apply the principles of training and conditioning for specific fitness components** (e.g., develop a stretching program for improved flexibility...).

❑ **K.2.S2.C.3 Design and implement effective warm-up and cool-down routines for specific individual/dual-type physical activities** (e.g., running, table tennis, cycling...).

❑ **K.2.S2.C.4 Examine factors** (e.g., enjoyment, previous experiences, values and attitude, social benefits, financial commitment, medical conditions, incentives, stages of change...) **that have an impact on adherence to a personal fitness plan.**

## Skills

❑ **S.2.S2.A.1a Participate in different types of training and conditioning activities that contribute to personal fitness development.**

❑ **S.2.S2.A.1b Participate at a level consistent with planned and self-directed aerobic activities.**

❑ **S.2.S2.A.2 Demonstrate use of heart-rate monitoring** (e.g., pulse points, heart monitors, software programs...) **in personal fitness training.**

❑ **S.2.S2.A.3a Assess current personal physical fitness levels using appropriate fitness tests and information technology** (e.g., stopwatches, heart-rate monitors, fitness-related software programs...).

❑ **S.2.S2.A.3b Analyze own fitness test results** (e.g., using information technology...) **and determine the factors that contributed to the results.**

## Attitude Indicators

2.1 Show an interest in and responsibility for personal fitness.

2.2 Appreciate the role and contribution of regular participation in physical activity for health and fitness.

2.3 Show respect and acceptance for physical and performance limitations of self and others.

## Notes

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## Notes

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