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**EXERCISE PRESCRIPTION**  
**Apply knowledge of exercise physiology**  
**principles**

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<b>level:</b>	<b>5</b>
<b>credit:</b>	<b>5</b>
<b>final date for comment:</b>	December 2002
<b>expiry date:</b>	December 2003
<b>sub-field:</b>	Fitness
<b>purpose:</b>	People credited with this unit standard are able to: apply knowledge of exercise physiology to physical activity and exercise prescription; apply knowledge of exercise physiology to stages in the human life cycle; apply knowledge of the interaction of common illnesses and conditions with physiological capacity for exercise; apply physiological norms and ranges to programme development for a variety of client groups; and access sources of information on exercise physiology to update knowledge. This unit standard is designed for people who will, with little supervision, be prescribing exercise for clients in and associated with fitness facilities, recreation programmes and sports.
<b>entry information:</b>	Open.
<b>accreditation option:</b>	Evaluation of documentation and visit by NZQA and industry.
<b>moderation option:</b>	A centrally established and directed national moderation system has been set up by the Sport, Fitness and Recreation Industry Training Organisation - Fitness Advisory Group.

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**special notes:**

- 1 Special needs groups include:  
life cycle stages - children and adolescents, older people and seniors, ante- and post-natal women; people with activity limitations imposed by - asthma, arthritis, diabetes, hypertension, cardiac insufficiency and injury, visual impairment, hearing impairment, common motor disabilities including epilepsy and head injuries, and undergoing functional rehabilitation.
- 2 Physical activity should be understood to include a full range of intensity from minimal physical activity to maximum intensity physical activity using the alactic energy system that can be sustained for only a few seconds.

## **Elements and Performance Criteria**

### **element 1**

Apply knowledge of exercise physiology to physical activity and exercise prescription.

### **performance criteria**

- 1.1 Analysis of energy production and conversion pathways establishes their role and function at a physiological level in supporting physical activity.

Range: breadth of knowledge includes - macronutrient energy sources; direct energy sources; alactic energy system; lactic energy system; aerobic energy system; energy sources and systems related to intensity and duration of exercise; biochemical pathways involved in ATP production and replenishment, and the metabolising of lactic acid; consequences and characteristics of depletion of energy substrates; processes of fatigue and recovery (cellular, muscular, systemic); energy storage in the body; influences on storage levels of energy substrates (including manipulation); measurement of energy cost of exercise; measurement of energy use.

- 1.2 Analysis of structure and function of body systems involved in the storage and transport of energy substrates, oxygen and metabolic products establishes their role in supporting physical activity.

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Range: body systems - circulatory, hepatic, muscular;  
energy substrates - protein, carbohydrate (blood glucose, liver and muscle glycogen), fats (triglycerides, free fatty acids);  
metabolic products - lactate, CO<sub>2</sub>;  
processes - glycolysis, gluconeogenesis, lipolysis, use of protein as fuel.

1.3 Analysis of muscle physiology explains muscle function in supporting movement.

Range: breadth of knowledge includes - detail structure of muscle (fibre, cell sarcomere, myofibrils, myofilaments, actin, myosin), mechanism and biochemistry of muscle contraction (sliding filament theory), nature and function of motor units, fibre recruitment, fibre types (types, distribution, significance for exercise choice, trainability), mechanism of force-length and force-velocity relationships.

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- 1.4 Analysis of the function and role of the cardiopulmonary system in exercise explains its role in supporting physical activity.

Range: breadth of knowledge includes - physiology of heart function, physiology of respiration (oxygen consumption,  $\text{VO}_2$  max, Respiratory Quotient (RQ)), measures of cardiac and pulmonary function (significance, norms and ranges), acute effects of exercise on cardiac function and respiration (intensity, duration, type), chronic (training) effects of exercise on cardiac function and respiration, features of (normal) ECG and spirometry traces in rest and in exercise, measurement and assessment of cardiopulmonary capacity and fitness.

- 1.5 Analysis of physiology of regulatory systems establishes their role in controlling aspects of physical activity.

Range: hormones include - growth hormone, thyroid and parathyroid hormones, ADH and aldosterone, insulin and glucagon, catecholamines, glucocorticoids and ACTH, prostoglandins and endorphins, sex hormones;  
breadth of knowledge includes - hormone action (characteristics, specificity, mechanisms), hormone interactions, exocrine and endocrine glands, hormonal responses to exercise and training, thermoregulation (mechanisms, receptors, regulation -at rest, -in exercise, acclimatisation, heat disorders, management), fluid balance.

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1.6 Description of acute and chronic effects of exercise on physiology explains salient features of exercise bouts and the training process.

Range: acute effects include - warming up (body temperature, cardiac function, respiration), sustained exercise, lactate build-up in anaerobic exercise, fatigue, recovery, oxygen debt, circulatory shift to working muscles, RQ;  
chronic effects include - cardiovascular function, muscle cell adaptations, muscle adaptations, neural adaptation, connective tissue adaptation, skeletal adaptation, metabolic adaptations.

1.7 Overall fitness and the basis of performance are described through definition and analysis of components of fitness.

Range: components of fitness - strength, speed, power, aerobic fitness, anaerobic fitness, muscular endurance, flexibility, agility, body composition.

1.8 Variables used in exercise prescription are described through definition and analysis of principles of training.

Range: principles of training - training thresholds, frequency, duration, intensity, progressive overload, specificity, reversibility, periodisation.

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**element 2**

Apply knowledge of exercise physiology to stages in the human life cycle.

Range: children, adolescents, ante- and post-natal women, aging adults, the elderly (seniors).

**performance criteria**

2.1 Analysis of developmental physiological changes in children and adolescents establishes guidelines for exercise prescription for these groups.

Range: skeletal development (stages, bone growth processes), development of cardiovascular and muscular capacity, gender differences.

2.2 Analysis of physiological changes relevant to exercise associated with ante- and post-natal periods explains exercise prescription guidelines for ante- and post natal women.

Range: physiological requirements of embryo and foetus, cardiovascular characteristics, temperature regulation, hormonal changes affecting musculoskeletal system, body shape and composition, injury prevention.

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2.3 Analysis of physiological changes relevant to exercise associated with normal aging establishes guidelines for exercise prescription for older people and seniors.

Range: breadth of knowledge includes - age related trends for components of fitness (strength, speed, power, aerobic fitness, muscular endurance, flexibility, agility, body composition), cardiovascular capacity, bone density, functional mobility, postural conditioning, functional strength, functional flexibility, physiological correlates of inactivity.

**element 3**

Apply knowledge of the interaction of common illnesses and conditions with physiological capacity for exercise.

Range: illness and conditions include - asthma, arthritis, diabetes, hypertension, cardiac insufficiency/injury, visual impairment, hearing impairment, epilepsy, head injuries, people undergoing functional rehabilitation, hemiplegia, paraplegia.

**performance criteria**

3.1 Analysis of limitations imposed by common conditions and illness on the development and expression of components of fitness establishes guidelines for exercise prescription for these groups.

Range: components of fitness - strength, speed, power, aerobic fitness, muscular endurance, flexibility, agility, body composition.

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3.2 Description of beneficial effects of regular activity and programmed exercise on the course and expression of common conditions and illness supports participation in programmed physical activity for these groups.

Range: type of exercise - aerobic conditioning, resistance training for strength, resistance training for muscular endurance, functional mobility training, postural conditioning, flexibility training, skill training.

3.3 Description of harmful effects and risks associated with exercise and common illnesses and conditions establishes activity limitations for these groups.

Range: overuse injury, environmental hazards, accident risks.

#### **element 4**

Apply physiological norms and ranges to programme development for a variety of client groups.

Range: norms and ranges include - maximum (safe) heart rates, physiologically effective heart rates for aerobic conditioning and health maintenance, blood pressure systolic and diastolic, exercise blood pressure safety limits, body composition; client groups definition criteria - age, gender, ethnicity, special needs.

#### **performance criteria**

4.1 Identification and collection of sources provides database on physiological norms and ranges for a defined group under each criterion.

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- 4.2 Application of available client information to American College of Sports Medicine (ACSM) recommended levels of activity for a defined group under each criterion generates activity programme targets.

**element 5**

Access sources of information on exercise physiology to update knowledge.

Range: texts, periodicals, professional and academic bodies and institutions, New Zealand training providers, electronic databases.

**performance criteria**

- 5.1 Sources of current exercise physiology information and search methods are described in terms of relevance to updating professional knowledge.

Range: cost, accessibility, efficiency, status.

- 5.2 Search process is carried out to produce a catalogue of current output from one international journal and one electronic database in a selected topic in exercise physiology.

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**Comments to:**

Sport, Fitness and Recreation Industry Training Organisation  
- Fitness Advisory Group  
Unit Standard Revision  
PO Box 160  
WELLINGTON

*by* December 2002.

**Please Note:**

Providers must be accredited by the Qualifications Authority before they can offer programmes of education and training assessed against unit standards.

Accredited providers assessing against unit standards must engage with the moderation system that applies to those unit standards. [Please refer to relevant Plan ref: 0069]