Title	**Demonstrate knowledge of functional anatomy and biomechanics and their application to exercise prescription**		
Level	**5**	**Credits**	**15**

Purpose	People credited with this standard are able to: demonstrate knowledge of the functional human anatomy; demonstrate knowledge of general concepts associated with body shape, composition and weight; apply biomechanical principles to the description and analysis of posture, movement and exercise; and, analyse biomechanical implications of normal processes, musculoskeletal injury and common conditions.

Classification	Exercise > Human Anatomy, Physiology and Nutrition

Available grade	Achieved

Guidance Information

1 Recommended skills and knowledge for entry into this unit standard: Unit 30634, *Demonstrate knowledge of human anatomy, physiology and health risk factors.*

2 All learning and assessment within this unit standard must be carried out in accordance with the following, as relevant to their role:
- relevant legislation including Health and Safety at Work Act 2015, Privacy Act ~~1993~~2020, Consumer Guarantees Act 1993, Accident Compensation Act 2001, and any subsequent amendments;
- guidelines and codes of practice applicable to this standard include Code of Ethical Practice endorsed by Exercise New Zealand;
- organisational policies and procedures including Emergency Action Plans (EAPs) and Standard Operating Procedures (SOPs).

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of functional human anatomy.

Performance criteria

1.1 Describe the structure and distribution of musculoskeletal connective tissue and its function in support and movement.

Range types of connective tissue (ligament, tendon, muscle fascia), location of connective tissue, structure of connective tissue, ligament structures around major joints, injury and repair.

1.2 Explain how musculoskeletal connective tissue can impact on range of motion and muscle function.

1.3 Explain the terms origin and insertion and use them when describing muscle movement.

1.4 Explain the difference in structure and function of structural, postural and phasic muscles.

1.5 Describe the function of the nervous system elements during physical activity.

Range parts of the brain involved in movement, relationship of peripheral nervous system and spinal cord, sensory organs involved in proprioception.

1.6 Describe the gross anatomy of internal organ systems, their role and effect on physical activity.

Range digestive system, hepatic system, renal system, endocrine system.

Outcome 2

Demonstrate knowledge of general concepts associated with body shape, composition and weight.

Performance criteria

2.1 Explain the different somatotypes and the implications of these on weight and body composition management.

Range somatotypes – ectomorph, endomorph, mesomorph; implications – possible manipulations of somatotypes, effect on physical activity, general function.

2.2 Explain factors that contribute to different somatotypes.

Range genetics, basal metabolic rate, energy balance, hormones.

2.3 Critique methods of gathering body dimensions of exercise participants.

Range body mass index, body ratios, body profile (circumference measures), sum of skin folds, use of technology.

2.4 Describe the effects of weight cycling on body composition and physical activity.

Range body fat distribution, metabolic rate, energy levels, psychological.

2.5 Critique other sources of information on body shape, composition and/or weight.

Outcome 3

Apply biomechanical principles to the description and analysis of posture, movement and exercise.

Performance criteria

3.1 Explain basic mechanical concepts and their relevance to the description and analysis of human movement.

Range weight, gravity, force, torque, distance and displacement, speed, velocity, acceleration, momentum, types of lever, mechanical advantage, friction, equilibrium and stability, linear and rotational motion.

3.2 Describe movement and qualitative analysis in terms of the action of forces produced by and acting on the body in physical activity.

Range type of force and torque – internally generated (muscular), external sources, resistive, motive;
types of motion, planes of motion, the link system, kinetic links and chains.

3.3 Analyse standing and sitting postures using biomechanical principles and identify corrective requirements to promote good posture.

Range principles – force production, loading of skeletal muscle and connective tissue;

3.4 Analyse normal gait, propulsion, and spinal and shoulder movement patterns in terms of biomechanical movement description.

Range gross movement, movement around joints, force production, loading of skeletal muscle and connective tissue.

3.5 Analyse exercises designed to develop fitness components using biomechanical principles and identify common corrective requirements.

Range fitness component – strength, speed, flexibility, power, agility, aerobic endurance, muscular endurance;
analysis includes – muscle activation sequence.

Outcome 4

Analyse biomechanical implications of normal processes, musculoskeletal injury and common conditions.

Performance criteria

4.1 Analyse the biomechanical aspects of the developmental and aging processes and identify implications on exercise prescription.

Range aspects – changing body dimensions, absolute and relative strength of structural elements, ability to produce and withstand forces;
implications for - posture, movement, strength, speed, flexibility.

4.2 Analyse musculoskeletal injury, describe the recovery process, and identify implications on exercise prescription.

Range injury type – trauma, overuse, sprain, strain;
injury – muscle, tendon, ligament, bone.

4.3 Analyse the biomechanical aspects of pregnancy and identify implications on exercise prescription for ante and post-natal women.

Range body dimensions, absolute and relative strength of structural elements, ability to produce and withstand forces, biomechanical analysis of special exercises to assist pregnancy and recovery following childbirth.

4.4 Analyse biomechanical aspects of common conditions and identify implications on exercise prescription.

Range conditions include – arthritis, diabetes, hypertension, cardiac insufficiency and injury, head injuries, obesity, people undergoing functional rehabilitation;
analysis include – body dimensions, strength of structural elements, strength of musculoskeletal systems, limits of adaptation.

Planned review date	~~31 December 2022~~to be updated

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	23 November 2017	N/A
	2		

Consent and Moderation Requirements (CMR) reference	0099

This CMR can be accessed at http://www.nzqa.govt.nz/framework/search/index.do.

Comments on this unit standard

Please contact Toi Mai WDC qualifications@toimai.nz if you wish to suggest changes to the content of this unit standard.