

## Higher National Unit Specification

### General information for centres

**Unit title:** Mechanics for the Health and Fitness Professional

**Unit code:** DW64 35

**Unit purpose:** This Unit is designed to provide the candidate with a working knowledge and understanding of mechanical principles in relation to health and fitness activities. On completion of the Unit the candidate should be able to advise participants in relation to moving safely and using equipment effectively. The Unit is aimed at candidates, who wish to work in the health and fitness industry, it will be of most relevance to those who wish to work in a gym environment.

On completion of the Unit the candidate should be able to:

- 1 Describe the main mechanical principles involved in lifting and moving safely during everyday activities.
- 2 Explain, using mechanical principles, the reasons and advantages for using the recognised correct technique for a specific exercise.
- 3 Apply mechanical principles to analyse the load experienced by an individual throughout the range of motion using specific equipment.
- 4 Apply mechanical principles correctly to suggest methods of improving the efficiency/ effectiveness of a selected compound exercise for an individual.

**Credit points and level:** 1 HN Credit at SCQF level 8: (8 SCQF credit points at SCQF level 8\*)

*\*SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

**Recommended prior knowledge and skills:** Access to this Unit will be at the discretion of the centre, however knowledge of exercise equipment and technique, human anatomy and components of fitness would be of benefit. This knowledge may be demonstrated by candidates gaining a relevant unit (SCQF 6/7). Candidates would also benefit from having experience of regular participation in health and fitness activities. Candidates should have good communication and numeracy skills. These may be demonstrated by achievement of core skills Communication and Numeracy at Higher level or by possession of suitable NQ unit (SCQF level 5/6).

**Core Skills:** There are opportunities to develop the Core Skills of Numeracy and Problem Solving at SCQF level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

**Context for delivery:** If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

## **General information for centres (cont)**

**Assessment:** With the exception of Outcome 1 (which may be assessed with a report or short answer questions), the assessments should give the candidate the opportunity to apply their knowledge to a specific situation of their choosing.

It is intended that the level of knowledge required progresses with each outcome and the assessments should reflect this. Outcome 1 begins with description of relatively simple principles while Outcome 4 requires the greatest level analysis and the application of more complex principles.

## **Higher National Unit specification: statement of standards**

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The sections of the Unit stating the Outcomes, knowledge and/or skills, and evidence requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

### **Outcome 1**

Describe the main mechanical principles involved in lifting and moving safely during everyday activities.

#### **Knowledge and/or skills**

- ◆ Balance
- ◆ Managing loads
- ◆ Posture

#### **Evidence Requirements**

Candidates will need to provide evidence to demonstrate their knowledge and/or skills by showing that they can:

Provide oral or written description of how everyday activities should be performed, in relation to balance, posture and managing loads, to ensure the safety of the performer. Two elements from the content and context statement must be assessed. Candidates should not have prior knowledge of the elements to be assessed. Different combinations of elements should be chosen if re-assessment is required.

#### **Assessment guidelines**

The candidate will be required to provide an accurate description of how mechanical principles can be used in everyday activities to ensure safety.

### **Outcome 2**

Explain, using mechanical principles, the reasons and advantages for using the recognised correct technique for a specific exercise.

#### **Knowledge and/or skills**

- ◆ Joint alignment
- ◆ Range/type of motion

## **Higher National Unit specification: statement of standards (cont)**

**Unit title:** Mechanics for the Health and Fitness Professional

### **Evidence Requirements**

Candidates will need to provide oral or written evidence to demonstrate their knowledge and/or skills by showing that they can:

- ◆ Explain with reference to mechanical principles why a particular technique should be used to perform a selected exercise.

### **Assessment guidelines**

In order to satisfy the requirements the candidate should select the exercise carefully. Candidates should ensure that they have (or can get) the information on technique required. Furthermore, the exercise should have enough degrees of freedom to allow variations in technique and therefore allow the candidate to explain the benefit derived from adopting good form.

In explaining why a techniques should be used the candidate should highlight some of the mechanical issues arising from incorrect technique.

## **Outcome 3**

Apply mechanical principles to analyse the effect of equipment on the load/forces experienced by an individual throughout the range of motion using specific equipment.

### **Knowledge and/or skills**

- ◆ Personal equipment
- ◆ Fixed weights
- ◆ Free weights
- ◆ Other types of resistance

### **Evidence Requirements**

Candidates will need to provide evidence to demonstrate their knowledge and/or skills by showing that they can:

- ◆ Analyse the effect of one piece of personal equipment and three pieces of fixed weight equipment, on the force experience by the performer (forces in two different positions should be examined for each piece of equipment).
- ◆ Use mechanical principles to analyse the forces exerted by a muscle, for a specific performer during all phases of a selected free weight exercise.
- ◆ Analyse one other form of resistance (used in a health and fitness context) and explain how the load experienced can be varied, using this form of resistance.

### **Assessment guidelines**

Candidates will be required to analyse the effect of equipment and body segment length on loading. While it may be desirable for candidate to calculate approximate values for forces experienced in a variety of specific situations, it is acceptable for the analysis to be in relation/proportion to the load/force experienced in different positions or using different loading methods.

## **Higher National Unit specification: statement of standards (cont)**

### **Unit title:** Mechanics for the Health and Fitness Professional

It is expected that candidates will examine sport shoes and analyse how they affect the forces experienced by the performers. However it is possible for a candidate to select a different piece of personal equipment and analyse the effect it has on the load experienced.

The pieces of fixed weight equipment should, where possible, involve different types of lever and a cam system.

### **Outcome 4**

Appropriate mechanical principles are applied correctly to suggest methods of improving the efficiency/effectiveness of a selected compound movement for an individual, in relation to the movement's aims.

#### **Knowledge and/or skills**

- ◆ Aim of movement
- ◆ Principles to improve efficiency/effectiveness

#### **Evidence Requirements**

Candidates will need to provide evidence to demonstrate their knowledge and/or skills by showing that they can:

- ◆ Apply mechanical principles to the performance of a movement and suggest methods that would improve the performance and may help to prevent injury. Candidates should detail how the application of their suggestions will improve the mechanical efficiency/effectiveness of the performance.

#### **Assessment guidelines**

It is anticipated that the candidate will select either a compound resistance training exercise (for example; clean, snatch, clean and press, squat etc) or a continuous/cyclical type exercise (for example running, rowing, cycling, etc.). By allowing the candidate to detail the aim of the movement it is possible for the candidate to choose an exercise that is of most relevance to them.

Using video footage and computer software to aid identification of areas that could be improved should be encouraged. However lack of this equipment should not prohibit candidate from succeeding.

## **Administrative Information**

<b>Unit code:</b>	DW64 35
<b>Unit title:</b>	Mechanics for the Health and Fitness Professional
<b>Superclass category:</b>	MD
<b>Date of publication:</b>	August 2006
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## **Higher National Unit specification: support notes**

### **Unit title: Mechanics for the Health and Fitness Professional**

This part of the Unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

### **Guidance on the content and context for this Unit**

This Unit is intended to give candidates an understanding of mechanical principles and their role in health and fitness. While mechanical principles are important in any movement performed, for a health and fitness student they have a major role in the following areas; Lifting and moving safely during everyday activities, Ensuring correct technique during exercise, Loadings experienced during exercise, and Improving performance.

#### **Outcome 1**

Everyday Activities — Standing, sitting, walking, manual handling

Balance — centre of gravity, size and position of base

Managing loads — distance from load, absorbing force, size of muscle group used

Posture — distributing load, line of force

#### **Outcome 2**

Joint alignment — line of action of force, direction of movement

Range/type of motion — joint types, joint range of movement, linear, angular

#### **Outcome 3**

Personal equipment — sport shoes, impulse

Fixed weights — torque, levers type, cams, variable, fixed, isokinetic

Free weights — anatomical levers, internal muscle force, angle of pull

Other types of resistance — friction, elastic, air, water

#### **Outcome 4**

Movement's aim — strength, speed, endurance, power, flexibility

Principles to improve efficiency/effectiveness- necessary movements, work done, transfer of momentum, summation of forces, size of movement, elastic energy, force velocity curve, force and acceleration

### **Guidance on the delivery and assessment of this Unit**

The 'Outcomes' and 'Knowledge and or skills' for this Unit have, on the whole, tried to focus on the candidate applying knowledge and remained quite general. This is to try and reduce the assessment burden but should not mean that the underlying principles are not taught.

In order to apply, analyse and explain reasons it is assumed that there must already be knowledge at a lower level (ie able to identify, describe etc.). It is likely that this underpinning knowledge, although not directly assessed, will still have to be delivered to the candidate.

## **Higher National Unit specification: support notes (cont)**

**Unit title:** Mechanics for the Health and Fitness Professional

### ***Opportunities for developing Core Skills***

Candidates are required to analyse the effect of equipment and body segment length on loading. Accurate calculations for a range of data are needed in order that analysis in relation/proportion to the load/force experienced in different positions or using different loading methods is detailed and informed. Since safety is paramount candidates have to understand, analyse and apply data on relevant on balance, forces exerted by a muscle, for a specific performer during all phases of a selected free weight exercise and variation of loads in relation to forms of resistance. Support materials to provide practical exemplification and underpin formative calculations on exercise related work could be particularly useful.

Candidates will be required to analyse and seek solutions to a range of theoretical and practical problems and issues as they identify and work towards their analysis. Identifying and considering the variables and analysing the relative significance of each before identifying an appropriate strategic approach will provide opportunities to develop elements of planning, critical thinking and general problem solving skills to an advanced level. Analysing and evaluating the potential impact of theoretical calculations in exercise activities will be a critical aspect of underpinning knowledge and understanding, and candidates should be given opportunities to discuss the role of mechanical principles to assure an understanding of moving safely, ensuring correct technique, and safety precautions required in activities for performance enhancement.

### **Open learning**

This Unit could be delivered by open learning with suitable support material. However, the candidate may have to attend the centre for assessment purposes and would have to overcome the following difficulties. Access to suitable equipment and performers would be required in order to conduct some of the analysis required.

### **Candidates with additional support needs**

This Unit specification is intended to ensure that there are no artificial barriers to learning or assessment. The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative Outcomes for Units. For information on these, please refer to the SQA document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs*, which is available on the SQA website [www.sqa.org.uk](http://www.sqa.org.uk).

## General information for candidates

### Unit title: Mechanics for the Health and Fitness Professional

To succeed in this unit you will have to, meet the following 'Outcomes' by, demonstrating that you can:

- 1 Describe the main mechanical principles involved in lifting and moving safely during everyday activities.
- 2 Explain, using mechanical principles, the reasons and advantages for using the recognised correct technique for a specific exercise.
- 3 Apply mechanical principles to analyse the load experienced by an individual throughout the range of motion using specific equipment.
- 4 Apply mechanical principles correctly to suggest methods of improving the efficiency/ effectiveness of a selected compound exercise for an individual

In order to achieve this it would be useful to draw from knowledge (perhaps gained in other units) in the following areas:

- ◆ Resistance Training Exercises
- ◆ Core skills
- ◆ Fitness components
- ◆ Human Anatomy

Assessments will require you to use knowledge, gained through tutor lead activities and individual study, and apply it to meet the Outcomes above. This knowledge will cover a variety of mechanical related topics including:

- |                     |                       |                     |
|---------------------|-----------------------|---------------------|
| ◆ Centre of gravity | ◆ Momentum            | ◆ Balance           |
| ◆ Force             | ◆ Torque              | ◆ Vectors           |
| ◆ Velocity          | ◆ Levers              | ◆ Impulse           |
| ◆ Acceleration      | ◆ Types of resistance | ◆ Type of movement  |
| ◆ Work              | ◆ Power               | ◆ Range of movement |

While the content of this unit will have some overlap into the area of Sports Mechanics, there are significant differences. Some mechanical principles, which play a major role in sport, are not addressed as they have little relevance in a health and fitness setting (for example projectiles, drag etc). Should individual candidates have an interest in a specific sports related aspect, they should be encouraged to apply the principles to their area of interest and undertake further self study while the majority of taught content focuses around health and fitness examples.

The following resources may be useful in helping you gain this knowledge:

Carr G. "*Mechanics of sport*", Human Kinetics, 1997

Kreighbaum E.F., Smith M.A. "*Sports and fitness equipment design*", Human Kinetics 1996

Wesson K., Wiggings N., Thompson G., Hartigan S. "*Sport and PE a complete guide to advanced level study*" (2<sup>nd</sup> Ed.) Hodder & Stoughton, 2000

Hall S. "*Basic Biomechanics*", (4<sup>th</sup> Ed.) McGraw-Hill, 2003

McGinnis P.M. "*Biomechanics of sport and exercise*", Human Kinetics, 1999

Aaberg E. "*Muscle mechanics*", Human Kinetics, 1998

Floyd R.T., Thompson C.W. "*Manual of Structural Kinesiology*", (14<sup>th</sup> Ed), McGrawHill, 2001