Higher National Unit specification

General information

Unit title: Biomechanics and Movement Patterns (SCQF level 7)

Unit code: H71K 34

Superclass: PB

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Version: 02

Unit purpose

This Unit is designed to provide the learner with a working knowledge and understanding of mechanical principles in relation to human movement. On completion of this Unit the learner should be able to recognise deficiencies in the application of biomechanics in human movement as a result of injury. The Unit is aimed at learners that work within the Sports Therapy industry and includes competencies and scope of practise as specified by the Society of Sports Therapists.

Outcomes

On successful completion of the Unit the learner will be able to:

1 Explain the relationship between force and movement.
2 Describe the basics of force and how mechanical principles can be used to provide efficient movement.
3 Explain how movement analysis can reduce sporting injury through the use of observational skills and research.

Credit points and level

1 Higher National Unit credit at SCQF level 7: (8 SCQF credit points at SCQF level 7)

Higher National Unit Specification: General information (cont)

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Recommended entry to the Unit

Access to the Unit will be at the discretion of the centre. However, knowledge of human anatomy, basic rehabilitation principles, components of fitness and clinical assessment technique would be of benefit. This knowledge may be demonstrated by learners gaining the relevant HN Units at SCQF levels 7 and 8 as appropriate. Learners should also have good communication and numeracy skills. These may be demonstrated by achievement of *Communication* and *Numeracy* at Higher level or by possession of a suitable NQ Unit (SCQF levels 5/6).

Core Skills

Achievement of this Unit gives automatic certification of the following:

Complete Core Skills	None
Core Skill component(s)	Critical Thinking at SCQF level 5

There are also opportunities to develop aspects of Core Skills which are highlighted in the Support Notes of this Unit Specification.

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.

The Assessment Support Pack (ASP) for this Unit provides assessment and marking guidelines that exemplify the national standard for achievement. It is a valid, reliable and practicable assessment. Centres wishing to develop their own assessments should refer to the ASP to ensure a comparable standard. A list of existing ASPs is available to download from SQA's website **(http://www.sqa.org.uk/sqa/46233.2769.html)**.

Equality and inclusion

This Unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on our website **www.sqa.org.uk/assessmentarrangements**.

Higher National Unit specification: Statement of standards

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Acceptable performance in this Unit will be the satisfactory achievement of the standards set out in this part of the Unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

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. Learners 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

Explain the relationship between force and movement.

Knowledge and/or Skills

- Mechanics of movement
- Air/Water/Fluid resistance
- Friction
- Force
- Dynamics of movement

Outcome 2

Describe the basics of force and how mechanical principles can be used to provide efficient movement.

Knowledge and/or Skills

- Joint/Lever system
- Motion
- Mechanical principles
- Gait analysis and common faults

Outcome 3

Explain how movement analysis can reduce sporting injury through the use of observational skills and research.

Knowledge and/or Skills

- Observation:
  - Preparation
  - Action
  - Recovery
  - Quality of movement

Higher National Unit specification: Statement of standards (cont)

Unit title: Biomechanics and Movement Patterns (SCQF level 7)

- Research:
  - Model performance
  - Application of mechanical principles
  - Movement patterns required for skill

- Development:
  - Plan of action to reduce injury potential
  - Performance monitoring

Evidence Requirements for this Unit

Learners will need to provide evidence to demonstrate their Knowledge and/or Skills across all Outcomes.

To achieve Outcome 1 the learner will require written evidence to demonstrate an understanding of all aspects of the Knowledge and/or Skill section. The instrument of assessment will be restricted response questions and the assessment will be conducted in supervised conditions. The learners should be assessed on the following:

Mechanics of movement:	Gravity, centre of gravity, base of support, balancing point
Air/Water/Fluid resistance:	Drag, streamline, angle of release, lift force, spin, buoyancy
Friction:	Co-efficient of friction, effect of increasing/decreasing friction
Force:	Newton's Laws, momentum, force, acceleration, inertia
Dynamics:	Time, weight

For Outcome 2 learners will need to provide written/ oral evidence of all elements listed under knowledge and/ or skills. Learners should be assessed on the following:

Joint/Lever system:	1st/2nd/3rd class levers
Motion:	Linear, angular, curvilinear, projectile, summation of forces axes of rotation
Mechanical principles:	Movement around sagittal, frontal and longitudinal planes Analyse how motion produces torque/shearing forces and Identify which structures may be affected
Biomechanics of gait:	Features of normal gait pattern and common faults

For Outcome 3 the learner will be required to produce a written report based on a recorded/ captured performance. The report will include research into a model performance of the skill showing analysis of the application of the mechanical principles. The report will also include an analysis of the recorded/captured performance describing the quality of movement and areas that require to be developed. This should include a suggest plan of action and a schedule for performance monitoring. All aspects of the knowledge and skills section must be covered.

Higher National Unit specification: Statement of standards (cont)

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Model Performance

Information on the theoretical model performance for the skill/movement will allow the learner to make comparisons. The mechanical principles should be discussed giving written feedback on the observed performance including any faults. The learner should produce a plan of action — prioritising skill development and monitoring — goal setting; short/ medium/ long term goals.

Higher National Unit Support Notes

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Unit Support Notes are offered as guidance and 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 part of a Group Award and intended to give learners an understanding of the main forces and biomechanical principles associated with efficient movement patterns. Mechanical principles are important in any movement pattern, for a sports therapist they are significant in helping to reduce the chance of injury/re-injury and in the re-education of movement patterns.

Outcome 1 requires the learner to demonstrate an understanding of:

- Describe the effects on mechanics of movement due to gravity, air/water/fluid resistance, friction and force.
- Describe the effects on dynamics of movement due to time — timing/quick/sustained, weight — fine/firm.

Outcome 2 requires the learner to demonstrate an understanding of:

- Describe the differences between 1st/2nd/3rd class levers.
- Discuss the production of forces including; Linear, rotational, curvilinear, projectile, summation of forces and axes of rotation.
- Identify movement around sagittal, frontal and longitudinal planes.
- Analyse how motion produces torque/shearing forces and identify which structures may be affected.
- Discuss the normal features of the gait cycle including; Heel strike, mid-stance and toe off phases and common faults.

Outcome 3 requires the learner to demonstrate an understanding of:

- Movement patterns may include: walking, running, throwing, lifting, kicking, turning.
- Model performance must include: Efficiency, phases of movement (preparation, action, recovery), quality of movement. This will allow the learner to make comparisons.
- Produce written feedback on observed performance including faults.
- Produce a plan of action — improve efficiency of skill.
- Produce a monitoring process — short/medium/long term goals.

Higher National Unit Support Notes (cont)

Unit title: Biomechanics and Movement Patterns (SCQF level 7)

Guidance on approaches to delivery of this Unit

This Unit forms a constituent component of the Group Award Sports Therapy.

The underpinning knowledge for this Unit is general however it is essential to underpin how movement is controlled, especially in external environments. A variety of teaching methods will enhance delivery: group discussion will blend learner experience with input from the deliverer. Delivery should encourage individual research, review and reflection.

Delivery of knowledge for Outcome 1 and 2 is more effective if practical examples are worked through with the learner's. Assessment for these Outcomes can be done after delivery of information.

Outcome 3 would benefit from trial observations of movement patterns to help develop the learners observation skills.

Guidance on approaches to assessment of this Unit

Evidence can be generated using different types of assessment. The following are suggestions only. There may be other methods that would be more suitable to learners.

Centres are reminded that prior verification of centre-devised assessments would help to ensure that the national standard is being met. Where learners experience a range of assessment methods, this helps them to develop different skills that should be transferable to work or further and higher education.

Outcome 1 should be conducted in the form of a closed-book assessment under supervised conditions.

Outcome 2 can be conducted in the form of written/oral assessment. Written assessment should be in the form of closed-book supervised conditions. Oral assessment can be done in the form of a practical assessment with a checklist and supplementary questions.

Outcome 3. The learner must produce a written report based upon observation of a chosen movement pattern. The report must include research into a model performance describing the efficiency, phases of movement (preparation, action, recovery), quality of movement. This will allow the learner to develop analytical skills through repeated observation and produce written feedback on the observed performance including faults. The learner must also produce a plan of action showing how to improve efficiency of skill and show methods of monitoring progress — short/medium/long term goals.

Higher National Unit Support Notes (cont)

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Opportunities for e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or social software. Centres which wish to use e-assessment must ensure that the national standard is applied to all learner evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. The most up-to-date guidance on the use of e-assessment to support SQA's qualifications is available at **www.sqa.org.uk/e-assessment**.

Opportunities for developing Core and other essential skills

This Unit has the Problem Solving component Critical Thinking embedded in it. This means that when the candidates achieve the Unit, their Core Skills profile will also be updated to show they have achieved Critical Thinking at SCQF level 5.

There may be opportunities to gather evidence towards Core Skills in this Unit such as *Communication, Working with Others* and *Problem Solving* throughout the Unit.

History of changes to Unit

Version	Description of change	Date
02	Core Skills Components Critical Thinking at SCQF level 5 embedded.	03/06/14

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General information for learners

Unit title: Biomechanics and Movement Patterns (SCQF level 7)

This section will help you decide whether this is the Unit for you by explaining what the Unit is about, what you should know or be able to do before you start, what you will need to do during the Unit and opportunities for further learning and employment.

The Unit contains basic knowledge about the fundamental physical and mechanical principles that control human movement and is an introduction to biomechanics — the mechanical principles that govern all human movement. The Unit should be delivered in such a way as to provide you with the practical opportunities to relate these principles to the techniques and movement patterns.

On completion of this Unit you will be able to describe mechanical principles and the effect they have on human performance, this will be achieved by observation and analysis from a video and live performance.

The Unit will be assessed by restricted response questions for Outcome 1, a written/or oral assessment for Outcome 2 and a comprehensive written report for Outcome3.

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

Aaberg. E, (1998): *Muscle Mechanics, Human Kinetics*.

Carr G, (1997): *Mechanics of Sport, Human Kinetics*.

Floyd. R.T, Thompson. C.W, (2001): *Manual of Structural Kinesiology*, 14th Edition, McGraw Hill.

Hall. S, (1998): *Basic Biomechanics*, 4th Edition, McGraw Hill.

Kreighbaum, E.F, Smith, M.A., (1996): *Sports and Fitness Equipment Design, Human Kinetics*

McGinnis, P.M., (1999): *Biomechanics of Sport and Exercise, Human Kinetics*.

Perry, J., Burnfeild, J. (2010): *Gait Analysis: Normal and Pathological Function*, 2nd Edition, Slack Incorporated.

Wesson, K et al, (2000): *Sport and PE: A Complete Guide to Advanced Level Study*, 2nd Edition, Hodder and Stoughton.