

Foundations of Neuroscience of Sport Performance

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Attendance:

<https://checkin.bangor.ac.uk/>

Agenda

- What you measured an hour ago, and where those milliseconds went
- What sport and exercise psychology is, and where this module sits in it
- The road through the semester
- Science vs practice, and a first taste of designing a study

Suggestions for optimal learning

- Attend lectures, seminars, etc.
- Ask for breaks when you need one
- Ask for clarification as soon as possible
- Take notes
- Do not copy the slides
- Review your notes regularly
- Study from books and articles. The slides are not the only study resource.
- Do the optional ungraded homework
- Be proactive

Resources

- Activities
 - lectures (2 h, every week)
 - practicals (1 h, every week)
- Blackboard website
 - Recordings (Panopto)
 - Reading list (Talis)
 - Presentation slides
 - Class data workbook (view-only, updated after each practical)
- People
 - Lecturers
 - Personal Tutor
 - Peer guides
 - Fellow students

I'll now demonstrate the Blackboard website with the Module Handbook, the Talis Reading List, etc.

Click on this link:

<https://blackboard.bangor.ac.uk/ultra/>

What we measured in the practical class

About 50 people, five taps each, twice.

On the screen: the class's reaction times.

- Where is the middle of the room?
- How wide is the spread?
- Did your second round agree with your first?

Whatever your number, something like **a quarter of a second** passed between the screen changing and your finger moving.

Where did it go?

Switch to the Excel W01_chart tab (histogram, then round 1 vs round 2 scatter). Two minutes at most. Take one answer to each question from the room, then land the fragment. Do not explain anything yet; the next slide does.

Reaction time, taken apart

Eye detects → Brain perceives → Brain decides → Brain plans → Spinal cord relays → Muscle contracts

Every box costs time. Every box can be trained, fatigued, distracted, or fooled.

This module walks the chain, one box at a time.

Point at boxes, not at words. Green boxes: biology (Weeks 2, 4, 8). Blue: cognition (Weeks 5, 7, 11). Yellow: behaviour, what a coach can see (Weeks 8, 9, 10). Don't give the week numbers here; the roadmap does.

Definitions

Sport and Exercise Psychology is the:

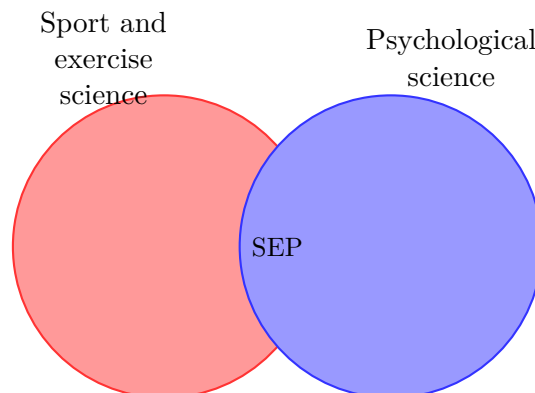
- **study** of people's behavior, thoughts, and feelings in sport and exercise contexts
- **applications** of that knowledge

The ABC of Psychology

- **Affect (Feelings):** Emotions, moods; Stress, anxiety; Motivation
- **Behavior (Actions):** Performance, habits; Communication; Leadership
- **Cognition (Thoughts):** Beliefs, attitudes; Decision-making; Problem-solving

Discipline location in relation with Sport Science and Psychology

Sport and exercise psychology lives in the *intersection* of sport and exercise science and psychological science



Two objectives

We will review in turn each of the two objectives: sport and exercise.

Sport and exercise psychology objectives:

- Sport Exercise (bidirectional relationship)

Objective: Sport psychology

Understand the effects of psychological factors on physical or motor performance.

Examples:

- What are the effects of anxiety on basketball free-throwing accuracy?
- Does greater self-confidence improve a child's ability to learn to swim?
- Do psychological skills (e.g., imagery) facilitate injury recovery

Objective: Exercise Psychology

Understand the effects of physical activity on psychological development, health, and well-being.

Examples:

- Does running reduce anxiety and depression?
- Does taking physical education classes improve a child's self-esteem?
- Do children become more aggressive by participating in youth sports?

Optional: roles of sport and exercise psychologists

Main roles:

- Research
- Teaching
- Consulting

Research

Goal: Advance knowledge in the field

Where: University or Research Institute

Teaching

Goal: Educate future sport and exercise psychologists

Where: usually in a University

Consulting

Goal: depending on the client (e.g., well-being, performance)

Where: Athletic teams, military, fitness industry

Optional: Two specialties

Main specialties:

- Clinical
- Educational

Clinical sport and exercise psychologists

- Identify and treat individuals with emotional disorders (e.g., anxiety, depression, eating disorders)
- Require clinical license on top of sport and exercise psychology training

Educational sport and exercise specialists

- Not licensed for clinical psychologists
- Extensive training in kinesiology
- Provide “mental coaching” through psychological skills

Optional: Brief historical overview of sport and exercise psychology

Historical timeline:

- 1890-1920s: Early years
- 1920-40s: First laboratory testing
- 1940-60s: Preparation for the future
- 1960-80s: Academic discipline
- 1980-90s: Multidisciplinary science and practice
- 2000-present: Contemporary sport and exercise

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Optional: Development of sport and exercise psychology (scrollable slide)

Early years

- 1890-1920s
- Philosophical perspective
- Experimental perspective
- E.g., Why do cyclists ride faster when racing in groups than individually?

First laboratory testing

- 1920-40s
- Development of laboratories in
- various western countries
- Testing athletes on reaction times, concentration, aggression, etc

Preparation for the future

- 1940-60s
- University professors teaching sport and exercise psychology -First consultants hired by professional athletic teams

Academic discipline

- 1960-80s
- Kinesiology (sport and exercise science) becomes a discipline
- Sport and exercise psychology as part of kinesiology

Multidisciplinary science and practice

- 1980-90s
- Sport and exercise psychology becomes a separate discipline
- Specialty scientific societies and journals

Contemporary sport and exercise psychology

- 2000-present
- Exponential growth
- Esteemed academic discipline
- Recognised practical importance
- Driving knowledge in other fields

Three orientations

Main orientations:

- Social-psychological
- Psychophysiological
- Cognitive-behavioral

Social-Psychological

Study of how individuals are influenced by the social environment and vice versa

Psychophysiological

Physiological activity (e.g., brain waves, heart rate) as markers of psychological states (e.g., concentration, attention)

Cognitive-behavioural

Mental processes (e.g., memory, attention, language, perception) driving observable behaviour (e.g., performance, decisions)

Where this module sits

Social-psychological

Teams, coaches, culture, motivation climates

Other modules, other years

Psychophysiological and cognitive-behavioural

Brain, nerves, muscles, and the mental processes that connect them to performance

This module

Same discipline, same definition, same ABC. We are taking the biological and cognitive route through it.

Timetable

Click on this link:

https://bangoroffice365-my.sharepoint.com/:x:/g/personal/grg20plq_bangor_ac_uk/IQCr67CxHvWQQIH1T8fXsYvdAXu_Z2h_tUBTj4a-I-gIAM0?e=JUqd0a

How a week works

Lecture, 2 hours

- Slides and reading on Blackboard before the session
- Questions welcome at any point
- Slides titled *Optional* go further than the coursework and exam do. They are there for the curious but not assessed.

Practical, 1 hour

1. **Measure** something about yourself
 2. **Pool** it anonymously through a form on your phone
 3. **Look** at the class's data together
- NB: Nothing you type is ever linked to your name.
 - Some weeks are in the computer room and use Excel Online. If you have never used a spreadsheet, that is fine. It starts with typing one number into one cell.

Say the last two sentences slowly. This is the slide that decides whether the nervous students come back to Week 3.

Assessment

Coursework · 40% · 1-hour online test

- Opens in Week 6, after we read one scientific paper together. Two weeks to complete it.
- Questions on what that paper found and how its ideas connect to practice.
- *Everything you need will have been covered in class.*

Exam · 60% · 2 hours

- January exam period.
- Questions on the core concepts from Weeks 2–11 and their relevance to sport and exercise.
- *Optional slides and “if you have time” boxes are not examined.*

Full details, dates and marking criteria: module handbook on Blackboard ([link](< <https://blackboard.bangor.ac.uk/ultra/> >)).

Review questions

Discuss in small groups

1. What is sport and exercise psychology? What are its two objectives?
2. Which of the three orientations does this module take, and why?
3. In your own words: what happens between the screen turning green and your finger moving?

Science vs practice | Sport and exercise psychology as science



Tenets of the scientific method:

- Systematic approach to studying a question
- Control/manipulation of conditions
- Empirical (based on observations)
- Objective evidence and not opinions
- Critical analysis of measurements and ideas

A major objective of the application of the scientific method is the development of a **theory**

What is a **theory**?

- Not a speculative guess...
- ...but a set of interrelated facts on a certain phenomenon
- Describes the **what** of a certain phenomenon
- Explains the **how** and **why** of its mechanisms
- Supported by **empirical evidence**
- Makes **testable predictions**

Science vs practice | Sport and exercise psychology as practice



- Guided by trial-and-error learning
- Based on systematic observation, personal experience, introspection, intuition, ...and scientific method

Compared to scientific knowledge:

- More holistic (global)
- Quicker to implement novel ideas
- Produces fewer or no explanations
- Affected by bias and less reliable

Critical reflections | small-group activity

You are interested in studying the effects of two strategies of penalty taking in football/soccer.

Strategy A. Pick a target and ignore any goal-keeper's movements

Strategy B. Observe the goal-keeper movements during the run-up and then decide where to place the ball

How would you design an experimental study to test which strategy leads to better performance outcome?

Think about participants, Instructions, Measurements, Groups/Conditions, Analysis

Somebody ran a similar study. Navarro and colleagues (2013) discussed these two strategies and tested one of them with real penalty takers and a real goalkeeper, under different experimental conditions.

NB: You will read the paper in a later session. Your coursework is on it.

Institute for the Psychology of Elite Performance



<https://ipep.bangor.ac.uk/>

Further Reading

- [Why elite athletes are harnessing their own brain waves for sporting success](#)
- [Golf: The neuroscience of the perfect putt](#)
- [Unlocking the secrets of flawless putts: Understanding human performance in high-pressure situations](#)

Review (MCQs 1)

1) Which best describes Sport and Exercise Psychology?

- A) The study of physical training methods
- B) The study and application of behaviour, thoughts, and feelings in sport/exercise contexts
- C) The study of nutrition in sport
- D) The application of biomechanics to performance

correct answer: B

Review (MCQs 2)

2) Which is NOT one of the two main objectives?

- A) Understanding effects of psychological factors on performance (Sport)
- B) Understanding effects of physical activity on health and well-being (Exercise)
- C) Developing strength and conditioning programmes
- D) Understanding psychological development related to activity (Exercise)

correct answer: C

Optional (MCQs 3)

3) Which population is explicitly within Sport/Exercise Psychology's remit?

- A) Only elite athletes
- B) Only children and adolescents
- C) Children, people with disabilities, elderly, recreational, and elite athletes
- D) Only adults in clinical care

correct answer: C

Optional (MCQs 4)

4) Which role focuses on advancing knowledge?

- A) Teaching
- B) Consulting
- C) Research
- D) Personal tutoring

correct answer: C

Optional (MCQs 5)

5) Which statement about specialties is true?

- A) Educational specialists diagnose and treat emotional disorders
- B) Clinical SEP require an additional clinical licence
- C) Clinical SEP do not work with mental health issues
- D) Educational SEP cannot work in universities

correct answer: B

Review (MCQs 6)

6) Which best matches the psychophysiological orientation?

- A) Studying social context effects on individuals
- B) Using brain waves/heart rate as markers of psychological states
- C) Emphasising thoughts driving behaviour
- D) Analysing technique via biomechanics

correct answer: B

Review (MCQs 7)

7) A core tenet of the scientific method is:

- A) Relying on expert opinion over data
- B) Systematic approach and control of conditions
- C) Avoiding replication
- D) Prioritising intuition

correct answer: B

Review (MCQs 8)

8) A scientific theory is best described as:

- A) A speculative guess
- B) A set of interrelated facts describing, explaining, and predicting a phenomenon
- C) A personal belief supported by anecdote
- D) A single confirmed hypothesis

correct answer: B

Review (MCQs 9)

9) In the chain from screen to finger, which of these happens **last**?

- A) The brain decides to respond
- B) The spinal cord relays the command
- C) The eye detects the change
- D) The brain perceives that the screen changed

correct answer: B

Review (open questions)

Discuss briefly in pairs/small groups in class/after class:

- 1) Give two real-world examples of science or practice of Sport and Exercise Psychology you've encountered.
- 2) Contrast “science” vs “practice” in Sport and Exercise Psychology: what are the strengths and limitations of each?