University of Thessaly

Department of Physical Education & Sport Science

MSc

Sport & Exercise Psychology

Research Methods & Statistics

Research Methods & Statistics

Module outline

Part 1. Introduction to research methods (3 sessions)

Part 2. Quantitative Research (6 sessions)

the use of statistics

Part 3. Qualitative Research (3 sessions)

Research Methods & Statistics

Assessment

1. An early-term exam on research methods (30%).

(week 4 or week 5)

Research Methods & Statistics

Assessment

2. Research Abstract

A joint small-scale study will be carried out.

(a) Preparing data file
(b) Handling data
(c) Analyzing data
(d) Writing a 250 words research abstract.

Deadline: 18 December 2016

Research Methods & Statistics

Assessment

3. A dual **Research Proposal** (50%)
A proposal presenting how a particular research problem can be addressed using both a quantitative and a qualitative approach (2500 words).

Deadline: 29 January 2016

Research Methods & Statistics

Research Proposal

Introduction stating ONLY (a) the purpose and significance of your study (not a review of the literature) (5%) and (b) the importance of using both quantitative and qualitative methodological approaches for the investigation of the research question (15%)

Methods

Quantitative Part: Outline the quantitative methods that will be used describing (a) sampling and participants, (b) measures and instruments, and (c) procedures. (15%)

Qualitative part: (a) Outline the qualitative approach that will be used, including the major research question(s) you plan to ask, the data you wish to collect and analyze, your relationship to the topic and the participants being studied; (b) the challenges you anticipate to face when conducting the study (15%)

Introduction to Research Methods

Research

What is Research?

Understanding of reality* & quest for knowledge

Kerlinger, 1986

*even though reality is perceived in different ways

by different research philosophies / paradigms

Research

What are the goals of Research?

- Description
- Interpretation
- Prediction
- Intervention & Change

Sport Psychology Research

Domains of Research

- Human Performance

  Competitive sport

- Exercise and Physical Activity

  Recreation, Health, and Quality of life

- Physical Education

  Heath education

Sport Psychology Research

Objects of Research

- Cognition
- Emotion
- Behaviour

Sport Psychology Research

Most popular topics (since the 90s)

- **Motivation**
- **Anxiety**
- Psychological skills
- Team dynamics
- **Physical activity & health**

Research Methods

Research & Research Methods

Research Steps

- I consider
- I plan
- I do
- I write

Research & Research Methods

What is Research Methods?

The understanding of the Scientific research processes

- Designing
- Conducting
- Reporting

Research & Research Methods

Levels of research - Research focus

Basic research ---------- Applied Research

theory development	'real world' problems
most control	limited control
limited direct applied value	immediate applied value

<u>Examples</u>

A. Immediate effects of smoking on selective attention.

B. Effectiveness of a anti-smoking program on smoking behaviour.

Research & Research Methods

Levels of Research - Research settings

Field	Laboratory
real setting	controlled environment
real conditions	manipulation
ecological validity	desired conditions

Examples 1.

A. Relationships between goal involvement and enjoyment in primary school children.

B. The effect of goal difficulty on persistence on a rowing task.

Examples 2.

A. The relationship between anxiety and performance in young archers.

B. The relationship between anxiety and performance in young archers.

Research & Research Methods

Levels of Research - Research design

Cross-sectional	Longitudinal
comparison	development
between-participants	within-participants
relationship	+ causality

Examples 1.

A. Differences in fair-play between male and female primary school children.

B. The effects of a year-long motivational intervention on elders' physical activity.

Examples 2.

A. The relationship between competitive experience on competitive anxiety

B. The relationship between competitive experience on competitive anxiety

Types of research

Analytical Research
- Review (critical / systematic)
- Meta-analysis

Descriptive Research
- Survey - Epidemiological
- Correlational
- Observation
- Case studies

Experimental Research

Qualitative Research

Psychometric Research

Analytical research

Review

Comprehensive and critical overview of a research topic.

- Perspectives
- Research questions
- Approaches & Methods
- Models & Hypotheses
- Findings
- Critique & directions

example

Hardy, J. (2006). Speaking clearly: A critical review of the self-talk literature. *Psychology of Sport and Exercise, 7,* 81-97.

Analytical research

Meta-analysis

Synthesis of findings on a particular relationship / model / theory

- Accumulation of all available findings
- Effect size
- Moderators (regulating factors)
- Critique & Directions

example

Hatzigeorgiadis, A., Zourbanos, N., Galanis, E., & Theodorakis, Y. (2011). Self-talk and sports performance: A meta-analysis. *Psychological Perspectives, 6*, 248-256.

Descriptive research

Survey

Investigation of opinions, attitudes, behaviours of a population

description – generalization – norms

comparison

questionnaires – (interviews) / self-reports

sampling

Example

Theodorakis, Y., Papaioannou, A., Hatzigeorgiadis, A., & Papadimitriou, E. (2005). Children's profile of healthy and unhealthy behaviors: Demographic characteristics and perceptions of social environment. *Hellenic Journal of Psychology, 2,* 225-242

Descriptive research

Correlational research

Investigation of variables to explore relationships

cognitive – affective – behavioural

prediction (not causality)

objective measures & self-reports

example

Hatzigeorgiadis, A., & Biddle, S.J.H. (2008). *Negative self-talk during sport performance: Relationships with pre-competition anxiety and goal-performance discrepancies. Journal of Sport Behavior,31, 237-253.*

Descriptive research

Case study

Detailed investigation of a particular units (individual, group, team) to understand its particular functioning, similarities and differences with other units

usually (but not always) qualitative methods

in depth analysis

particularities

example

Jowett, S (2003). When the honeymoon is over: A case study of a coach-athlete dyad in crisis. *The Sport Psychologist, 17*, 444-460.

Descriptive research

Observation

Observing individuals in naturalistic settings, mostly behaviour, to describe and interpret independently

not relying on self-report

descriptive – evaluative

limited access to perceptions – cognition – affect

time consuming

example

Boubaki, S., Hassandra, M., & Hatzigeorgiadis, A. (2010). *Moral behavior in Physical Education: An observation of pro-social and antisocial behaviours in real settings*. International Conference on Psychology of Physical Activity, Trikala, Greece.

Experimental research

The most scientifically appropriate method to test and support causal relationships among variables.

control for extraneous variables

manipulation (independent variable)

evaluation of outcome (dependent variable)

laboratory (mostly) but field also

example

Hatzigeorgiadis, A., Zourbanos, N., Mpoumpaki, S., & Theodorakis, Y. (2009). Mechanisms underlying the self-talk – performance relationship: The effects of motivational self-talk on self-confidence and anxiety. *Psychology of Sport and Exercise, 10*, 186-192.

Qualitative research

In depth investigation and collection of data and information based on interviews, discussions, and narratives

thorough analysis

not hypothesis based

subjective interpretation (researcher & participant)

grounded theory

example

Shillinga, C. & Bunsell, T. (2009). The female bodybuilder as a gender outlaw. *Qualitative Research in Sport and Exercise, 1*, 141–159.

Research Steps

Preliminary stages – I consider

Selections of scientific domain

Identification of the (or your) ‘problem’

Research Steps

Introductory stages – I read

Study of the literature

More study of the literature

Formulation of Research question(s)

Research Steps

Designing stages – I plan

Selection of variables & Formulation of questions / hypotheses

Selection of participants

Measures & Selection of instruments

Research Steps

Conducting stages – I do

Data collection

Data analysis

Interpretation

Research Steps

Reporting stages – I write

Thesis

Presentations

Journal articles

Research Steps

I'm done

… ???

Research Steps

I consider

I read

I plan

I do

I write

I read

How to …

Get familiar with the research area – choose the one you like

Read the papers you are mostly interested in

Read the abstract to check if this is what you want to read

Read the introduction to understand what it's about and get ideas

Read the method to understand how the study was designed and conducted

Read the results (but don't mess with statistics if not ready)

Read the discussion to understand what the results mean

Read critically

Read Thomas & Nelson – Read papers

Research Steps

I consider

I read

I plan

- variables & hypotheses
- participants
- measures & instruments

I do

I write

I plan

→ Hypothesis

relation between variables

→ Variables

what can vary (and we measure)

Variables

- sex
- age
- height
- weight
- BMI
- training method
- performance
- anxiety
- confidence
- smoking

Types of Variables

- Continuous

vary in quantity

measured in metric system

age, BMI, time

- Categorical

vary in quality

values represent characteristics

sex, training method, sport

Types of Variables

➢ Independent	➢ Dependent
Antecedent	Consequence
Cause	Effect
Experimental treatment	Outcome
Influence dependent	Influenced by independent

Types of Variables

The effect of sex on vertical jump performance

Variables

Sex	Categorical / 2 levels Independent
Vertical jump	Continuous Dependent

Examples

Identify in the titles below the variables and their attributes

The effect of imagery training on free throwing performance

The effect of aerobic exercise and resistance training on enjoyment and exercise adherence

Changes in mood states before and after vigorous physical activity

The impact of a life-skills program on students self-determination

Preferences in leadership style among athletes competing at local and national level.

Changes in body esteem in middle aged women as a function of participation in organised physical activity programs

Hypothesis

... hypothetical statement regarding the relationship between two or more variables

statement

testable

providing an anticipated result / outcome

• Research question
can imagery improve free throwing performance?

→Research Hypothesis
Imagery training will improve free throwing performance in basketball players

Hypothesis

Statistical hypotheses

Null hypothesis

hypothesis of no differences / relationships

Alternate hypothesis

opposite of null without hypothesis

non-directional - no specific prediction (direction) on differences/relationships

directional - specific prediction (direction) on differences/relationships

* More … when statistics come

Hypothesis

Null hypothesis
basketball players using imagery training will not differ on free throwing percentages from players not using imagery training

Alternate non-directional hypothesis
basketball players using imagery training will differ on free throwing percentages from players not using imagery training

Alternate directional hypothesis
basketball players using imagery training will have better free throwing percentages than players not using imagery training

Examples

For the following research questions:

1. Identify variables

2. Form
(a) Null hypothesis
(b) Alternate non-directional hypothesis
(c) Alternate directional hypothesis

- Competitive anxiety as a function of sex
- The effect of age on reaction time
- Differences between primary and secondary school students on goal orientations

Research Steps

I plan

- variables & hypotheses
- participants
- measures & instruments

Sampling

… selecting a part (sample) out of a total (population) …
aiming at studying the part and making inferences for the total

Population
the total of individuals comprising a group (students of the UTH; postgraduate students of the DPESS)

Sample
part of the population that best represents the population

Sampling Procedures

Representative sample – Who & How many

- Size of population
- Accuracy of conclusions
- Homogeneity of population
- Type of research

descriptive research

population <1.000 appx 30%
10.000 apprx 10%
>150.000 apprx 1%
>10.000.000 apprx 0.025%

experimental research

large effect - groups of 10 to 20
medium effect - groups of 20-30

qualitative research – no standards

Sampling methods – Probabilistic

- Random
- Stratified
- Systematic
- In groups
- In stages

Sampling methods – Probabilistic

Random - Lottery

- number members of population (1 – N)
- pick number
- put number back – pick number …

Random numbers Table

- number members of population (1 – N)
- pick starting point and number of digits
- select sample

Random numbers

22 17 68 65 84	68 95 23 92 35	87 02 22 57 51	61 09 43 95 06	58 24 82 03 47
19 36 27 59 46	13 79 93 37 55	39 77 32 77 09	85 52 05 30 62	47 83 51 62 74
16 77 23 02 77	09 61 87 25 21	28 06 24 25 93	16 71 13 59 78	23 05 47 47 25
78 43 76 71 61	20 44 90 32 64	97 67 63 99 61	46 38 03 93 22	69 81 21 99 21
03 28 28 26 08	73 37 32 04 05	69 30 16 09 05	88 69 58 29 99	35 07 44 75 47
93 22 53 64 39	07 10 63 76 35	87 03 04 79 88	08 13 13 85 51	55 34 57 72 69
78 76 58 54 74	92 38 70 96 92	52 06 79 79 45	82 63 18 27 44	69 66 92 19 09
23 68 35 26 00	99 53 93 61 28	52 70 05 48 34	56 65 05 61 86	90 92 10 70 80
15 39 25 70 99	93 86 52 77 65	15 33 59 05 28	22 87 26 07 47	86 96 98 29 06
58 71 96 30 24	18 46 23 34 27	85 13 99 24 44	49 18 09 79 49	74 16 32 23 02
57 35 27 33 72	24 53 63 94 09	41 10 76 47 91	44 04 95 49 66	39 60 04 59 81
48 50 86 54 48	22 06 34 72 52	82 21 15 65 20	33 29 94 71 11	15 91 29 12 03
61 96 48 95 03	07 16 39 33 66	98 56 10 56 79	77 21 30 27 12	90 49 22 23 62
36 93 89 41 26	29 70 83 63 51	99 74 20 52 36	87 09 41 15 09	98 60 16 03 03
18 87 00 42 31	57 90 12 02 07	23 47 37 17 31	54 08 01 88 63	39 41 88 92 10
88 56 53 27 59	33 35 72 67 47	77 34 55 45 70	08 18 27 38 90	16 95 86 70 75
09 72 95 84 29	49 41 31 06 70	42 38 06 45 18	64 84 73 31 65	52 53 37 97 15
12 96 88 17 31	65 19 69 02 83	60 75 86 90 68	24 64 19 35 51	56 61 87 39 12
85 94 57 24 16	92 09 84 38 76	22 00 27 69 85	29 81 94 78 70	21 94 47 90 12
38 64 43 59 98	98 77 87 68 07	91 51 67 62 44	40 98 05 93 78	23 32 65 41 18
53 44 09 42 72	00 41 86 79 79	68 47 22 00 20	35 55 31 51 51	00 83 63 22 55
40 76 66 26 84	57 99 99 90 37	36 63 32 08 58	37 40 13 68 97	87 64 81 07 83
02 17 79 18 05	12 59 52 57 02	22 07 90 47 03	28 14 11 30 79	20 69 22 40 98
95 17 82 06 53	31 51 10 96 46	92 06 88 07 77	56 11 50 81 69	40 23 72 51 39
35 76 22 42 92	96 11 83 44 80	34 68 35 48 77	33 42 40 90 60	73 96 53 97 86
26 29 13 56 41	85 47 04 66 08	34 72 57 59 13	82 43 80 46 15	38 26 61 70 04
77 80 20 75 82	72 82 32 99 90	63 95 73 76 63	89 73 44 99 05	48 67 26 43 18
46 40 66 44 52	91 36 74 43 53	30 82 13 54 00	78 45 63 98 35	55 03 36 67 68
37 56 08 18 09	77 53 84 46 47	31 91 18 95 58	24 16 74 11 53	44 10 13 85 57
61 65 61 68 66	37 27 47 39 19	84 83 70 07 48	53 21 40 06 71	95 06 79 88 54
93 43 69 64 07	34 18 04 52 35	56 27 09 24 86	61 85 53 83 45	19 90 70 99 00
21 96 60 12 99	11 20 99 45 18	48 13 93 55 34	18 37 79 49 90	65 97 38 20 46
95 20 47 97 97	27 37 83 28 71	00 06 41 41 74	45 89 09 39 84	51 67 11 52 49
97 86 21 78 73	10 65 81 92 59	58 76 17 14 97	04 76 62 16 17	17 95 70 45 80
69 92 06 34 13	59 71 74 17 32	27 55 10 24 19	23 71 82 13 74	63 52 52 01 41
04 31 17 21 56	33 73 99 19 87	26 72 39 27 67	53 77 57 68 93	60 61 97 22 61
61 06 98 03 91	87 14 77 43 96	43 00 65 98 50	45 60 33 01 07	98 99 46 50 47
85 93 85 86 88	72 87 08 62 40	16 06 10 89 20	23 21 34 74 97	76 38 03 29 63
21 74 32 47 45	73 96 07 94 52	09 65 90 77 47	25 76 16 19 33	53 05 70 53 30
15 69 53 82 80	79 96 23 53 10	65 39 07 16 29	45 33 02 43 70	02 87 40 41 45
02 89 08 04 49	20 21 14 68 86	87 63 93 95 17	11 29 01 95 80	35 14 97 35 33
87 18 15 89 79	85 43 01 72 73	08 61 74 51 69	89 74 39 82 15	94 51 33 41 67
98 83 71 94 22	59 97 50 99 52	08 52 85 08 40	87 80 61 65 31	91 51 80 32 44
10 08 58 21 66	72 68 49 29 31	89 85 84 46 06	59 73 19 85 23	65 09 29 75 63
47 90 56 10 08	88 02 84 27 83	42 29 72 23 19	66 56 45 65 79	20 71 53 20 25
22 85 61 68 90	49 64 92 85 44	16 40 12 89 88	50 14 49 81 06	01 82 77 45 12
67 80 43 79 33	12 83 11 41 16	25 58 19 68 70	77 02 54 00 52	53 43 37 15 26
27 62 50 96 72	79 44 61 40 15	14 53 40 65 39	27 31 58 50 28	11 39 03 34 25
33 78 80 87 15	38 30 06 38 21	14 47 47 07 26	54 96 87 53 32	40 36 40 96 76
13 13 92 66 99	47 24 49 57 74	32 25 43 62 17	10 97 11 69 84	99 63 22 32 98

Sampling methods – Probabilistic

Systematic

- number members of population (1 – N)
- divide population (N) by required sample size (n)
(κ = N / v, π.χ. κ = 500 / 50 = 10)
- pick a number (x) from 1 to k (e.g. 6)
- select sample by adding x to k .. x+κ, x+2κ, x+3κ, … (e.g. 6, 6+10, 6+20, 6+30, …) until you reach target

Stratified

Population is categorized based on certain characteristics (e.g. sex)

Sample selected randomly but following the ratio of the population

Sampling Methods – Non Probabilistic

Opportunity

Asking individuals to participate

Volunteer

Individual offer to participate

Less scientific – More popular

Research Steps

I plan

- variables & hypotheses
- participants
- measures & instruments

What do we generally measure

Performance

Behaviour

Dispositional characteristics

Situational states

Attitudes

Emotions

Knowledge

What do we measure in Sport & Exercise Psychology*

Motivation & perceived competence
- motives
- goal perspectives
- self-efficacy
- intrinsic & extrinsic motivation
- competence

Anxiety and coping
- trait anxiety
- state anxiety
- coping strategies & styles

Psychological skills
- goal setting
- imagery
- self-talk

*Advances in sport & exercise psychology measurement (Duda, 1998)

What do we measure in Sport & Exercise Psychology

Group processes & dynamics
- cohesion
- leadership

Morality
- moral behaviour, judgment, attitudes
- aggression

Self concepts
- self-esteem
- physical self-perceptions
- body image

Health related factors
- physical activity & exercise behaviour
- smoking - drinking – substance use

How do we measure

Performance measures & instruments

Questionnaires

- content
  - Development - Psychometric theory
  - Evaluation - Psychometric testing
- response format
  - likert scales
  - semantic differential scales
  - rating scales

likert scale

Semantic differential scale

Rating scale

How do we measure

Questionnaires

- length
  - small vs large
- instructions
  - clarity & confidentiality
- self-reports
  - + easy access - mass data
  - + access to what cannot be ‘seen’
  - - social desirability
  - - boredom

Psychometric Properties

Validity

the degree to which a measure measures what it is supposed to measure

Reliability

the degree to which a measure measures with consistency what it measures

Is a valid measure always reliable?

Is a reliable measure always valid?

Validity

Types of Validity

- face validity
- content validity
- construct validity
- concurrent validity
- discriminant validity
- predictive validity
- convergent validity

Validity

Face validity

the degree to which a test measures what it seems to measure

Not necessary condition. Sometimes not desired (personality testing)

Complexity of construct may decrease face validity

Validity

Content validity

the degree to which a test assesses all dimensions of a construct

e.g. multiple dimensions of basketball ability (speed, strength, dribbling, shooting, passing, vision, …)

e.g. multiple dimensions of personality

Validity

Concurrent validity

the degree to which the results of a test concur with the results of another validated test that assesses the same construct.

e.g. a short form of a questionnaire compared to the full version

Validity

Discriminant validity

The degree to which a test can categorize individuals into groups based on the characteristic that is assessed.

e.g. individual with high trait anxiety from individuals with low trait anxiety

Validity

Predictive validity

the degree to which the results of a test can predict the results of a different test or the results of the same test in the future

e.g. attitudes towards smoking predicting smoking behaviour in the future

Reliability

Types of reliability

Stability

Internal consistency

Objectivity

Reliability

Stability

The degree to which a test gives stable results across time (given that the assessed construct remains unchanged)

e.g. measures of personality within a month's interval

Reliability

Internal consistency

The degree to which the components of a test are strongly inter-related, and also related to the final test result.

e.g. The relationships between the items of a confidence questionnaire.

Reliability

Objectivity

the degree to which a test provides the same results regardless of who uses it (not so frequent in psychology).

e.g. measures of skinfolds by different researchers

Reliability

Factors influencing reliability

Situational factors
- fatigue, motivation

Test factors
- length, instructions

Researcher
- ability, familiarization

Procedures
- accuracy, number of repeats

Research Steps

I consider

I plan

I do

- Data collection
- Data analysis
- Interpretation

I write

Data Analysis

The use of Statistics

Essential tool for Research (at least quantitative)

Data analysis – Results

BUT ALSO

the most important element to designing research

Results

Descriptive statistics – Basic indices

- Information regarding (description) variables

Continuous variables (e.g. age)
Mean (21.34 years)
Standard deviation (2.13)
Range (16-28)

Categorical Variables (e.g. sex)
Frequencies (37 males / 43 females)

Statistical Analyses

Basic (simplistic) types of data analyses

- Relationships between variables
- Mean differences

Depends on …

- research question
- variables and measurement scales

Statistical analyses

Relationships

- relationship between age and competitive anxiety
- relationship between anxiety and performance

(Correlations - Regression)

Differences

- differences between males and females on self-esteem
- differences in performance before and after mental training program

(t-tests – Analysis of Variance)

Research Steps

I consider

I plan

I do

I write

I write

What is the problem/research question → **Introduction**

How the problem was investigated → **Method**

What was found → **Results**

What does it mean → **Discussion**

Parts of Research

Introduction

- Description of the broader ‘problem’ – issue
- Presentation of constructs and relevant theories
- Review of the existing literature
- Importance of the study – Contribution to the literature
- Purpose of the study
- Research hypotheses

Example exercise

Research topic

Being favourite to win increases athletes' anxiety.

Description of the broader 'problem' – issue
Presentation of constructs and relevant theories
Review of the existing literature
Importance of the study – Contribution to the literature
Purpose of the study
Research hypotheses

Method

Participants

- Description of sampling procedures
- Characteristics of participants

    demographics (sex, age, experience, …)

    groups membership

    informed consent

Method

Measures & Instruments

- What was measured - variables
- Task description
  - evaluation
  - norms
- Questionnaires
  - scales & subscales
  - example items
  - scoring
  - validity & reliability

Method

Procedures

Description that allows precise replication

- Research design
- Preparation
- Ethics approval
- Communication with participants
- Administration of measures
- Instructions
- Experimental conditions
- Treatments
- Controls

Method

Analyses

- Presentation of statistical analyses that will be used
- Purpose of each analysis

Example exercise

Research topic

Being favourite to win increases athletes' anxiety.

Participants

Measures

Procedures

Parts of Research

Results

- Descriptive Statistics
- Main analyses – Hypothesis testing
- Tables and Figures

Parts of Research

Discussion

- Overview of results
- Hypothesis testing outcome
- Interpretation of results – link to theory
- Comparison with relevant studies
- Practical Implications
- Limitations
- Directions of future research
- Conclusion - Contribution to the literature

Textbooks

Thomas, J. R. & Nelson, J. K. (2003). *Research methods in physical activity*. Champaign, Ill: Human Kinetics.

Dyer, C. (2006). *Research in Psychology*. MA: Blackwell.

Duda, J. L. (1998). *Advances in sport and exercise psychology measurement*. Morgantown, W.Va: Fitness Information Technology.