NORGES IDRETTSHØGSKOLE

MASTER PROGRAMS 2026/28

INDIVIDUAL EXAM

IN

MET 401- RESEARCH METHODS AND STATISTICS

Information

- Start of exam: Thursday October 29, 2026, at 10.00 a.m
  - End of exam: Thursday October 29, 2026, at 14.00 p.m. in WISEflow
  - Exam results will be available within three weeks from the exam date: 19th of November 2026
  - Aids: None
  - Give your answer in English or Norwegian

The examination takes the form of an incomplete manuscript for an article. The manuscript contains a brief introduction and parts of the methods section, followed by defined tasks. You are not required to conduct analyses in SPSS or use a dataset. Instead, describe which analyses could be used, how results should be presented and interpreted, and critically reflect on methodological strengths and weaknesses. The total score is 100 points.

Article manuscript

Title: Device-measured physical activity, health behaviours and wellbeing in Norwegian adults - a population-based cross-sectional study

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Introduction

Regular physical activity is associated with better physical and mental health. Current recommendations advise adults to undertake at least 150-300 minutes of moderate-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity activity, each week (Bull et al., 2020). Population surveillance is needed to estimate how many adults reach recommended levels and to identify groups with low activity.

Questionnaires are practical in large studies but may be affected by recall and social-desirability bias. Accelerometers can describe the intensity and temporal pattern of movement without relying on recall, although estimates depend on device placement, wear-time criteria and analytical decisions (Migueles et al., 2022). Sociodemographic factors, health related quality of life and health behaviors such as smoking and diet may also be associated with both physical activity and health outcomes.

The aims of this study were to estimate the prevalence of adults meeting the aerobic physical-activity guideline and to examine whether selected sociodemographic and health-behaviour factors were associated with device-measured physical activity. The study also examined cross-sectional associations of physical activity with health-related quality of life and obesity.

Methods

Design and sample

A stratified random sample of 6,000 adults aged 18-79 years was drawn from the Norwegian National Population Register. Of those invited, 2,800 consented and attended the examination, and 2,360 provided valid accelerometer data. Basic information on age and sex was available for the full invited sample. The study was approved by the Regional Committee for Medical and Health Research Ethics and reported to Sikt. All participants gave written informed consent.

Physical activity

Participants wore a triaxial accelerometer on the hip continuously for seven days. A valid record required at least four days, with at least 10 hours of waking wear per day.

Prespecified algorithms classified time as sedentary, light-intensity or moderate-to-vigorous physical activity. The study defined meeting the aerobic PA guideline as accumulating at least 150 minutes of device-estimated moderate-to-vigorous physical activity during a valid week. Daily step count and sedentary time were also derived.

Health behaviours

Questionnaires assessed current smoking, coded as yes or no, and diet was assessed using a 12-item index scored from 0 to 12, with higher scores indicating closer adherence to dietary recommendations. Highest completed education was classified as lower secondary education or less, upper secondary education, or tertiary education. Trained staff measured height, weight and waist circumference. Body mass index was calculated as weight in kilograms divided by height in meters squared, and obesity was defined as a body mass index of at least 30 kg/m².

Quality of life

Health-related quality of life was assessed with a validated scale ranging from 0 to 100, with higher scores indicating better quality of life. All measurements were collected during the same study period.

Tasks

TASK 1 Statistical analysis and presentation I (20 points)

Estimate the prevalence of meeting the aerobic physical-activity guideline in the population and examine factors associated with meeting the guideline.

A) Describe how you would estimate of the prevalence of meeting the aerobic physical-activity guideline in women and men and for examining whether the prevalence differs by sex.

B) Describe suitable crude and adjusted analyses for examining whether education, current smoking and diet score are associated with meeting the guideline. Specify how the variables should be included and justify the effect measure.

C) Explain the important assumptions for the analyses and how the prevalence and association results should be presented in tables, figures and text.

TASK 2 Statistical analysis and presentation II (20 points)

Examine the association between daily moderate-to-vigorous physical activity and health-related quality of life.

A) Describe appropriate crude and adjusted statistical analyses and justify your choices.

B) Explain the most important assumptions relevant to the analyses.

C) Explain how the results should be presented and which effect measures and uncertainty estimates should be reported.

D) In a model adjusted for age, sex, education, smoking and diet score, the quality-of-life score is 1.8 points higher per additional 30 minutes of moderate-to-vigorous physical activity per day (95% CI 0.9-2.7; $p < 0.001$). Interpret this result.

TASK 3 Statistical analysis and presentation III (20 points)

Examine whether meeting the aerobic physical-activity guideline is associated with obesity.

A) Describe suitable crude and adjusted analyses and justify the selection of covariates.

B) Explain important assumptions relevant to the analyses.

C) The adjusted odds ratio for obesity is 0.68 for adults meeting versus not meeting the guideline (95% CI 0.57-0.82; $p < 0.001$). Explain how this result should be presented and interpreted.

TASK 4 Measurement methods and uncertainty (20 points)

For this task, focus on device based physical activity and self-reported diet.

A) Discuss in general terms the strengths, weaknesses and suitability of these two measurement methods for the stated study aims.

B) Discuss how random and systematic measurement error may affect the prevalence and association estimates.

C) Explain how the reliability and validity of these measures could be investigated or supported, and why standardization is important.

TASK 5 Overall methodological reflection (20 points)

Use the manuscript as point of reference

A) Explain why a cross-sectional design is suitable for some, but not all, of the study aims

B) Assess the generalizability of the study

C) Define the term confounding and discuss why addressing potential confounding is important in cross sectional and longitudinal studies. You may use TASK 2D to exemplify.

D) Discuss the most important research ethics considerations.

References

Bull FC, Al-Ansari SS, Biddle S, Borodulin K, Buman MP, Cardon G, Carty C, Chaput JP, Chastin S, Chou R, Dempsey PC, DiPietro L, Ekelund U, Firth J, Friedenreich CM, Garcia L, Gichu M, Jago R, Katzmarzyk PT, Lambert E, Leitzmann M, Milton K, Ortega FB, Ranasinghe C, Stamatakis E, Tiedemann A, Troiano RP, van der Ploeg HP, Wari V, Willumsen JF. World Health Organization 2020 guidelines on physical activity and sedentary behaviour. Br J Sports Med. 2020 Dec;54(24):1451-1462. doi: 10.1136/bjsports-2020-102955. PMID: 33239350; PMCID: PMC7719906.

Migueles JH, Aadland E, Andersen LB, Brønd JC, Chastin SF, Hansen BH, Konstabel K, Kvalheim OM, McGregor DE, Rowlands AV, Sabia S, van Hees VT, Walmsley R, Ortega FB; External review group. GRANADA consensus on analytical approaches to assess associations with accelerometer-determined physical behaviours (physical activity,

sedentary behaviour and sleep) in epidemiological studies. Br J Sports Med. 2022 Apr;56(7):376-384. doi: 10.1136/bjsports-2020-103604. Epub 2021 Apr 12. PMID: 33846158; PMCID: PMC8938657.

Thomas JR, Nelson JK, Silverman SJ. Research methods in physical activity. 8th ed.. Champaign: Human Kinetics; 2022.