NTNU – Trondheim
Norwegian University of
Science and Technology

Exam SPO 3055 research methods in exercise physiology – 26-30.11.2012

1. What should you consider while preparing and writing a review paper?

2. Although suggestions that tobacco might be related to lung cancer had been made by clinicians as far back as 1912, and several studies had provided some evidence for this, it did not receive general attention until 1950 when the JAMA published two papers on this subject in its issue of May 27, one by Wynder and Graham (1) and the other by Levin, Goldstein and Gerhardt (2), and the BMJ published a similar report by Doll and Hill (3) on September 30. Wynder and Graham (1) studied 684 cases of microscopically confirmed bronchogenic carcinoma; these included 605 male and 25 female patients with epidermoid, undifferentiated and unclassified carcinomas and 39 male and 15 female patients with adenocarcinoma. The patients came from hospitals and private practices of physicians in various US states and cities. A standard questionnaire form was used which included questions on history of other lung diseases, smoking, occupation, exposure to dusts and fumes, alcohol intake, residence, education, and cause of f death of parents and siblings. Personal interviews were obtained in 634 cases, a mailed questionnaire was used in 33 cases, and the information was obtained in 17 cases from a person who had known the patient intimately throughout his adult life. The physician authors of the report apparently conducted these interviews.
In addition, two nonmedical investigators interviewed 780 male and 552 female patients without cancer of the lungs on the general surgical and medical services at three hospitals in St. Louis. The age-adjusted data on smoking habits for the 605 male lung cancer patients and the 780 male controls follow:

	Percentage Distribution	
Amount of Cigarette, Smoking for 20+ years *	Lung cancer patients	Controls
None (less than 1 per day)	1.3	14.6
Light (1-9 per day)	2.3	11.5
Moderately heavy (10-15 per day)	10.1	19.0
Heavy (16-20 per day)	35.2	35.6
Excessive (21-34 per day)	30.9	11.5
Chain (35+ per day)	20.3	7.6

* Counting 1 cigar as 5 cigarettes and 1 pipeful as 2 ½ cigarettes included pipe and cigar smoking. Among the lung cancer patients, 4% were pipe smokers (controls, 12.4%) and 3.5% were cigar smokers (controls, 7.8%).

Question 2a:
What type of study is this? Why are the data age-adjusted?

Question 2b:
What does 'association' mean? Would you conclude from these data that an association exists between smoking and lung cancer?

Question 2c:
What additional data would be helpful?

Doll and Hill (3) studied 702 patients with carcinoma of the lung, 637 patients with carcinoma of the stomach, colon or rectum, and 709 non-cancer control patients. The study was conducted in 20 London hospitals, which notified the investigators of all patients admitted with carcinoma of the lung, stomach, colon, or rectum. Four social workers interviewed the patients using a set questionnaire. For each lung cancer patient, the social worker was instructed to interview as a control of the first patient on the ward lists of the same sex, within the same five-year age group, and with a diagnosis other than cancer. For all patients, the final diagnosis on discharge was checked.The authors report that the diagnosis in 489 of the lung cancer patients was confirmed by autopsy, biopsy, or exploratory operation, while in 220 patients other diagnostic criteria were used. A greater percentage of the lung cancer patients than the non-cancer controls came from social classes IV and V (semi-skilled and unskilled laborers) but the differences were not statistically significant. A significantly higher proportion of the lung cancer patients than the non-cancer controls were residents of small towns and rural areas outside London, but this was not true for the 98 cases and 98 controls seen at the district hospitals, i.e. hospitals without special chest surgery or radiotherapy centres.

Question 2d:
What is meant by the term 'statistically significant'?

Question 2e:
Why do authors present the data on social class and residence?

3. Through epidemiological and clinical studies your research group and others have observed that aerobic fitness predicts longevity (individuals with high aerobic capacity have a higher life expectancy than individual with low aerobic capacity) and that a gene named x10 is more expressed in the individuals with high aerobic fitness. You do not known whether the individuals with high aerobic capacity exercise more or whether they are naturally born with a high aerobic capacity. Furthermore, the function of the x10 gene is not known and you do not know if the gene expression changes following exercise training. You are planning new sets of experiments and realize that in order to understand these observations better, you need to conduct some animal research.

3a. Discuss briefly pros and cons of animal research. Include the key words; *human physiology*, *species differences*, *cause and effect* and *ethics.*

3b What is translational research and what is the major advantage with this approach?

3c. Design an animal study. The study proposal should include a short background (5-10 lines; use the text above as the base), hypotheses and describe the approach that could confirm/reject your hypotheses (animal model, experimental methods and design). Maximum 2-3 pages. (Details of methods are not required, focus on design –does your design answer the aim/hypotheses?)

Choose either 4 A or B

A

Aerobic capacity can be divided into 2 components; 1) inborn aerobic capacity (this is the aerobic capacity that an individual possess without any exercise) and 2) acquired aerobic exercise capacity (gain in aerobic capacity after exercise training).

You aim to resolve the following issue; Inborn aerobic capacity or acquired aerobic capacity which is the most important factor determining healthy ageing and longevity.

B

The gene x10 is related to aerobic capacity. You want to investigate; 1) Whether gene expression of x10 is increased with exercise training or if individuals with inborn high aerobic capacity have a high expression of x10 without any exercising training. 2) Which functions the x10 gene modulate.

5. You have taken images (3d T1 volume) of the brain before and after 6 weeks of strength training of the right leg in 20 right-footed individuals and used segmentation to estimate the left putamen volume in number of voxels for each image. You want to determine whether the volume of the left putamen has changed significantly after training and whether there is any correlation to the change in strength in the right leg in these individuals.

Subject #	Left putamen volume before training (no. of voxels)	Left putamen volume after training (no. of voxels)	Right leg strength before training, maximum voluntary contraction torque (Nm)	Right leg strength after training, maximum voluntary contraction torque (Nm)
1	5454	5176	153	192
2	3923	3900	136	155
3	5517	5325	92	120
4	4382	4253	157	201
5	4154	4161	156	160
6	4204	3962	141	229
7	4101	3999	123	162

8	4398	4407	107	117
9	4401	4170	149	187
10	5542	5434	85	130
11	3578	3554	101	104
12	4265	4229	159	168
13	3761	3604	153	179
14	4795	4310	127	186
15	5279	5128	144	166
16	4709	4507	130	193
17	3994	3813	151	193
18	4281	4375	142	145
19	5411	5212	138	175
20	4273	4280	112	120

Describe how you would test these data to determine if there was a significant change in left putamen volume. Show the results of your chosen statistical test and make a conclusion. State how you would improve the study design to be able to make a more rigorous evaluation of whether this is a real effect. Finally, how would you normalise the data and test for a correlation between change in left putamen volume and change in right leg strength. Again, show how you would test this statistically and make a conclusion.

Deadline for handing in two copies of the exam is Friday 30th of November@15:00 (3pm) at Inger Skogens office, 3rd floor AHL (mid elevators).

Good Luck!