Task A) Two-sample t-testing (paired samples)

The QuatroLingo corporation is developing a revolutionary Virtual Reality language learning app. Their pilot group includes 20 testers. First, the testers took a test in Danish consisting of 100 questions. Next, the testers wore the headset with the app for four weeks. Then, they took the same test. The following table contains the test scores:

Employees	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Correct answers before app	25	12	16	22	32	14	5	26	5	12	36	12	32	29	11	11	13	33	12	15
Correct answers after app	32	25	22	36	32	56	20	33	42	36	54	58	45	45	47	25	28	46	28	25

(1) What are your null and alternative hypotheses?

(2) Can the company assume that there is any effect of the app in terms of language learning? Explain why there is / is not an effect. Can you verify this using R? You can also use SPSS if you really have to.

Show your scripts to the TA.

Task B) Two-sample t-testing (between samples)

DubiousCar cannot decide if they should produce automatic or manual transmission cars. They want to offer their customers the thrill that any other car manufacturer can't offer. They belive drivers should be faster with the automatic transmission. To compare the two transmissions, they invited 30 amateur drivers to complete a lap on a race course. Half of the drivers used manual and the other half automatic transmission. The following table presents the results, in sec:

Groups	N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Manual	42	56	52	94	32	36	49	56	85	25	41	25	36	55	69	52
Automatic	52	63	96	99	56	32	29	38	39	84	89	53	65	78	88	46

(1) What are your null and alternative hypotheses?

(2) Can the pharmacy company assume that the automatic transmission help drivers drive faster? Explain why there is / is not an effect. Can you verify this using R? Again you can also use SPSS, but you should know better by now.

Show your scripts to the TA.

Task C) One-Way ANOVA

A researcher is interested in comparing three new designs for fitness trackers. They want to know if the trackers are aesthetically appealing to the users. 24 young tech-savvy participants are recruited and split into three groups of 8. Each group is given demos of one of the three tracker bracelets (the 'inside is the same'). The participants are asked to rate the designs for cool appeal on a 10-point linear scale (1 = not cool at all, 10 = really cool). Are there any differences between the three conditions using alpha=0.05? The data are given in the following table:

Tracker A	Tracker B	Tracker C
8	5	2
6	5	3
6	9	2
9	6	5
9	5	6
8	8	8
4	2	6
6	5	5

Please note: try to complete the following using R output.

(1) Fill in the gaps:

a. The independent variable is _____, with ___ levels.
b. The dependent variable is _____ _____
c. There are _____ experimental conditions and r _____ participants per condition.
d. This is a _____ group experiment design.
e. Define null and alternative hypotheses:
   i. H_0: _____ _____ _____ _____ ___
   ii. H_1: _____ _____ _____ _____

Can you obtain the values below using R or SPSS?

(2) Calculate degrees of freedom:

a. $df_{between}$=
b. df_{within}=
c. df_{total}=

(3) Calculate sum of squares:

a. $SS_{between}$=
b. SS_{within}=
c. SS_{Total}=

(4) Calculate mean squares:

a. $MS_{between}$=
b. MS_{within}=

(5) Calculate F:

$F = \frac{MS_{between}}{MS_{within}}$=

(6) Fill in the summary table

Source of variation	Sum of Squares	df	Mean Square	F	p
Between groups					
Within groups					
Total					

(7) Are there any differences between the three conditions using alpha=0.05? Please report the results:

Submission Details

Please read the following guidelines how you should prepare your solutions.

Each student has to complete the exercise sheet individually and also to submit individually.
You should be able to present the results of each task in the exercise.

For all tasks you will need to prepare one PDF document including the solution/results for all tasks. Please upload it to the Ilias platform according to the submission.
The final deadline for this exercise sheet is the 8th of **January 2018, 10:00 am**.

In case you have urgent questions please contact Rufat Rzayev or Romina Kettner.
Further information can be found on the course website and in the Ilias course.
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