

11.1 Research designs and statistical interpretation: evidence and transfer

Name: _____ Class: _____ Date: _____ **Total: 8 marks**

KEY WORDS interaction effect • random assignment

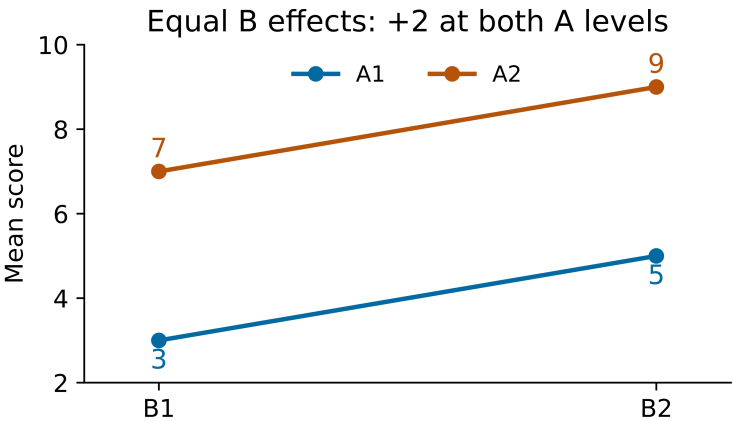
Objective

Classify designs by assignment and measurement structure; Choose the statistical test that matches design and data type; Interpret main effects, interactions and distributional evidence. Original practice and authored marking guidance.

1 Key knowledge and worked examples

interaction effect : The dependence of one factor’s effect on the level of another factor. **random assignment** : Allocating participants to conditions by chance to support causal inference.

Choose a test from the design, scale and assumptions, not merely the number of groups. Paired observations require a paired or repeated-measures analysis; independent groups require an independent-group analysis. An interaction can be meaningful even if averaged main effects cancel. Statistical significance is evidence under a model, not a condition for describing an observed difference. Report estimates and uncertainty and qualify population claims.



Invented balanced examples; no significance test is shown.

Worked case. Fictional mean scores are: task A, novices 4 and experts 8; task B, novices 8 and experts 4. Compute marginal means and describe the pattern.

Novice marginal mean= $(4+8)/2=6$; expert marginal mean= $(8+4)/2=6$. Task A marginal mean= $(4+8)/2=6$; task B marginal mean= $(8+4)/2=6$. The task contrast reverses by expertise, an interaction pattern despite equal marginal means. Means alone do not establish a population interaction; variability, design and inference are needed.

2 Practice

2.1 Each participant learns a list using exactly one of three rehearsal strategies. The design is: [1]

- A. within-subjects B. between-subjects C. correlational D. longitudinal E. quasi-experimental

2.2 Counts of students choosing each of three majors, broken down by gender, are best analysed with: [1]

- A. an independent-samples t-test B. one-way analysis of variance C. a chi-square test D. a Pearson correlation E. linear regression

2.3 Revisit the worked case. State one conclusion its evidence supports and one stronger conclusion it does not support. Explain the difference. [2]

3 Exam-style questions

3.1 The same 24 people complete two tasks. Another analyst treats the 48 scores as independent. Explain the problem and a suitable analysis family. Give the interpretation, supporting reasoning, a relevant alternative or limitation, and an appropriate check. [4]

Solutions

2.1 Answer: B. Different participants serve in each condition, with the strategy manipulated between them. The other options do not satisfy the stated defining conditions.

2.2 Answer: C. The data are categorical counts in a 2×3 table, $df = (2-1)(3-1) = 2$. Compare the exact process, design or evidence, rather than an associated keyword.

2.3 Use the worked case evidence to support a bounded claim and explain why a causal, universal or stronger claim needs additional evidence. The claim must fit the specific design and observed process.

3.1 Scores within a person are related. Ignoring pairing uses an inappropriate independence assumption and loses information about within-person differences. For suitable quantitative difference data and assumptions, a paired t-test may fit; a justified non-parametric alternative may be appropriate otherwise. Randomized or counterbalanced order also addresses sequence effects. Award B1 each (authored) for the interpretation, its reasoning, a relevant limitation/alternative and an appropriate check, up to four points. Accept a different justified answer satisfying these demands.