3.1 Research methods and the experimental study

Name: _____ Class: _____ Date: _____ **Total: 28 marks**

KEY WORDS independent variable • sign test

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Objective

Identify variables, designs and controls, compute descriptive statistics, apply the ethical framework, and structure the experimental-study report with an inferential decision at HL (approaches to researching behaviour plus the IA).

1 Key knowledge and worked examples

Methods toolkit. Experiments: lab, field, natural, quasi; independent, repeated, matched designs with counterbalancing. Sampling: random, opportunity, volunteer; sampling chooses who, ALLOCATION assigns conditions. Descriptive statistics: mean dragged by outliers, median resists, mode for categories; range vs SD. Correlation $r \in [-1, +1]$, never a cause. Qualitative: case studies, observations with inter-rater reliability, interviews, focus groups, questionnaires, triangulation. Ethics: consent, deception + debrief, protection, withdrawal, confidentiality, 3Rs. Evaluation: generalizability, credibility, bias. Sign test: $N = 8$, 2 negative signs $\rightarrow S = 2$ exceeds the critical value $\rightarrow$ not significant at 5%. IA: aim $\rightarrow$ exploration $\rightarrow$ analysis $\rightarrow$ evaluation $\rightarrow$ appendices.

2 Practice

2.1 In the rehearsal experiment, state the independent variable and the dependent variable, each operationalised. [2]

2.2 State one strength and one limitation of a repeated-measures design, naming the countermeasure for the limitation. [3]

2.3 Compare random sampling with opportunity sampling for a school study: one advantage and one disadvantage of each. [4]

2.4 In the rehearsal pilot, semantic-processing recall scores were 9, 8, 10, 7, 9 and 9. Calculate the mean and the median of the set, and state what the two condition means alone cannot show. [4]

2.5 State two ethical requirements the IA must satisfy before any data collection. [2]

3 Exam-style questions

3.1 *(IA design style.)* Design a simple experiment on the effect of background music on anagram solving: state the aim, the design with a reason, two controls and the ethical safeguards. [6]

3.2 *(HL statistics.)* Eight participants complete both conditions; six improve and two decline. Explain what the sign test would decide and why, stating N, S and the 5% level. [4]

3.3 *(Method choice.)* A researcher wants to understand why students avoid asking questions in class. Compare an anonymous questionnaire with semi-structured interviews, and recommend one, with a reason. [3]

Solutions

2.1 IV: the level of processing at encoding, operationalised as acoustic counting (does the word rhyme with X?) versus semantic judgement (does the word fit this sentence?) (1). DV: the number of words correctly recalled in 60 seconds, operationalised as the count of correctly spelled list words written (1).

2.2 Strength: no participant variables between conditions, since everyone does both – individual differences cannot explain the difference in recall (1). Limitation: ORDER effects (practice or fatigue) carry over between conditions (1); counterbalanced by splitting participants into AB and BA halves (1).

2.3 Random sampling: every student has an equal chance, improving representativeness (1); but it needs a full list, is slow, and refusals still skew the achieved sample (1). Opportunity sampling: quick and cheap from the classes available (1); but over-represents the accessible group (one year group, one timetable slot), limiting generalizability (1).

2.4 Semantic set 9, 8, 10, 7, 9, 9: mean $= 52/6 = 8.67$ words (1); ordered 7, 8, 9, 9, 9, 10, median $= (9 + 9)/2 = 9$ words (2). The means alone cannot show VARIABILITY (the spread within each condition), whether the difference exceeds chance, or anything about causation outside this sample – descriptive statistics describe, inferential tests decide (1).

2.5 Any two of: informed (or parental/guardian where required) consent obtained before participation; no deception beyond what is unavoidable, with a full debrief; right to withdraw at any time including withdrawal of data; protection from physical or psychological harm; confidentiality/anonymity of data (2).

3.1 Aim: to investigate the effect of background music (present vs absent) on the number of anagrams solved in three minutes (1). Design: repeated measures – the same solvers do both conditions, removing individual differences in verbal ability; counterbalancing (half music-first) removes order effects (2). Controls: matched 20-anagram lists per condition, the same room and volume, written standardised instructions, a fixed 3-minute window (2). Ethics: informed consent with the right to withdraw, anonymised scoring, no deception – the debrief explains the comparison after both conditions (1).

3.2 $N = 8$ (all participants show a direction of change), $S = 2$ (the SMALLER frequency, the two declines) (1). At the 5% significance level for $N = 8$, the critical value of S is 0 (1). Since the observed $S = 2$ exceeds 0, the result is NOT statistically significant (1): a 6-and-2 split could plausibly arise by chance, so the null hypothesis stands and the difference is reported as a chance-level finding (1).

3.3 Questionnaire: anonymous, so honest answers on an embarrassing topic, and many respondents quickly (1); but fixed answers miss reasons the researcher did not anticipate, and social desirability survives anonymity (1). Semi-structured interviews pursue the unanticipated answer, so the MECHANISM behind avoidance emerges, but with fewer participants and interviewer effects. Recommendation: interviews first to map the reasons, then a questionnaire built from them to measure their spread – or interviews alone if only understanding, not prevalence, is sought (1 for a reasoned choice).

Local review guidance: show the substitution before each statistic; every design choice carries a because; (R1 3.2) the decision names N, S, the critical value and the null hypothesis. Authored classroom guidance.