7.11 Correlational Analysis: Co-Variables, Correlation Coefficients and Scattergrams: 30-minute Pack

AQA 7182 · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer the short questions in full sentences where required. The final 8-mark question must be answered in full sentences. Time guidance: 30 minutes.

1 A researcher provides the following co-variable data for 5 participants in a study of hours of sleep and attention score. Sketch a labelled scattergram on graph paper and plot the five points. Data: Participant A (hours sleep = 6, attention score = 62), B (8, 78), C (5, 55), D (7, 73), E (4, 50). In your answer box state the coordinates you plotted and indicate the method mark criteria.

(Total for Question 1 is 4 marks)

2 A published study reports a correlation coefficient of r = 0.78 between weekly exercise time and self-reported wellbeing in adults. Describe what the value r = 0.78 tells you about the direction and strength of the relationship and give one limitation of interpreting this number on its own.

(Total for Question 2 is 3 marks)

3 State briefly why correlational analysis cannot establish cause and effect. Give one example of a plausible third variable that could produce an observed correlation between two co-variables.

(Total for Question 3 is 4 marks)

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4 A scattergram is drawn showing the relationship between hours of study per week (x) and number of social activities attended per week (y) for 7 students. The plotted points are roughly clustered with higher study hours associated with fewer social activities. Describe the correlation you would report for this scattergram, state whether it is positive, negative or zero, and give one practical implication a researcher might draw.

(Total for Question 4 is 4 marks)

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5 Sketch and label axes and plot these points for co-variables 'daily screen time in hours' (x) and 'sleep hours per night' (y): P1 (2, 8.0), P2 (4, 7.0), P3 (6, 6.0), P4 (8, 5.0). State the coordinates you plotted and explain briefly why these points illustrate the concept of a linear negative correlation. (Method mark: plotting correctly earns 1 mark.)

(Total for Question 5 is 3 marks)

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6 Explain two ways in which correlational studies can be useful to psychologists, giving a brief example for each use.

(Total for Question 6 is 2 marks)

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7 A study reports r = -0.64 between daily stress score and hours of sleep per night in a working adult sample. Explain fully what this coefficient tells you about the relationship, and give three evaluation points about the practical interpretation and limitations of this finding.

(Total for Question 7 is 6 marks)

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Mark scheme · 7.11 Correlational Analysis: Co-Variables, Correlation Coefficients and Scattergrams: 30-minute Pack

Question 1

plots all five points in their correct positions on a labelled axes system (hours sleep on x axis, attention score on y axis) awarding the method mark	**M1**
states plotted coordinates correctly: A (6,62), B (8,78), C (5,55), D (7,73), E (4,50) oe	**B1**
labels axes with units or scales for hours and attention score oe	**B1**
provides a brief comment on overall pattern, e.g. points show a positive association, attention tends to increase with hours sleep oe	**B1**

Answer: Plotted coordinates: A (6,62), B (8,78), C (5,55), D (7,73), E (4,50). Method mark awarded for plotting all five points correctly on labelled axes with a consistent scale; the plotted pattern shows a positive association where attention tends to increase with more hours of sleep.

Question 2

states direction: r = 0.78 is a positive correlation, as r is greater than zero oe	**B1**
states strength: 0.78 indicates a strong relationship, fairly close to +1 oe	**B1**
gives limitation: correlation does not imply causation, or there may be a third variable affecting both exercise and wellbeing, oe	**B1**

Answer: r = 0.78 indicates a strong positive relationship, so higher weekly exercise is associated with higher wellbeing. A limitation is that the coefficient alone does not show causation and could reflect a third variable or directionality problems.

Question 3

states that correlations measure association, not manipulation of an IV, so no variable has been experimentally manipulated to establish causation oe	**B1**
states directionality problem: cannot tell which variable, if either, causes the other oe	**B1**
states third-variable problem: a separate factor could be causing both correlated variables oe	**B1**
gives a plausible example of a third variable, e.g. socio-economic status affecting both exercise levels and wellbeing, or personality influencing both stress and sleep duration oe	**B1**

Answer: Correlations show associations but do not manipulate an independent variable, so they cannot prove cause and effect. There is a directionality problem, and a third-variable could cause both measured variables. Example third variable: socio-economic status could influence both exercise levels and self-reported wellbeing.

Question 4

describes pattern: as hours of study increase, number of social activities tends to decrease oe	**B1**
identifies correlation as negative oe	**B1**
comments on strength: gives plausible qualifier, e.g. weak/moderate/strong negative association based on how tightly points cluster oe	**B1**
gives a practical implication, e.g. universities may consider that encouraging more study time could reduce social engagement, or they should design support so students can balance study and social life oe	**B1**

Answer: The scattergram shows a negative correlation: as study hours increase, social activities tend to decrease. Depending on clustering, this could be described as a moderate negative association. A practical implication is that support for student wellbeing should consider how increased study requirements may reduce social engagement, so timetabling could help students balance both.

Question 5

plots all four points in their correct positions on labelled axes, awarding the method mark	**M1**
states plotted coordinates correctly: P1 (2,8.0), P2 (4,7.0), P3 (6,6.0), P4 (8,5.0) oe	**B1**
explains that the points lie roughly on a straight line sloping downwards, showing that as x increases y decreases, which is a linear negative correlation oe	**B1**

Answer: Plotted coordinates: P1 (2,8.0), P2 (4,7.0), P3 (6,6.0), P4 (8,5.0). Method mark for plotting all four correctly with labelled axes. These points lie close to a straight line sloping downwards, so higher daily screen time is associated with fewer hours of sleep, illustrating a linear negative correlation.

Question 6

useful for studying variables that cannot be ethically or practically manipulated, e.g. correlation between smoking and lung disease where experimental manipulation would be unethical oe	**B1**
useful for establishing relationships to generate hypotheses for later experimental testing, e.g. finding a correlation between social media use and anxiety could lead to experimental studies or longitudinal research oe	**B1**

Answer: Correlational studies are useful for examining relationships where manipulation is unethical or impossible, for example smoking and lung disease. They are also useful for identifying associations that suggest hypotheses for later experimental or longitudinal study, for example an observed link between social media use and anxiety.

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Question 7

states direction: r = -0.64 is a negative correlation oe	**M1**
states strength: -0.64 indicates a moderately strong to strong negative relationship, fairly far from 0 toward -1 oe	**A1**
explains meaning in context: higher stress scores are associated with fewer hours of sleep per night, on average oe	**A1**
evaluation point: practical significance, e.g. the strength suggests a meaningful association that might warrant workplace interventions to reduce stress to improve sleep oe	**B1**
evaluation point: limitation due to causality, e.g. directionality problem means it could be that poor sleep increases stress rather than stress reducing sleep oe	**B1**
evaluation point: third-variable or sampling issues, e.g. a health condition or shift-working status might cause both high stress and reduced sleep, or the sample may not generalise to all workers oe	**B1**

Answer: r = -0.64 indicates a moderately strong negative relationship: as stress increases, hours of sleep tend to decrease. Practically, this suggests a meaningful association that might justify interventions to reduce workplace stress to improve sleep. Limitations are that causality is not established, since sleep problems might cause stress (directionality), and a third variable such as shift work or health problems could underlie the association; the sample may also limit generalisability.

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