

PSYC121: week 4

Section 2: z scores

Hint / Reminder: Sketch a normal (z score) distribution and mark the mean/mode, and mark off the relevant parts of the question so you know what you are trying to achieve and how to interpret any calculations you make.

Hint/ Reminder 2. For questions 6 & 7, remember that from the week 4 lecture material, typically in psychology we use the 5% level as a cutoff to decide, in broadly described terms, whether something is extreme or unlikely vs. at least somewhat plausible or likely.

z-scores 1

z-score distributions

Q1. What is the relationship between the sign of a z-score and its position in a distribution?

Positive values to the right of the mean, negative values to the left of the mean

Q2. If a distribution has a mean of 100 and a standard deviation of 10, what is the raw score equivalent to a z-score of 1.96?

119.6 (z is just slightly less than 2 standard deviations (each SD is 10) more than the mean of 100)

Q3. If a distribution has a mean of 157 and a standard deviation of 19, what is the raw score equivalent to a z-score of 1?

157+19=176

z-scores 2 Using z-score tables

Q4. What proportion of scores lie between the mean and a z-score of 0.5?

.1915

Q5. What is the combined proportion of scores lying between $z=-1.2$ and $z=.85$?

0.3849 between -1.2 and 0 and then .3023 between 0 and .85, so 0.3849+.3023=.6872

z-scores 3 Applying z-scores to inferential problems

Q6. A Neuropsychologist has presented a test of face recognition to 200 neurotypical participants and finds that the scores are normally distributed with a mean of 85 and the standard deviation of 12. Two brain-damaged patients are also given the test. The one with right hemisphere brain damage scored 58 and the one with left hemisphere damage scored 67.

1. What is the z score of the right hemisphere patient when compared to the neurotypical group?

Z=-2.25

2. What proportion of neurotypical participants score lower than this patient?

0.0122

1. Is this patient likely to belong to the population of neurotypical participants? (justify your answer)
(no, his score is so low, ie $<5\%$, as to put him into the area of unusual or extreme scores, and we would infer that his score is unlikely to be part of the neurotypical distribution)

1. What is the z score of the left hemisphere patient when compared to the neurotypical group?

z=-1.5

1. What proportion of neurotypical participants score lower than this patient?

0.0668

1. Is this patient likely to belong to the population of neurotypical participants? (justify your answer)

(because this score is not extremely low by conventional standards (it is not in the extreme 5% area), we would not say it is unlikely and reject the possibility. Nonetheless it is clearly a low score. One might say it is not very likely, but is plausible)

Extra activity

Come back to this afterwards for some extra practice if you want:

Q7. Tom Bunion has measured the foot size of men and women and found each to be normally distributed. The men have a mean size of 55 with a standard deviation of 5 and the women a mean of 33 and a standard deviation of 5. Joanna Toes has foolishly measured two individuals but forgotten to note their gender. These have foot sizes of 37 and 47. To which gender is each more likely to belong? What evidence is there for this?

37 more likely to be female as this lies within the likely distribution for females ($z=.8$ for shoe size 37, $p=.5-.2881=.2119$ with smaller sizes in the female distribution) but outside the distribution for males ($z=-3.6$, $p<(.5 - 0.4990)$ (table stops at 3.1)

47 more likely to be male as this lies within the distribution for males ($z=-1.6$, $p=0.4452$ or 5.48% with smaller sizes in the male distribution) but outside the 95% CI for females ($z=2.8$, $p=.0026$)