

Intro to Stats

Probability

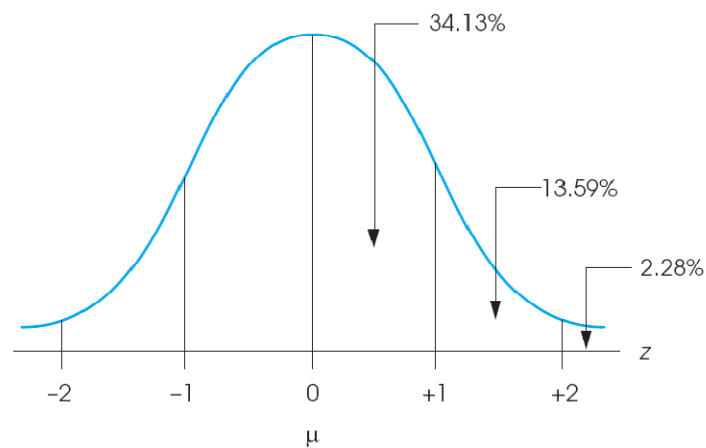
Probability theory

- ▶ Provides a basis for thinking about the probability of possible outcomes
- ▶ & can be used to determine how confident we can be in an effect
- ▶ (not due to chance)

Remember the problem

- ▶ The hypothesis is formed with respect to a population --- but tested with a sample
- ▶ We rely on what is known about populations to estimate whether effect is due to chance or not

Normal Distribution



Assumptions

- ▶ Large sets of data should approximate a normal curve
 - (it is assumed that the population is normally distributed)

Standard Scores

- ▶ Can therefore compare between samples if standardized with respect to the mean and SD
- ▶ Standard scores: comparable because in standard deviation units
- ▶ The z score is a common standard score
 - The number of SDs above the mean
 - Are comparable across different distributions

IQ Scores

- ▶ Standardized for comparison
- ▶ $M = 100$
- ▶ $SD = 15$

Z Scores

$$z = \frac{(X - \bar{X})}{s}$$

z = z score

X = individual score

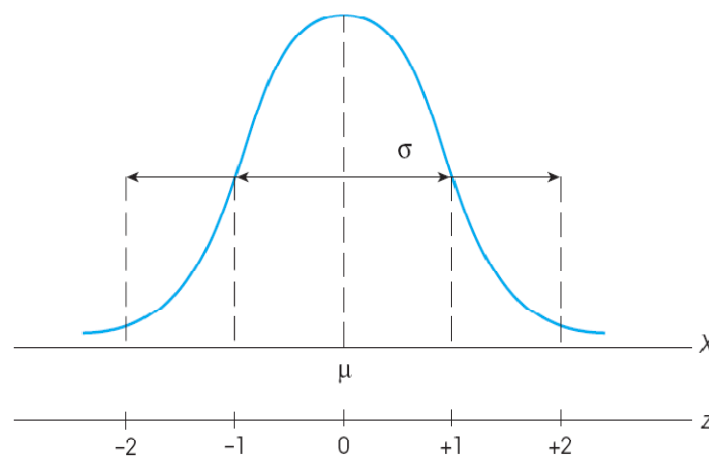
\bar{X} = mean of distribution

s = SD of distribution

Parts of the z -score

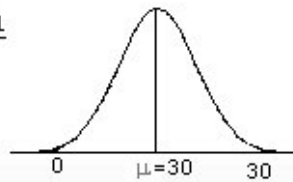
- ▶ The z -score can be broken into the sign and the magnitude of the value
 - The sign (+/-) tell us the position of the score relative to the mean
 - A positive z score means that the value is above the mean
 - A negative z score means that the value is below the mean
 - The number (magnitude) itself tells us the distance the score is from the mean in terms of the number of standard deviations

How it works



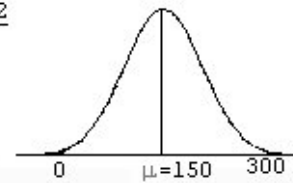
Usage of z-scores

Group 1

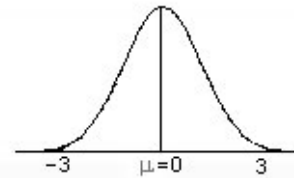


Using the z-distribution puts both distributions on the same standard scale with a mean of zero

Group 2



$$Z = \frac{X - \mu}{\sigma}$$



Jump to Probability

- ▶ A certain % of scores fall below or above each z score in a predictable way (as seen earlier)
- ▶ This can give us the probability of attaining a particular score
 - Does the sample differ from the population (is there a difference between groups?)

*Use a table for exact percents

Testing Hypotheses

- ▶ If the probability of an event is extreme, it is unlikely that it is due to chance
- ▶ Psychology uses 5% ($p < .05$) as the extreme probability
 - z-score > 1.96
- ▶ If significant ($p < .05$), the research hypothesis is a more likely explanation than the null

