

Correlation

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Measurement Scales

- Measurement: assigning _____ in systematic fashion
- Discrete/ _____ / Categorical
 - Measures direction of response
 - Yes or No
 - Agree/Disagree
- Continuous/ _____
 - Measures intensity of agreement
 - Strongly Disagree to Strongly Agree

Measurement Scales

Properties:

1. Uniquely classifies
2. Preserves order

Types:

1. _____
2. Ordinal

} Non-metric

3. _____
4. Natural zero

3. Interval
4. _____

} Metric

Correlation

- General term that refers to:
 - Number of _____ statistical techniques
 - _____ correlation
 - tetrachoric correlation
 - _____ product moment correlation
- Measure of strength of relationship between two variables
 - _____ analysis is same as...
 - ... _____ analysis
- Characteristics
 - Direction
 - Magnitude

Correlation Coefficient

- r
 - ranges from _____
- $r = +1$
 - perfect _____ linear relationship
- $r = -1$
 - perfect _____ linear relationship
- $r =$ _____
 - indicates no correlation

Pearson Product Moment Correlation

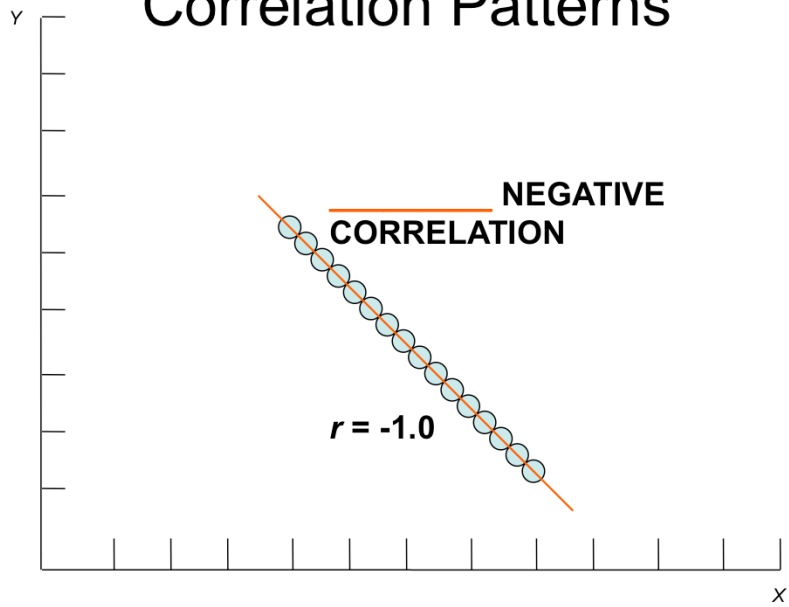
- Statistical measure of the _____
or _____ between two variables.
 - Ex: Is position in hierarchy associated with salary?
 - Ex: Is conscientiousness associated with job performance?
 - Ex: Is anxiety associated with blood pressure?

Assumptions for Pearson correlation

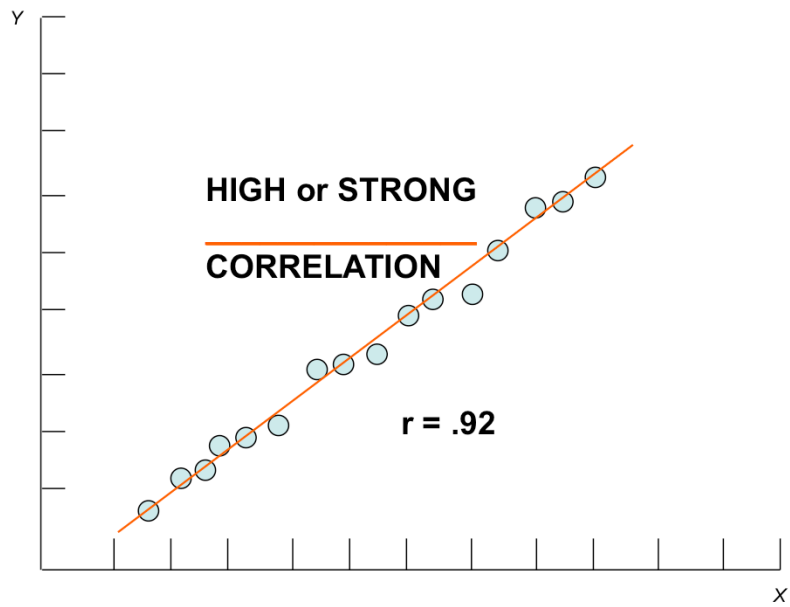
Scores on the X and Y variables:

1. Are quantitative (i.e. _____ measured)
2. _____ related
3. Have a bivariate _____ distribution
4. Have no extreme _____
5. Scores on Y have the similar _____ across levels of X (and vice versa)

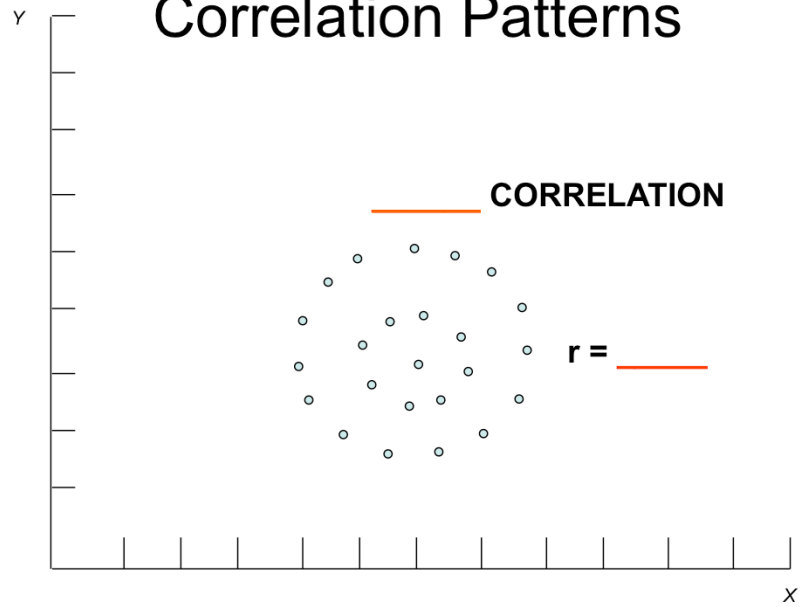
Correlation Patterns



Correlation Patterns



Correlation Patterns



Coefficient of Determination (r^2)

- Proportion of _____ in Y explained by X (or vice versa)
- Measure obtained by _____ correlation coefficient
- That proportion of _____ in a variable that is accounted for by another variable

Coefficient of _____

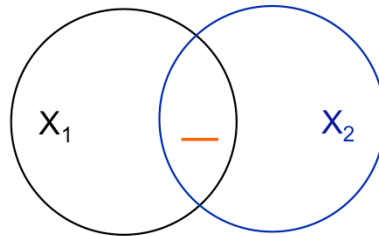
$$r^2 = \frac{\textit{Explained variance}}{\textit{Total Variance}}$$

X_1 = blood pressure

X_2 = anxiety

$r = .45$

$r^2 = .45^2 =$ _____



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Coefficient of _____ (r^2)

$$r^2 = \frac{SSr}{SS_t} = 1 - \frac{SSe}{SS_t}$$

_____ Theory says: Obtained Score = True Score + _____

Types of Alternative Correlations

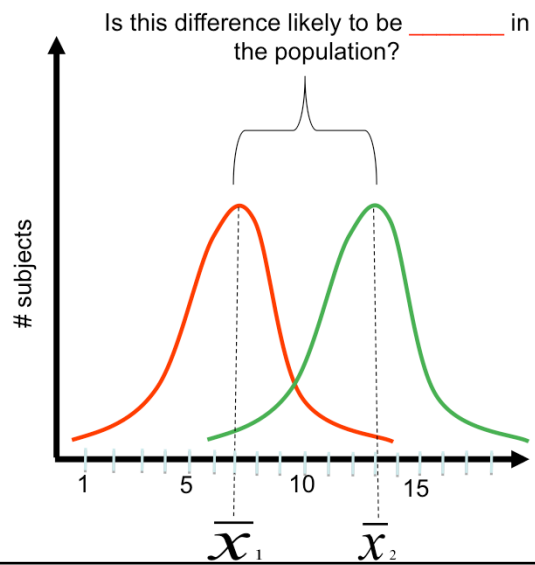
- X and Y scores are ranks (ordinal data)
– _____
 - X is true dichotomy, Y is quantitative variable
– _____ (r_{pb})
 - X and Y are both true dichotomies:
– Phi coefficient (____)
 - X is artificially dichotomized, Y is quantitative
– _____ (r_b)
 - X and Y are both artificial dichotomies
– Tetrachoric r (_____)
- Pearson r
- Pearson r

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Point Biserial Correlation

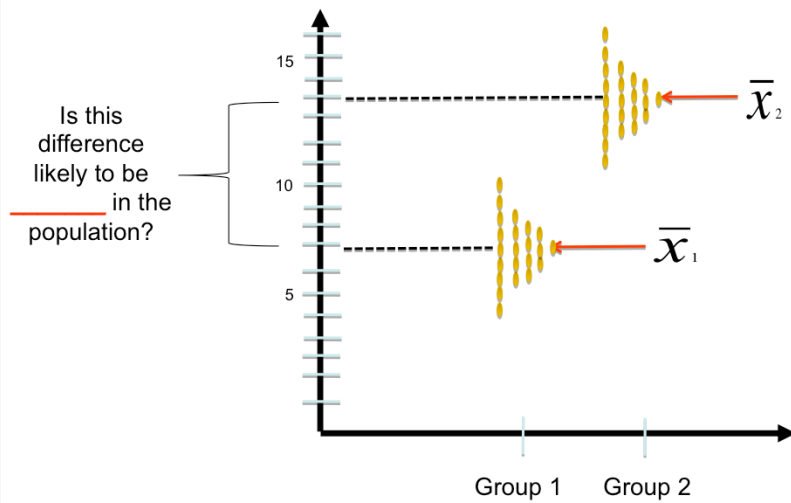
- One variable is _____ (with only _____ levels); other is _____
- Example:
 - Correlation between Gender and Height
 - Correlation between CurrentlyEmployed and Life Satisfaction

Difference in Group



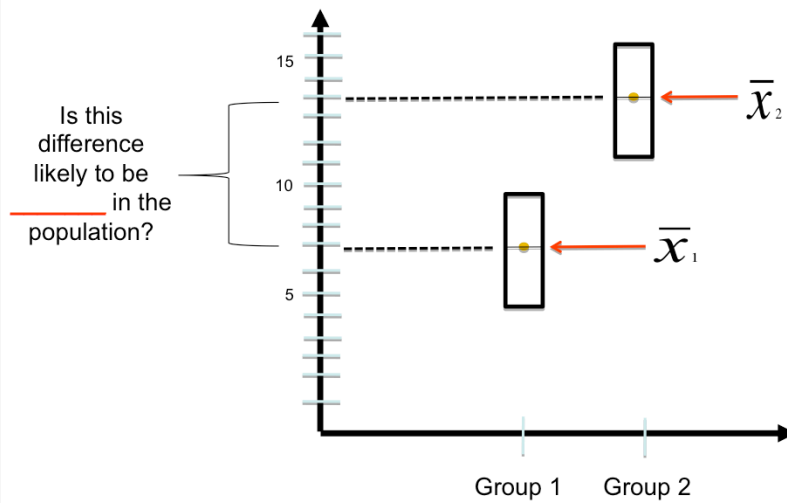
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Alternative View: Difference in Group _____



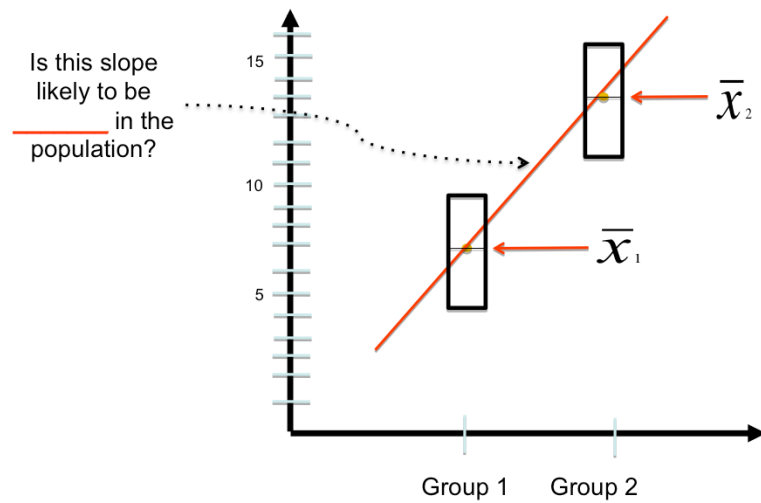
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Alternative View: Difference in Group _____



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Alternative View: Difference in Group



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Relationship between r_{pb} and t

$$t = \frac{r_{pb}\sqrt{N-2}}{\sqrt{1-r_{pb}^2}}$$

$$r_{pb} = \sqrt{\frac{t^2}{t^2 + df}}.$$

Group Statistics

		N	Mean	Std. Deviation	Std. Error Mean
HEIGHT	male	34	69.03	1.946	.334
	female	34	63.88	2.409	.413

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
HEIGHT	Equal variances assumed	.975	.327	9.691	66	.000
	Equal variances not assumed			9.691	63.205	.000

Correlations

		GENDER	HEIGHT
GENDER	Pearson Correlation	1	-.766**
	Sig. (2-tailed)	.	.000
	N	68	68
HEIGHT	Pearson Correlation	-.766**	1
	Sig. (2-tailed)	.000	.
	N	68	68

**. Correlation is significant at the 0.01 level (2-tailed).

Converting r_{pb} to t

- r_{pb} = square root of $(t^2 \div [t^2 + df])$
- If $t =$ _____ and $df =$ _____
- Then $t^2 = 93.915$
- So...square root of $(93.915 \div [93.915 + \text{_____}])$

Thus, r_{pb} = square root $(93.915 \div 159.915)$
= square root $(.58728)$
= _____

Thanks!

I hope to see you next time at the
Experimental Design workshop

BKM