University of HUDDERSFIELD

T-tests

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Presentation Outline

- **Introduction to T-tests**
  - Types of t-tests
  - Assumptions

- **Independent samples t-test**
  - SPSS procedure
  - Interpretation of SPSS output
  - Presenting results from HMR

- **Paired samples t-test**
  - SPSS procedure
  - Interpretation of SPSS output
  - Presenting results from HMR

Introduction

- **T-tests** compare the values on some continuous variable for two groups or on two occasions

- **Two types:**

  - independent samples t-test – compares the mean scores of two different groups of people or conditions

  - paired samples t-test – compares the mean scores for the same group of people on two different occasions

Assumptions

- **Independence of observations** – observations must not be influenced by any other observation (e.g. behaviour of each member of the group influences all other group members)
- **Normal distribution**
- **Random Sample** (difficult in real-life research)
- **Homogeneity of Variance** – variability of scores for each of the groups is similar.
  - Levene's test for equality of variances.
  - You want non significant result (Sig. greater than .05)

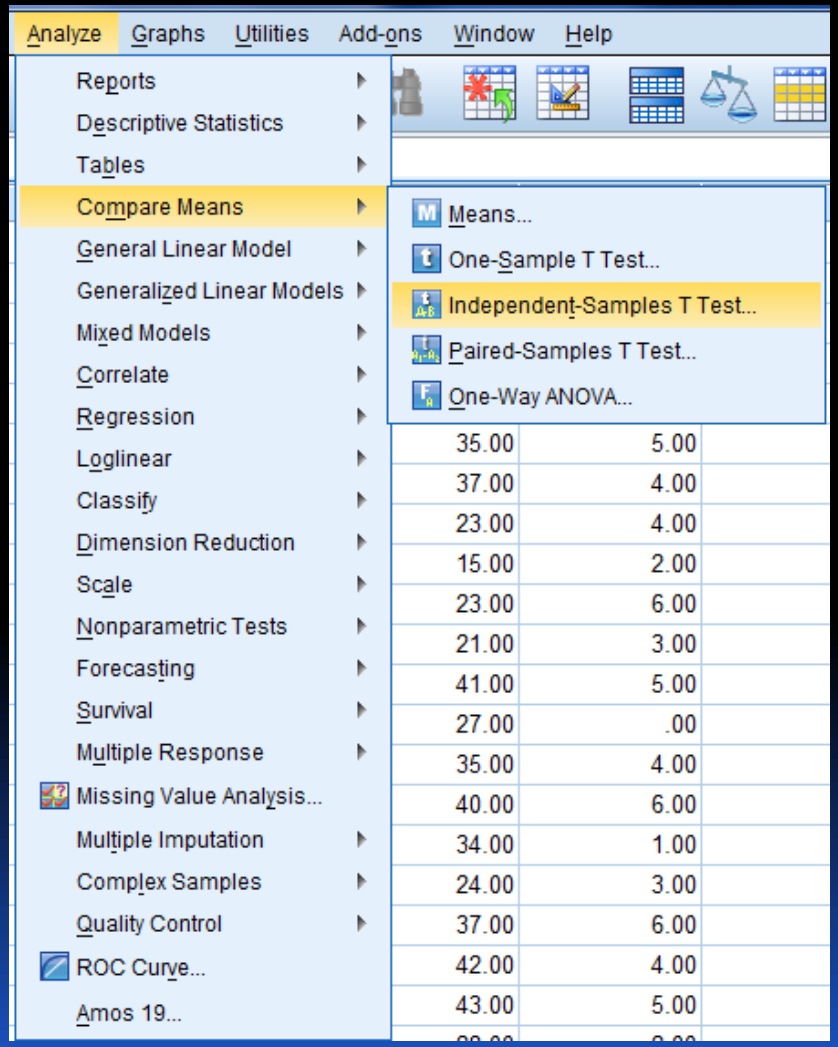
Independent Samples T-test

Research Question:

Is there a significant difference in the mean criminal behaviour scores for violent and non-violent offenders?

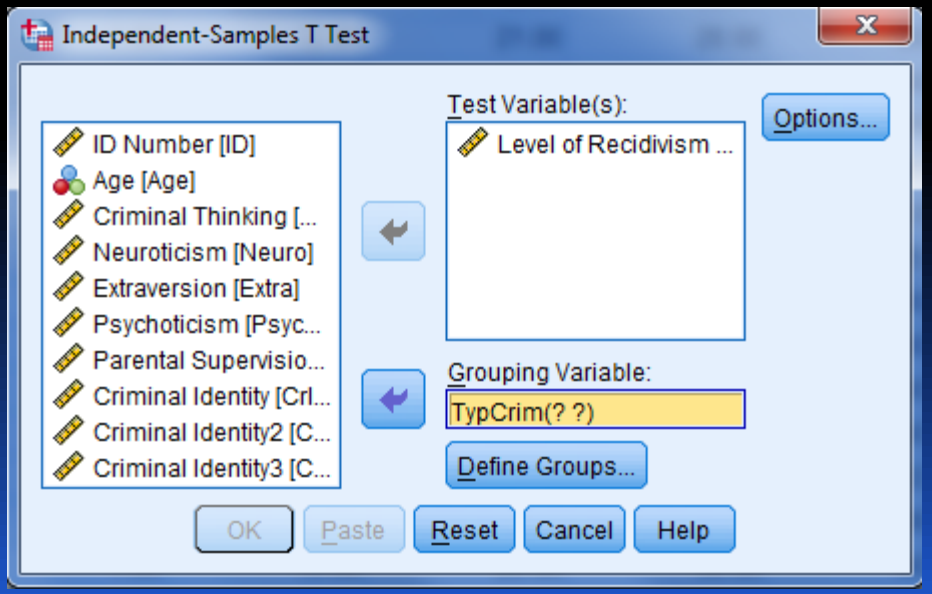
Independent Samples T-test (SPSS)

- From the menu click on **Analyze**
- then select **Compare means**
- then **Independent Samples T test**



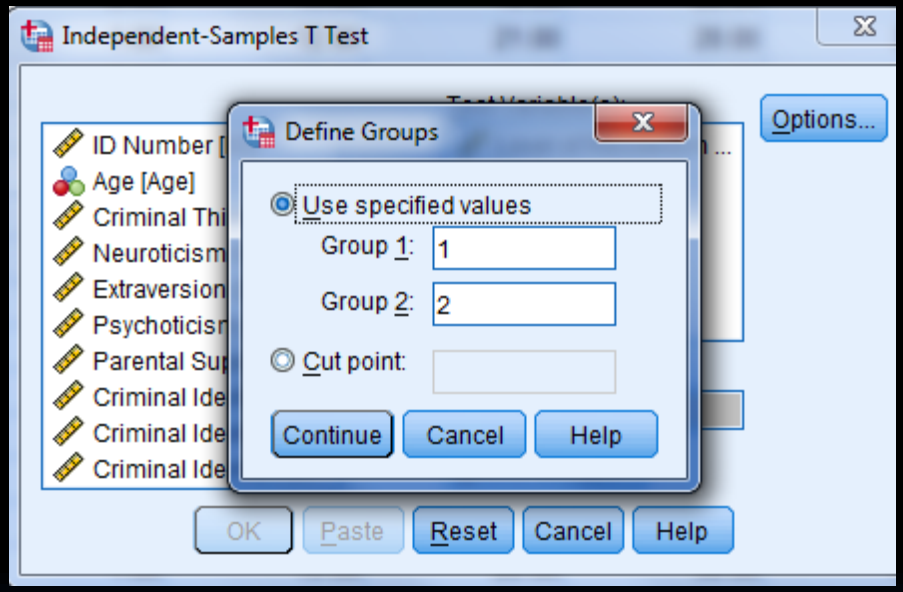
Independent Samples T-test (SPSS)

- Move continuous DV (recidivism) into the **Test variable** box
- And categorical IV (type of criminal) into **Grouping variable** box



Independent Samples T-test (SPSS)

- Click on **Define groups** and type in the numbers used in data set to code each group
  - Group 1 = 1
  - Group 2 = 2
- Click on **Continue**
- and **OK**



Interpretation of SPSS output

- **Checking the information about groups:**
  - Means
  - Standard Deviations
  - Number of participants in each group

Group Statistics

	Type of Criminals	N	Mean	Std. Deviation	Std. Error Mean
Level of Recidivism	1.00 NonV	45	2.7556	1.73409	.25850
	2.00 Violant	44	4.0000	3.32013	.50053

Interpretation of SPSS output

- **Checking assumptions**
  - **Levene's test for equality of variance** (whether the variation of scores for two groups is the same)
  - If Sig. value for Levene's test > .05 – use the first line in the table (**Equal variance assumed**)
  - If Sig. value for Levene's test < or = .05 – use the second line in the table (**Equal variance not assumed**)

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Level of Recidivism	Equal variances assumed	5.335	.023	-2.223	87	.029	-1.24444	.55969	-2.35690	-.13199
	Equal variances not assumed			-2.209	64.513	.031	-1.24444	.56334	-2.36967	-.11921

Interpretation of SPSS output

- **Differences between groups**
  - **Check column Sig. (2-tailed)**
  - If Sig. value > .05 – no significant difference between groups
  - If Sig. value < or = .05 – significant difference between groups

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
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Calculating the effect size

- The formula is:

$$\text{Eta squared} = \frac{t^2}{t^2 + (N1 + N2 - 2)}$$

$$\text{Eta squared} = \frac{-2.21^2}{-2.21^2 + (45 + 44 - 2)} = .05$$

- According to Cohen (1988)
  - .01 = small effect
  - .06 = medium effect
  - .14 = large effect

Presenting results

An independent samples t-test was conducted to compare the criminal behaviour (recidivism) scores doe violent and non violent offenders. There was a significant difference in score between the two groups of offenders, $t(87) = -2.21$, $p < .05$, two-tailed with violent offenders ($M = 4.00$, $SD = 3.32$) scoring higher than non violent offenders ($M = 2.76$, $SD = 3.32$). The magnitude of the differences in the means (mean difference = -1.24, 95% CI: -2.37 to -.12) was small (eta squared = .05)

Paired samples t-test

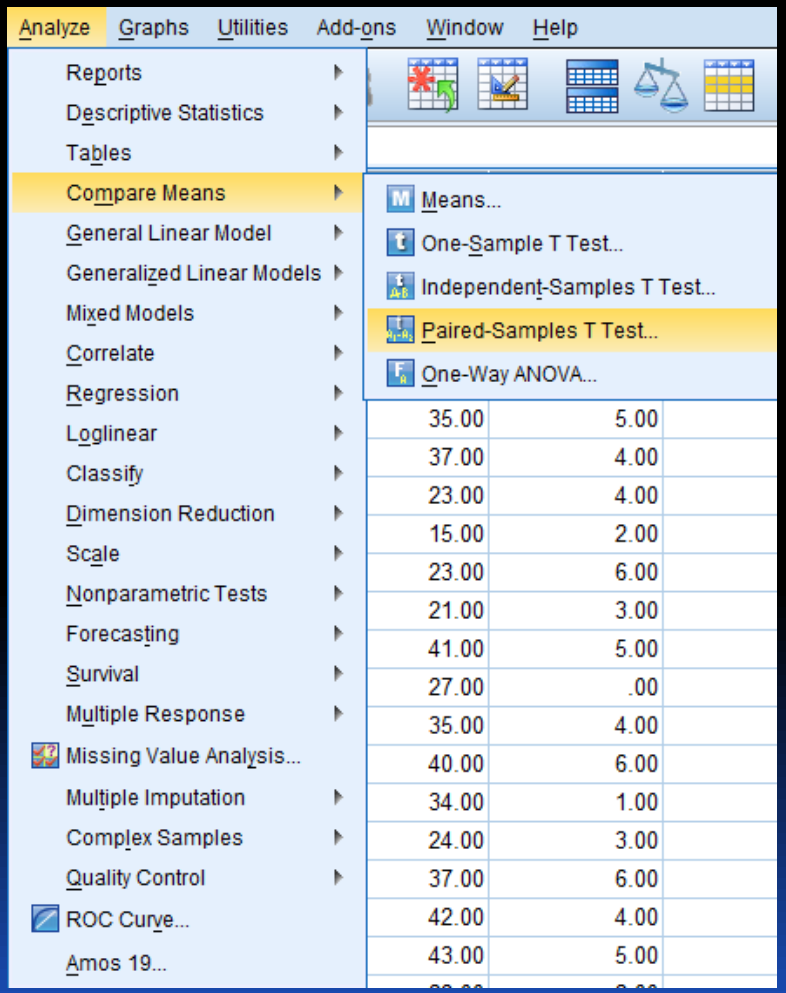
- **A Paired samples t-test** – one group of participants measured on two different occasions or under two different conditions (e.g., pre-test & post-test; Time 1 & Time 2)

- **Research question** – Is there a significant change in prisoners' criminal social identity scores after 2 year sentence in high security prison? Does the process of prisonization have an impact on prisoners' criminal identity test scores?

- **You need:**
  - 1 categorical IV (Time 1, Time 2)
  - 1 continuous DV (criminal social identity test scores)

Paired samples t-test (SPSS)

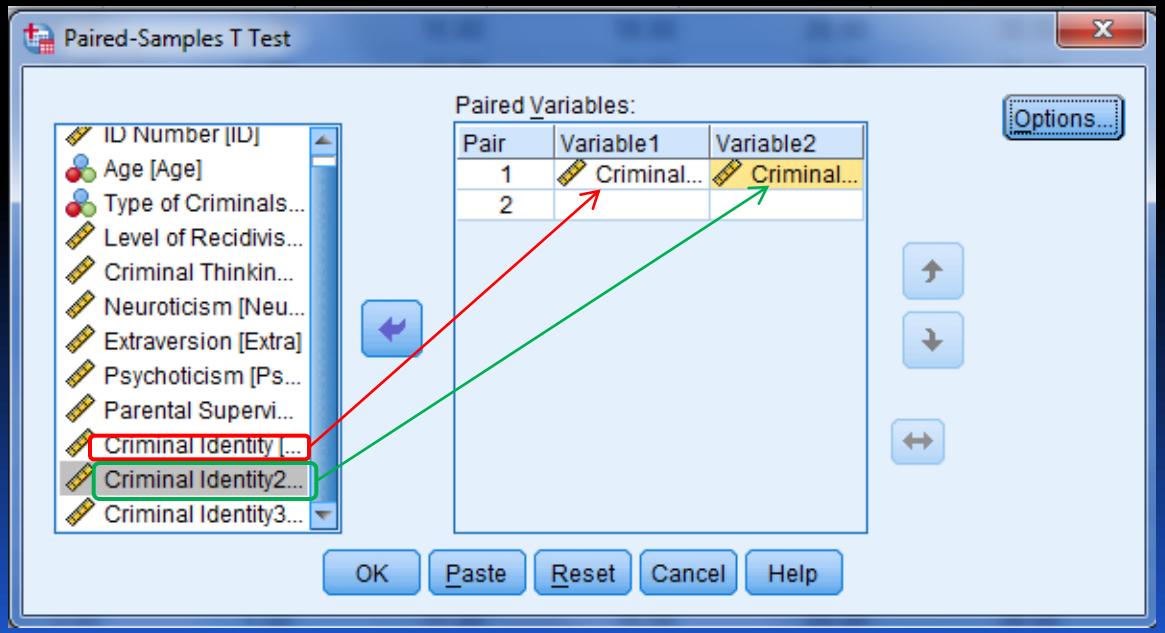
- From the menu click on **Analyze**
- then select **Compare Means**
- then **Paired Samples T test**



Paired samples t-test (SPSS)

- Click on the 2 variables that you are interested in comparing for each subject (criminal identity, criminal identity 2) and move them into **Paired Variables** box

- Click **OK**



Interpretation of SPSS output

- **Descriptive Statistics**

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Criminal Identity	18.7303	89	8.93762	.94739
	Criminal Identity2	26.3146	89	9.84031	1.04307

- **Correlations**

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Criminal Identity & Criminal Identity2	89	.941	.000

Interpretation of SPSS output

- **Differences between Time 1 & Time 2**
  - **Check column Sig. (2-tailed)**
  - If Sig. value > .05 – no significant difference
  - If Sig. value < or = .05 – significant difference

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	Criminal Identity - Criminal Identity2	-7.58427	3.35006	.35511	-8.28997	-6.87857	-21.358	88	.000

Calculating the effect size

- The formula is:

$$\text{Eta squared} = \frac{t^2}{t^2 + (N - 1)}$$

$$\text{Eta squared} = \frac{-21.36^2}{-21.36^2 + (88 - 1)} = .84$$

- According to Cohen (1988)
  - .01 = small effect
  - .06 = medium effect
  - .14 = large effect

Presenting results

A paired samples t-test was conducted to evaluate the impact of the prisonization process on prisoners' scores on the criminal social identity. There was a significant increase in criminal social identity scores from Time 1 ($M = 18.73$, $SD = 8.94$) to Time 2 ($M = 26.31$, $SD = 9.84$), $t(88) = -21.36$, $p < .001$ (two-tailed). The mean increase in criminal social identity scores was -7.58 with a 95% confidence interval ranging from -8.29 to -6.88. The eta squared statistic (.84) indicated a large effect size.