

Research Methods

Parametric and Non-parametric Tests

Stacey Coleman

1

Recap

Parametric and non-parametric?

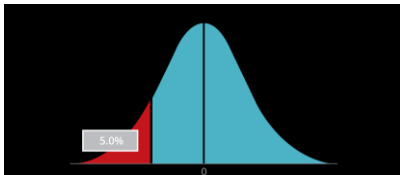
Parametric – The Basics!

Non-parametric – The Basics!

The tests

Tails

- One-tailed tests
 - ✓ Interested in the **direction** of the difference
 - ✓ One mean is lower OR higher than the other



Recap

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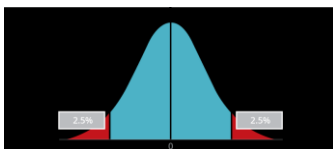
Parametric – The Basics!

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The tests

Tails

- Two-tailed tests
 - ✓ Not particularly interested in the direction of the difference
 - ✓ The two means are different from each other or from the same population



3

RecapParametric
and non-
parametric?Parametric –
The Basics!Non-
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The tests

Errors**Type I error**

- Deciding that the null hypothesis is false when it is actually true
- Thinking we have found something significant when we haven't!

Type II error

- Deciding the null hypothesis is true when it is actually false
- Not realising that a difference is there

4

Recap**Parametric
and non-
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The tests

**What's the
difference between
parametric and
non-parametric
tests?**



**And why does it
matter?!**

5

Recap**Parametric
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The tests

Quite simply...

- Parametric tests make assumptions about the parameters (defining properties) of the population distribution
- Non-parametric tests do not make any such assumptions

6

Recap

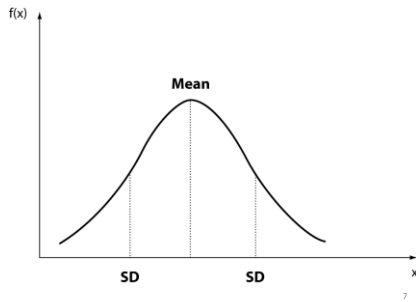
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Parametric or non-parametric?



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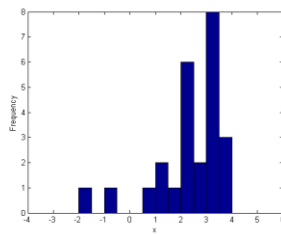
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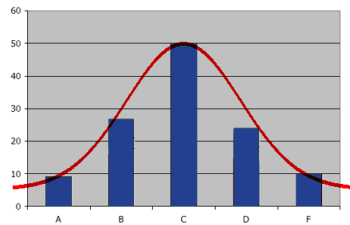
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The tests

1) Normal distribution of data

- Parametric tests are sometimes referred to as 'distribution tests'



10

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Parametric
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The tests

1. Normal distribution of data

- Parametric tests are sometimes referred to as 'distribution tests'

2. Numerical data!

11

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The tests

1. Normal distribution of data

- Parametric tests are sometimes referred to as 'distribution tests'

2. Numerical data!**3. Interval or ratio data**

12

Scale Type	Properties of scale
Nominal	Records differences <i>A is red; B is blue A is extravert; B is introvert</i>
Ordinal	Records differences and magnitudes <i>A is larger than B 1st, 2nd, 3rd place (not how many seconds between each place)</i>
Interval	Records differences and magnitudes, and has equal intervals <i>A is two units larger than B</i>
Ratio	Records differences and magnitudes, has equal intervals and a true zero <i>A is twice as large as B Race finish times – timed from a real zero mark</i>

13

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Parametric: The Basics!

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The tests

1. Normal distribution of data
 1. Parametric tests are sometimes referred to as 'distribution tests'
2. Numerical data!
3. Interval or ratio data
4. Large population samples

14

Recap

Parametric and non-parametric?

Parametric – The Basics!

Non-parametric: The Basics!

The tests

1. Use the Median and do not assume anything about distribution
 - o 'Distribution free' tests



15

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1. 'Distribution free' tests

2. Mathematically, value is ignored

16

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17

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3. Data is analysed according to rank

18

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The tests

1. Use the Median and do not assume anything about distribution

1. 'Distribution free' tests

2. Mathematically, value is ignored

3. Data is analysed according to rank

4. Less powerful than parametric tests

19

Recap

Parametric
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The Basics!Non-
parametric:
The Basics!**The tests**

- If you have the right data, it is always best to use a parametric test where you can.

- If you have collected data that can **only** be analysed using a non-parametric test, make sure you are using the correct non-parametric test!

- E.g., χ^2 for independence

	Colour preference			Row total
	Red	Green	Blue	
Male	16	18	16	50
Female	20	9	21	50
Column total	36	27	37	100

20

Recap

Parametric
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parametric:
The Basics!**The tests** **χ^2 for independence**

- A χ^2 (X^2) statistic is used to investigate whether distributions of categorical variables differ from one another

- Compares the counts of categorical responses between two (or more) independent groups

- NB: The numbers only represent the category of which the participant is a member!*

21

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	Colour preference			Row total
	Red	Green	Blue	
Male	16	18	16	50
Female	20	9	21	50
Column total	36	27	37	100

- 1) At what LEVEL is this data?
 - Nominal, ordinal, interval or ratio?
- 2) What CAN this data tell us?
- 3) What CAN'T it tell us?
- 4) Why are we able to use a Chi² for independence?

Recap

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Parametric Technique	Non-Parametric Technique
None	Chi-square for goodness of fit
None	Chi-square for independence
None	McNemar's Test
None	Cochran's Q Test
None	Kappa Measure of Agreement
Independent samples t-test	Mann-Whitney U Test
Paired-samples t-test	Wilcoxon Signed Rank Test
One-way between-groups ANOVA	Kruskal-Wallis Test
One-way repeated-measures ANOVA	Friedman Test
Two-way between-groups ANOVA	None
Mixed between-within ANOVA	None
Multivariate analysis of variance (MANOVA)	None
Analysis of covariance (ANCOVA)	None

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and non-
parametric?Parametric –
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parametric:
The Basics!**The tests****In summary:**

- Parametric tests make assumptions about the defining properties of the population distribution; non-parametric tests do not.
- Non-parametric tests can be used when your data is not normally distributed
- Non-parametric tests must be used when analysing categorical data
- There are many statistical tests – both parametric and non-parametric!

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**Any
questions?**

25
