

Open Science using the statistical package JASP

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An Experiment and its Replication

An experiment with three conditions:

- The "close" condition
- The "intermediate" condition
- The "distant" condition





The description given here is a modification of and inspired by the actual experiment executed by Williams, L.E. and Bargh, J.A. (2008). Keeping One's Distance. The Influence of Spatial Distance Cues on Affect and Evaluation. *Psychological Science*, *19*, 302-308.

Williams and Bargh (2008) tested:

 $H_0: \mu_{close} = \mu_{intermediate} = \mu_{distant},$ that is, the three means are equal

rendering

p-value = .01, that is, smaller than .05, that is, the means are significantly different

with $m_{close} = 5.61$, $m_{intermediate} = 6$, $m_{distant} = 4.86$ and

 η^2 = .11 , that is, the three conditions explain 11% of the variation in attachment, which is a medium to strong effect of condition The replication by Joy-Gaba, Clay, and Cleary (2016) rendered

p-value = .79

 $\eta^2 = .00$

Joy-Gaba, J., Clay, R., and Cleary, H. (2016). Replication of keeping one's distance: The influence of spatial distance cues on affect and evaluation by Williams L.E. and Bargh J.A. (2008) *Psychological Science*, *19*, 302-308). Retrieved from <u>https://osf.io/a78bm/</u>

The Replication Crisis

This is only one of 100 psychological experiments of which only about 33% were successfully replicated (OSC, 2015).

This resulted in a reduced trust in science by scientists and society: The replication crisis was born.

Scientists are alerted:

- Estimating the reproducibility of psychological science (OSC, 2015)
- An open investigation of the reproducibility of cancer biology research (Errington et al., 2014)

"Society" is alerted:

- Is psychology a real science? (Is psychologie well een echte wetenschap, Volkskrant, 12-8-2016)
- Public Trust in Science (Rathenau Instituut, August 28, 2018)

Open Science Collaboration. (2015). Estimating the reproducibility of psychological science. *Science, 349,* 6251. <u>https://osf.io/ezcuj/</u> Errington, T.M., Iorns, E., Gunn, W., Tan, F.E., Lomax, J., and Nosek, B.A. (2014). An open investigation of the reproducibility of cancer biology research. *eLIFE, 3*, e04333. <u>https://elifesciences.org/collections/9b1e83d1/reproducibility-project-cancer-biology</u> Volkskrant (2016). <u>https://www.volkskrant.nl/columns-opinie/is-psychologie-wel-een-echte-wetenschap~b9978e6c</u> Rathenau Instituut (2018). Public Trust in Science. <u>https://www.rathenau.nl/en/science-figures/impact/trust-science/public-trust-science</u>

Addressing the Replication Crisis: The Open Empirical Cycle

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Addressing the Replication Crisis: The Open Empirical Cycle

Step 1: Preparation (Observation)

Step 2: Formulate Research Hypotheses (Induction)

Step 3: Planning of Data Collection and Analysis

Step 4: Get Approval from the (Medical) Ethical Testing Committee and Data Management Plan

Step 5: Preregistration and Preregistered Reports

Step 6: Execution of Data Collection and Analyses (Testing)

Step 7: Publish Data and Analyses

Step 8: Write an Open Access Report (Evaluation)

Step 9: Having Your Report Reviewed

Step 1: Preparation

- Review literature
- Gaps in the literature
- Quality of the literature
- Variables that are not covered in the literature

• Writing it up sharpens thoughts

- Write down you research questions:
 - 1. New questions
 - 2. Replication studies
 - 3. Exploratory studies

Step 2: Formulate Research Hypotheses

A research hypothesis is a verbal representation of the expected relations between the variables resulting from Step 1.

Step 3: Planning of Data Collection and Analysis

- Describe population
- Describe research design
- Describe variables
- Derived variables
- Statistical model
- Formal hypotheses
- Power Analyses or Updating
- Missing data
- Data exclusion
- Exploration
- Replication

Step 4: (M)ETC and Data Management Plan

- Much of the previous three steps
- Informed consent forms
- Data management plan

Step 5: Preregistration and Preregistered Reports

This is the pre-data-*collection* or pre-data-*access* account of all that has been covered in the previous four steps.

Step 6: Execution of Data Collection and Analysis

Proof that data *collection* takes place after preregistration.

Proof that data *access* takes place after preregistration.

Step 7: Publish Data and Analyses

Data and analyses should be FAIR, Findable, Accessible, Interoperable, Reusable, that is, accessible to all interested parties.

Most of the remainder of this presentation discusses how that can be achieved.

Step 8: Write an Open Access Report

Include a link to your pre-registration.

Include a link to your data-analyses repository.

Publishing open access is an important feature of open science.

Being able to unobstructedly obtain everything (also the report) related to a research project will enable anyone to:

- benefit from your research
- reuse (parts) of your research
- engage in a fully informed discussion about your research.

This should both increase the impact of your research and increase the trust in your research and the trust in science in general.

Step 9: Having your Report Reviewed

May lead to changes in your report and possibly deviations from your pre-registration.

These deviations can be highlighted in your report using footnotes.

Continued: Step 7: Publish Data and Analyses

Opening, that is, publishing, your data, analyses input, analyses results, and interpretation of the results

Others can:

- Inspect your data
- Reproduce your analyses (and get all the information, cf., the missing m_{intermediate} in Williams and Bargh, 2008)
- Read your interpretation of the analyses
- Data are available for meta analyses and "null-findings" become accessible

Being open will add to the trust in your research, that of the group to which you belong, and science in general

Open the Data Analyses of your Thesis



Open Data Analyses should be FAIR

- Findable: Place your data and analyses in a public repository
- Accessible: Make certain your data come with a codebook, and your analyses with annotations
- Interoperable: Ensure that data and analyses can be opened on different types of computers
- Reusable: Include a license, that is, make clear what others are (not) allowed to do with your data

For further elaboration and information see "<u>How to make your data FAIR</u>" (Research Data Management Support, Utrecht University). To verify if your data is FAIR already, see <u>FAIR Cheatsheets: to publish your research data and software FAIR - Research Data Management</u> <u>Support - Utrecht University (uu.nl)</u>.

Interoperable



JASP 0.13.1

Released July 16th, 2020.

This version adds mixed models, the reliability module, and the R console. For a complete list of all improvements and bug fixes per release, see the <u>release notes</u>.

Having trouble installing JASP under Mac OS X?

Take a look at our installation guide.

Want to go back?

You can download many of JASP's previous versions.







Joy-Gaba, Clay, and Cleary (2016) replicated Willams and Bargh (2008)

The replication data and analyses are contained in openJoyGaba.jasp

The Data Collected by Joy-Gaba, Clay, and Cleary (2016)

	penJoyGaba		Jt101\Desktop	JASP-UU\KENN	ISCLIP Open Your Cours
	Descriptiv	res T-Tests	ANOVA	Mixed Models	Regression Freque
T	🐣 condition	siblings	\ parents	Nometown	$\langle f_x$ averagebond
1	close	6	7	5	6
2	intermediate	6	6	3	5
3	distant	5	6	3	4.66667
4	close	5	5	4	4.66667
5	intermediate	6	5	4	5
6	distant	5	6	3	4.66667
7	intermediate	6	6	6	6
8	close	5	4	6	5
9	close	7	5	5	5.66667
10	close	7	5	6	6
11	close	7	6	5	6
12	intermediate		7	7	
13	close	7	7	6	6.66667
14	intermediate	6	5	4	5
15	distant	6	5	7	6
16	close	6	6	5	5.66667
17	distant	5	6	2	4.33333
18	close	5	6	5	5.33333
19	intermediate	6	6	5	5.66667
20	intermediate	6	5	3	4.66667
21	intermediate	7	7	5	6.33333
22	close	6	7	6	6.33333
23	distant	6	7	6	6.33333
24	intermediate	7	7	3	5.66667
25	distant	3	5	2	3.33333
26	distant	7	7	5	6.33333
27	intermediate	5	6	6	5.66667
28	distant	5	6	3	4.66667
29	close	5	5	6	5.33333
30	distant	6	7	5	6

Data collected by, License, Data analyzed by, Code book, and Descriptive Statistics



Include Annotations of your Analyses

Explain using annotations which analyses were executed and what your interpretation of the outcomes was

Descriptives T-Tests ANO	VA Mixed Models Regression Frequencies	Factor	SEM
Descriptive Statistics	000		Descriptive Statistics
▼ ANOVA	000		Descriptive Statistics condition siblings parents hometown averagebond
siblings 12 parents hometown	Dependent Variable averagebond Fixed Factors condition		Valid 133 125 133 133 125 Missing 0 8 0 0 8 Minimum 1.000 1.000 1.000 2.333 Maximum 3.000 7.000 7.000 7.000
			ANOVA
		<	The nul-hypothesis H0: muclose = muintermediate = mudistant is evaluated.
			ANOVA - averagebond
	A	•	condition 0.488 2 0.244 0.236 0.790 0.004 Residuals 125.900 122 1.032 1.032 1.032 1.032
	WLS Weights		Note. Type III Sum of Squares
Display Descriptive statistics			The p-value of .79 is larger than .05 therefore the null-hypothesis is not rejected.
Estimates of effect size			The proportion of variance explained equals .004, that is, virtually no variance of averagebond
 			is explained by condition.
▶ Model			Descriptives
Assumption Checks			Descriptives - averagebond
Contrasts			close 5.439 0.831 44
Post Hoc Tests			distant 5.307 1.145 38 intermediate 5.310 1.065 43
Descriptives Plots			



By doing this you Create an Annotated Logbook of your Analyses

As shown on the previous two slides JASP tracks the analyses that you execute

There is a Descriptive Statistics button on the left side of the screen

rendering the data overview on the right side of the screen

• There is an ANOVA button on the left side of the screen

rendering analyses with annotations on the right side of the screen

If you continue executing analyses and adding annotations to your analyses, you create a logbook that will help you to track your traces, therefor it will be completely clear to others:

- Which analyses you did
- How you did them (this should shortly be explained in the annotations)
- How you interpret the results (this should shortly be explained in the annotations)

In this manner you make the data and analyses from your study accessible

Findable Using the Open Science Foundation

A https://osf.io/z7tbg/											
SFHOME - My Quick Files My Pro	ojects Search Support Donate 🜔 Herbert Hoijtink -										
Open Your Course Files Wiki Analytics Registrations Contributors Add-ons Settings											
Open Your Course Public											
Contributors: Herbert Hoijtink Date created: 2020-10-05 02:49 PM Last Updated: 2020-10-21 09:44 AM Create DOI Category: Project Description: Add a brief description to your project License: CC0 1.0 Universal											
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Add important information, links, or images here to describe your project.	Add Component Link Projects										
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Open Your Course											
- 🍅 OSF Storage (Germany Frankfurt)											
Codebook.joyGaba.pdf 2020-10-05 04:46 PM											

Reusable

Fully Open Data Analyses: Include the CC0 1.0 Universal License With Your Data

The license can be included in your mydata.jasp file.

The CC0 1.0 Universal Public Domain Dedication:

- Is truly open, that is, anybody can use your data for whatever purpose
- If you include a reference to a paper or your contact information in the mydata.jasp file, anybody using your data can refer to you

The CC0 1.0 Universal Public Domain Dedication: <u>https://creativecommons.org/publicdomain/zero/1.0/</u>

The Conflict between Fully Open Data Analyses and Privacy Regulations

Personal data can only be published if privacy is guaranteed. One way to achieve this is, if data are truly anonymized (General Data Protection Regulation: <u>https://gdpr-info.eu/</u>).

- Truly anonymized data is no longer personal data and thus no longer subject to the GDPR
- It involves the complete and utter removal of all personal identifiers in a database
- Anonymized data can no longer be attributed to any particular individual by any means

If anonymization cannot be achieved, you can still "Open your Analyses" by publishing only your code book, results, references, license and annotated analyses (these are often called meta data). This can be done using a myresults.html file that can be created based on your mydata.jasp file.

This page was constructed using quotes and input from Handling Personal Data in Research (Utrecht University)

The Conflict between Fully Open Data Analyses and your Future Research Plans

- Therefore, you may want to impose restrictions on the use of your data, e.g., "can only be used to reproduce the analyses you executed"
- However, this cannot be arranged via the application of a license, data are often considered to be facts and facts cannot be copyrighted (OpenAIRE)
- In such cases you can consider publishing only a part of your data, e.g., only the data and analyses that are used in a specific research report (but do provide complete meta data, most importantly, the code book of your complete data set)
- Then the unused data are only available for you and thereby you avoid being scooped out of your next paper

OpenAIRE: https://www.openaire.eu/how-do-i-license-my-research-data

Links to ...

JASP A Crash Course into JASP How to use JASP

REPOSITORIES

Open Science Foundation Yoda (Utrecht University)

> LICENCES Creative Commons OpenAIRE

ANONIMIZED AND FAIR DATA

How to Make you Data FAIR Handling Personal Data FAIR Cheatsheets General Data Protection Regulation

OPEN SCIENCE

Open Science Community Utrecht Summer school 'Open Science Bootcamp'



Links to ...

THE WORKSHOP MATERIALS Open your Course/Bachelor Thesis



How To ...

Use one of the example data sets that downloaded with this presentation: data.sav, data.txt, or data.csv.

Execute each of the steps in the following slides.

How to Create a mydata.jasp File

Make certain that JASP is installed on your computer. If not, install it from <u>https://jasp-stats.org/download/</u>

If JASP is installed, start the program.



J o	penJoyGaba	(C:\Users\hoi	jt101\Desktop	JASP-UU\KENN	ISCLIP Open Your Course)		
Ξ	Descriptiv	res T-Tests		Mixed Models			
т	condition	siblings	A parents	hometown	f xaveragebond	+	
1	close	6	7	5	6	-	
2	intermediate	6	6	3	5		
3	distant	5	6	3	4.66667		
4	close	5	5	4	4.66667		
5	intermediate	6	5	4	5		
6	distant	5	6	3	4.66667		
7	intermediate	6	6	6	6		
8	close	5	4	6	5		
9	close	7	5	5	5.66667		
10	close	7	5	6	6		
11	close	7	6	5	6		
12	intermediate		7	7			
13	close	7	7	6	6.66667		
14	intermediate	6	5	4	5		
15	distant	6	5	7	6		
16	close	6	6	5	5.66667		
17	distant	5	6	2	4.33333		
18	close	5	6	5	5.33333		
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20	intermediate	6	5	3	4.66667		
21	intermediate	7	7	5	6.33333		
22	close	6	7	6	6.33333		
23	distant	6	7	6	6.33333		
24	intermediate	7	7	3	5.66667		
25	distant	3	5	2	3.33333		
26	distant	7	7	5	6.33333		
27	intermediate	5	6	6	5.66667		
28	distant	5	6	3	4.66667		
29	close	5	5	6	5.33333		
30	distant	6	7	5	6		



1. After the data spreadsheet opens

SEM

Factor

2. Click on Descriptives to open the analysis screen

Execute your Analyses – Start with Simple Descriptives – and Add Notes to your Results



Continue your Analyses with an ANOVA and Add Notes to your Results



Please note that ...

Currently you have to make a different mydata.jasp file for each selection of cases you make, e.g., before filtering (marked by the red ellipse), and before deleting or adding cases. Otherwise, all your analyses will be based on the latest selection of cases created.

This will be remedied in one of the future JASP releases.

		-	-	-		
	Descriptiv	ves T-Tests	ANOVA	Mixed Models	Regression	Frequencies
T	condition	siblings	parents	hometown	📏 averagebond	+
1	1	6	7	5	6	
2	2	6	6	3	5	
3	3	5	6	3	4.66667	
4	1	5	5	4	4.66667	
5	2	6	5	4	5	
6	3	5	6	3	4.66667	
7	2	6	6	6	6	

(C:\Users\hoijt101\Desktop\JASP-UU\KENNISCLIP Open Your Course)

A knowledge clip explaining the main features of JASP (selecting cases, computing variables, recoding, opening a data file, saving a mydata.jasp file, executing analyses, getting help, etc.) can be found at <u>https://osf.io/z7tbg/</u>

A virtually complete elaboration of all the features of JASP can be found at <u>https://jasp-stats.org/how-to-use-jasp/</u>



Save a mydata.jasp file as a myresults.html File on your Computer – only contains the annotated results

OpenJoyGaba (C:\Users\hoijt101\Desktop\JASP-UU\KENNISCLIP Open Your Course)



How to Make your Data Analyses Findable Using the Open Science Foundation



Step 1: Create a Free Account







Step 3: Make your Project Publicly A	vailable										
A https://osf.io/z7tbg/ 1: anybody can sur	https://osf.io/z7tbg/ 1: anybody can surf here to access your data analyses if										
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Open Your Course Files Wiki Analytics Registrations Contributors Add-ons Settings											
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Open Your Course											

Drag your Data and other Relevant Files into the Project you Created



The End