Empirical Research Methods 1
Topic: Experiment design, from research question to hypothesis

Instructor: Albulene Grajcevci

Tutors: Shravani & Piumal

Session 2: November 6th, 2023

ALPHA AND BETA ERRORS

ALPHA AND BETA ERRORS

- Alpha error = false positive = Type I error: Rejection of a true H0

- Beta error = false negative = Type II error: Acceptance of a false H0

Alpha level

- **<u>Very, very, very important and foundational concept</u>**
- Alpha level is namely a cut-off probability value
  - If the probability of our data (given that H0 is true) is below the cut-off level, then the data is so unlikely that we assume H1 is true
  - On the other hand, if our data (given that H0 is true) is above the cut-off level, we have no reason to reject H0 and therefore we keep the H0

  <u>This cut-off level probability usually set it fairly low, 5% or 0.05, so the chances of making an error are low.</u>

Alpha level

- Setting a Beta level explicitly is rather rarely done, has to do with the "power" of the test (number of participants etc), the realistic chance of being able to find an effect. More relevant for us: setting the alpha level

- "Statistical significance": a.k.a. "significance" or "sign." If our results have a p-value lower than our alpha value, the, results are interpreted as significant

- If our results have a p-value higher than our alpha value, the, results are interpreted as non-significant

Alpha level

- Later on this ERM1 seminar we will learn more about: p-value, significance, power, etc.

- What is important for now: that is clear for you what alpha and beta errors are and how they relate to the H0

- **Also please notice all these concepts go around the H0!**

Empirical Research Methods 1
Topic: Quality criteria, structure and content of scientific texts

Instructor: Albulene Grajcevci

Tutors: Shravani & Piumal

Session 2: November 13th, 2023

Quick note before we start

Same as with the slides from the previous topic and applicable to all future slides, headers in green like this:

Factorial design meets research questions, hypotheses, and IV and DV (again!)

◊ Which are some possible research questions and hypotheses for this factorial design? Define (or create) the IV's and DV's for this factorial design

Factor: Size of technology

Factor: Group size	Smartphone (S)	Tablet (M)	Tabletop (L)
Groups of three (3)	S-3	M-3	L-3
Groups of five (5)	S-5	M-5	L-5

→ 2 × 3 design

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…mean that those questions on those slides will be asked in the seminar session

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Agenda

➢ Control group

➢ Blind and double-blind study designs

➢ Quality criteria: Objectivity, Reliability, Validity

➢ Parts of a scientific paper

➢ Plagiarism and the importance of citations

➢ The fantastic world of APA style

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From last week…

◇ **Experimental design**: How you set up your experiment:

  ▫ Between groups vs. within subject?

  ▫ Assignment of participants (e.g., randomization)?

  ▫ Inclusion of control variables? Which ones?

  ▫ Sample size (n)?

  ▫ (…)

  ▫ **Factorial design**: part of the experimental design

    ◇ Definition of factors and factor levels (e.g., 2 x 3)

    ◇ Having more than one factor / IV allows you to determine possible interactions between factors

Resources:
http://support.sas.com/resources/papers/sixsigma1.pdf
https://en.wikipedia.org/wiki/Design_of_experiments#Discussion_topics_when_setting_up_an_experimental_design

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CONTROL GROUP

Control group

"…a group separated from the rest of the experiment such that the independent variable being tested cannot influence the results."

https://www.thoughtco.com/control-and-experimental-group-differences-606113

	Factor 1: Prompt A	
	Prompt A: on	Prompt A: off
Prompt B: on	A-B	B
Prompt B: off	A	Control Group

Factor 2: Prompt B

Control group

◇ Not all experiments have a control group

◇ Experiments with a control group can be called "controlled experiments"

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BLIND AND DOUBLE-BLIND STUDY DESIGNS

Blind and double-blind experimental designs

➤ For preventing biases on our research study

➤ Blind study: the participant doesn't know to which condition they were assigned to, but the experimenter knows ;-)

➤ Double blind: neither the experimenter nor the participant know the condition to which the participant was assigned

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Blind and double-blind experimental designs

1. "For preventing biases on our research study"… What kind of biases do you think a blind or double-blind study can prevent?

2. What are some possible complications that would need to be accounted for in case of wanting to conduct a blind or double-blind study?

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QUALITY CRITERIA: OBJECTIVITY, RELIABILITY, VALIDITY

Main quality criteria: Hierarchical relationship
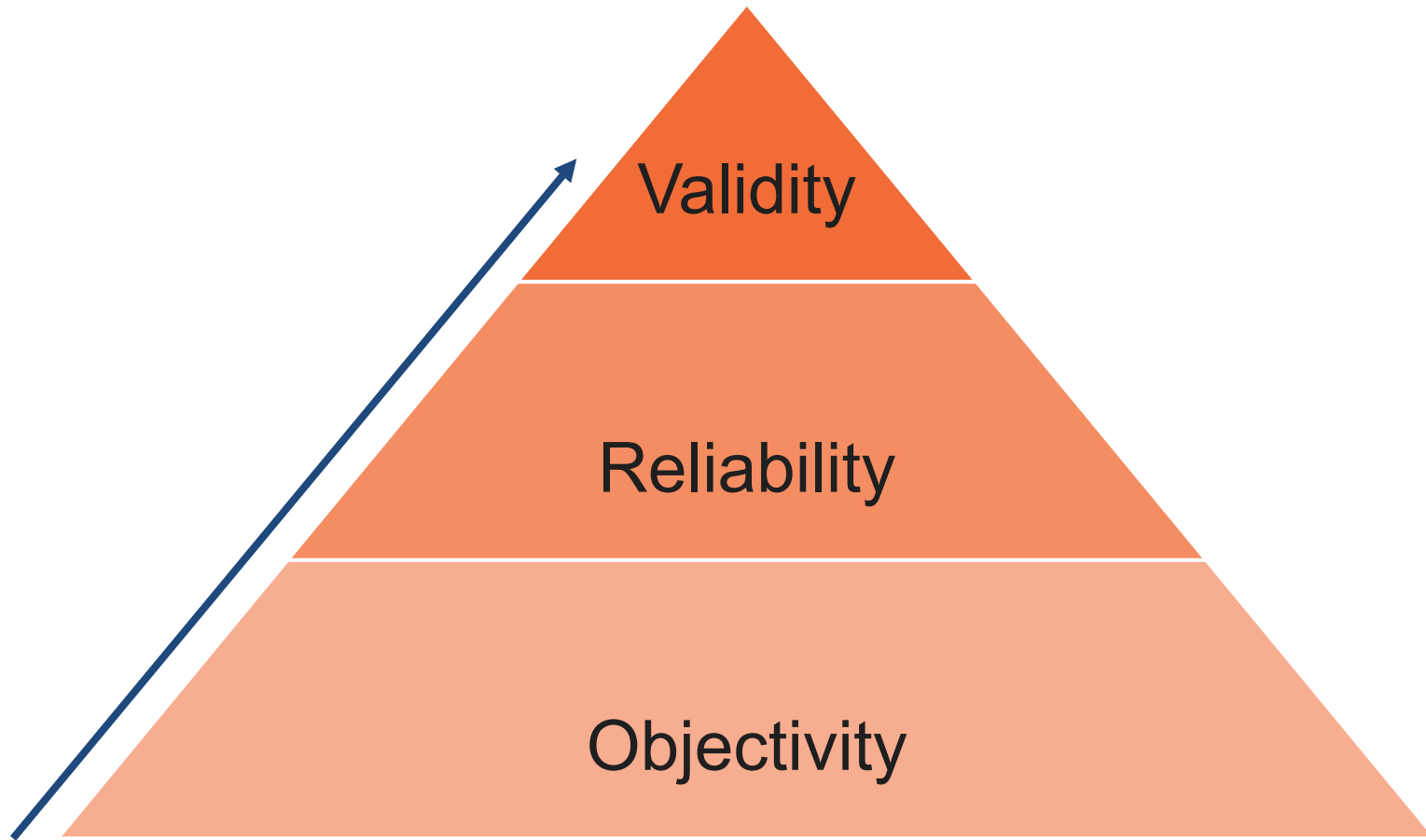
Quality criteria: Objectivity

1. If data has not been collected and analyzed **objectively**, any results are due to personal biases and therefore cannot be reliable or valid.

Example: for measuring a table, we could use our hand (e.g. "2 hands long, 1.5 hands width") but that varies from person to person. Therefore, an objective measure could be a ruler

Maybe let's use this instead…
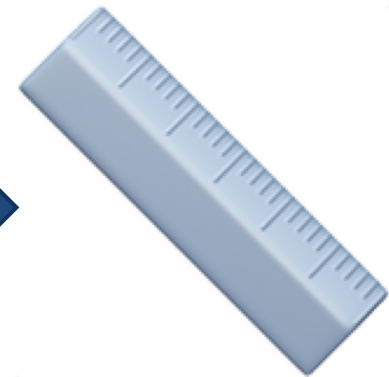
How to increase objectivity

◇ While conducting experiments:

- Trained experimenters (experimenter guidelines)

- Blind experimenters (blind to exp. conditions)

- Standardization of the situation

◇ When analyzing data:

- Standardize analysis procedures

- For qualitative analysis: Inter-rater reliability

- Blind analysis

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Quality criteria: Reliability

2. Assuming data has been collected objectively, it also needs to be **reliable**: obtaining the same results, of the same object, if measuring multiple times.

Example: for measuring the <u>same table</u> multiple times, the ruler should provide highly similar measurements, regardless of who makes the measurement or when

Friday, 10 am

40 cm

Wednesday, 7 pm

38.5 cm

Sunday, 2 pm

39 cm
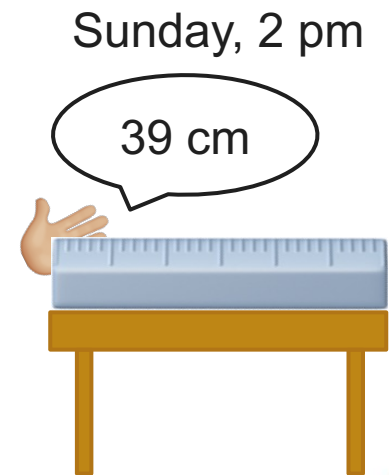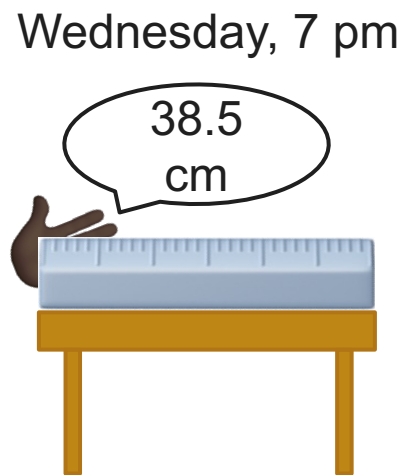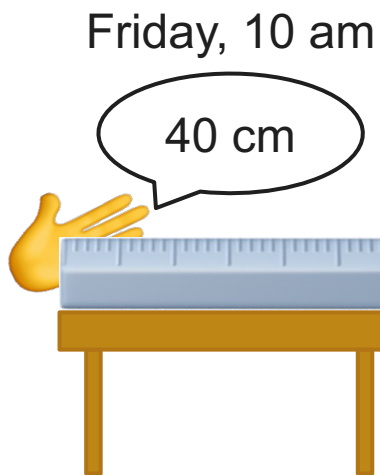
Quality criteria: Validity

3.   Finally, even if data is objective and reliable, it may still not be **valid**. For that, we need to ensure that measure what we truly intend to measure; do justice to the underlying construct.

Example: using a ruler that is well calibrated (correct spacings). If we're measuring in cm then that the ruler is in centimeters and not inches
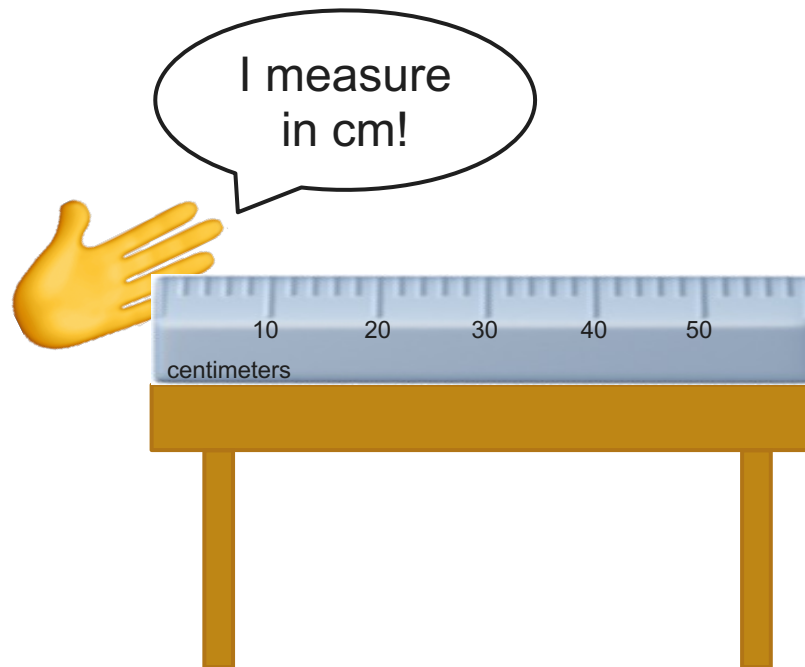
PARTS OF A SCIENTIFIC PAPER

Typical parts of a scientific paper

◇ Parts

- Title

- Abstract

- Introduction

- Theoretical background

- Research design & methods (sample, sampling technique, exp. procedure, data collection (incl. which DVs and how are they measured), ethical considerations, quality criteria and how to meet them, overview on analysis)

- Results

- Discussion

- Limitations and future research

- Conclusions

- References

- Acknowledgements

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PLAGIARISM AND CORRECT CITATIONS

We already mentioned this aspect during the first session. This is a quick reminder (with memes) about it

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PLAGIARISM!

WHAT? ME PLAGIARIZE? NO WAY!

[1]

[2]
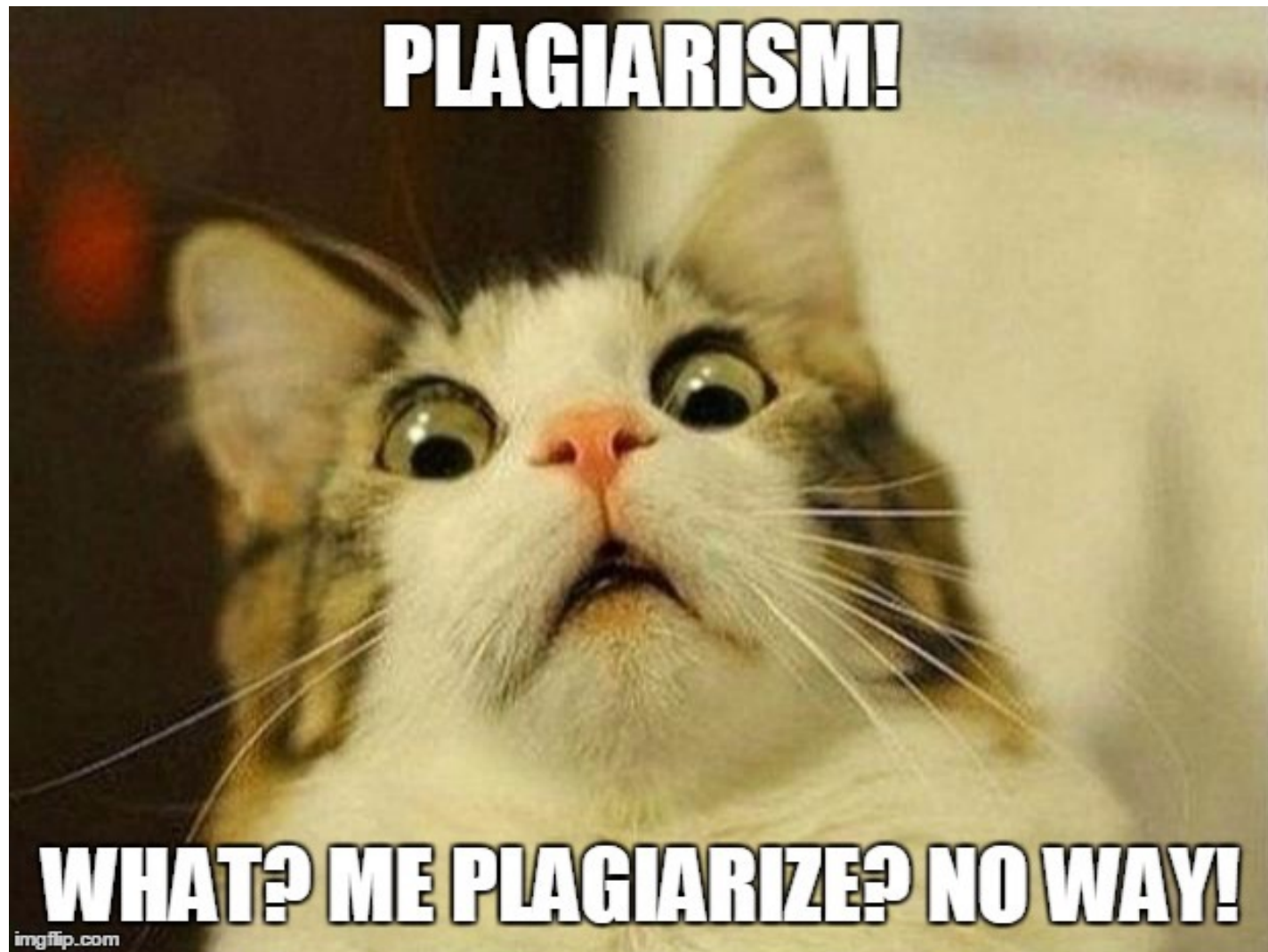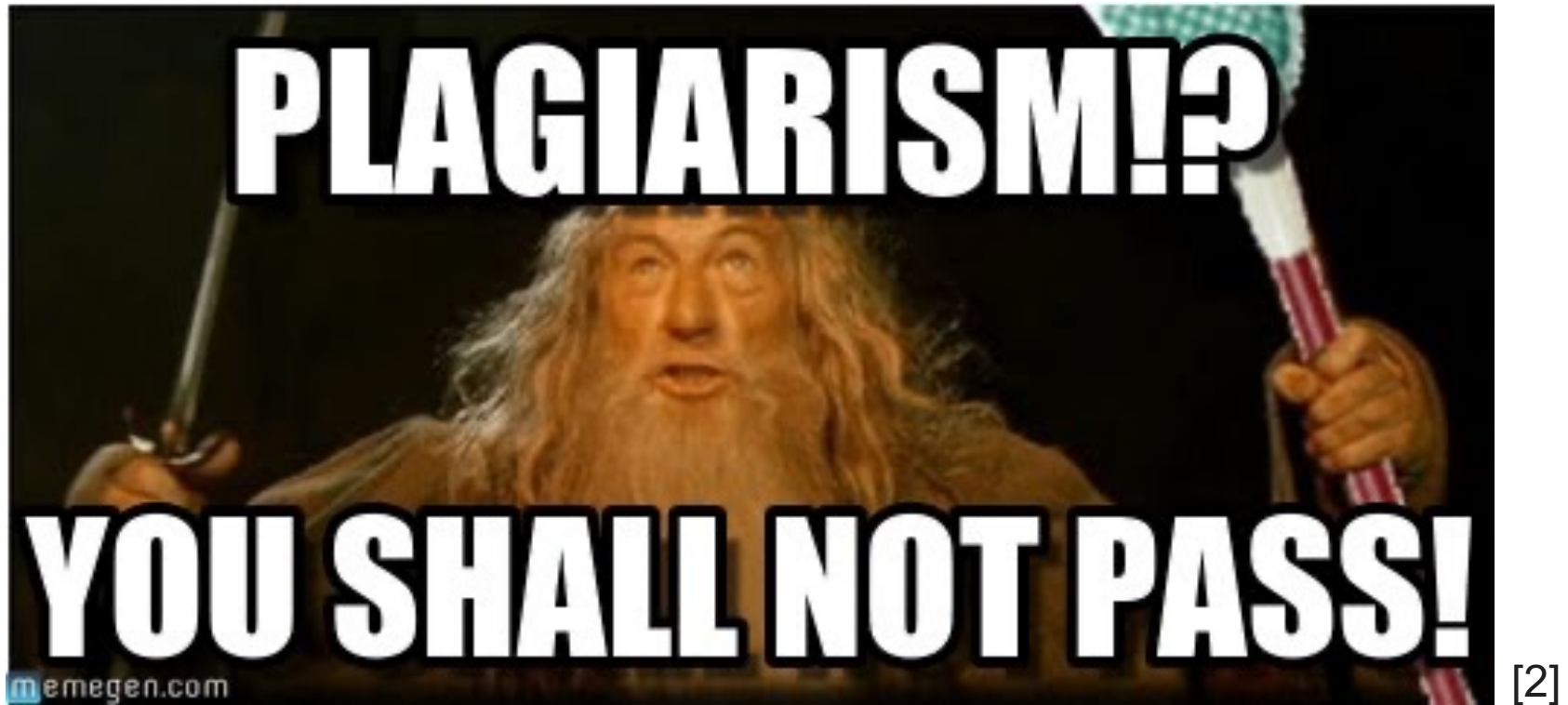
Consequences of plagiarism:

- Minor violations   → worse grade
- Major violations   → failing the class
- Serious or repeated violations → losing the right for examinations → failing the
                                                              study program

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[3]

[1] https://imgflip.com/i/qert2
[2] https://shhs-southhadleyschools.libguides.com/incorporatingquotes
[3] http://memes.com/img/1093232

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THE FANTASTIC WORLD OF APA STYLE

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APA:
Have you heard about that?

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APA: quick intro

- Acronym of "American Psychological Association". Funded in 1892

- Very influential organization in the field of Psychology

- Created the APA style and Publication manual (on next slide) which is not only used in Psychology but also in other fields.

- You will need to use APA style for most, if not all, of your classes

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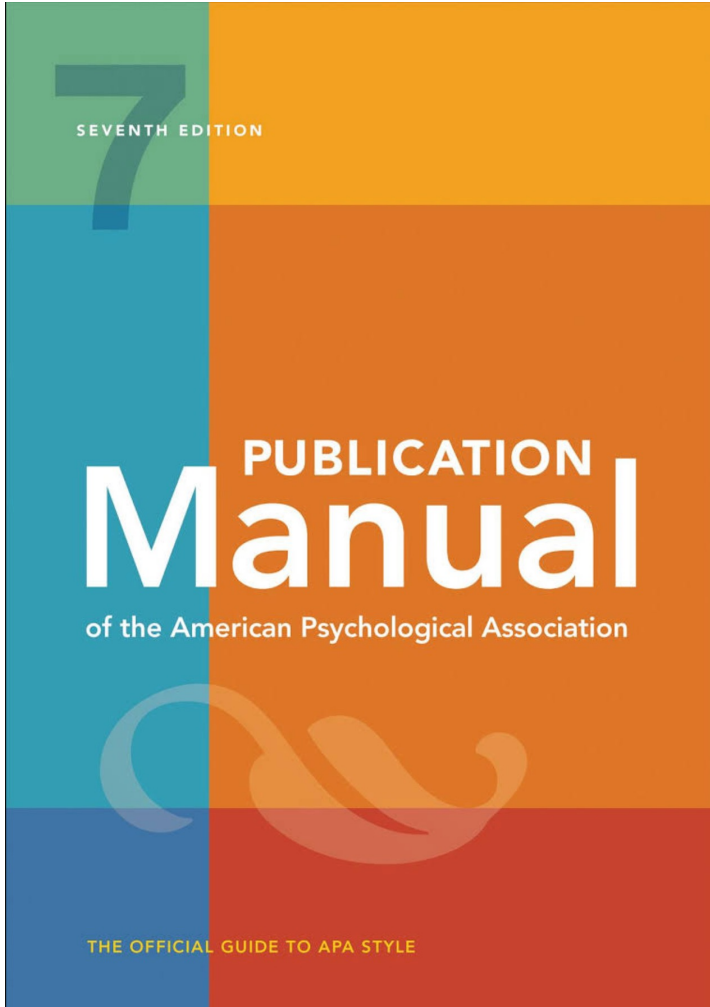
- Latest edition: 7th; released in 2019

- Comprehensive book; it is recommended to read about the respective topics once you need them

- You do <u>not</u> need to learn the rules by heart for the exam!

- However, it can be handy to master the most important rules without checking the book every single time

All ideas, results, analyses, etc. that you did not produce yourself, **need to be cited accordingly!**

APA:
Frequently needed rules

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In-text citations: Paraphrasis

◇ You refer to results / ideas / argumentation of someone else, describing in your **own words** what they have stated before

◇ Format:

…text text text (Weinberger & Fischer, 2006).

Last name(s) of author(s)	Year of publication

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In-text citation: Direct quotation

◇ **Word-for-word** reproduction of text

◇ Try to avoid using direct quotations as much as possible

◇ "Basic" format:

"text text text" (Weinberger, 2014, p. 840)

Quotation in quotation marks

Last name(s) of author(s)

Publication year

Page number of quotation

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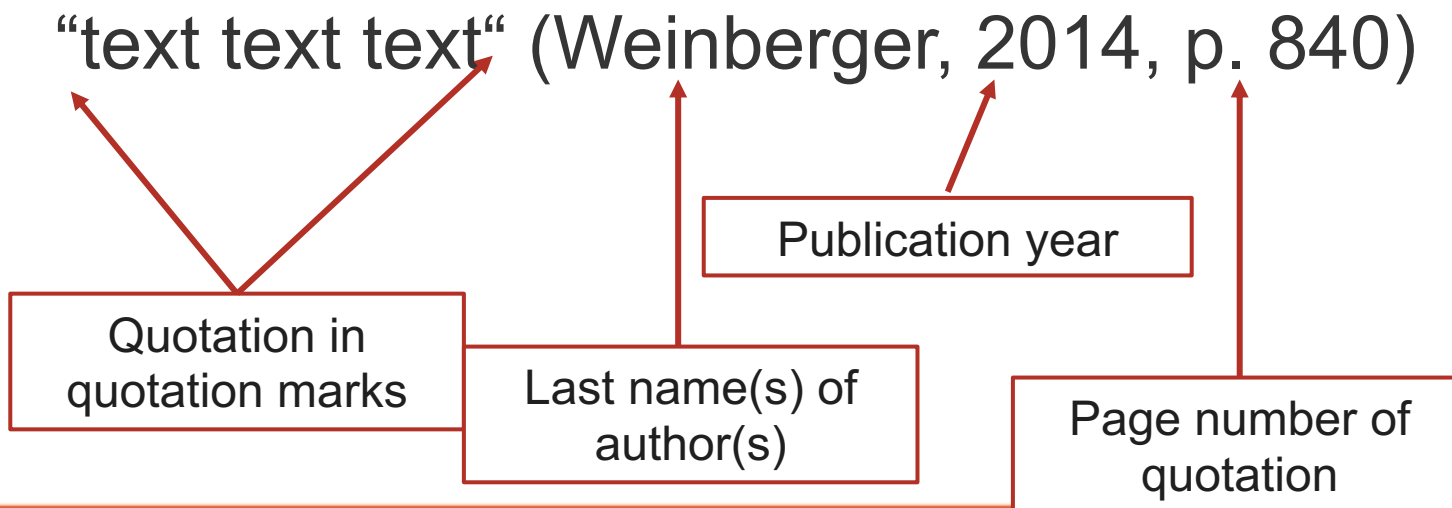
In-text citations: Amount of authors

Number of Authors to Include in In-text Citations

For a work with one or two authors, include the author name(s) in every citation.

(McCall, 2019)

(Moyer & Hendricks, 2014)

Thornton and Manning (2016)

For a work with three or more authors, include the name of only the first author plus "et al." in every citation, including the first citation, unless doing so would create ambiguity.

(Huerta et al., 2019)

Kapoor, Bloom, Montez, et al. (2017)

Kapoor, Bloom, Zucker, et al. (2017)

To learn more about avoiding ambiguity in in-text citations, see pp.266-267 of the manual.

Morningside University. (2021, February 25). *LibGuides: APA Citations (7th ed.): In-text Citation Author Rules*. Morningside.libguides.com; Morningside University. https://morningside.libguides.com/APA7/authors

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APA (7th ed.): Reference list

◇ **Journal article**

◻ Tsovaltzi, D., Judele, R., Puhl, T., & Weinberger, A. (2015). Scripts, individual preparation and group awareness support in the service of learning in Facebook: How does CSCL compare to social networking sites? *Computers in Human Behavior, 53*, 577-592. doi: 10.1016/j.chb.2015.04.067

◇ **Book**

◻ Ladel, S., Knopf, J., & Weinberger, A. (Eds.). (2018). *Digitalisierung und Bildung* (1st ed.). Springer Fachmedien Wiesbaden

◇ **Book chapter**

◻ Weinberger, A. (2018). Orchestrierungsmodelle und -szenarien technologie-unterstützten Lernens. In S. Ladel, J. Knopf, & A. Weinberger (Eds.), *Digitalisierung und Bildung* (pp. 117–139). Springer Fachmedien Wiesbaden. https://doi.org/10.1007/978-3-658-18333-2_7

◇ **Conference papers**

◻ Schmitt, L., & Weinberger, A. (2016, August). Dyadic argumentation of elementary school children with a reflective tool. *Earli SIG 26 (Argumentation, Dialogue and Reasoning)*.

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APA Advice

◇ Ensure to always consult the rules from the latest edition of the APA style. Currently (2021) we're on the 7th Edition

◇ You can rely on software and web services for managing and correctly writing your references. However cross-check that the service complies with the latest edition of APA

▫ Some suggestions: BibTeX, Google scholar, mybib.com, citationmachine.net

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Self-paced APA exercise 1

Instructions: Write the correct reference (as in a reference list)
The answer is in the next slide!

- Title: A lifespan perspective on embodied cognition
- Type: Journal article (Frontiers in Psychology)
- Authors:
  - Loeffler, Jonna
  - Raab, Markus
  - Cañal-Bruland, Rouwen
- Year: 2016
- Volume: 7
- Pages: 1-6
- Doi: 10.3389/fpsyg.2016.00845
- Keywords: Cognition; Developmental; Elderly; Embodiment; Lifespan; Sensorimotor

Self-paced APA exercise 1 ANSWER

Loeffler, J., Raab, M., & Cañal-Bruland, R. (2016). A Lifespan Perspective on Embodied Cognition. *Frontiers in Psychology*, *7*. https://doi.org/10.3389/fpsyg.2016.00845

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Self-paced APA exercise 2

Instructions: Write the correct reference (as in a reference list)
The answer is in the next slide!

- ◇ Title: Content Analysis: An Introduction To Its Methodology
- ◇ Type: Book
- ◇ Authors: Klaus Krippendorff
- ◇ Year: 2012
- ◇ ISBN: 1483307034
- ◇ Publisher: Sage
- ◇ 456 pages
- ◇ Location: Thousand Oaks, California

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Self-paced APA exercise 2 ANSWER

Krippendorff, K. H. (2013). *Content Analysis - 3rd Edition : an Introduction to Its Methodology*. Sage Publications, Inc

Self-paced APA exercise 3

Instructions: For the following publications, identify if they are a journal article, conference proceeding, or a book chapter
The answer is in the next slide!

Bransford, J. D., & Schwartz, D. L. (1999). Rethinking transfer: A simple proposal with multiple implications. *Review of Research in Education, 24,* 61–100.

Clark, H. H. (1985). Language use and language users. In G. Lindzey & E. Aronson (Eds.), *Handbook of social psychology* (3rd ed., pp. 179–231). New York: Harper and Row.

Clark, H. H., & Wilkes-Gibbs, D. (1986). Referring as a collaborative process. *Cognition, 22*(1), 1–39.

D'Angelo, S., & Begel, A. (2017, May). Improving communication between pair programmers using shared gaze awareness. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (pp. 6245–6290). New York: ACM.

Dillenbourg, P., Lemaignan, S., Sangin, M., Nova, N., & Molinari, G. (2016). The symmetry of partner modelling. *International Journal of Computer-Supported Collaborative Learning, 11*(2), 227–253.

Gergle, D., & Clark, A. T. (2011). See what i'm saying?: Using dyadic mobile eye tracking to study collaborative reference. In *Proceedings of the ACM 2011 conference on Computer supported cooperative work* (pp. 435–444). ACM.

Hayes, A. F., & Krippendorff, K. (2007). Answering the call for a standard reliability measure for coding data. *Communication methods and measures, 1*(1), 77–89.

Jermann, P., Mullins, D., Nüssli, M.-A., & Dillenbourg, P. (2011). Collaborative gaze footprints: Correlates of interaction quality. *CSCL2011 Conference Proceedings. Volume I - Long Papers*, 184–191.

Mason, L., Pluchino, P., & Tornatora, M. C. (2015). Eye-movement modeling of text and picture integration during reading: Effects on processing and learning. *Contemporary Educational Psychology, 14*, 172–187.

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Self-paced APA exercise 3 ANSWER

Bransford, J. D., & Schwartz, D. L. (1999). Rethinking transfer: A simple proposal with multiple implications. *Review of Research in Education, 24*, 61–100. Journal article

Clark, H. H. (1985). Language use and language users. In G. Lindzey & E. Aronson (Eds.), *Handbook of social psychology* (3rd ed., pp. 179–231). New York: Harper and Row. Book chapter

Clark, H. H., & Wilkes-Gibbs, D. (1986). Referring as a collaborative process. *Cognition, 22*(1), 1–39. Journal article

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Hayes, A. F., & Krippendorff, K. (2007). Answering the call for a standard reliability measure for coding data. *Communication methods and measures, 1*(1), 77–89. Journal article

Jermann, P., Mullins, D., Nüssli, M.-A., & Dillenbourg, P. (2011). Collaborative gaze footprints: Correlates of interaction quality. *CSCL2011 Conference Proceedings*. Volume I - Long Papers, 184–191. Conference proceedings

Mason, L., Pluchino, P., & Tornatora, M. C. (2015). Eye-movement modeling of text and picture integration during reading: Effects on processing and learning. *Contemporary Educational Psychology, 14*, 172–187. Journal article

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IMPORTANT!

Now that we have covered the topic of APA and how to cite. It will be obligatory for now on to cite your references, both in-next and in the bibliography, using APA style!

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