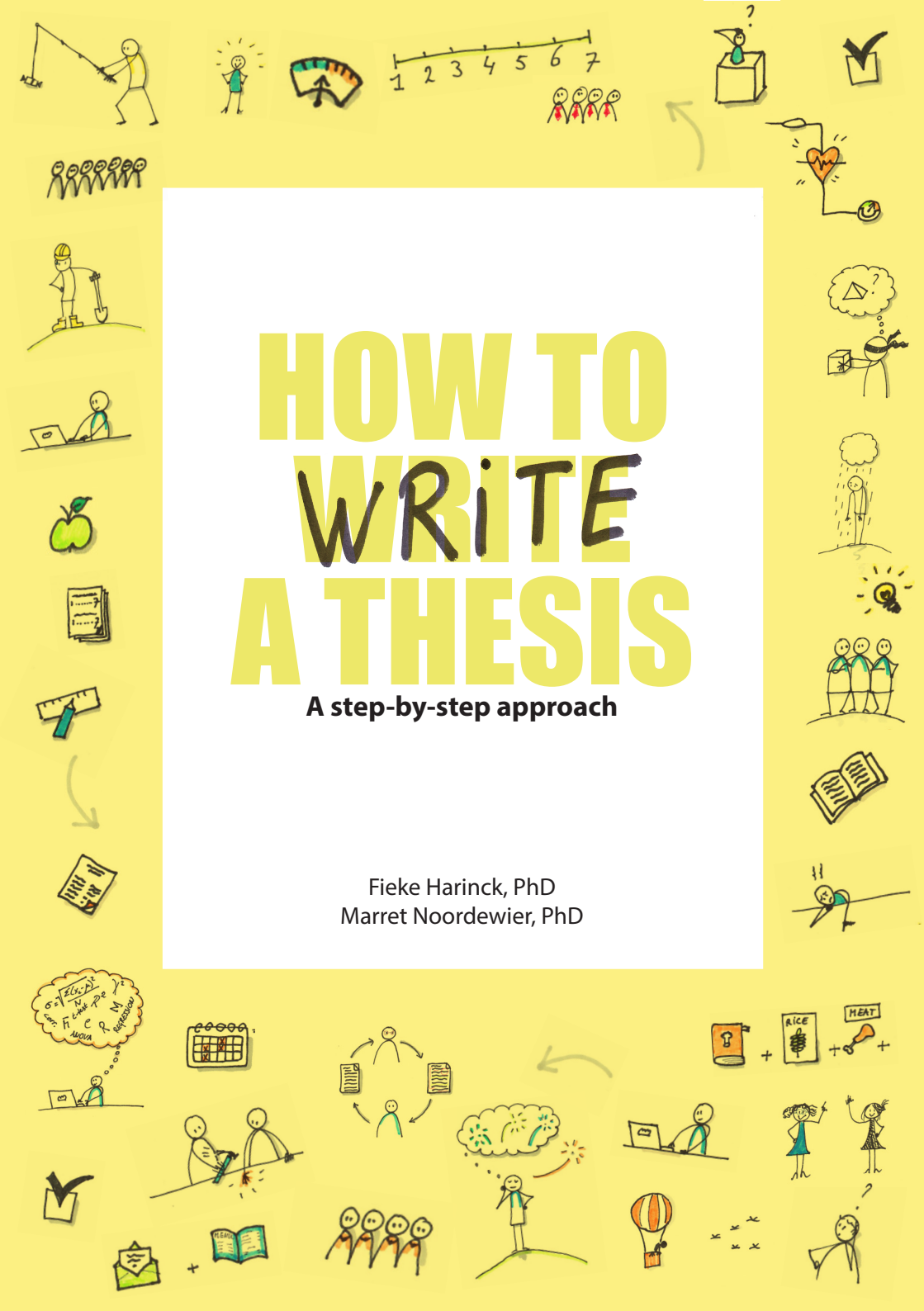

# HOW TO WRITE A THESIS

## A step-by-step approach

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How to write a thesis – a step-by-step approach



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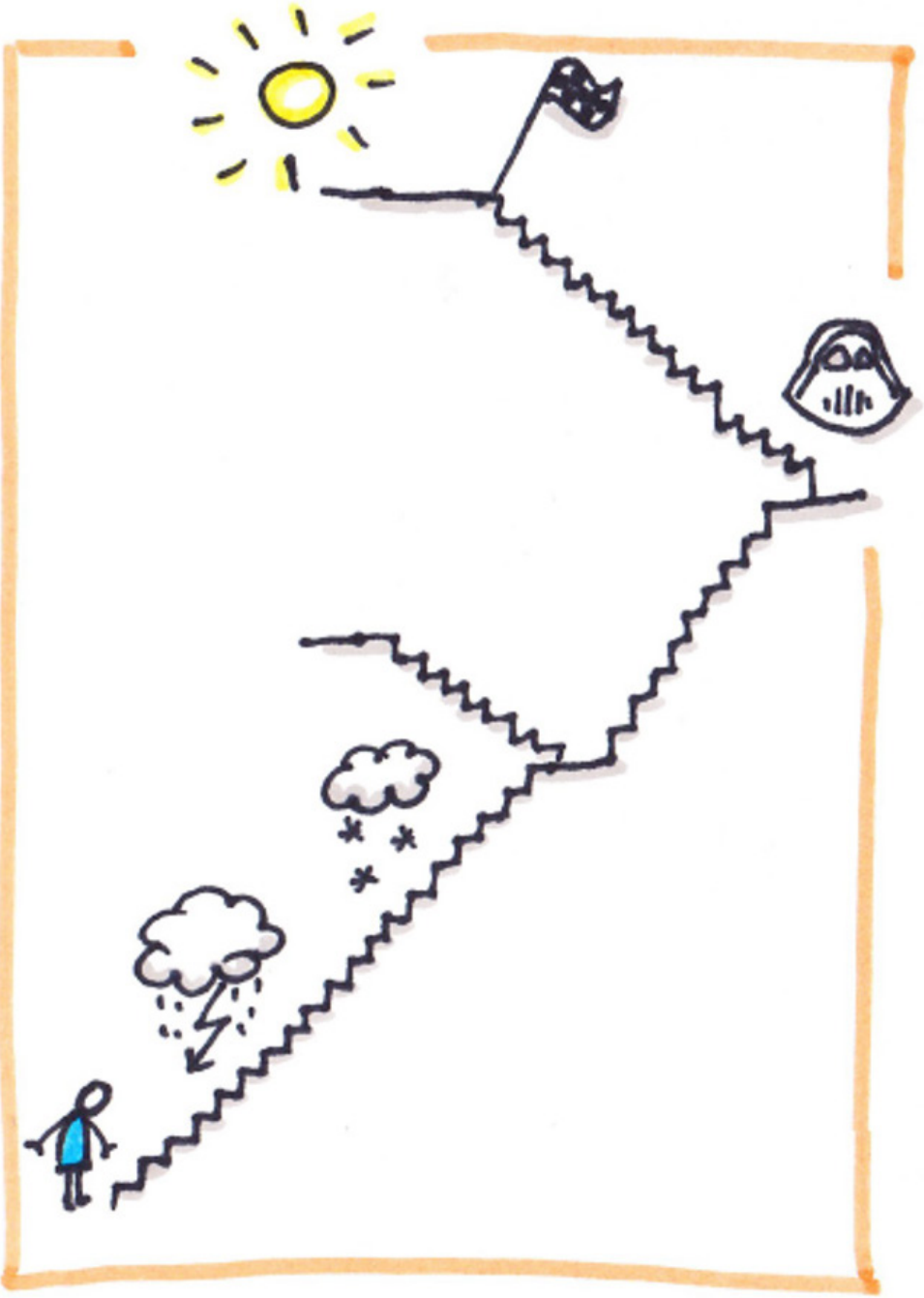


# The purpose of this book

We (Fieke Harinck and Marret Noordewier) work at the unit of Social, Economic, and Organisational Psychology at Leiden University, and we have supervised many students writing their master theses for many years. We see that students face similar problems or challenges during this process. So, we wanted to give our students some extra back-up and support while they were writing their theses. Right now, you are reading our solution, which we think might come in handy for any student writing an empirical thesis in the social sciences.

With this book, we take you through the process of writing an empirical thesis, step-by-step. We (primarily) focus on experimental research since that is most common in our field. By breaking down the steps of experimental research in chronological order and including tips in each step, we hope to give you some guidance in the task of writing a thesis.

In the first part of the book, we focus on the content of the thesis and setting up and conducting a study (e.g., reading, developing a research question, collecting data, etcetera). In the second part we focus on writing and give you some tips and tricks to write a readable thesis. The third part is about the personal stuff (motivation, how to deal with your supervisor or feedback, etcetera). The last part is about statistics; we give a short description of the most frequently used statistical tests and how to work with them.

Each step consists of a page of text, and a complementary drawing to illustrate the step. We hope you enjoy the book and also enjoy writing your thesis. But above all, we try to keep things simple, even if the content or the work of the thesis seems hard.

P.S. A disclaimer: even though our tips and guidelines are as general as possible, they reflect our view, and your supervisor might have different ideas about how to go about writing a thesis. In that case; follow your supervisor's advice.

## Part 1

The content of the thesis

# OVERALL STRUCTURE

1. INTRODUCTION = INVITATION + MENU


2. METHOD = RECIPE

3. RESULT = DESCRIPTION OF THE ACTUAL DISH

4. DISCUSSION = EVALUATION

# The overall structure of a thesis

Before you start, it is useful to already have a sense of the overall structure of the thesis, to know where you are heading. The overall structure of a thesis can be seen as a giving a dinner party, from preparation to cleaning afterwards.

The introduction of your thesis is like the invitation for your dinner party. In the invitation you try to make people enthusiastic for your dinner; in your introduction you try to make people enthusiastic for your thesis research. You describe what you are going to cook (study) and the ingredients (research concepts) so people know how you want to go about, and what they can expect (a.k.a. hypotheses).

The method section is the recipe of your dinner; you describe what ingredients you use (participants, design, and materials) and you explain step-by-step how you prepare the meal (procedure). Ideally, someone reading the recipe of your research could do the same research (or make the same dish).

In the results section you describe what came out of the oven (data analysis and results). How did you test it (describe the tests) and is the end result as you expected it beforehand (hypothesis testing)? Was the meat indeed medium-rare or did it come out well done or even overcooked? Describe the results for a reader, so the reader knows what the results look like.

Finally, in the discussion you evaluate the dinner. You look back upon the dinner, decide which was the best dish, which dish was different than anticipated and you reflect on how you can adapt the recipe to make the dish better. And of course, you need to do the dishes afterwards, and decide what you need to throw away and which leftovers you want to put into the fridge for later consumption (future research).


READ

# Read

Your first task in a thesis project is to familiarize yourself with the topic that you will study. So, after you have chosen (or have been assigned to) a topic, you can start reading about it. You can also look up information on the internet, or interview someone who is an expert or whatever suits you to get more knowledge about the topic. Note what you find interesting, intriguing, funny or confusing; those issues might be a starting point for your own research.

It is normal to feel (a little) overwhelmed in this first phase. Allow yourself nót to know where it is all going to end yet, and just satisfy your curiosity by reading about the topic and by digging deeper into the parts that you find interesting. Things become clearer in a few weeks; but first familiarize yourself with the topic. Your supervisor will also help you structure the information and may already have some ideas on the research questions.

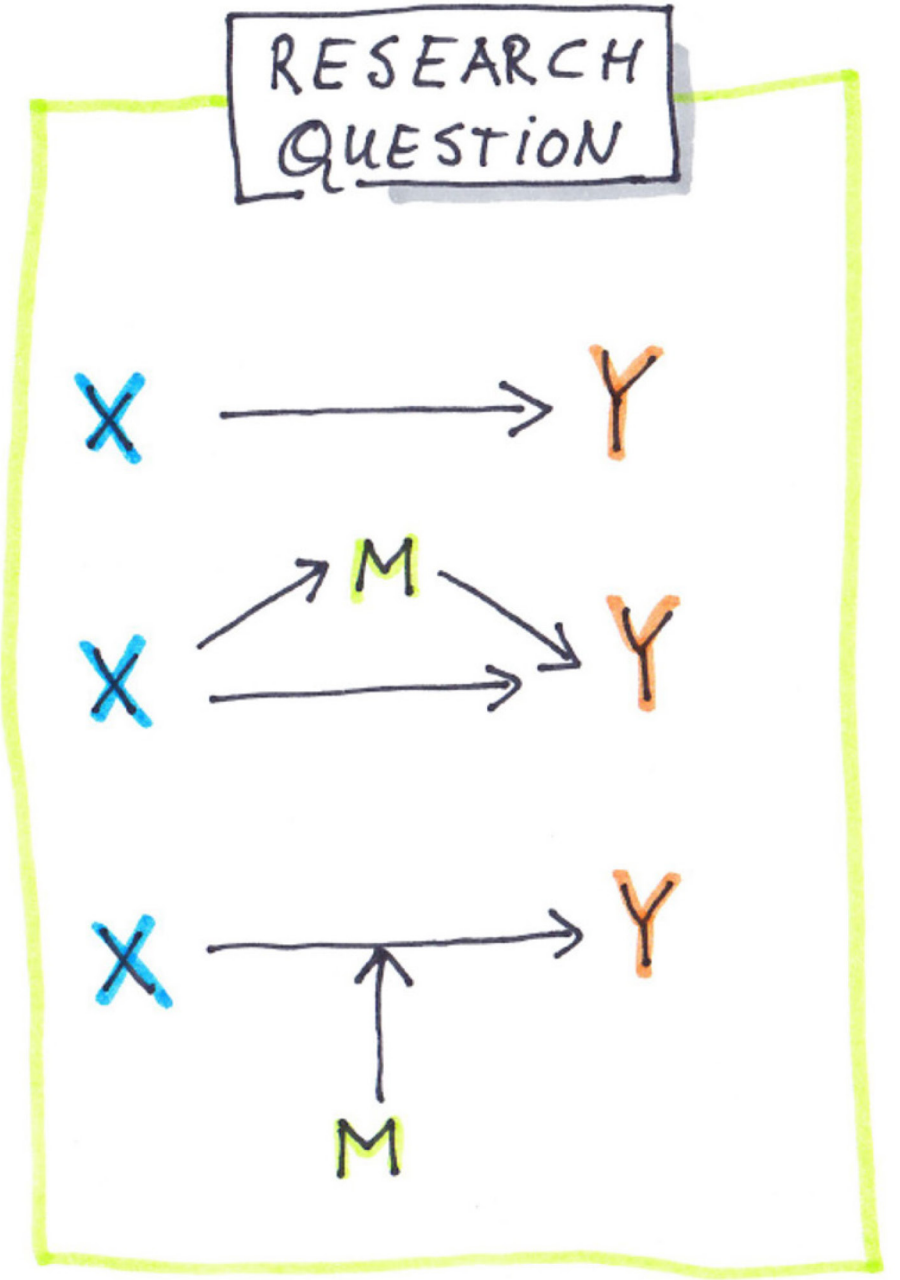

THINK (OUT OF THE BOX)

# Think

Think while getting familiar with the topic. What characteristics do you especially like about the topic, which characteristics do you find strange, confusing or fascinating? Is there another concept or theory that might be interesting or relevant for your topic or do you know some other research that you would like to combine with this topic? You can literally think of anything here; please think outside the box.

Students sometimes have no idea how creative or innovative their ideas are. Since you are a newbee to the topic, you have the valuable 'fresh look', unhampered by knowledge about 'how things are done' or prior experience. Experienced researchers (your supervisor) have a lot of knowledge and expertise, but this knowledge can sometimes hamper creativity or block seeing new angles or perspectives. We have had students who came up with really good ideas (inversed loss aversion for example) without realizing how new or innovative their idea was.

So think, and dare to think outside the box; science needs it.


RESEARCH QUESTION
X
Y
X
M
Y
X
Y
M

# Research question

As a third step, you start to formulate your research question(s). A research question generally has the format of “We investigate the effect of X on Y”. For example, we investigate the effect of stress (X) on well-being (Y). Often, the research question is more elaborate than just the effect of X on Y, and a third concept (M) is included. For example, “We investigate the effect of stress (X) and feelings of threat (M) on well-being (Y)”.

It can be helpful to draw a research model of your research question, as shown on the page to the left. It can help you to structure your thoughts about how the different concepts are related to each other and how they are supposed to influence each other. On the left you see common research models. The basic model is a straight arrow from X to Y. This model shows a main effect of X on Y, and it means that there is a direct influence of X on Y.

In the drawing you also see two other types of research questions with concept M being a mediator (upper drawing) or a moderator (lower drawing). A mediator means that M (statistically) explains the effect (i.e., X affects Y via M) while a moderator means that M influences the effect of X on Y (i.e., the effect of X on Y depends on levels of M).

HAMMER → PAIN

CAUSE → EFFECT

X → Y

INDEPENDENT → DEPENDENT

INDEPENDENT & DEPENDENT VARIABLES

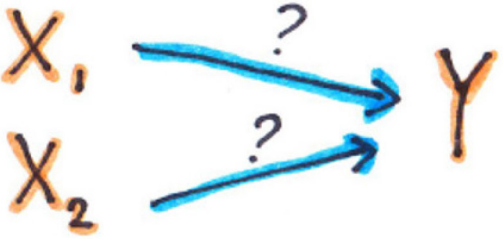
# Independent and dependent variables

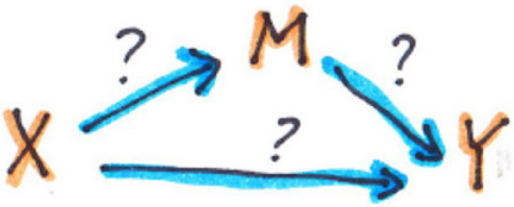
When you formulate your research question, you define what your independent and dependent variables are. Independent and dependent variable is scientific jargon for cause and effect. This page aims to freshen up your knowledge about these concepts.

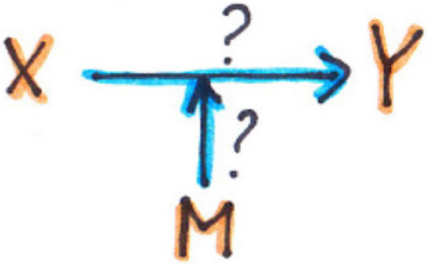
An *independent* variable is something that causes or influences the effect that you are going to measure. In the research questions on the earlier pages X is called the independent variable because it influences Y. Y, in turn, is called the *dependent* variable because Y is influenced by—dependent upon—X.

For example, if you would like to investigate the effect of hammer force (X) on the experience of pain (Y), the hammer force is the independent variable and the experience of pain is the dependent variable. The level of pain (Y) is dependent on the force of the hammer (X), so therefore we call Y the dependent variable. M as moderator is also an independent variable. M as mediator is typically referred to as one of the dependent variables.

Often, experimenters manipulate the independent variable; they create different forces of the hammer before they measure the subsequent pain experience (e.g., low vs. high force). It is however also possible that an independent variable is not explicitly controlled or manipulated, for example when a researcher just measures or observes the hammer's force and subsequent pain experience.




HYPOTHESES

# Hypotheses

Once you have established your research question(s), you need to make predictions about the effects of your independent variables on your dependent variables; the so-called hypotheses.

In the research question you could be quite general: "We investigate the effect of an anti-stress training on feelings of threat and well-being", but in the hypotheses you need to become explicit in your expectations and tell your readers *how* the training will affect well-being (positively, negatively, U-shaped?).

In the text leading up to the hypothesis, you furthermore explain *why* you have these expectations/hypotheses; the so-called 'rationale'. Take readers by the hand and explain, step-by-step, the background to your hypotheses, based on theory or prior research. Or, when you are studying (partly) unexplored territory, hypotheses can be based on sound argumentation.

Hypotheses have explicit directions or make explicit comparisons. For example, you have the expectation that anti-stress training (vs. no such training) (X) leads to more well-being (Y), because you expect the training to decrease a person's feelings of threat (M).

In the drawing this would reflect the triangular hypotheses, and you could write that "it is expected that anti-stress training leads to higher levels of well-being due to the diminishing effect of the training on feelings of threat". Do not write "training will have *an effect* on well-being" since in this latter sentence the direction of the effect is still missing. Make explicit how you expect X to affect Y.

When you have different groups in your study, make explicit how you expect the groups to differ. If you have a control group (without experimental treatment) and a training group, you can write that "it is expected that the training group will feel less threatened and will consequently have higher levels of well-being *compared to* the control group". Do not write just about the training group

("the training group will be less threatened and consequently will have higher levels of well-being") because your reader does not know with what you compare the training group and the meaning of "more" is unclear (more than what?). Nor write that "there is a *difference* between the training group and the control group" because also in this sentence a clear direction of how the groups differ is missing.

In the drawing there are question marks next to each arrow; when you make this drawing for your own project, you can put plusses (+) and minuses (-) instead of the question marks. A plus (+) next to the arrow from X to Y means that higher levels of X are related to higher levels of Y, for example more stress leads to higher levels of well-being. A negative relation between two concepts, a minus (-) from X to Y means that higher levels of X lead to lower levels of Y, for example more stress leads to lower levels of well-being.


HOW?
SURVEY
EXPERIMENT
OBSERVATIONS
CHOOSE A METHOD

## Choose a method

While you are working on a research question and hypotheses, it is also time to start thinking about how you are going to study or test these hypotheses. Are you going to do a laboratory experiment with a lot of experimental control, are you going into the field, or are you going to ask people about certain topics? Will you do a survey, observations, or will you ask your participants to do a specific task and measure their performance?

Sometimes you can choose the method yourself, and sometimes it is decided for you by your supervisor. The type of research you will do depends on your research question, what you find interesting, on what is already available, or—more pragmatic—what your supervisor is already doing. When your study is a follow-up study on prior research, you may want to use a similar study set-up in order to compare your results with the prior research. Also, because it can be quite a hassle to get an experimental situation or task to work properly, you can benefit from that prior experience by using a similar set-up. Just make sure you mention the prior research so a reader knows whom to give the credit for it.

There is a lot to tell about (experimental) methodology which is beyond the scope of this book. For more information on methodology we refer you first to your own methodology courses, or the recommended reading at the end of this book.

# STRUCTURE INTRO

# Introduction structure

The goal of the introduction section is to provide the theoretical background of your hypotheses and to present a *reasoning* that explains how you got to your hypotheses.

The start of your introduction (= first paragraph) introduces the topic of investigation. The function of this paragraph is to make readers interested in your work. You can do so by, for example, briefly presenting a theoretical or practical problem, or an intriguing anecdote. You then present your research question and you explain (in general terms) how you will address this question.

After the opening, you start the main part of the introduction, in which you present your reasoning. You discuss relevant definitions, prior research, theories, and gaps in the literature. Rather than providing a summary of your literature search, you explain how your information supports the logic of your hypotheses. As a rule of thumb, you can see each paragraph as one step in your reasoning (see also the next step; Make an outline).

The introduction ends with the hypotheses (which should be very clear at this point and thus repeat in a formal way what you just argued for) and a short description of the current research (as a 'bridge' to your method section that follows).

# MAKE OUTLINE OF INTRODUCTION

1. RQ
2. Topic A
   - DEFINITION
   - PRIOR RESEARCH
   - NEW....
3. TOPIC B
   - DEF.
   - RELATION WITH A

... etc

# Make an outline

Make an outline of your introduction before you start actually writing your introduction. With an outline, in which you describe the reasoning steps that you present in each paragraph, you can more easily structure what you are going to write and where, because you separate the process of *thinking* from the process of *writing*. Without an outline, it is easy to 'drown' in your literature or to get lost in your train of thought.

On the left you see an example with a bullet point for each paragraph. In the first paragraph you introduce the research question (RQ), so the reader is prepared for the topics that are coming. You may also highlight how studying this question is innovative and relevant. In the second paragraph you introduce your first major concept, and explain how you are going to use it. Then you discuss how prior theories and research on this topic is relevant to your hypotheses. Then you turn to topic B, which you first introduce and then relate to topic A, and so on.

Each outline may look different, but the general idea is that you think about the structure of your introduction as a set of reasoning steps. You create this structure before you start writing, so you do not dive into the details immediately. Once you are satisfied with the structure (and often also after feedback from your supervisor), you can start filling the paragraphs with text, knowing what you want to discuss in each paragraph.

An outline gets even better when you use core sentences as first sentence in each paragraph (see the writing tip at page 84/85). A core sentence captures the core/essence of what you want to say in the paragraph. Your outline can be a list of core sentences, and these core sentences can be elaborated upon in each paragraph.


RICE
MEAT
METHOD

# Method

After writing the theoretical introduction, you start writing the practical part: the method. We first explain how to structure the method section of your thesis. Later, we elaborate on the specific topics in each section.

The goal of the method section is to explain, step-by-step, a) how you carried out your study (the procedure), and b) how you measured or manipulated your concepts; the so-called operationalizations. You need to report exactly how you conducted your research and what measurements, tasks, manipulations and equipment you used and in which order, so other researchers can replicate your research.

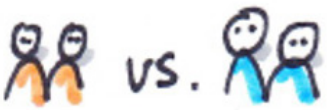
Remember we compared the method with the recipe in a cookbook: you need to explain which steps you take when carrying out the research and which ingredients you need.

By the way, the method is written in *past tense* in your thesis, since your thesis is a report of a study that you have carried out and is finished. You can write the method section in the future tense when you write a research proposal, since the study still needs to be carried out.

1. DESIGN & PARTICIPANTS

2. PROCEDURE


3. MANIPULATIONS/ CONDITIONS




4. MEASUREMENTS

METHOD – STRUCTURE

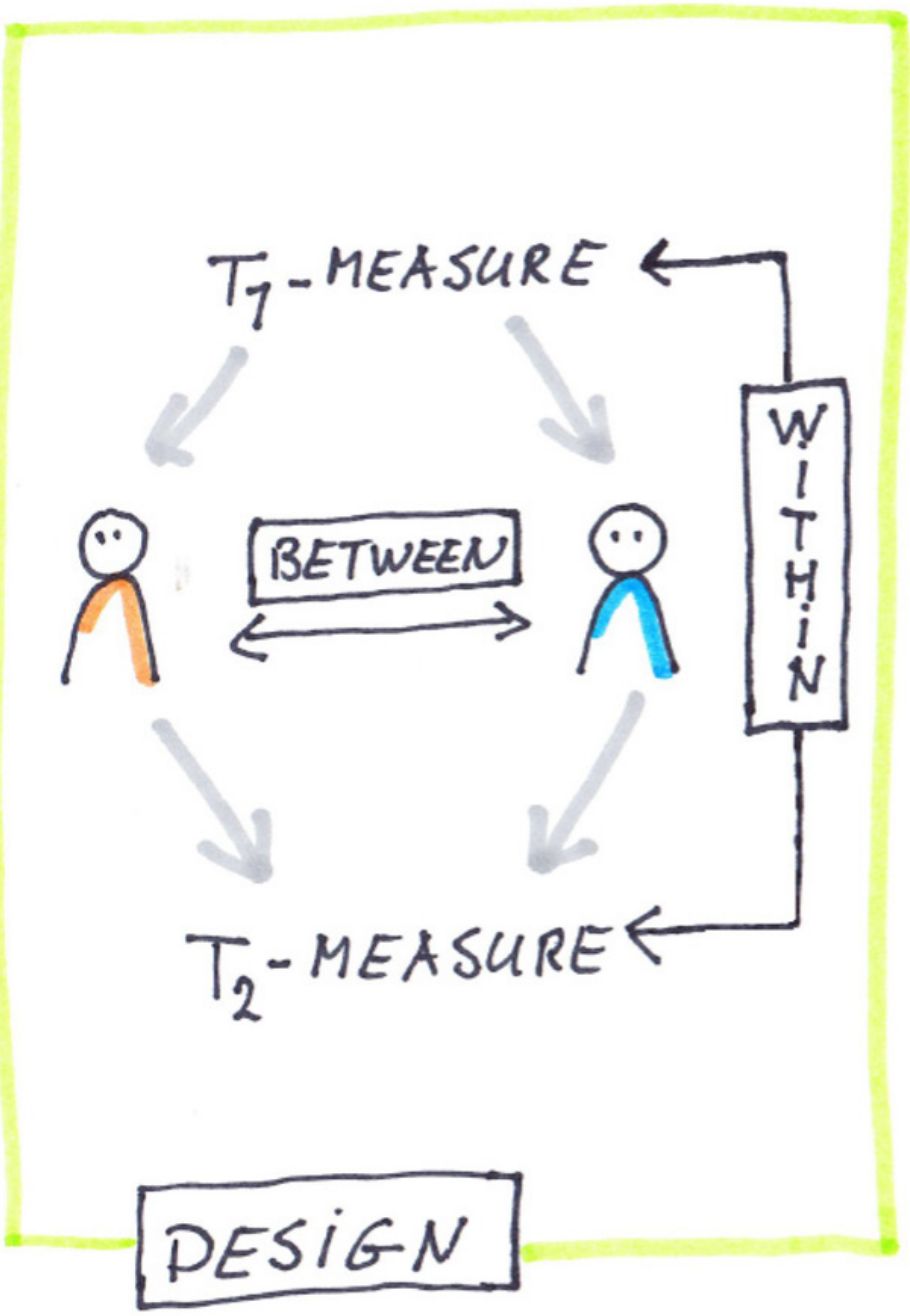
# Method structure

The method section has several standard sections. First of all, you describe the *participants* of your study. You report how many participants you had, the average age and how many of which gender (and sometimes other demographics, when relevant to your study). The participants section is often combined with the *design* of your study. You explain the type of design (e.g., between-subjects, within-subjects, or mixed) and mention the conditions you will compare (more about the design on the next page).

You also need to describe the *procedure and materials* of your study; what happens to your participants from the start of your study until the end. It may help to pretend that your readers are participants; describe what happens to them (i.e., all relevant elements of the conditions and experimental manipulations) during your study in chronological order. As said before, a reader should be able to create the same conditions exactly as you did. Tip: add the entire set of instructions and measurements to an Appendix.

Finally, you need to report your measurements ('dependent variables'). Be as concrete and specific as you can be here, including number of items, the alpha (reliability) and some examples of items. Also include the range of the scale (e.g., from 1 'never' to 7 'always' or 'ranging from 200 to 400 nmol/liter') so readers can interpret the numbers in the results section.

Some writers make separate headings of each of these topics, other writers combine procedure, manipulations, and measurements into one section or they present the procedure at the end of the method. Check with your supervisor the most preferred way. In the next pages we will give some more info about the separate topics.


T1 - MEASURE
BETWEEN
WITHIN
T2 - MEASURE
DESIGN

# Design

The design of your study is a technical description of the experimental set-up and how your participants are divided over the different treatments. An example of a description of the design is: "The study had a 2 (training: anti-stress vs. control) by 2 (language: Dutch vs. English) between-subjects design with well-being as dependent variable".

In experimental research, you often compare groups of participants who differ on a specific dimension; they are the so-called different *conditions*. These conditions can be experimentally manipulated—participants receive different treatments or instructions. Or these differences between groups can occur more naturally—e.g., smokers vs. non-smokers, men vs. women. In this latter case we speak of a quasi-experimental design, since the allocation to a condition or group is not random, but determined by the characteristics of the participants themselves.

There are between-subjects designs, within-subjects designs, and mixed designs. In a *between-subjects* design you test the difference between independent groups who received different treatments. Participants are either in one group or in another group, e.g., either in the training group or in the control group.

In a *within-subjects* design, the same group of participants undergoes several measurements or treatments and you want to test the difference between the measurements or treatments. For example, when all participants' feelings of stress are measured before and after a training. In this example, the time factor (before and after) is considered a within-subjects factor.

In a *mixed* design, a study has a combination of between- and within-subjects factors. An example is a study in which participants do a training or a control task (between-subjects factor) but in both groups the participants' feelings of stress are measured before and after the training/task (within-subjects factor).

# PROCEDURE

## STEPS

1. ENTER
2. INFORMED CONSENT
3. MEASUREMENTS (1)
4. READ INSTRUCTIONS
5. CARRY OUT TASK
6. MEASUREMENTS (2)
7. DEBRIEFING & PAYMENT

# Procedure

In the procedure, you describe what a participant experiences or does in your study, in chronological order, from the beginning to the end.

For example, you invite participants into the lab, and when they enter they first sign an informed consent form. Then you measure certain concepts (for example when you have a T0 measure). At a certain moment they will receive instructions and they will carry out a task. After the task or treatment you will probably do some more measures, and at the end of the study you will pay and debrief your participants.

The timeline of your study might be different, and you need to elaborate on the specific procedure that is followed, but the bottom line again is that your procedure section should enable an independent researcher to carry out your research in a similar way.

# MEASUREMENTS

## Measurements and materials

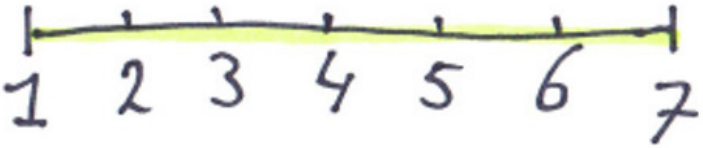
In this part of your method section, you describe the measurements that you took and the materials that you used.

Describe your experimental manipulations, for example giving anti-stress instructions to one group and giving a jig-saw puzzle to the control group. Describe how the instructions were given, and when the participants received them, in such a way that a reader understands the differences between the different conditions and can imagine what the participants experienced. Important short instructions and essential elements of the study can be put in the text of the method section. Longer or more elaborate instructions or full descriptions of tasks and manipulations can be put in an Appendix.

Also describe all measurements that were part of the study. In psychology, you often use scales to measure your concepts (e.g., conflict management styles, stress, or psychological safety). Give the reference and the name of the scale when you use a scale that was developed in prior research, or mention "developed by the authors" when you developed the scale yourself. When you describe a scale, give it a clear label, and mention a) the number of items, b) some examples of the items, c) the range of possible answers, and d) that you compute a mean, including the Cronbach's α (reliability) of the scale. Report all items when you developed a new scale (for example in an Appendix or Supplemental Materials). A scale's reliability, α (Cronbach's alpha), needs to be calculated based on the data of the current (your!) study, and as such, it can only be calculated *after* you have collected your data. Do not report the alpha or reliability of prior research using this particular scale in your method.

Sometimes you have to code specific answers or behaviors. For these kinds of measures you need to describe the coding scheme thoroughly. Ideally, for the reliability of your coding, you have the coding carried out by two people (incl. a calculation of the interrater reliability). Also describe what was done when the two coders disagreed.

NOMINAL




ORDINAL

°C/F

INTERVAL

SCALES

## Nominal, ordinal, and interval variables

The type of independent and dependent variables you have determines what kind of data you gather, which determines the statistical tests you can use when analyzing your data. There are many different types of variables; age, gender, shoe size, happiness, blood pressure, creativity, group number, training condition and so on. Here we discuss three types of variables that you are likely to have in your own research, and on the subsequent pages we help you to know which kind of tests you can use.

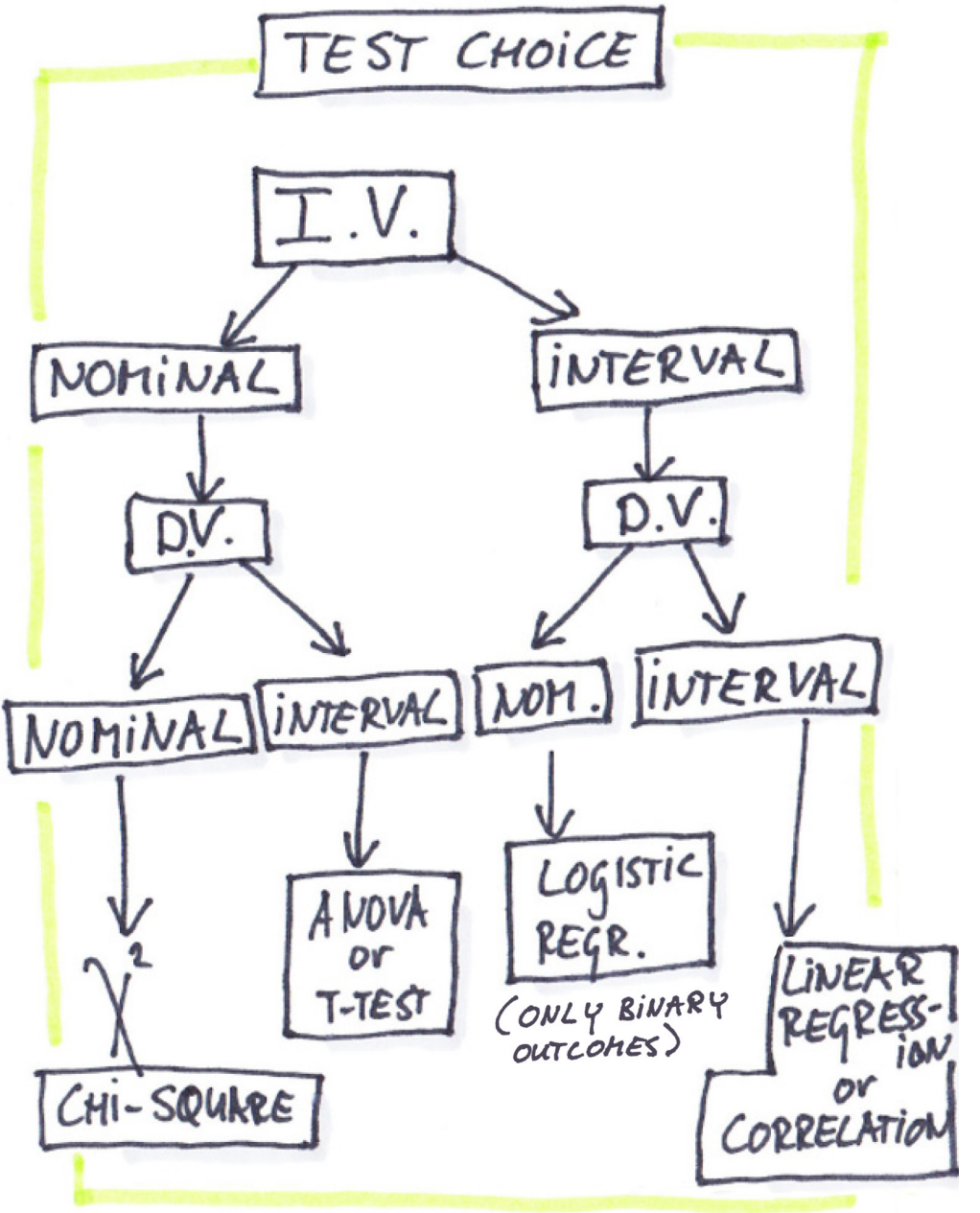
A variable is *nominal categorical* when it has two or more groups in it. Nominal categorical variables are merely labels such as gender, eye color, or what group participants are in (e.g., experimental vs. control group). You can give these variables a number, but this number does not represent an actual value and it does not matter what number you give it. Also questions that can be answered with mutually exclusive options (yes vs. no answers) are nominal scales. Check: if the numbers of your variable refer to labels (e.g., yes/no) and it does not make sense to calculate a mean for these numbers (average eye color?, average gender?, average yes/no?), you have found a nominal variable.

A variable is *ordinal categorical* when the order of the numbers or labels on the scale is important, but the absolute value of the numbers and the distance between them are not important. For example, people can indicate their socio-economic status (SES) as 'lower class', 'lower middle class', 'middle class', 'upper middle class' or 'upper class'. Someone in the lower-middle class has a lower SES than someone from the upper class, but is impossible to say how much lower. Also, using different answering options will change the scores, so the absolute score is not informative, but the relative position on the scale is. Check: if you can calculate the *relative position* on the scale, but the absolute value is not informative, you probably have an ordinal variable.

A variable or scale is *interval* (or numerical) when you have a

(rather) continuous variable or scale, such as temperature, weight, or length. In this type of variable, the order ánd the absolute difference between two scores makes sense. A person of 1.50 meter is shorter than a person of 1.75 meter, and the 25 cm difference is similar to the difference between a person of 1.75 meter and 2.00 meter. Check: if both the relative and absolute values of your scale are meaningful, it probably is an interval variable.

Many psychologists use Likert scales in their questionnaires. They, for example, measure concepts like satisfaction, psychological safety, or organizational commitment, on scales ranging from 1 'not at all' to 7 'very much' (or any other numerical range). These scales are somewhere in between an ordinal scale and an interval scale, and are sometimes called quasi-interval scales (De Heus et al., 2002) because the order of the numbers on the scale is important and the researchers have tried to make the psychological distances between the numbers as equal as possible. Although we can never be sure that the psychological distance between the numbers of the Likert scales are equal, as in 'pure' interval scales, these scales are often treated as interval scales.


TEST CHOICE
I.V.
NOMINAL
INTERVAL
D.V.
D.V.
NOMINAL
INTERVAL
NOM.
INTERVAL
$\chi^2$
CHI-SQUARE
ANOVA or T-TEST
LOGISTIC REGR.
(ONLY BINARY OUTCOMES)
LINEAR REGRESS-ION or CORRELATION

# Analysis plan and test choice

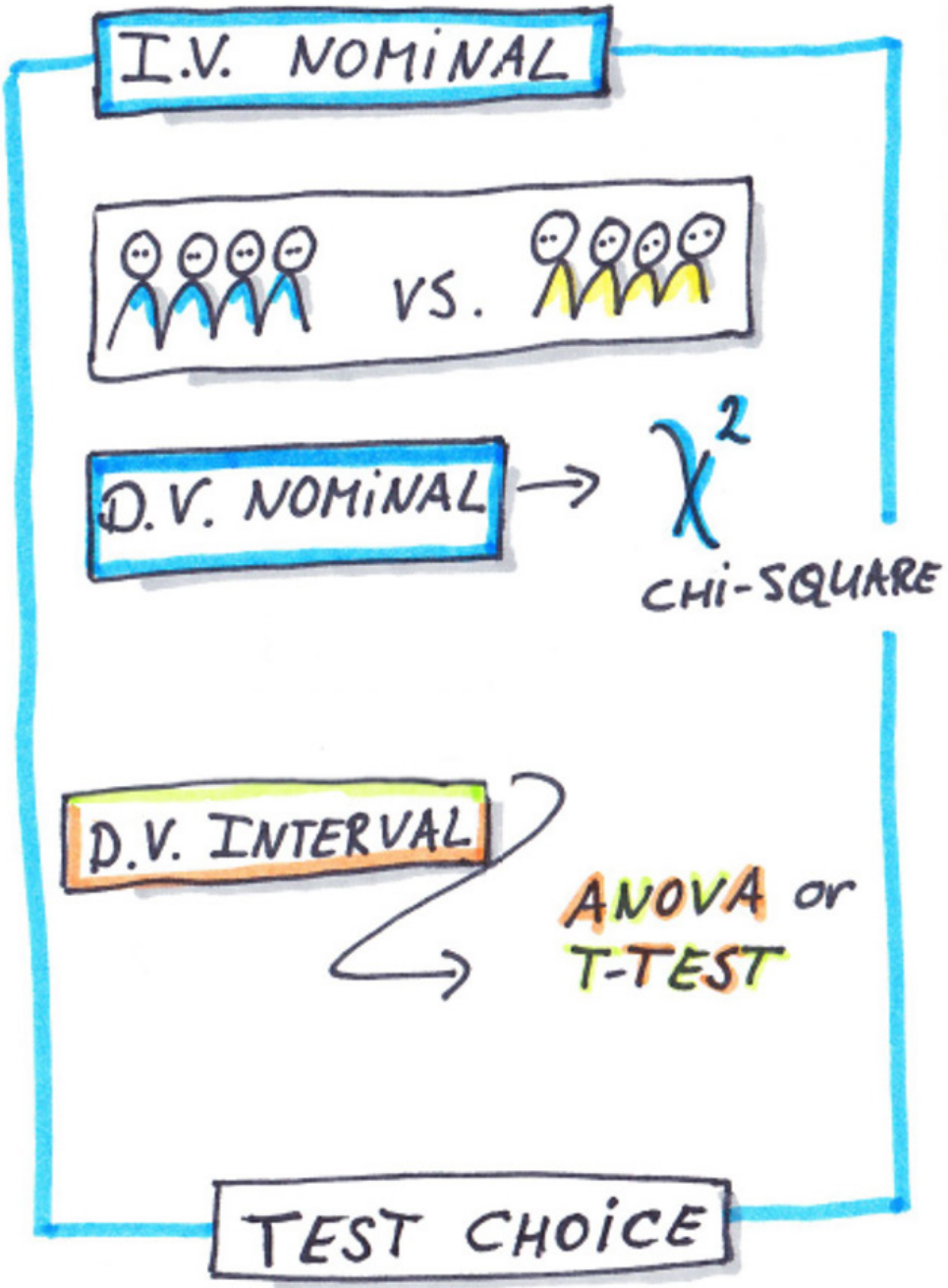
The type of data or measurements determines what kind of statistical test you can or should use when analyzing your data. You need to think about the kinds of tests before you carry out your research (the so-called Analysis Plan). Think about your measurements and the type of analyses they allow you to do when you are setting up your study, and make sure you know how to analyze your data before you start collecting your data. Do not wait until you have the data and you need to start analyzing, because you have a problem if you find out after the data collection that you cannot do the analyses, or the analyses you have to do are way too difficult.

The statistical test you need to use for your analyses depends on your independent variable (X) and dependent variables (Y) (for more about independent and dependent variables, see page 16/17). To make a choice, you first have to know the type of your independent variable, and then you have to know the type of your dependent variable.

On the following pages we will discuss which tests you can use depending on the type of independent and dependent variables. We will focus on the most common independent and dependent variables: nominal and interval variables. Before you conduct a statistical test, check the assumptions of the test.

At the end of this book (page 112 and further) you will find a part about statistics in which we will discuss the specific tests in a bit more detail.

Again, please note that Likert scales are often treated as an interval variable in statistical analyses.

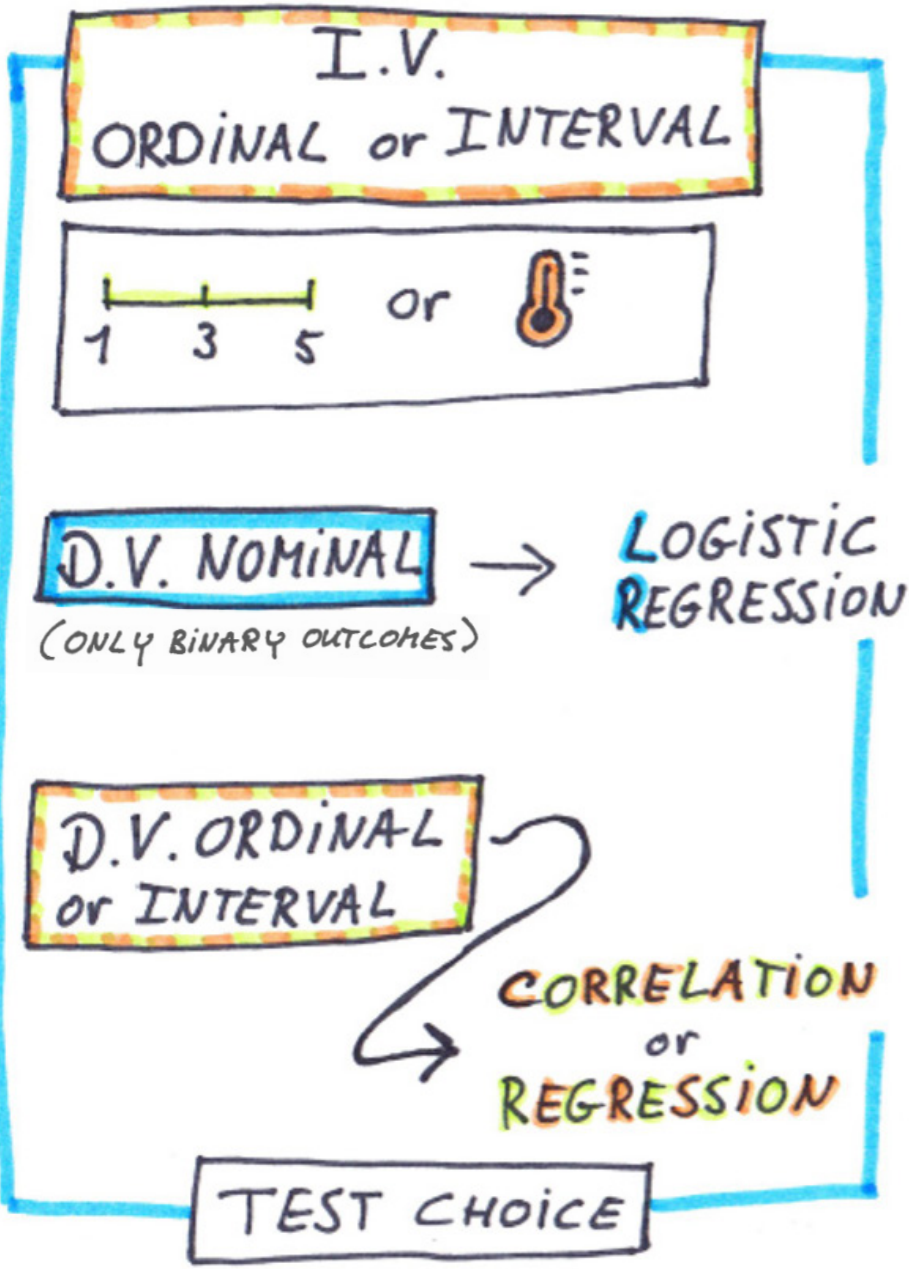

I.V. NOMINAL
VS.
D.V. NOMINAL
$\chi^2$
CHI-SQUARE
D.V. INTERVAL
ANOVA or
T-TEST
TEST CHOICE

# Test choice for nominal independent variables

In experimental research, the independent variable is often a nominal variable: for example when you compare different experimental groups or treatments. When your independent variable is nominal (different groups) and your dependent variable is also nominal, you need a *Chi-square* test. Examples of nominal dependent variables are questions with a yes or no answer, or a vote for a political party, or a choice between options (e.g., products or pictures). A Chi-square test basically counts how often the 'yes' or 'no' answer or specific vote occurs in each group, and then checks whether these frequencies differ between the groups.

When your independent variable is nominal, and your dependent variable is interval, you use *analysis of variance*, a.k.a. ANOVA. An ANOVA compares the variance within and between groups (e.g., experimental groups vs. a control group) to test whether groups differ from each other (e.g., on well-being).

Use a univariate or multivariate ANOVA when you have a design with multiple between-subjects factors. Use a one-way ANOVA when you test a design with only one between-subjects factor. If you compare just two groups, you can also use an independent samples *t-test*. Use a repeated-measures ANOVA or paired t-test when you test a design with a within-subjects factor.


I.V.
ORDINAL or INTERVAL
1 3 5
or
D.V. NOMINAL
(ONLY BINARY OUTCOMES)
LOGISTIC REGRESSION
D.V. ORDINAL or INTERVAL
CORRELATION or REGRESSION
TEST CHOICE

## Test choice for interval independent variables

When your independent variable is an interval variable, you can use *regression analyses* for your tests. Regression analyses generally predict the level of the dependent variable based on the levels of the independent variable(s). You will use logistic regression when your dependent variable is nominal with binary outcomes (i.e., two categories). Since logistic regression is relatively less common in thesis projects, we will not discuss it here.

You use linear regression when your dependent variable is an interval variable, or, in other words, you use linear regression when you want to predict an interval variable based on one or more other interval independent variables. For example, when you want to predict the well-being of employees based on their salary, number of colleagues and last-year's well-being scores.

If you have two interval variables, but you have no clear theoretical idea about which variable is the independent or the dependent variable, you can also test how they are related using correlations.

# APPROVAL

* SUPERVISOR ☐
* SECOND READER ☐
* ETHICS COMMITTEE ☐
* BUDGET KEEPER ☐
* ..... ☐

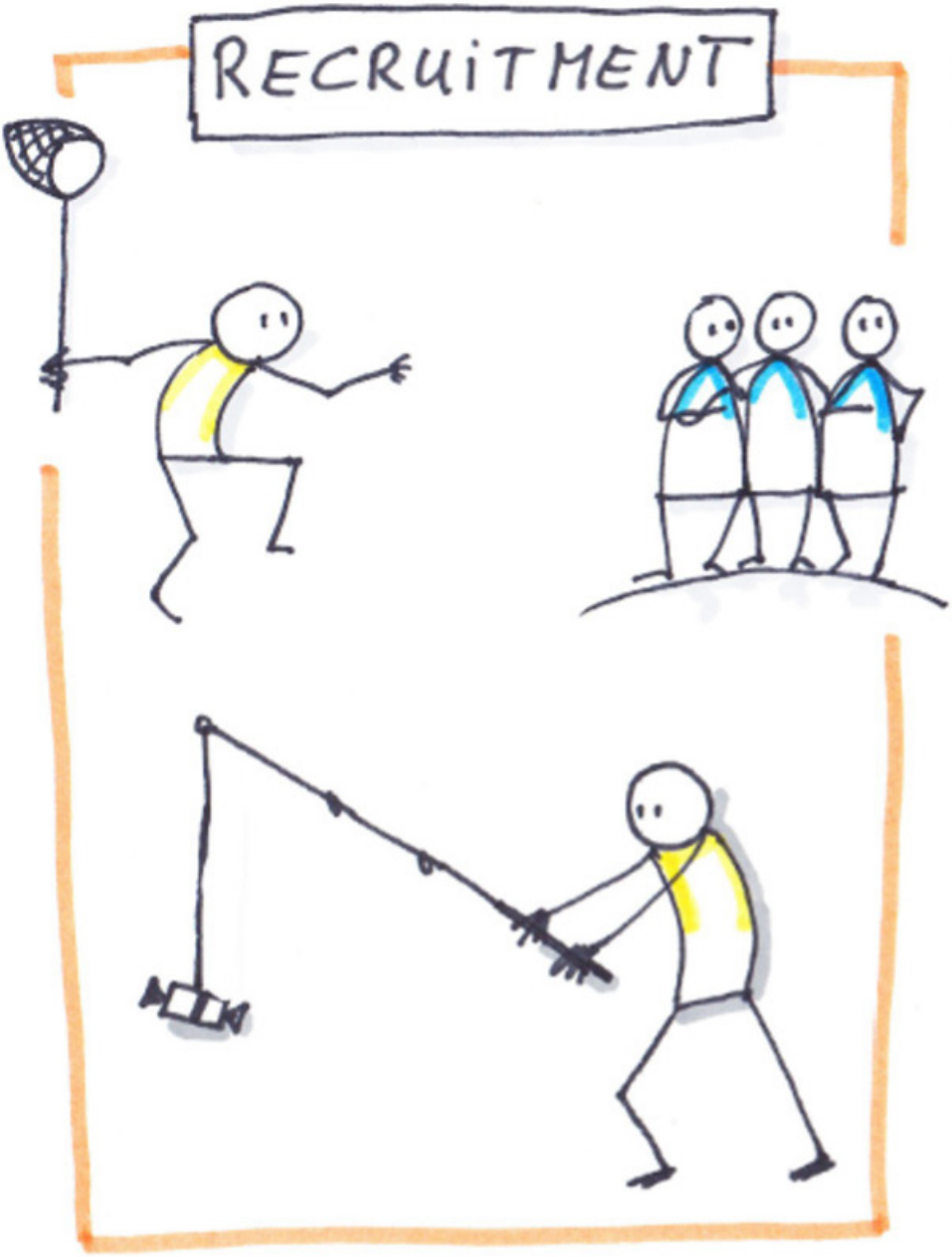
# Preparing your study

Once your research proposal is ready (usually a shortened version of your introduction plus method, including an analysis plan, a budget, and a planning), the first writing and thinking part is over (this is a good moment to celebrate; i.e., do not forget to appreciate that sub-steps are completed). Now the more practical work starts.

First make sure that you have your supervisor's approval, then hand in your proposal. Check (with your supervisor) which parties need to approve your research before you can actually start. You can think of a second reader, a research ethics committee, the budget keeper (if you reward participants), and maybe there are even more parties involved in your research. You may also want to preregister your study (i.e., specify your research plan in an online registry prior to the study). Every organization has its own rules and regulations, and figuring out what to send in to whom by whom is something you have to pay attention to (and your supervisor will help you here).

Getting approval usually takes some time, and during that period you can work on all relevant details of your study. For example, make your questionnaires (online or offline), program your study, get acquainted with equipment and study location (if needed), make a step-by-step protocol for the study or experiment, train experimenters, coders, confederates, or research assistants and make a plan for participant recruitment and organize the finances (if needed). Quite a lot indeed.

Depending on the type of research you do, this practical part is less or more time-consuming; an online survey that is posted on social media takes less time to organize than a highly controlled lab experiment with psychophysiological measurements.


RECRUITMENT

## Recruitment of participants

Participants can be found online (e.g., Prolific, or your personal network) and offline (in university cafeterias, or libraries). Doing studies via Prolific can go relatively quickly, but you have little control over how focused or engaged the participants are. Most psychology students have to participate in studies for course credits, and sometimes you can make use of these systems too.

Whether you will collect your data in the lab, in the field, or online typically depends on the type of study you run. If you need a lot of experimental control or you use more advanced measures (e.g., physiological measures or facial expressions), then you usually use the lab. If you, however, need a more diverse sample and your study involves a set-up that can stand alone without active supervision in a less standardized context, you could collect data online.

When recruiting participants in the field, sometimes students feel an 'inner hurdle' to approach people and ask them whether they would like to participate in a study. Although we understand the hesitation (believe us, we have been there), it might help to know that you get used to doing it. Put a smile on your face, appreciate the people who collaborate and—best tip—do it together with a friend or colleague, to share the burden. Carrying a tray of cookies, candy, or healthy snack in exchange for participation helps too.

Be aware that in some places you are not allowed to recruit (trains or public transportation for example). So, always check beforehand.

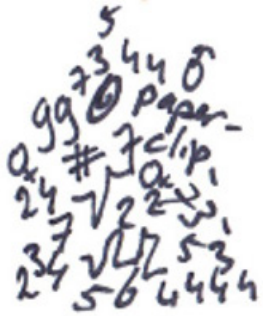
# DATA COLLECTION

## Data collection

The actual data collection can be a lot of work when you do a lab study. Especially the first runs of your study can be challenging, and there are several things you can do about that. First, have a protocol; a stepwise, chronological list of the things you need to do and say from the moment participants enter your lab to when they leave. This protocol might also be handy if someone would like to replicate your study later. Second, do some test runs before you actually start collecting data. During the test runs (or 'soft launch') you can check whether your instructions are correct, whether the timing is right, whether you have everything you need, and whether the data is stored correctly. Once you have gone through the first hectic phase, things will go much more smoothly, and after a few days you might even get bored.

For lab and non-lab studies it is also useful to keep a logbook, in which you note down specific characteristics of each session, such as when participants were late or knew each other, when there was a fire drill during the session, or a laptop broke down and so on. This logbook is important to make sense of your raw data later, and can be used to decide whether data can or cannot be used (in case of the fire drill for example).

# RAW -> ORDERED



| # | $V_1$ | $V_2$ | $V_3$ | $V_4$ |
|---|---|---|---|---|
| 1 | ♂ | 3 | 2 | 7 |
| 2 | ♀ | 3 | 1 | 6 |
| 3 | ♀ | 4 | 2 | 6 |
| 4 | ♀ | 5 | 1 | 99 |

# From raw data to a workable data file

After you have collected your data, you have to transform these raw data to a workable data file. Whether you use SPSS, R or Excel, you always have to have a data file with all relevant data such as: participant numbers, conditions, questionnaires and other measurements (such as performances on tasks or physiological measures).

It may take some time to compose the data file that you will analyze. Store your raw data carefully and make a copy of it. In this copy you perform all transformations that you need to do in order to make a processed data file. You can also include the logbook remarks into the data file, to make sure that you always have this information at the ready. Make a written record of all the steps you take to transform the raw data into the working data file, including coding or transformations.

First, make sure to remove all identifiable information from the data file to store all data in a coded form, to ensure pseudonymization of the participants. At the website of research ethics committees, you can find the latest rules and regulations regarding data storage and privacy regulations. Discuss these rules and regulations with your supervisor.

We then recommend taking a good look at the data. Where are your independent and dependent variables and do the values look OK to you (no weird values)? Then, depending on the software you used, you for example first need to organize the variables into columns or you have to add condition variables or averaged variables. Your data might require additional coding. For research regarding creativity for example, you may need to code the products of your participants first before you can test your hypotheses. In case of physiological data, you need to process the raw data first, before you can analyze it. And in case you used paper-and-pencil questionnaires, you need to enter your data yourself.

If you decide not to use parts of the data or specific participants, record what you choose not to use and why, so other people can see what you did, why you did it, and how you came to the data file you used for your analyses. You need to be fully transparent about removing measures or participants and you need good reasons to do so.

 Tip 1: describe your variables clearly in your data file. During your thesis you might remember that PS_1_T2 means the first question of the psychological safety scale measured at Time 2, but it is easier in the long run when you enter the entire question and the Time 2 in the description box and the meaning of the values (anchors) in the value labels. In that way, you can still understand what the variable means in the future, and if other people would like to use your data one day, they can also more easily figure out what each variable means.

 Tip 2: check your missing values. You may have coded your missing values as '9' or '99'; make sure your statistics program knows that these values mean 'missing value' rather than actual scores.

At the end of this processing stage, you have the following files: 1) A raw data file, which is the unprocessed data that you did not touch; 2) The processed data, where you took all necessary steps to allow data analyses and; 3) A clear record of all steps you took to get from your raw data to your processed data (e.g., in a syntax or a logbook), so that you can remember your steps and you are fully transparent about it.

Once you have these data files, please return all materials to your supervisor. Your supervisor needs a copy of all three files, and all the physical materials (such as paper-and-pencil questionnaires, or hard copy informed consent forms) need to be stored by your supervisor.

# GETTING A FEEL

## Get a feel for your data

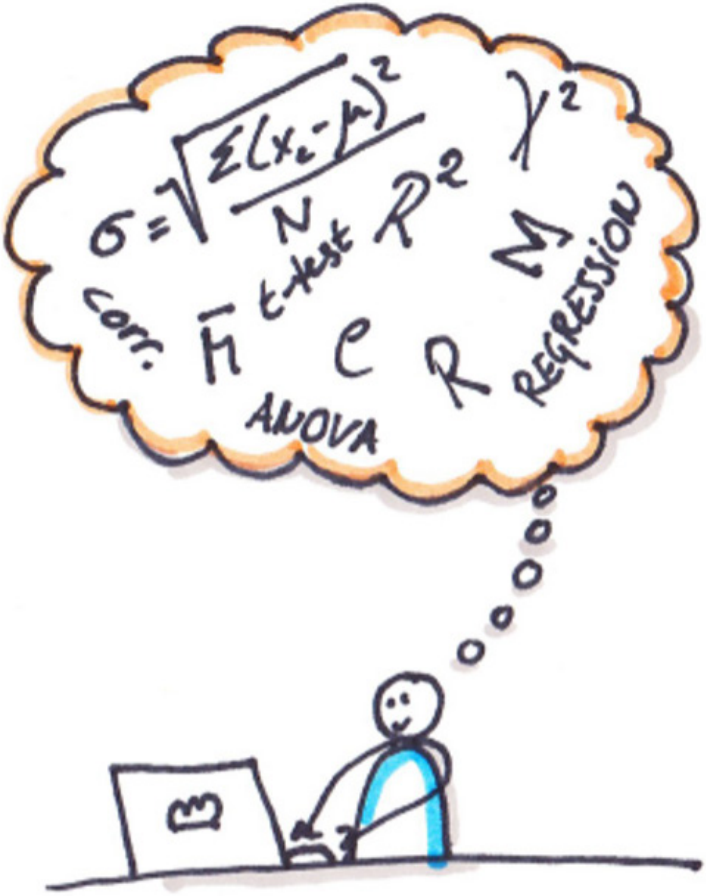
All right, you have a dataset in front of you that you can work with and SPSS, R, or Excel is running, now what? You can easily be overwhelmed by the idea of all the possible analyses that you could or should do, which may make you 'drown' in your data without an idea or direction.

We suggest you start with some 'light' analyses to get a feel for your data, such as describing your participants (mean age, gender distribution), calculating the scales (including the reliability alpha), or calculating the means and standard deviations of your main variables. This approach gives you a relatively easy entrance into your data, and it is a handy first check to see whether the means are within the range of the scales.

Another way to get a feel for your data is to make a correlation table or a frequency table of the main variables. With a correlation table you have a rough indication of how variables are related. As you probably know, correlation says nothing about cause and effect, but it can give you a sense of whether the variables in your dataset relate to each other in a sensible way. Frequency tables or plots can give information about the distribution of values (e.g., range, possible ceiling effects).

And what if you encounter strange things? First, check whether your statistics program does not accidentally treat missing values as actual values. Second, check whether you need to reverse-code your scores. Third, go back to your raw data and check whether your working file is still in accordance to the raw data. If these steps do not help; go to your supervisor for help.

# STATISTICS


$\sigma = \sqrt{\frac{\Sigma(x_i - \mu)^2}{N}}$
corr.
t-test
$R^2$
$\chi^2$
F
C
R
M
ANOVA
REGRESSION

## Remember your statistics courses

Now that you have a rough idea about your data, you can start with the main statistical analyses: testing your hypotheses. To test your hypotheses, you go back to your earlier work. You probably had to make an analysis plan for your study, so use that.

Start with manipulation checks if you had an experimental design; it is important to know whether your manipulations worked as intended. Then, take the first hypothesis (e.g., anti-stress training increases well-being). Look up the variables in your dataset that measure or manipulate the constructs in your hypothesis. In our example, there is a training group and a control group as independent variable (nominal) and the level of well-being as dependent variable (interval), so an ANOVA is the required test.

Go back to your statistics books, notes, and course syllabi; you are bound to find useful information in there that you did not pick up when you read it during your statistics courses. Some information only 'lands' when you are using your own data and need the statistics to test your own hypotheses. We had many light-bulb moments when working on our first datasets ("Oh, that is what a t-test is for!"). Tip: whenever you feel like you 'get lost' in your data, go back to your hypotheses to remember what you wanted to test.

# WRITE RESULTS

1. CORRELATIONS

2. TEST HYPOTHESES

SUPPORTED?


3. EXPLORATORY OR ADDITIONAL ANALYSES

## The structure of the results

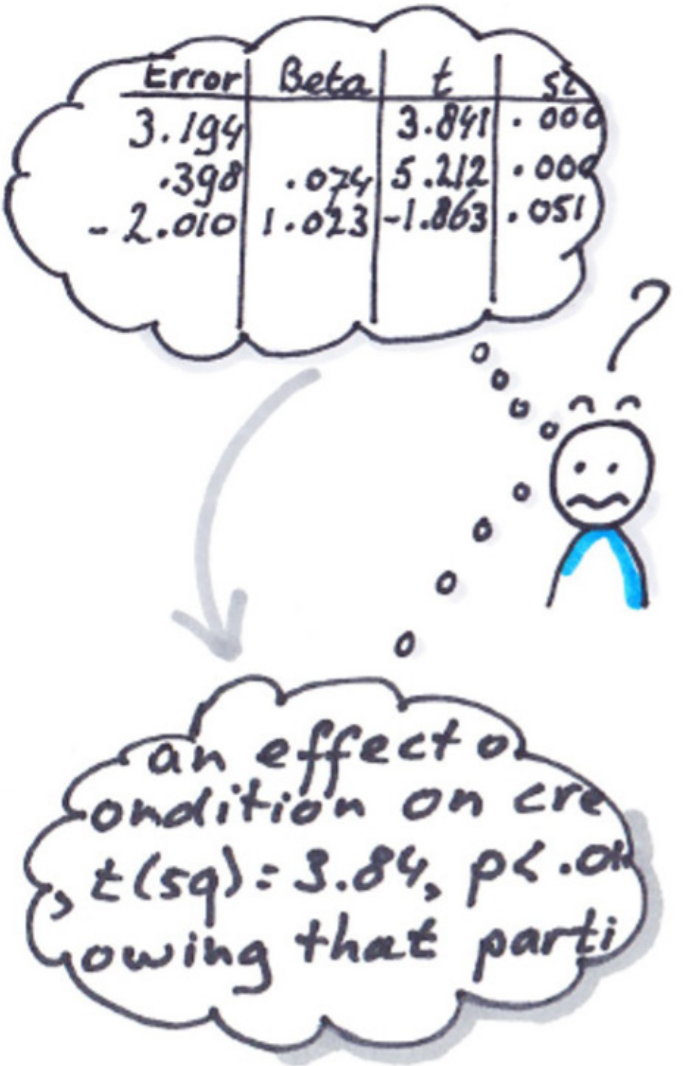
After analyzing your data, you will write your results section. In the first paragraph of your results section, it can be useful to briefly remind readers what your hypotheses were (particularly when your method section is quite long). In addition, you can give an overview of the tests that you executed to test your hypotheses.

After outlining all data preprocessing steps (e.g., data screening/cleaning, assumption checks) and describing the analyses on the manipulation checks (if applicable), you report the tests of your hypotheses. Stick to the same order of the hypotheses as in the introduction, and explicitly report whether your hypotheses were supported or not.

Finally, you can dig deeper into unexpected findings or do some exploratory analyses that you thought of while you were analyzing your data. Do any exploratory stuff *after* the regular stuff and provide a brief rationale for the extra analyses. Note that doing all kinds of tests without any direction or purpose can be great fun, but also very confusing and you may also increase the risk of Type 1 errors (significant effects that occur by chance). So, it is recommended to have some direction in exploratory analyses; e.g., incorporate conceptual meaningful variables to better understand (lack of) effects. Be clear in the results that these analyses are exploratory/post-hoc and do not draw strong conclusions (e.g., treat them as indications or directions for future research).

The results section typically ends with a brief factual summary of the results. This summary can help the reader to process all the statistics. Do not leave the reading 'hanging' with only a bunch of statistics; be clear on what you found.

# REPORTING RESULTS



## How to report your results

Doing the proper test for your hypothesis is one thing, reporting the results properly is another thing. The guidelines regarding what and how you should report change over time, so the best advice that we can give is to go back to your notes and files of your latest statistics course and look up what you need to report. If you do not have such files or courses, we refer you to the latest Manual of the American Psychological Association, which is often used as the base for reporting studies in psychology. And as always, the internet has many resources; just look up "How to report an ANOVA in APA" and you will find what you are looking for. Make sure you follow the latest edition of the APA Manual.

In part 4 of this book, we give you some specific information on how to report different tests (chi-square, ANOVA, regression), here we give you some general guidelines.

When you report your analyses, you first write down what kind of test you did, and what the independent and dependent variables were. An independent researcher using your data should be able to repeat your analysis based on this description.

Second, you report the effects and the statistics, e.g. "there was a significant effect of training, $F(1, 43) = 14.85$, $p < .001$ , $\eta^2 = .26$." Mention the test-output of all the effects that you test, also when they are not significant, and include effect sizes. If you test multiple effects in one test, for example in two-way ANOVA (two main effects and an interaction), you first report the main effects, and then the interaction (followed by extra tests if significant; see also page 125).

Finally, you give your reader information about what the effect looks like. Just indicating that there is a significant effect of training on well-being is not enough; you have to indicate the *direction* of the effect; e.g., people with a training felt happier ($M = 6.09$, $SD = 1.49$) compared to people without a training ($M = 4.56$, $SD = 0.94$). A reader thus needs to see the means and standard

deviations (or standard error) of the groups that are involved in the effect. In case of regression analyses, the B or β informs the readers of the direction of the relationship between the variables.

Tables are handy to summarize your results, especially when you analyze many dependent variables. Figures/graphs are good to visualize results, and are especially handy when explaining interactions. Make clear choices when presenting your results (e.g., use either a table or a graph, but not both; and avoid repeating all statistics in the text if they are already displayed in a table).


UNSUPPORTED HYPOTHESES
THINK
TALK
READ
EXPLANATION?!
NEW KNOWLEDGE

# Unsupported hypotheses

Results can be different than you hypothesized and especially when you find no effects, it can be somewhat disappointing. It may be good to know that studies quite often have results that do not support the hypotheses. You have probably read many articles with beautiful results and theoretical stories to back it up. However, be aware that it takes time to develop a good paradigm or adequate measurements to test hypotheses. For every published study, it is likely that there are multiple studies that did not work out. Your study might be one of these. Due to the Open Science movement, these results-that-did-not-work-out are more and more likely to be visible to the larger public.

The other good news is; there is always something to learn. It seems that there is something happening in your research that you and your supervisor did not see coming. The question now is: what happened? Why are the results not supporting your hypotheses? This question is the million-dollar question; if you find out what happened and what caused your results, you (and we) have learned something we did not know before. Now thát is true science; discovering things we did not expect, and then figuring out what happened or why it happened.

So grab this opportunity to create new knowledge and try to find an explanation for your unexpected results. Finding an explanation for your unsupported hypotheses is where you can actually help science forward. Based on your results, we can design new and better studies. Thanks to your unexpected or non-significant results!

BTW: do not put your explanation in the results section, but save your explanation for the discussion section (unless an explanation is needed for conducting exploratory analyses). In the results section you can simply state that the hypothesis is not supported by the data; in the discussion section you tell the reader why you think the hypothesis was not supported.

# DISCUSSION

# Discussion

The goal of the discussion is to discuss (surprise!) your findings and to give the reader an idea of what your research can and cannot contribute to our overall body of knowledge. The general question that you deal with is "what can we learn from this study?". It helps if you can take a bird's eye perspective: to take a look at your findings from a distance and to see how they are placed in the grander scheme of things.

There are two common pitfalls in a discussion: being too modest and not being modest enough. Being too modest is putting a lot of emphasis on everything that went wrong and on the unsupported hypotheses. Being not modest enough is overstating your results; e.g., by paying a lot of attention on trends in the data that did not reach statistical significance. Try to strike a balance between acknowledging the importance of the methodological approach and the results, and the boundaries of what can be concluded. Make sure that people can see the value of your research, and be realistic about what your research added to our prior knowledge, and what still needs to be done.

The discussion of a thesis usually has a rather fixed structure. It consists of several steps, and if you follow these steps, you will have a discussion that at least covers the necessary elements. In this book, we deal with each element in a specific order, but in your thesis, you might want to combine several elements or you might want to change the order because that works better for your flow. Do what is necessary to make your discussion section as clear as possible, and you can use the provided structure as a guideline.

# STRUCTURE DISCUSSION

1. SHORT DESCRIPTION RESEARH + RQ.
2. MAIN RESULTS + HYP. (SUPPORTED ? OR NOT → → WHY NOT ?
3. EXTRA RESULTS
4. THEORETICAL & PRACTICAL IMPLICATIONS (WHAT DID WE LEARN?)
5. FUT. RESEARCH (WHAT WOULD YOU DO DIFFENTLY NEXT TIME?)

→

WRITING DISCUSSION

## Discussion structure

A reader needs to be able to read and understand your discussion without having read the entire thesis. Therefore, the first part of the discussion is often a short summary of the research questions and the study (e.g., main elements of your logic, type of research, design, main variables). Use general language here; so do not repeat the method section but explain the basics.

In the second part, you summarize the main results and you state whether your hypotheses are supported or not. You can highlight specific findings that you think are important. If your hypotheses are supported, this part is relatively easy. Do not shove unsupported hypotheses 'under the carpet'. Unsupported hypotheses can be equally important as supported hypotheses, since they create a need for new insights or knowledge (see page 68/69).

In the next part, you reflect on the theoretical implications: what do your results mean in relation to prior research? In case you found (partial) support for your hypotheses, you can think (and write) about what this result means. Are your findings in line with prior research or not? What do your findings have in common with prior research, and what is different or new? What can you add to what we already knew? In case you did not find support for your hypotheses, you can think of how to explain these effects, and what this explanation means for future research.

Go back to your research questions; what is the answer to your questions? What was the niche you were investigating, or what was the innovation of your research, and what new knowledge did you generate? Were your results in line with prior research, or did it show a new perspective on something we thought we knew?

## 6. STRENGTHS & LIMITATIONS

(WHAT ARE THE BOUNDARIES OF THE RESEARCH)

+ SUGGESTIONS FOR FUTURE RESEARCH?

## 7. CONCLUSION

- 1 PARAGRAPH
- SHORT DESCRIPTION OF RESEARCH + ANSWER RQ
- END WITH A BANG

NOT A WHISPER (BEH, 2002)

Answering these kinds of questions will give you an idea of the theoretical implications of your research.

When explaining unsupported hypotheses, focus on possible methodological explanations, as well as theoretical explanations. For example, your data may show that your experimental manipulation had unanticipated effects. Reflect on the elements in the manipulations that may have caused this effect and come up with suggestions on how the manipulation can be improved.

Extra exploratory findings can be presented after the main results. These findings may help you in providing explanations for the (lack of) effects. Or maybe you found something unexpected, or you saw a pattern in the data that you think is worth discussing. Be relatively modest here, especially if you did not have hypotheses about these findings beforehand. Moreover, if your reflection has implications for future research, then present these ideas as well.

The next section deals with strengths and limitations. In this section, you indicate what your work can and cannot claim. What are the strongest aspects, and what are the boundaries of your research? The part on limitations often also has suggestions for future research. It is nice if you can come up with a suggestion for future research to overcome some of the limitations of your current study. Some students, however, almost burn their own study to the ground, which is not needed. Being critical of what you did is good, but keep an eye on all the good points as well.

If you have troubles thinking of future research you can ask yourself the following questions: “What would I do differently if I would do the study again?” or “What did I miss in this research, and what would be my next step if I continued this line of research?”. Or “Given the results found, what would be a relevant follow-up question to answer?”

Students sometimes stick to ‘repairing’ their research in this part; they focus on possible issues in their study and what could be done better next time. That information is indeed valuable, but it

is even nicer if you can add something more than methodological improvements. So think about how you can add relevant theoretical concepts that might be worthwhile investigating in the future as well. Tip: go back to the literature discussed in the introduction, as a starting point for enriching your theoretical scope.

Note though that it is better to elaborate on a few issues for future research well than to mention many only superficially. Merely mentioning that it would be good to, for example, study the topic in a different culture or setting is not that interesting. If you think that the topic should be studied in a different culture, you need to argue in which type of culture, why that would be interesting, what results you would expect, and why this is relevant to know. So, it is better to have two or three well-supported new avenues than many loosely-crafted suggestions.

You can add a practical implications section as well. Depending on your research this section might be relatively easy or difficult to write, but for every study it is worthwhile to think about how the knowledge that this study generated can be applied. Especially since knowledge valorization becomes more and more important, this part of your discussion might become more and more important as well.

Finally, you end your discussion with a conclusion. The conclusion is usually short (one paragraph) and it gives a short summary of your work including an answer to the research question(s). The last sentence is important. As Bem (2002) wrote about empirical papers: “End with a bang, not a whisper”. It is really boring if the last sentence of your thesis is something like “we hope this research inspires future researchers to study the topic more in depth”, since that sentence could be the last one in any paper or thesis. Rather, try to refer to an example in the beginning of your thesis, or make a nice slogan of the main result in your thesis. In the case of the anti-stress research, we might say something like “anti-stress training makes you a happier person”.

## Part 2

Writing tips

# WRITING TIPS

## Some tips for writing a readable thesis

In this section, we give you some of the tips we have found most valuable in our lives as academic non-native English authors. Reading books about writing has helped us a lot to create better texts; check the references in the back of this book if you want to know more.

Please be aware that being able to write a readable and comprehensible text is crucial if you want to be a successful academic (whatever profession you choose). In case of your thesis; your research might be ground-breaking and your results might be fantastic. However, if you do not write your work down in such a way that a fellow student or academic colleague understands what you have done and found, then it will go largely unnoticed, and your work deserves more than that.

Do yourself, your supervisor, and your readers a favor by trying to make a readable thesis. The next tips will help you to do so.


APA RULES

# APA style

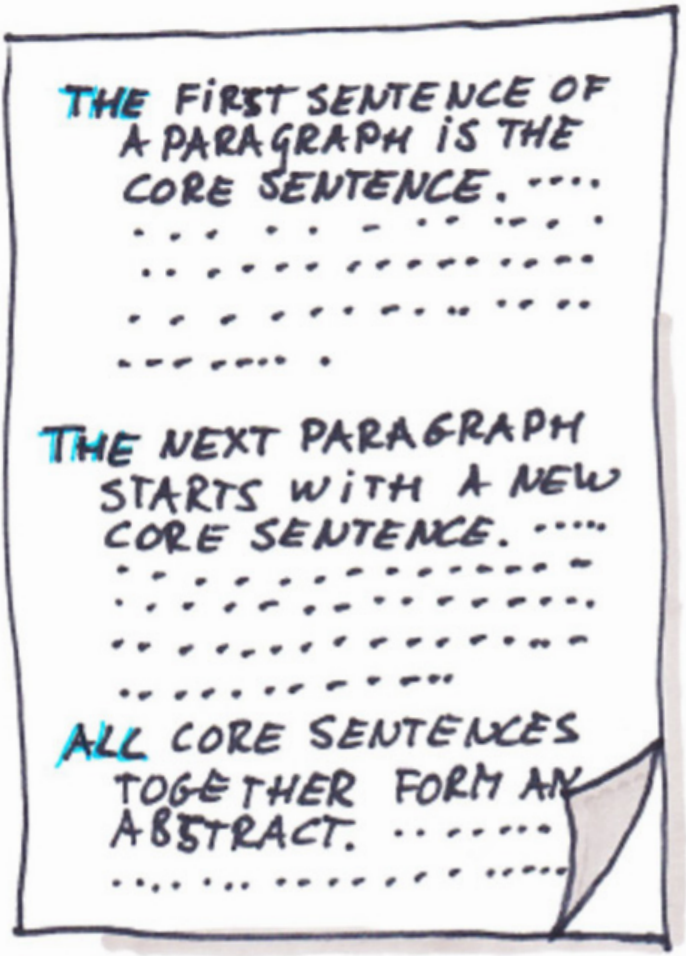
Most theses in psychology need to be written in APA style; a large set of guidelines about style, interpunction, language, and any other aspect of academic writing from the American Psychological Association (presented in the APA Manual). The APA Manual started as a seven-page article in Psychological Bulletin in 1929, and has expanded ever since. The uniformity and consistency of writing in APA style can help readers (and supervisors) to understand your work easily and quickly, since the style indicates the structure of the text, and helps finding the key points easily.

At the website: https://apastyle.apa.org/ you will find the latest style and grammar guidelines, below follow some of the most important guidelines for lay-out.

Write your text in a consistent font (e.g., Times New Roman 12-point), line spacing 2.0, flush left, no blank or empty lines. Use page numbering and a short running head.

Regarding the headings (labels of the different sections): there are 5 levels of headings. The style (uppercase/lowercase, bold, italicized, with or without end point) indicates the level of the heading. The title of the thesis and the main headings (e.g., Method, Results, Discussion; if you have one study) have a level 1 heading. Subsections get a level 2 heading, subsections in subsections get a level 3 heading, and so on and so forth.

# CORE SENTENCES



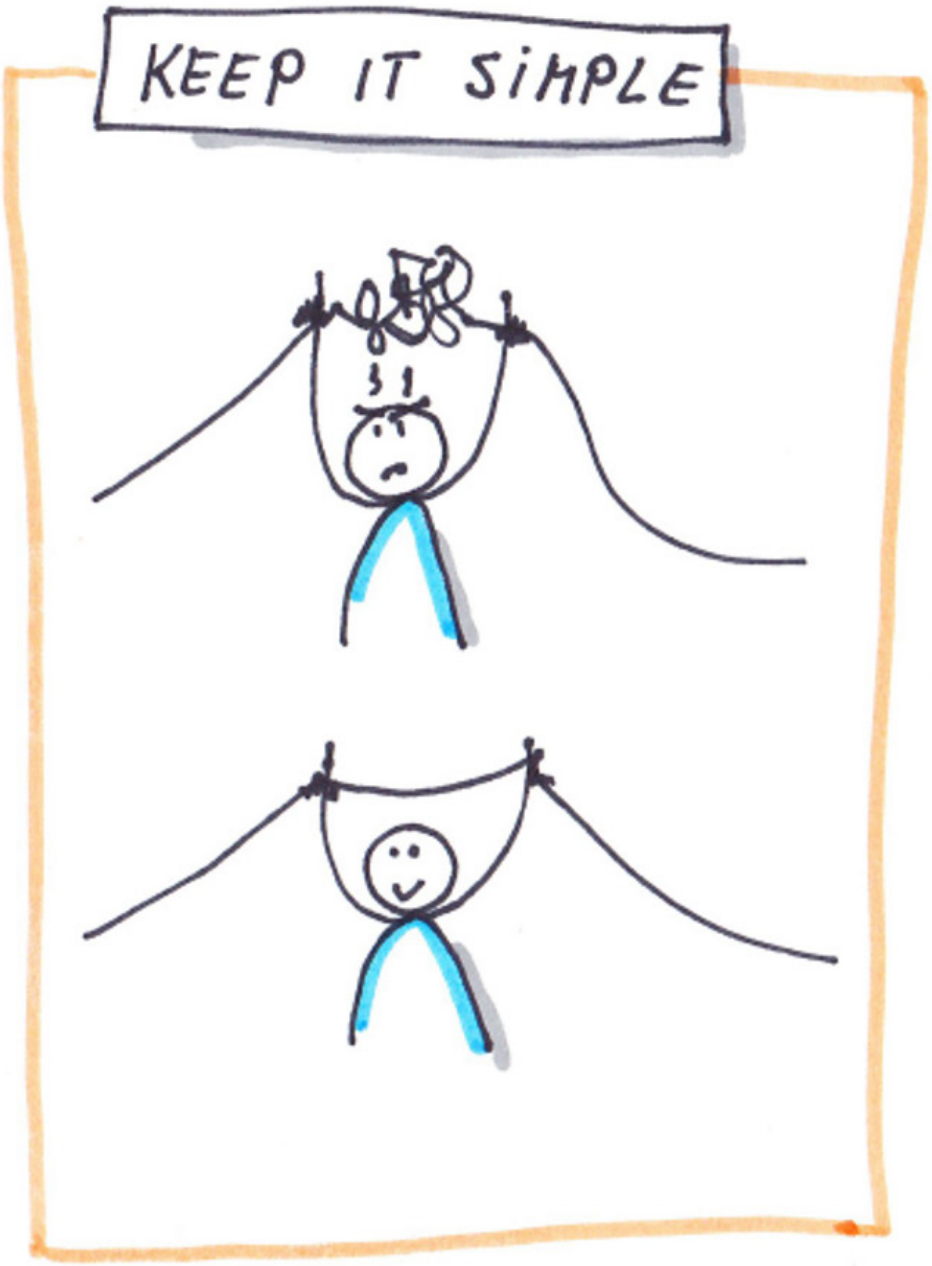
# Tip 1: start each paragraph with the core sentence

Each paragraph has one core message, and you start each paragraph with a sentence that reflects this core message. Many people end their paragraph with a sentence that summarizes the paragraph, we suggest you start with it. After the core sentence, you elaborate on the core sentence in the rest of the paragraph (e.g., how previous research [indirectly] supports the point you make). This method helps you to keep your text to the point and straightforward and you keep in the 'driver's seat' of your own reasoning. The paragraph then ends with what this elaboration means for your logic or hypotheses.

The next paragraph starts with a new core sentence again. This new core sentence is again the core of the paragraph, and you elaborate on this new core sentence in the remainder of the paragraph. Ideally, you would have a summary of your introduction if you highlight every first sentence of your introduction.

This writing tip is best for the introduction and discussion. The method and results sections are more technical and often have different types of paragraphs and sections (although a general rule of thumb could be that you are often clear when you start with the core of what you want to say).

Please present one core sentence in each paragraph. If you have a paragraph that is quite lengthy, you might have introduced topics that are not covered in your core sentence and your text becomes less clear. If you find a lengthy paragraph, check the content of the paragraph; maybe you need split it up in two separate paragraphs (each with their own core sentence).


KEEP IT SIMPLE

## Tip 2: keep it simple

Your thesis writing needs to be as clear as possible. So, use common words and consistent terminology rather than an overly intellectual style with difficult words (e.g., 'juxtaposed' instead of 'next to'). For a reader, your work needs to be clear and your goal is to be understood (not to sound 'smart').

Good to know: in academic writing, a different label typically means that you refer to a different concept. So, give each concept one label, and use that label throughout your text, even it means you repeat it 80 times. So 'value conflict' should not be alternated with 'conflict over values', or 'conflict over norms' or 'principled conflict' in the rest of the text, just call it 'value conflict' all the time.

In case you do not really know yet (or anymore) what you want to say: go back to the outline that you have created, to remember the core of what you want to say. Another strategy that some find useful is to say out loud (to an imaginary friend or roommate) what you want to say. In spoken word, you often present the main elements; now, you can transfer these main elements to text.

And a final note on abbreviations or acronyms: They do not help to keep the text simple, as not everybody may know them. Please only use them for very common concepts (IQ for example).


UGLY FIRST
EDIT

## Tip 3: write ugly first drafts

Do not be too critical of your first version. Some students may want to write an immaculate, perfect text from the beginning. They start to write a sentence, and then delete it because it is not completely right in their eyes. Then they write a new sentence, and delete it, and a new one and a new one. This process of trying to write a perfect text is usually slow, tedious, and frustrating.

It is more efficient to just slap your thoughts on paper first, and start editing in a second phase (e.g., how to structure the sentence better; how to say it). So first write what you want to say, without too much ado. Once you have your line of thought on paper, you leave it for one day, and the next day you start to polish and edit your text. It goes faster once you have some text to work with so you can add or change. Again, use the outline you have made in the beginning of your thesis.

After some productive writing, it is also a good idea to take some distance to your own work by leaving it for a bit (a day, or some days if you have the time). When you are in the middle of writing your text, it can be hard to see what is unclear or what is missing because the ideas are so clear in your head. When you re-read your text after not seeing it for a while, you may read the text more as an outsider and you may find omissions or unclarities that you could not see when you first wrote it.

So write in bits and pieces, and do not be too critical of the first version.


DELETE
R.I.P.
MY
BELOVED
TEXT

## Tip 4: kill your darlings….

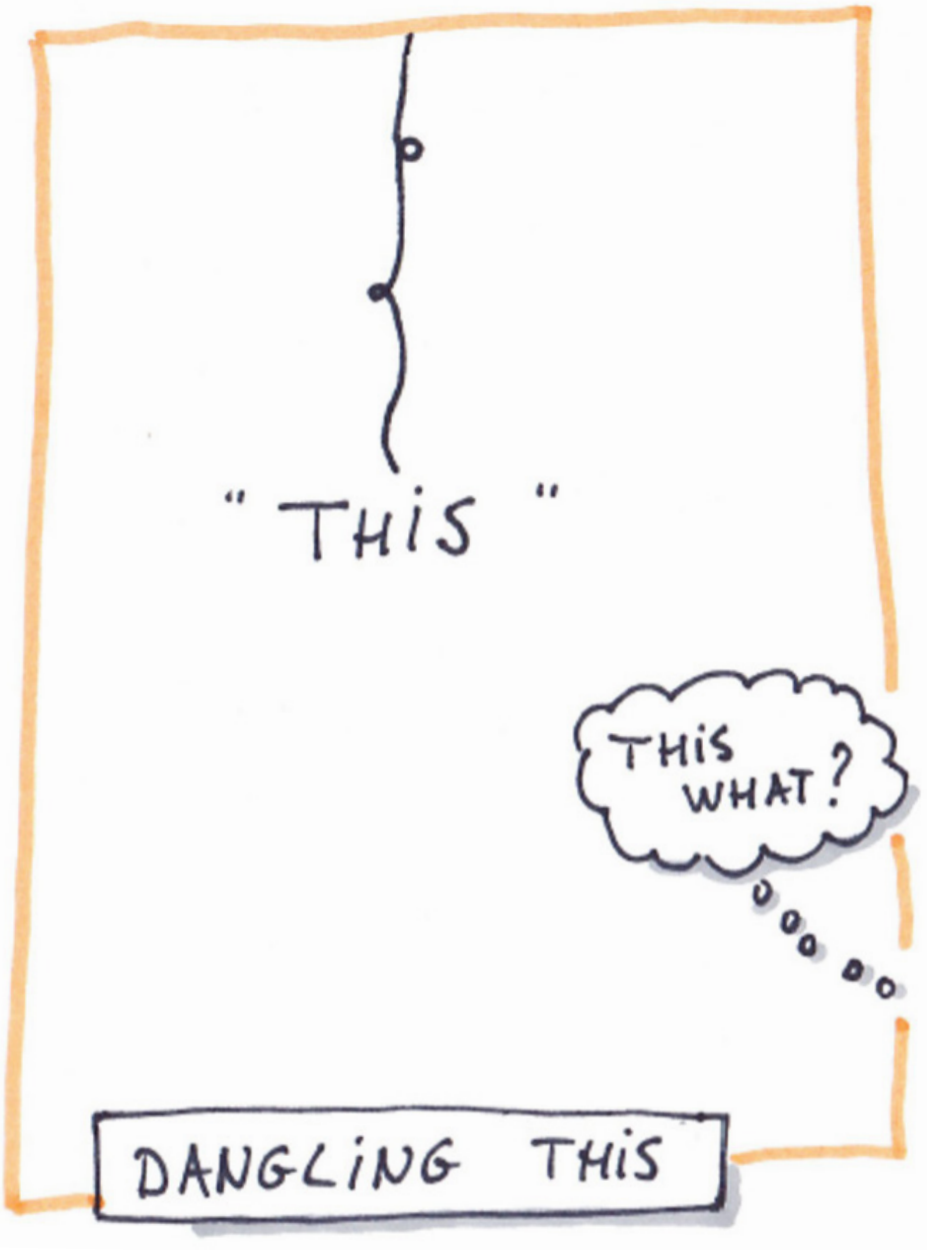
On the other hand, be critical of your text after the first version, and be prepared to delete parts of your texts in which you have put a lot of time and effort.

We know how hard it can be to delete your well-crafted work. Do you think we wrote this book in one shot? Ehm, no. You are looking at probably the 15th draft, and many pages and drawings have been cut, deleted, and thrown into a digital or physical dustbin.

For every sentence or drawing that we put in this book, we have thought: "Do we really need this sentence/drawing; does it help our readers to write their thesis effectively and efficiently?". If the answer was 'no', we ruthlessly deleted the idea, text, or drawing.

You can do the same for your thesis. Ask yourself what your reader needs to know in order to follow your line of thought, or to understand the answer to your research question. If you can delete a piece of the text without hindering the reader's understanding of your work, you probably have found a darling to kill.

Another moment to kill some darlings might be the moment you are completely stuck in a particular part of your thesis. Sometimes it is easier to delete a part that you are stuck on than to keep working on a piece of text that is getting from bad to worse. Keep a back-up of your work though. Just in case. A back-up file for killed darlings might also make it easier to delete them from the main text (although it is unlikely they will ever return).


" THIS "
THIS WHAT?
DANGLING THIS

# Tip 5: avoid the dangling 'this'

A mistake that is often made by Dutch people writing English is the so-called 'dangling this'. A 'dangling this' is the word 'this' without the company of a noun, but referring to a noun, for example in an earlier sentence. In Dutch, we often use a dangling this in our texts and it is a commonly accepted way of writing. In English it is not. A 'this' needs to be followed by a noun (= zelfstandig naamwoord). Below you will see some good and bad examples.

Example of a dangling 'this':

*In negotiations, people need their creativity in order to find win-win agreements. This is especially important for peace negotiations.*

The 'this' is dangling here, since it is unclear to what the 'this' is referring: to the need for creativity, to the creativity itself or to finding win-win agreements? To solve the problem of a dangling 'this' you put a noun after it, to make it explicit to what the 'this' is referring to.

Example of a possible solution:

*In negotiations, people need their creativity in order to find win-win agreements. This need for win-win agreements is especially important for peace negotiations.*

So Dutchies, please do not leave a 'this' dangling in mid-air, but add a noun to it to be clear about what you are referring to. This is much clearer ;-).

## Part 3

The personal part

# THE PERSONAL PART

# The personal part

You are likely to experience all kinds of emotions while writing a thesis: enthusiasm, frustration, amusement, disappointment, anger, relief. It is a process; anything can happen. Some students 'fly' through their thesis work, others experience more difficulties. We like to stick to the quote: "Everything will be OK in the end. If it is not OK, it is not the end".

So savor the positive moments, and we will give you some tips and tricks to deal with the less positive moments. In this part we will discuss some common situations such as how to start writing, a lack of motivation, how to deal with feedback from your supervisor, and what you can do when you are stuck.

⇒SCHEDULE
4 HOURS
A WEEK

START WRITING

## Plan hours to write

One day you actually have to start writing your thesis, and the sooner you start writing, the better. It is really nice and satisfying to have a document to work with, rather than an empty white screen with a flashing cursor waiting to be filled with text.

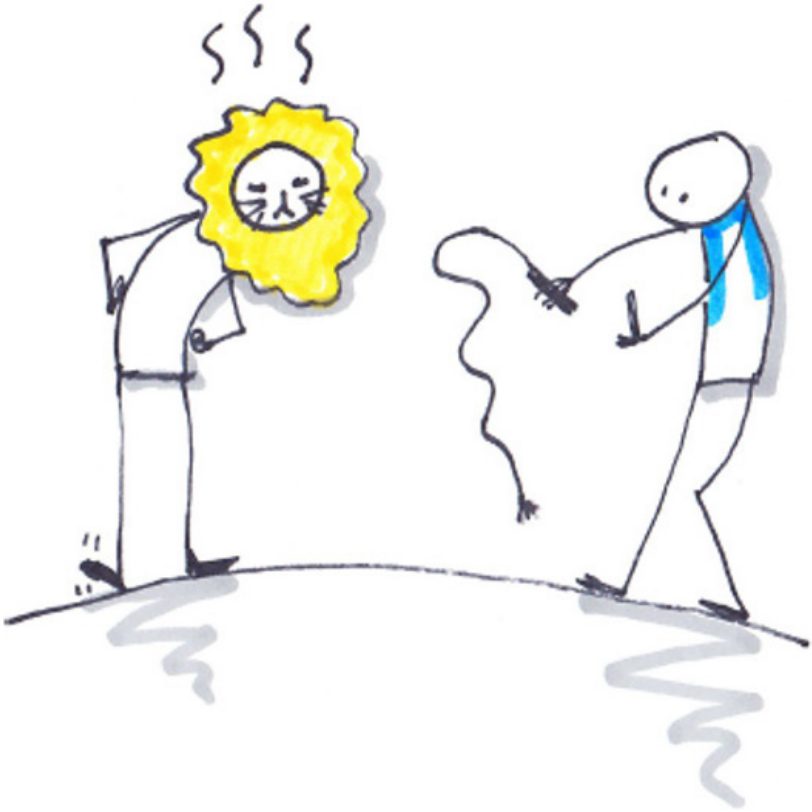
A great tip to start writing comes from Paul Silvia (2018) in his book "How to write a lot" (highly recommended if writing is a challenge for you). He argues that you should not wait for inspiration or motivation to start writing. Instead, you need to plan hours to write, and then write during these hours. Defend these hours against intruders and distractions, just sit at your computer and start typing.

So take your calendar, and schedule 4 hours (or 2 x 2 or 4 x 1) of writing time this week, and next week, and the week after, and so on and so forth. And write during these hours. Even if you do not feel like it or do not feel inspired. Just start, and after those 4 hours you are done. You will be amazed about the amount of work you have accomplished. Really.

Once you are in the middle of your thesis work, you will need to assign many more hours per week to writing. And with more hours, the same logic applies; plan them and defend them like you would with any other appointment. However, if you feel stuck, or are busy doing other things, keep at least the 4 hours to keep the momentum in your thesis work.

Another approach is to write one paragraph a day (even if you would delete it the day after). It will help you to get into the habit of writing and it will increase your productivity.

MANAGE
YOUR SUPERVISOR



## How to manage your supervisor?

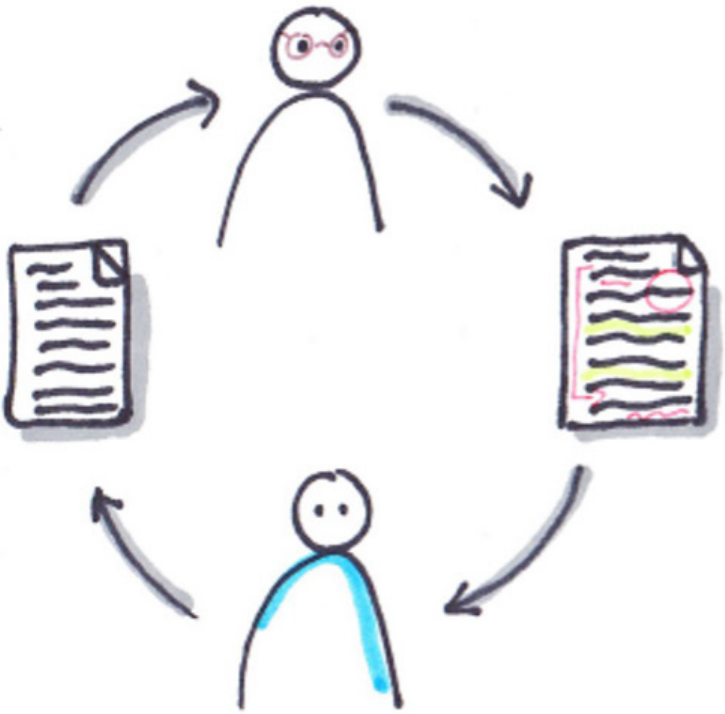
There are some things you can do to get the most out of your meetings with your supervisor.

First of all, start your meetings with a short summary of the latest activities in your thesis work. Why? Your supervisor probably has a lot of things to do besides supervising you, such as doing their own research, teaching courses, being in committees, supervising other students, writing reviews, etcetera. They typically have a lot of things on their minds, which often means that they are less aware of the specific details of your thesis work than you are. It is helpful to give specific updates, as these updates enable them to give you specific and adequate advice.

Second, prepare questions that you want to ask and think of possible solutions. When you are doing your thesis work, you probably encounter problems, or issues that need to be solved before you can continue. Collect these issues and discuss them when you meet your supervisor. It is even better if you can propose one or two potential solutions to the problem, to show how you would handle it. In this way you can show your adequacy; this approach shows initiative and if your supervisor would suggest an alternative solution, you have the opportunity to learn.

Finally, take notes of your supervisor's comments. It helps to remember their feedback. Supervisors may say a lot, and although you may think that you will remember all of it, you often forget parts, and that is a pity.

# FEEDBACK



## How to deal with feedback?

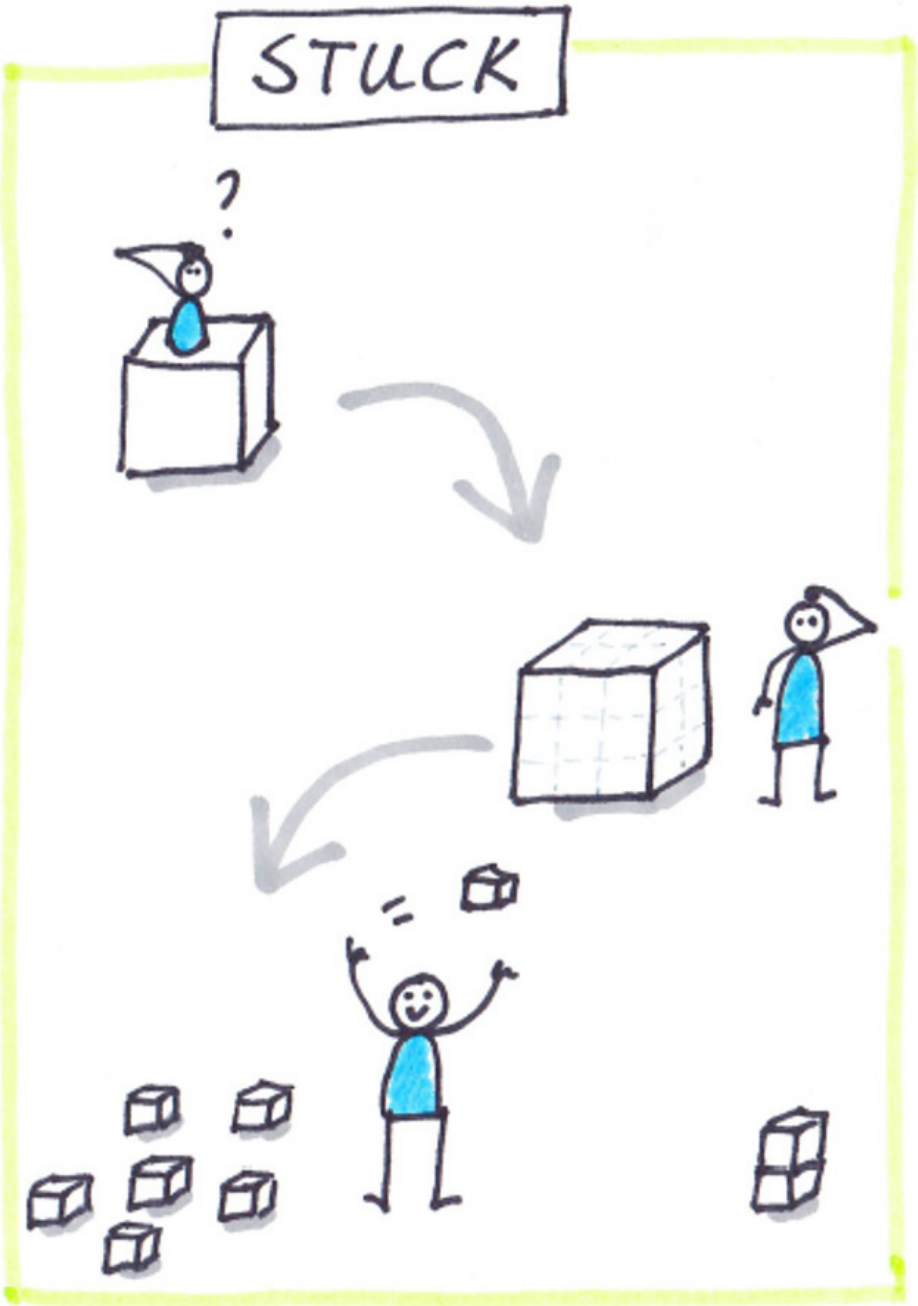
Getting feedback from your supervisor on your work is crucial; you cannot do all this by yourself. The feedback of your supervisor tells you whether you are on the right track, and what you need to improve or do differently. It can, however, be quite intense if you receive a lot of feedback on the texts that you so carefully crafted. Here are some tips on how to deal with it.

First, it might be helpful to realize that feedback is there for you to help you improve the text. So, take this mindset before you open the file; see it as part of the process of writing a thesis, as a way to learn and to make your thesis better.

Second, differentiate between minor and major points. What may seem like a lot of feedback at first can also include more detailed tips and suggestions on for example lay-out. You may get those 'easy-to-fix' issues out of the way first (which is also nice to get a sense of progress) before focusing on the more difficult (e.g., conceptual) parts.

Third, it can also be helpful to give your supervisor some guidance in advance, on what you would like feedback on. If you are unsure about the structure of the text, or about the rationale of Hypothesis 2, ask whether they can specifically look at that. Having specific points to look at makes giving feedback more efficient for your supervisor.

Finally, ask questions when you do not understand the feedback or you have difficulty incorporating it. If your supervisor does not know that you experience difficulties, it will also be hard to understand why you may not have incorporated some elements in updated drafts. Your supervisor can clarify things and give you tips on how to incorporate feedback.


STUCK
?

# Stuck

There might be moments in which you feel stuck; moments in which you have no clue how to continue. What can you do?

If you are stuck because you feel overwhelmed by all the possible things you could do, one solution is to break the larger project down into smaller pieces. Writing the results for example, is a general goal that can be broken down into several smaller goals such as writing the descriptives, correlations, manipulation checks, hypotheses, and the exploratory part. Smaller goals are easier to meet than larger goals, and may be more concrete and motivating to work on.

If you are stuck because you have no idea what you should do or how you can still improve the things you did; that is the moment you should contact your supervisor. It is a pity if you wait too long to get some help; it is your supervisor's job to help you, and it is your job to get the help you need.

And maybe good to know; we supervisors see a student who asks for help as a student who takes initiative and who takes the project seriously (rather than as, for example, an ignorant student).

RESOURCES

## Use your resources

Another thing you can do when you are stuck or need advice, is to use your resources. Using your resources is a term from solution-focused coaching and your resources are everything you have in your world that may help you to solve your current problem or situation. Resources could be your own skills, your knowledge or education, your prior experiences, or your personal network; everything that is in the 'backpack' of your personal life.

When you encounter a problem during your thesis work, ask yourself questions like: "How did I solve this type of problem earlier?", "Who else has had a similar problem and how did they solve it?", "Who or what could help me here?", "What have I learnt earlier about how to tackle the problem?", "What would my supervisor/mother/best friend advise me to do?". You undoubtedly have many resources at your disposal that may help you to solve the problem. And do not forget that your supervisor is one of them.

Another resource that you may create for yourself is to form a group with other students who are also working on their thesis. For some people it is highly motivating to work in a group, or to know that other people are working on their theses too, and face the same issues. They are a great source of knowledge and advice too.


TROUBLE

# Trouble

“Life is what happens to you when you are busy making other plans” (quote attributed to John Lennon). Sometimes things happen in your life that will delay your thesis. What to do?

First, there are study advisors to go to; they can help out students who find themselves in different degrees of trouble. They are the ones that can help you to get extra time or extra opportunities to overcome a delay or a difficult situation.

Also let your supervisor know what to expect from you. You do not need to inform your supervisor about what exactly is going on (that is totally up to you), but if you suddenly disappear from the radar without any warning or message, your supervisor may be worried, or annoyed.

Inform them about what you can or cannot do at the moment. If possible, it is very helpful if you can give them some information about when you can return to normal (even if this message is “I do not know when I can resume working”), or when you will give them an update about the situation.

If the trouble has to do with your supervisor personally, you should see a person from your program whom you trust, for example a program coordinator or a study advisor. And most academic institutions have appointed counsellors for these kind of problems, so go ask them for advice. Universities are required to create a safe space for all students and employees. If that is not the case for you, you need to ‘ring an alarm bell’ as early as possible and contact a study advisor or counsellor. Also, when you are in doubt on whether things are OK or not, you can ask for advice on the matter.


RELAX

# Relax!

Writing a thesis can be busy and stressful at times. It is important to plan moments of relaxation as an antidote to stress. Like you plan your thesis, also plan some time to relax and take some time off when you start to feel overwhelmed, or when you sacrifice sleep or dinner for work. Taking time off is good for several reasons.

First of all, it is good for you. It is good for your resilience and mental health if you have regular moments in your life in which you can relax and enjoy other things besides work.

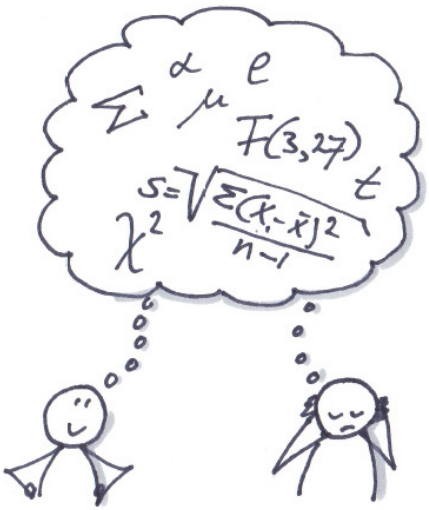
Second, the quality of your work will increase when you take a break once in a while. When you leave your thesis alone for a day (or more), you will have a fresh look when you return working on it.

This fresh look can help you to keep the focus on the core of what you are doing and to see where and how to improve your work. So make a planning with your supervisor and your co-workers about what needs to be done and when, and plan some free time as well. Adapt the planning if needed, and discuss it regularly with your supervisor and your co-workers to see whether you are still on track.

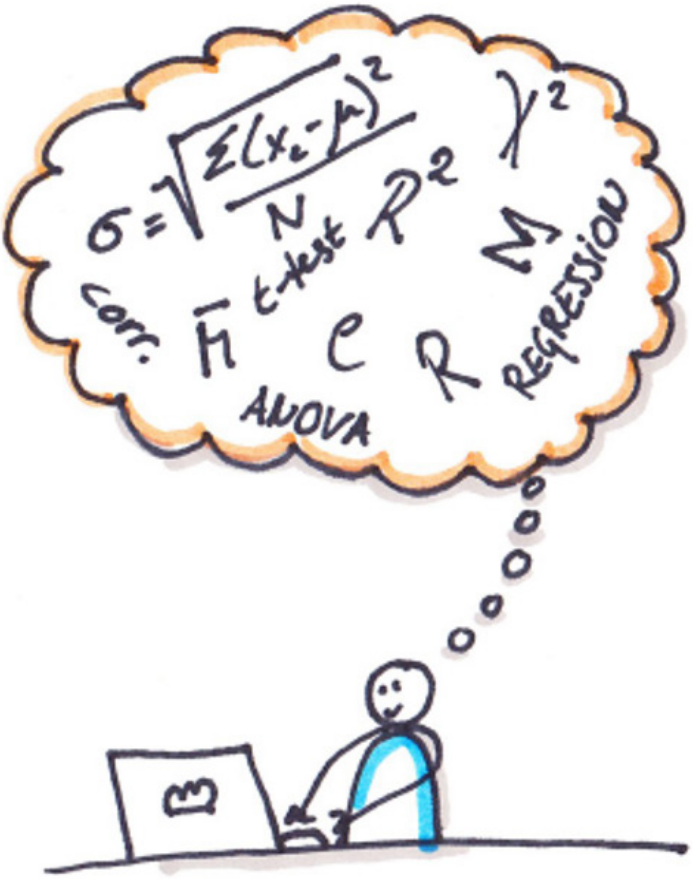
Please do not keep running around, frantically working on your thesis, needing a break but not taking it. It is not good for you, nor for your work. As one of our former teachers said “It is very professional to set your boundaries”, and taking a break to relax and take some distance from your work is a professional thing to do. Enjoy!

# Part 4

Statistics



# STATISTICS


$\sigma = \sqrt{\frac{\Sigma(x_i - \mu)^2}{N}}$
$\chi^2$
corr.
t-test
$R^2$
M
$\bar{H}$
C
R
REGRESSION
ANOVA

# Statistics

When writing a thesis in psychology, you are likely to need statistics (in SPSS, R, or any other program) when analyzing your data, unless you do literature research or you have qualitative data. You probably have had quite some statistics courses, but now you have your own data to analyze, so which analyses are you going to use, and what are you going to test?

In general, we often see that statistics come much more 'alive' when you have your own data and your own hypotheses to test. We have gathered some common tests (correlations, ANOVA, regression analysis, Chi-square test) to help you decide which tests to use depending on how your research or data are organized or look like. If you want to know which test you should use depending on the design of your study and your measurements, please check the pages on Test Choice (page 43 to 47).

We will give you some examples on how to report statistics. For more examples and the latest updates we advise you to check the APA Manual or related websites. Tip: google "APA how to report". Also, discuss the statistics with your supervisor as there are more tests than discussed here and the use and reporting of statistics is always evolving.


SCALE

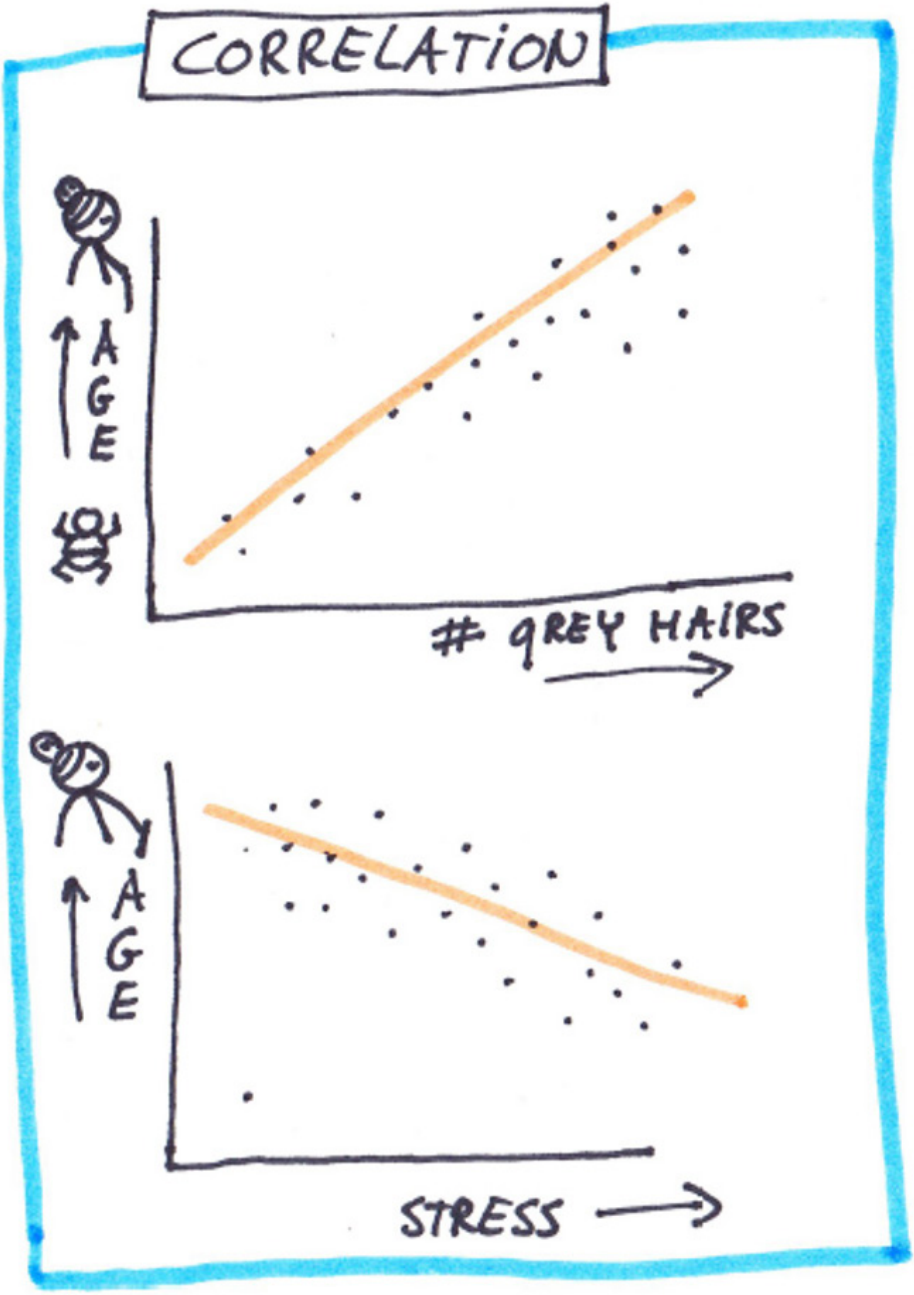
# Computing scales

If you collected data with scales, one of the first things you need to do before you can start analyzing your data, is to calculate the scales from the separate items. The concepts that your measure (e.g., self-esteem, neuroticism, or turnover intentions) are often measured with several questions or items. Rather than analyzing each separate item, you can combine items that measure the same concept into one larger scale, given that the items are of a similar type (all Likert scales usually). How do you do that?

First, you recode the reversed items. When you measure self-esteem for example, some items ask directly for positive self-esteem, but others may tap into negative self-esteem or insecurity. You need to reverse-code these latter items, so a high score on each item means the same thing (in this case: high self-esteem).

Second, you check the reliability of your scale via a reliabilty test, like the Cronbach's alpha (α) of the scale of the combined items. If the alpha is higher than .70, you can compute the scale without further ado. If the alpha is lower than .70, you can check whether deleting items will increase the reliability. When you decide to take out an item, always report that in your method section when discussing the scale.

Third, you compute the scale by averaging the separate items. With a mean (rather than a sum score), you keep the range of scores similar to the separate items. Using the mean instead of the sum will not affect the significance levels of the subsequent statistical tests.


CORRELATION
AGE
# GREY HAIRS
AGE
STRESS

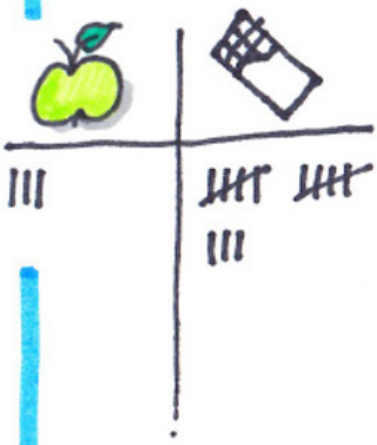
# Correlation

A correlation gives information about how two continuous variables are related, and it can be positive, negative or zero. A positive correlation means that when one variable increases, the other variable increases as well—e.g., older people generally have more grey hairs. A negative correlation means that when one variable increases, the other decreases—e.g., older people generally experience less stress. A correlation close to zero (or: a non-significant correlation) means that there is no relationship between the two variables and the closer the correlation to 1 or -1, the stronger the correlation.

Report correlations together with the degrees of freedom (*N*-2) and the significance level. An example is: "The correlation between A and B was positive, $r(48) = .29$, $p = .023$, indicating that higher levels of A are related to higher levels of B."

As you probably know: correlations do not imply a causal relationship. When two variables are related it does not mean that one variable causes the other or vice versa. In the example in the drawing, it would thus be nonsense to conclude that grey hairs reduce stress or that a decrease in stress would reduce the number of grey hairs. When two variables are correlated, there can always be an unknown third variable (in this case: 'age') that explains the relation. Demonstrating a causal relationship needs experimental research and a theoretical foundation.

# CHI-SQUARE



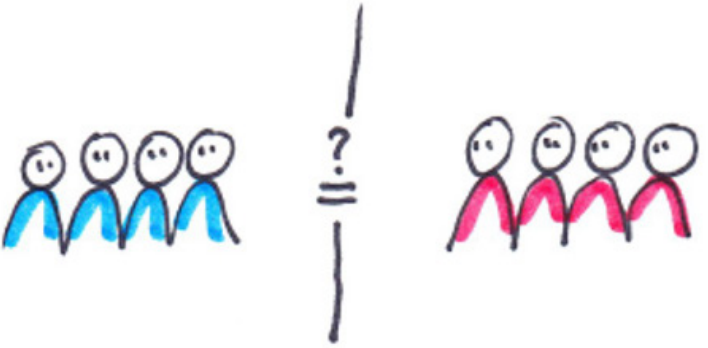
# Chi-square test

When you want to know the relationship between two categorical variables, such as food choice (apple vs. chocolate) in multiple groups (e.g., tired vs. non-tired people) the Chi-square test is used. The Chi-square test basically checks whether the occurrence of (in this case) a specific food choice is equally distributed over tired and non-tired people, or whether the tired or non-tired people have a preference for one of the choices. Chi-square compares the number of *observed* choices for apples or chocolate in tired and non-tired people with the number of *expected* choices in both groups if the choice of food was not related to being tired or not (= randomly divided over the two groups).

If the Chi-square test is significant, the number of observed choices for apples or chocolate significantly exceeds the number of expected choices in one of the groups (e.g., tired people choose chocolate more often than apples compared to non-tired people).

In practice, you often can use a Chi-square test when you want to compare frequencies in different groups. As soon as you tally, you can probably use a Chi-square test.

When you report a Chi-square test, please first note the degrees of freedom and the sample size in parentheses, and then the value of the test and the significance level. For example, $\chi^2(1, N = 81) = 13.38$, $p < .001$. Also report the odds ratio, to indicate how strong the effect is.



COMPARE

GROUPS/CONDITIONS/
TREATMENTS

1-WAY ANOVA or T-TEST

ANALYSES

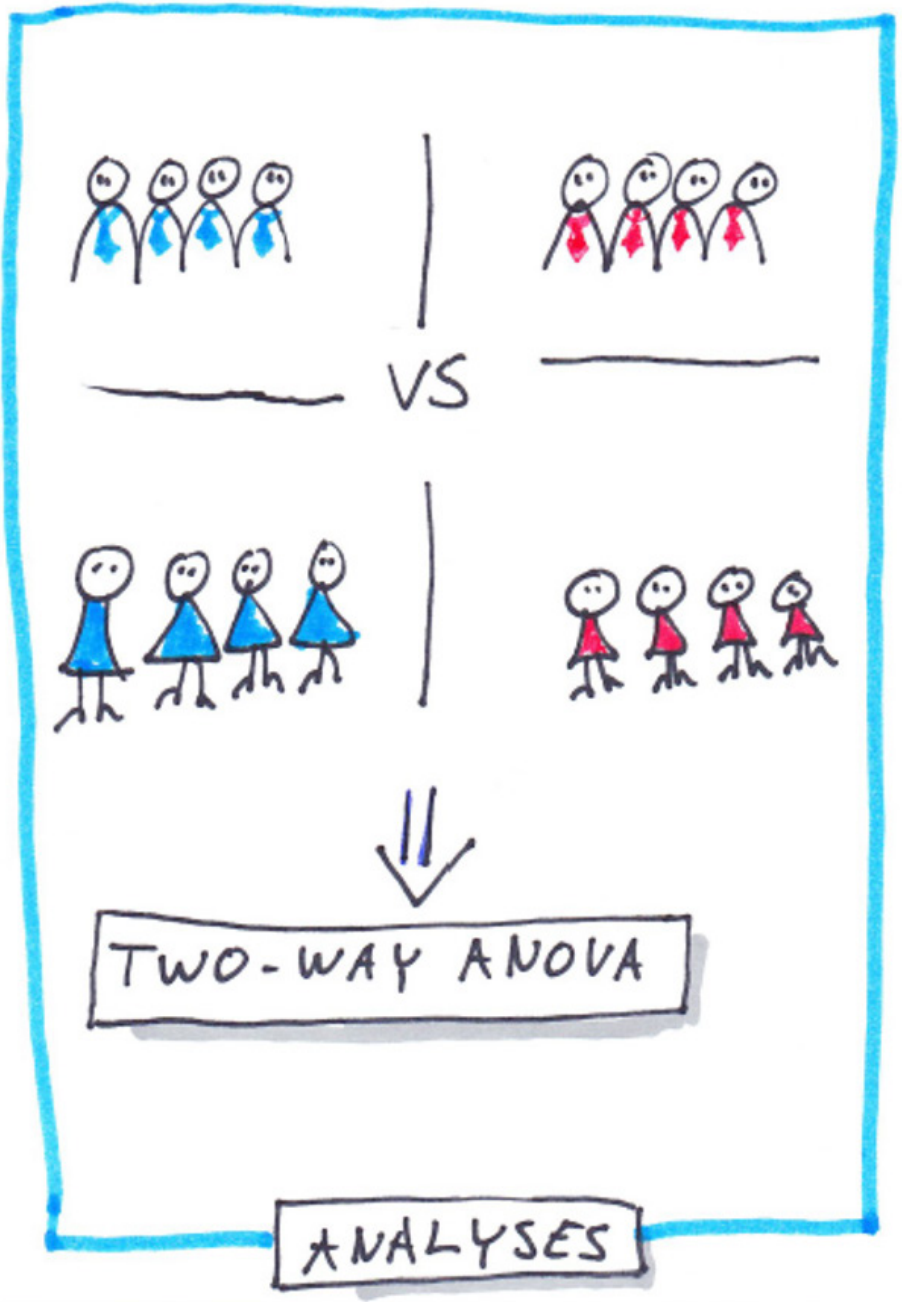
# ANOVA or t-test: comparing experimental groups

When you have a hypothesis in the form of 'group A will score higher on X compared to group B' and you have different experimental groups (i.e., a between-subjects design: group A vs. group B) an independent samples t-test or a one-way ANOVA is applicable. A hypothesis was that anti-stress training has a positive effect on well-being and there was a group of participants receiving an anti-stress training and a control group without training. In this case you could do an independent samples t-test or a one-way ANOVA with the training condition (anti-stress training vs. control) as a factor/ independent variable, and well-being as dependent variable.

Independent sample t-tests are suitable to compare two experimental groups. However, use one-way ANOVA when you want to compare *more* than two groups. An independent sample t-test cannot compare more than 2 groups.

If you compare 3 or more groups in a one-way ANOVA, a significant effect in the ANOVA will let you know that there is a significant difference between (at least) two of the groups. It does not tell you, however, which difference between which groups is significant. To find out which difference is significant, you need to carry out further post-hoc tests (for example post-hoc Tukey tests in which you compare two groups at a time) or simple contrast analyses. These tests will indicate which groups differ significantly from each other.

With one-way ANOVA you can test one dependent variable (= measure) per test. If you want to test multiple measures or multiple dependent variables in one test, you can use a Multivariate ANOVA or so-called MANOVA.


VS
TWO-WAY ANOVA
ANALYSES

# Two-way ANOVA

When you want to compare groups on two factors or dimensions a two-way ANOVA can be used. For example, you want to check whether the effect of anti-stress training on well-being depends on whether participants use a daylight lamp or not (daylight lamps can reduce winter depression). In statistical terms; whether the effect of training on well-being is *moderated* by lamp use (but note that there can also be other reasons than moderation hypotheses to conduct a two-way ANOVA, such as being interested in main effects).

Testing this moderation or interaction can be done with a two-way ANOVA, with training (anti-stress vs. control) and the use of a daylight lamp (yes vs. no) as between-subject factors and well-being as the dependent variable. This test checks for two main effects (effect of training and the effect of lamp use) and the interaction of the two factors (training x lamp use).

When you report a two-way ANOVA, give both main effects (training and lamp use) and their interaction (training x lamp use). Also give the means and standard deviations for each group, to help readers interpret the effects.

If the interaction effect is significant you need to carry out extra tests (e.g., simple main effects, planned comparison, or t-tests) to find out which cells differ significantly from each other, and which do not. To understand an interaction effect, it is often helpful to make a figure or graph of the means in each cell.

T1
MEASURE

T2-MEASURE

REPEATED-MEASURES
ANOVA (I)

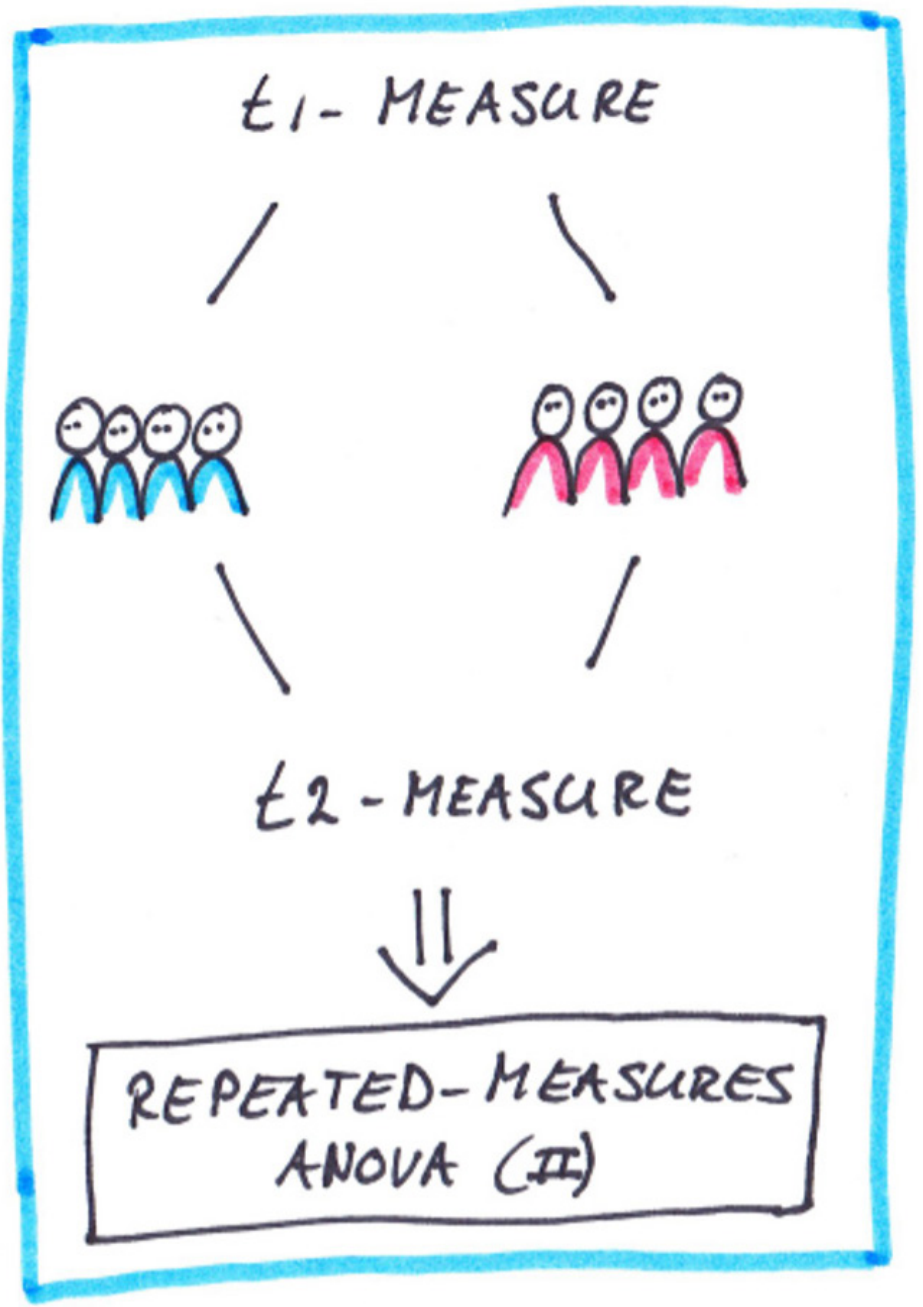
ANALYSES

## Repeated-measures ANOVA

When you measure the same construct (e.g., stress or well-being) at several times (e.g., before and after a training) you can use a paired t-test (for two measures) or a repeated-measures ANOVA (for 2 or more measures).

A significant within-subjects effect in a paired t-test or a repeated-measures ANOVA means that there is a significant difference between the two measures. For example, the stress has decreased (hopefully) after the training.

If you have more than two measurement moments in your research (e.g., four moments: two weeks before, just before, right after and two weeks later) a significant within-subjects effect means that there is a significant difference between at least two of these measurements, but this effect does not tell you where the significant difference is. You need further tests (e.g., simple contrasts or pairwise t-tests) to determine which difference between which two moments is significant. When conducting multiple tests, it is important to adjust for multiple comparisons (e.g., with a Bonferroni correction).

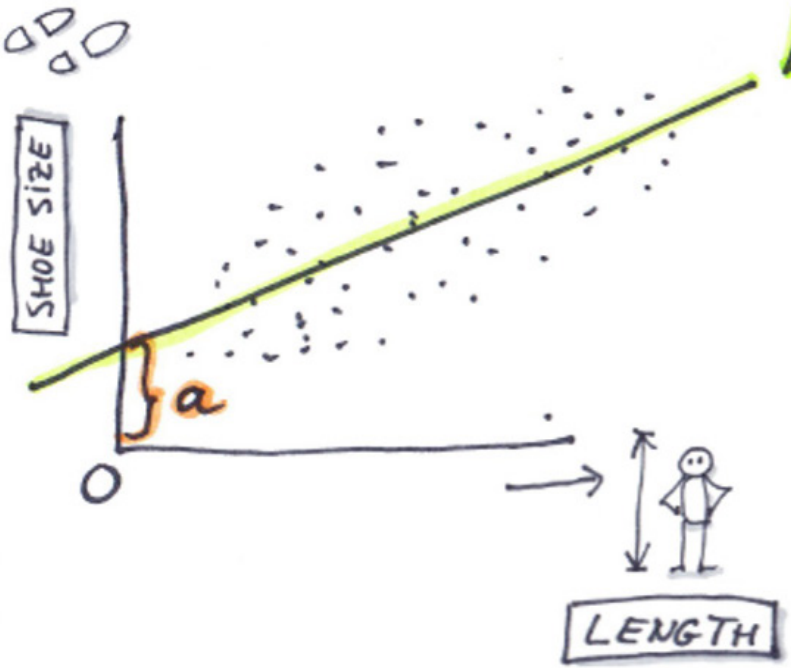

t1- MEASURE
t2 - MEASURE
REPEATED- MEASURES
ANOVA (II)

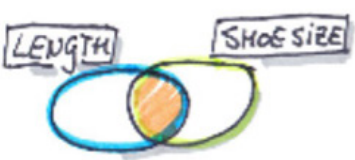
# Mixed designs: repeated-measures ANOVA II

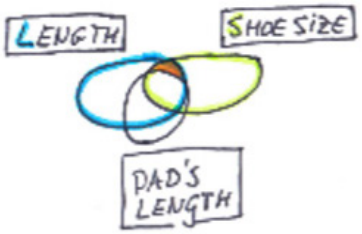
Sometimes your experimental design is mixed; it has a between-subjects factor and a within-subjects factor. For example, you measure stress in all the participants before an experiment, then they have an anti-stress training (experimental condition) or not (control condition), and then you measure stress again. In this design, time (before vs. after) is the within-subject factor and the treatment (anti-stress training vs. control) is the between-subjects factor and stress is your dependent measure. In this case, you also use a repeated-measures ANOVA.

In the output of your test, you will see the within-subjects effects (main effects and interaction of the between and within factors) and the between-subjects effect in a separate table. The between-subjects effects is sometimes overlooked, so do not forget to check and report it. Whether between or within or interaction effects matter most depends on your specific research question.

# REGRESSION


b
SHOE SIZE
a
O
LENGTH


LENGTH
SHOE SIZE


LENGTH
SHOE SIZE
DAD'S LENGTH

# Regression

When you want to know the relationship between two (or more) interval variables (e.g., scores on scales, or measures with many different values such as length, age, or blood pressure), you use regression. For example, we might want to predict a person's shoe size by their length.

A regression analysis will give you information on how well length (independent variable; IV) can predict the shoe size (dependent variable; DV). Regression analysis will give you betas (the standardized coefficient) or Bs (the unstandardized coefficient) that indicate the relationship between the IVs and the DV. Just like correlations, positive betas/Bs indicate a positive relationship, negative betas/Bs a negative relationship, and non-significant betas/Bs mean that the IV does not predict the DV.

A thing to note when doing regressions; the betas/Bs indicate the *unique* contribution of the IV on the DV (i.e., assuming that all other factors are constant/stay the same). The betas/Bs are likely to change when you add or remove predictors in the test, since these predictors might correlate with each other and regression ignores overlapping shared predicted variance. An IV that predicts a significant amount of variance in the DV when it is alone in the regression (simple regression), such as length, might become non-significant when another predictor, like their father's length, is added to the test (multiple regression). This is because a person's length and their father's length may both predict the same variance in the DV, making their unique contribution too small to be significant.

Note that regressions are not only used with interval variables; they are used for other type of data too (e.g., you might see it when researchers test interactions between categorical and continuous predictors or as alternative to ANOVA). To keep things simple: follow what you have been taught in your statistics course.

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# Recommended reading

## Methodology

Leary, M.L. (2012). Introduction to behavioral research methods (6th edition). Pearson.

Reis, H.T., & Gosling, S.D. (2010). Social psychological methods outside the laboratory. In S. Fiske, D. Gilbert, & G. Lindzey, (Eds.), The handbook of social psychology (5th ed., vol. 1, pp. 82-114). Wiley.

Wilson, T. D., & Aronson, E., & Carlsmith, K. (2010). The art of laboratory experimentation. In S. Fiske, D. Gilbert, & G. Lindzey (Eds.), The handbook of social psychology (5th ed., vol. 1, pp. 49-79). Wiley.

## Writing

Silvia, P. (2018). How to write a lot: A practical guide to productive academic writing (2nd Edition). American Psychological Association.

Wallwork, A. (2011). English for writing research papers. Springer.

Zinsser, W. (2019). On writing well: The classic guide to writing nonfiction. HarperCollins Publishers Inc.

## Statistics

De Heus, P., Van der Leeden, R. & Gazendam, B. (2002). Toegepaste data-analyse: Technieken voor niet-experimenteel onderzoek in de sociale wetenschappen. Elsevier bedrijfsinformatie bv.

Field, A. (2017). Discovering statistics using IBM SPSS Statistics (5th edition). Sage Edge.

Glen, S. (retrieved at 6/5/2021). Reporting Statistics APA Style. Retrieved from StatisticsHowTo.com: Elementary Statistics for the rest of us! https://www.statisticshowto.com/probability-and-statistics/reporting-statistics-apa-style/

This book covers the process of writing an empirical thesis from start to finish. We have divided the process into little steps, and we guide students in each step with a short text and a visual. In this way, students get guidelines and tips and tricks in each phase of their thesis project. We have tried to keep things simple: The texts are short, and the visuals are recognizable and make it easier to digest the book.

The book has four parts: 1) a part about the content of a thesis; 2) a part with writing tips; 3) a part about general issues such as how to stay motivated or how to deal with your supervisor, and 4) a part about the most common statistical analyses. The book thus covers all aspects of writing a thesis, in terms of the content as well as the process.

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