

# Research Design and Analysis

Research Design choices and choosing appropriate measures.

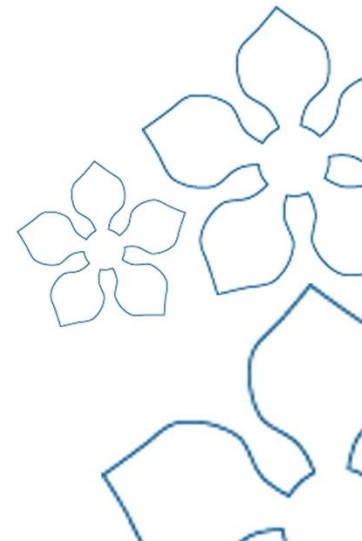
Dr. Kate Williams



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# Essential Reading...

Brace, N., Kemp, R., & Snelgar, R. (2012). *SPSS for Psychologists* (5<sup>th</sup> ed.). Hants: Palgrave Macmillan.

Pallant, J. (2010). *SPSS survival manual* (4<sup>th</sup> Ed.). Open University Press: McGraw-Hill.

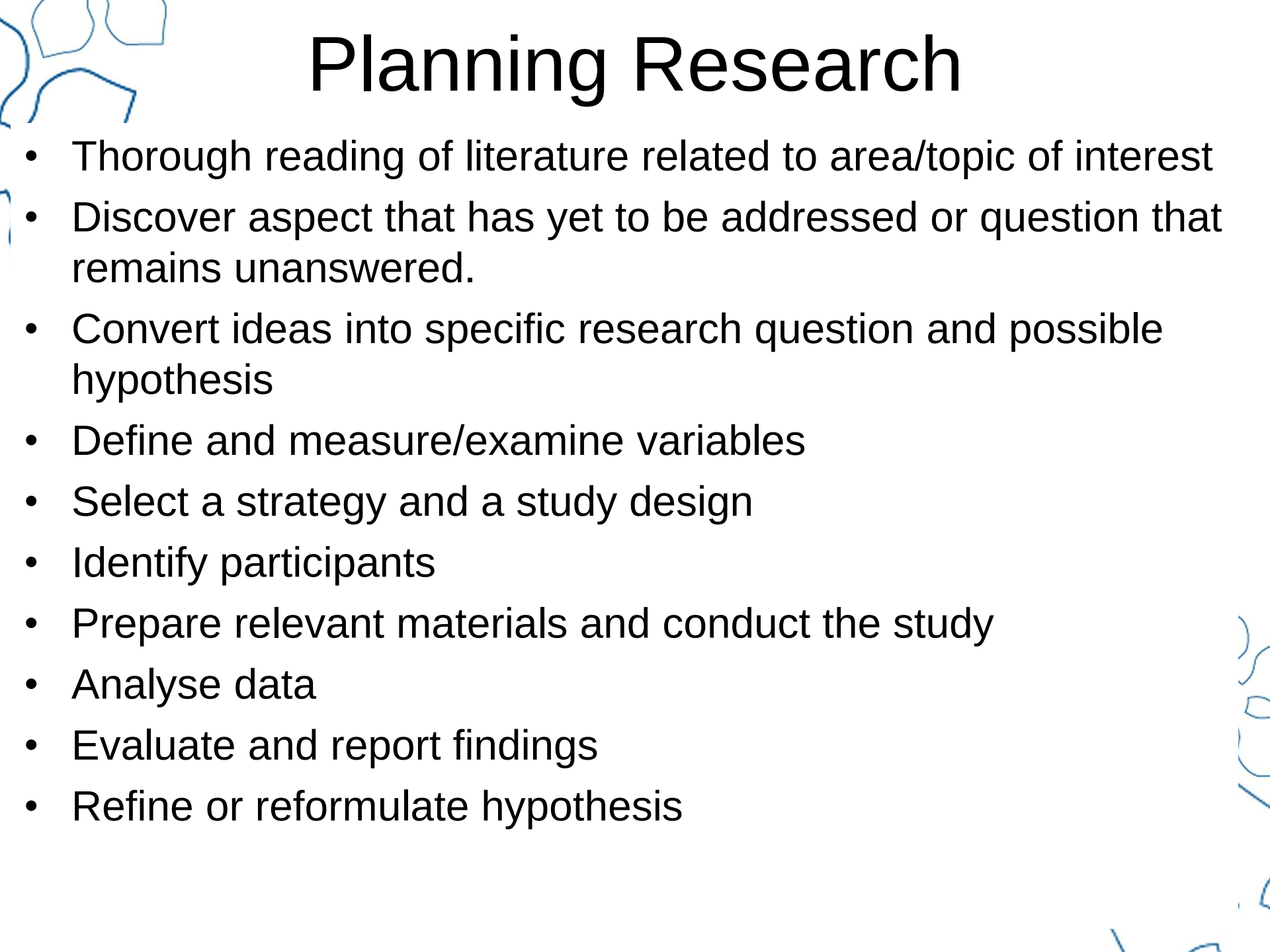
Coolican, H. (2014). *Research methods and statistics in psychology*. London: Taylor & Francis.



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# Planning Research

- Thorough reading of literature related to area/topic of interest
- Discover aspect that has yet to be addressed or question that remains unanswered.
- Convert ideas into specific research question and possible hypothesis
- Define and measure/examine variables
- Select a strategy and a study design
- Identify participants
- Prepare relevant materials and conduct the study
- Analyse data
- Evaluate and report findings
- Refine or reformulate hypothesis

# Understanding Design choices in Research

- Study design choices need to be considered carefully
- Choice of variables should be based on appropriate theory and/or empirical evidence
- Need to think carefully about the type of data you need to collect **BEFORE** you collect it



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# Hypotheses

- A prediction about the outcome of the research.
- **One-tailed:** makes a prediction regarding both the presence of an effect ***and*** the direction of this effect.
- **Two-tailed:** only predicts the presence of an effect, not its direction.
- **Null:** predicts a possibility that there will be ***no*** effect or association between variables.



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# Different types of research:

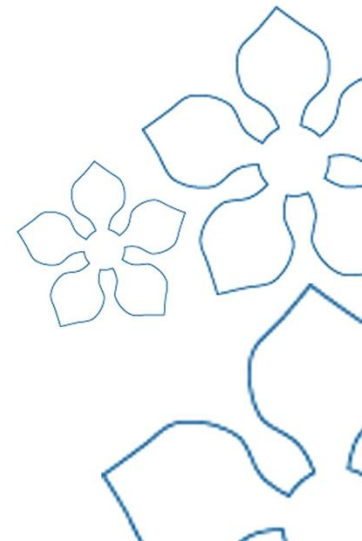
- Basic versus applied research
- Qualitative versus quantitative
- Experimental versus non-experimental



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# Review – Different Types of Data

Qualitative



Free text/words

Quantitative



Numbers

Categories / Continuous

Nominal, Ordinal, Ratio,  
Interval



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# Qualitative versus Quantitative Research

## Quantitative research:

- We are not really interested in the sample that we study – we are interested in the target population
- Ability to generalise results to target population

## Qualitative research:

- Interested in the specific experiences of our sample - the “real-life-world” of our participants
- Do not attempt to generalise to larger populations



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# Quantitative Research



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# Types of data

- Consideration of type of data important in study design
- So....how do you decide??

Two broad types of data:

- Categorical
  - e.g. gender, personality type
  - Limited number of groups to which people can belong/can only belong to one group
- Continuous
  - e.g. age, scores on a stress scale, seconds taken to complete a task.
  - Can take a vast range of values often from zero to an infinite number of different values
- You can turn continuous data into categorical but not vice versa

# Why does it matter?

- It will influence the quality of your results, the type of conclusions you can draw, & the type of statistical analyses you do.

## **Categorical**

- The results showed that a higher proportion of people in Group B (60%) were anxious compared to those in Group A (10%)

## **Continuous**

*Can use mean scores:*

- The results showed that the mean anxiety score of participants in group A was 2.3 and in group B was 24.7 (measured on a scale of 0-30)
- Enables more sophisticated option for statistical analyses

# Types of data

|          |                                                                                                           |
|----------|-----------------------------------------------------------------------------------------------------------|
| nominal  | records differences<br><i>A is red, B is blue</i>                                                         |
| ordinal  | records differences &<br>magnitudes<br><i>A is larger than B</i>                                          |
| interval | records differences & magnitudes<br>& has equal intervals<br><i>A is two units larger than B</i>          |
| ratio    | records differences & magnitudes,<br>has equal intervals & a true zero<br><i>A is twice as large as B</i> |

# Main Types of Variable

- Independent variables (IV)
  - Variables researchers control, manipulate or collate
  - The research conditions/factors
- Dependent variables (DV)
  - Scores or measurements taken (the data)
- Often want to examine a possible causal effect or association between the IV and the DV
- Confounding/Extraneous Variable
  - Variable that may effect the DV but not intended as part of your study



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# Conditions and Groups

- Use the manipulation of IV to produce conditions
  - The 'level' of the IV
  - Note: an IV is not always directly manipulated
    - E.g. Male and female
- Within-subject variation: Variation in the responses of same individual on more than one occasion.
- Between-subject variation: Variation between measures of different individuals.



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# Types of designs

- Related/Repeated or Within participants:
  - The same participants used in different conditions
  - Issues:
    - Order effects, practice effects, fatigue
    - Counterbalance orders of conditions to remove this as a confounding variable
- Independent or Between participants:
  - Different participants in different conditions/groups
  - Issues:
    - Individual differences between groups
    - Match individuals in groups as much as possible



# Experimental Research

- Mainly uses software packages for running experiments on PC
  - E.g., Superlab, E-prime, etc.
- Experimental research on the PC can involve:
  - Displaying pictures, words, films, or other forms of stimuli on the screen
  - Ps can view, respond, compare or perform other task with the stimuli
  - Play sound files: at specific points in the experiment or throughout.
  - Can randomise order of presentation of stimuli & use blocks of trials
  - Can change position, colour, exposure time of stimuli
  - Can provide Ps with feedback/corrections.
- For capturing data from an experiment you can:
  - Collect response time and/or accuracy (in all trials or by blocks of trials)
  - Can specify method of response: keyboard, mouse, microphone.
- Can also conduct experimental research without a PC, but this can lead to loss of standardisation, rigour and control.

# Measures

- Choosing appropriate measures for your study is a vital aspect of study design
- Need to think carefully about what it is you actually want to measure (think about your operational definition!) and the best way of measuring it
- Measures capturing psychological constructs are expected to be **reliable** and **valid**.



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# Examples of Psychological Measures

- Psychometric tests
  - IQ test
- Personality tests
- A questionnaire measuring psychological distress
- A questionnaire measuring attachment style



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# Psychometric Standards

Key measurement concepts:

- Reliability
  - Is the measure consistent and stable over time?
- Validity
  - Is it an accurate and precise measure i.e., does it measure what it claims to measure?
- Standardisation



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# Measures

Choosing a reliable and valid scale is always the best option:

- you know that you measuring something in a robust way (you haven't just made it up!)
- you have existing data from other studies to compare your findings with
- Sensitive to change within studies (if appropriate)
- Allows for stronger statistical analyses



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## **Test–retest reliability:** consistency of measurement over time

- Assessed by administering the measure to the same group of participants on two or more separate occasions and correlating the sets of scores.
- If the construct being measured is stable, scores should be consistent over time.
- E.g., you would not expect the results of a test of IQ or personality traits to be different if measured more than once.



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# (Some of) The Big Five Inventory

## Personality measure

|                                        | Disagree<br>Strongly | Disagree<br>a little | Neither<br>agree<br>nor<br>disagree | Agree<br>a little | Agree<br>strongly |
|----------------------------------------|----------------------|----------------------|-------------------------------------|-------------------|-------------------|
| In General I am someone who...         | 1                    | 2                    | 3                                   | 4                 | 5                 |
| Is talkative                           |                      |                      |                                     |                   |                   |
| Tends to find fault with others        |                      |                      |                                     |                   |                   |
| Does a thorough job                    |                      |                      |                                     |                   |                   |
| Is depressed, blue                     |                      |                      |                                     |                   |                   |
| Is original, comes up with new ideas   |                      |                      |                                     |                   |                   |
| Is reserved                            |                      |                      |                                     |                   |                   |
| Is helpful and unselfish with others   |                      |                      |                                     |                   |                   |
| Can be somewhat careless               |                      |                      |                                     |                   |                   |
| Is relaxed, handles stress well.       |                      |                      |                                     |                   |                   |
| Is curious about many different things |                      |                      |                                     |                   |                   |
| Is full of energy                      |                      |                      |                                     |                   |                   |
| Starts quarrels with others            |                      |                      |                                     |                   |                   |
| Is a reliable worker                   |                      |                      |                                     |                   |                   |

# Internal Consistency: consistency of measurement within the test itself

- All the items on a test should measure the same thing
- Items should correlate highly with each other
- Internal consistency reliability – the extent to which a test has homogenous content

Cronbach's alpha: response to each item is correlated with the response to every other item

Note : Interpreting Reliability .70 or above



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# E.g., a scale of Extraversion

Very much so   Moderately so   Somewhat so   Not at all so

1. I feel at ease with people.
2. I start conversations.
3. I take charge.
4. I am the life of the party.
5. I am skilled in handling social situations.
6. I make friends easily.
7. I talk to a lot of different people at parties.
8. I know how to captivate people.
9. I do not mind being the centre of attention.
10. I feel comfortable around other people.

*response to each item should be correlated with the response to every other item – otherwise not tapping into the same thing!*



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- **Split half reliability**

- internal consistency between two sets of scores

- **Inter-rater reliability**

- extent to which two different raters agree in their evaluations
- consistency of measurement when different people observe the same event or score the same test



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# Validity

How well a test actually measures what it is designed to measure

## Face validity

– test looks plausible at face value i.e., does it look like it is measuring what it claims to be measuring?

E.g., Life Orientation Test (Scheier & Carver, 1985): a measure of dispositional optimism

- **In uncertain times I usually expect the best**
- **If something can go wrong for me, it will**
- **I'm always optimistic about my future**
- **I hardly ever expect things to go my way**



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# Construct Validity

does the test successfully measure the psychological construct it is designed to measure?

- E.g., intelligence
- Assessed by looking at the relationship between test scores and other behaviours that it should be related to
  - Does scores on a new IQ test relate to academic performance?
  - does a measure of psychological distress report similar scores to a psychiatric interview.
- Should be related to measures of the same construct – *convergent validity* – and it should be unrelated to measures of unrelated constructs – *discriminant validity*

# Content Validity

- whether the items on a test measure all the knowledge or skills that are assumed to underlie the construct of interest
- E.g. does a measure of intelligence capture all types of intelligence or just certain types e.g. problem-solving ability; numerical reasoning;



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# Criterion-related Validity

- the ability of test scores to correlate with meaningful criterion measures
- are they able to predict future outcomes?
  - Test should predict present or future outcomes that are influenced by the construct being measured
  - e.g. does a measure of IQ successfully predict future performance/success in that job?
  - e.g., Do scores on a measure of conscientiousness predict future academic performance?



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# BUT BEWARE: scales and sub-scales

- Some psychological measures may include sub-scales
- Sometimes can either add up all items for total score, or create separate sub-scales for each
- Sometimes have to keep each sub-scale separate from others.



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- E.G., Impact of Event Scale, Horowitz et al. 1979

- INTRUSION SUB-SCALE: Seven items measure intrusive thoughts “intrusion” about a stressful event (0-35)

- “I thought about it when I didn’t mean to....”*

- AVOIDANCE SUB-SCALE: Eight items measure attempts to avoid those thoughts “avoidance” (0-40)

- “I stayed away from reminders of it”*

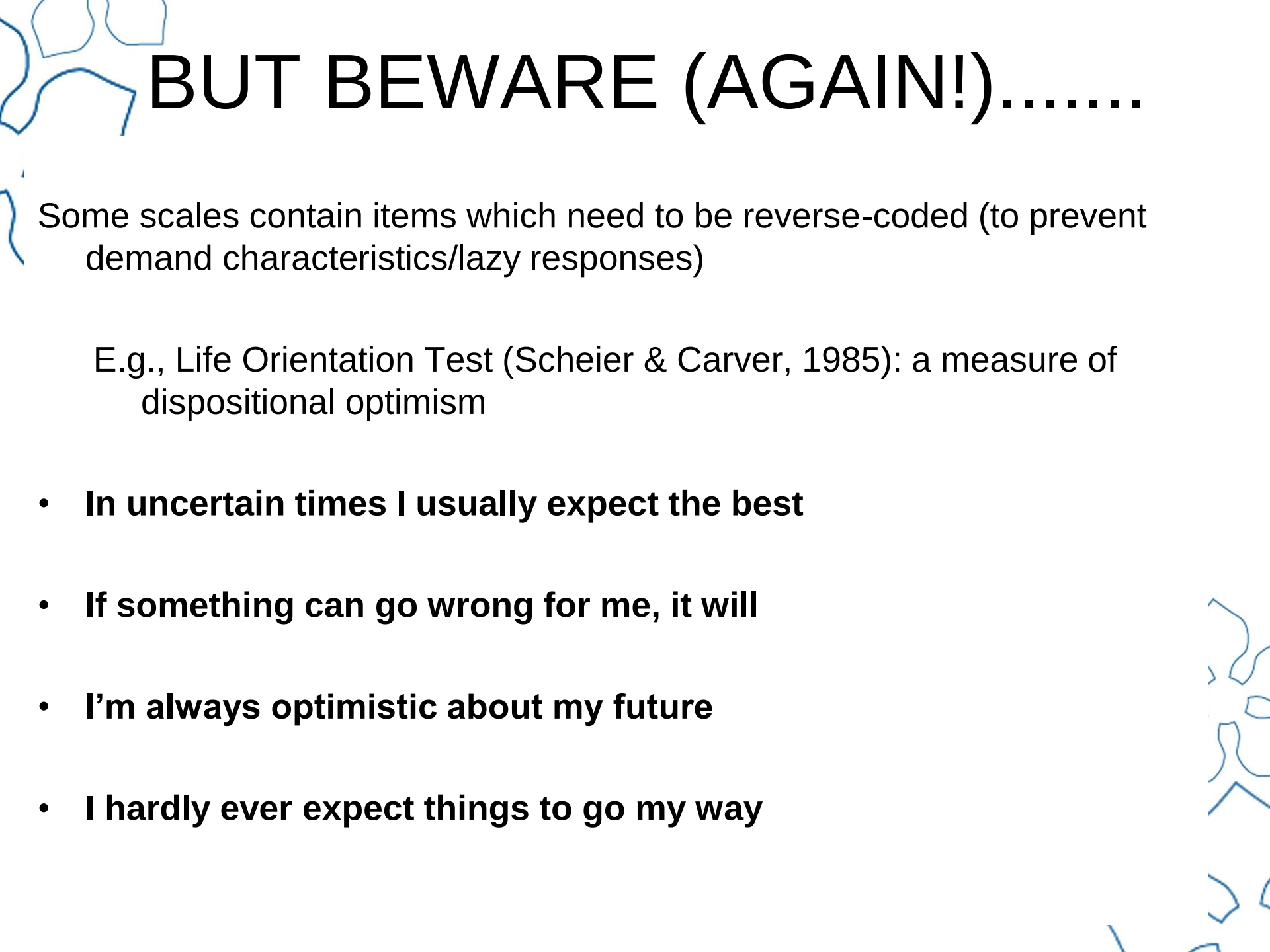
- Can be combined to create a “Global distress Scale” (0-75)



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# Impact of Event Scale (Horowitz et al., 1979)

| (Tick one box from each row)                                                                                    | Not at all               | Rarely                   | Sometimes                | Often                    |
|-----------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| I thought about it when I didn't mean to                                                                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I avoided letting myself get upset when I thought about it or was reminded of it                                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I tried to remove it from my memory                                                                             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I had trouble falling asleep or staying asleep, because of pictures or thoughts about it that came into my mind | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I had waves of strong feelings about it                                                                         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I had dreams about it                                                                                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I stayed away from reminders of it                                                                              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I felt as if it hadn't happened or wasn't real                                                                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I tried not to talk about it                                                                                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Pictures about it popped into my mind                                                                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Other things kept making me think about it                                                                      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I was aware that I still had a lot of feelings about it, but I didn't deal with them                            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I tried not to think about it                                                                                   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Any reminder brought back feelings about it                                                                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| My feelings about it were kind of numb                                                                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |



# BUT BEWARE (AGAIN!).....

Some scales contain items which need to be reverse-coded (to prevent demand characteristics/lazy responses)

E.g., Life Orientation Test (Scheier & Carver, 1985): a measure of dispositional optimism

- **In uncertain times I usually expect the best**
- **If something can go wrong for me, it will**
- **I'm always optimistic about my future**
- **I hardly ever expect things to go my way**

# Qualitative Research



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# Key elements

- Semi-structured interviews:
  - neutral open-ended questions, aimed at eliciting in-depth responses from participants
  - questions form a prompt to the interviewer
  - should enable participants to express their beliefs, opinions and feelings freely



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# Key elements

- Homogeneous sample
- Select appropriate method of data collection – semi-structured interviews, focus groups, participant diaries and self reporting tasks.
- an awareness of researcher's own role in the process and any biases/preconceptions
- E.g. would a CBT therapist and a Humanistic therapist identify the same themes from an interview?
  - Why?



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# Key elements of qualitative design

- What is the aim of your research?
- Who are your participants?
  - Are they able to answer your question i.e. A relevant participant group?
  - Are they representative?
  - Any inclusion/exclusion criteria
  - Do you need different sub-groups?
  - Written informed consent?
- How many interviews are you going to conduct?  
(time, cost, meeting aim of research)



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# The Interview Schedule

- What information do you want to get from your participants?
- An interview schedule helps to guide your questions to ensure you cover all important areas
- Include:
  - Introduction
  - Permission to record interview/anonymity
  - prompts and hints for follow-up questions
  - Wrap-up at end (thank and summary of research aim)



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# Categories of Questions

- **Opening:** get acquainted and feel connected
- **Introductory:** Begins discussion of topic
- **Transition:** Moves smoothly and seamlessly into key questions
- **Key:** Obtains insight on areas of central concern in the study
- **Ending:** Helps researchers determine where to place emphasis and brings closure to the discussion
- (Krueger, 1998)



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# Recruiting for Qualitative Studies

## **Recruitment for qualitative interview studies notoriously difficult**

- Convey a sense that the research will be interesting and worthwhile
- Make the contacts personal
- Build on existing relationships whenever possible
- Use appropriate screening criteria
- Offer incentives
- Make participation as convenient as possible
- Follow up



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# Finally....

- Read your stats books!!
- Read your Research Methods books!!
- Read journal articles/studies in the area of research you are interested in!!



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