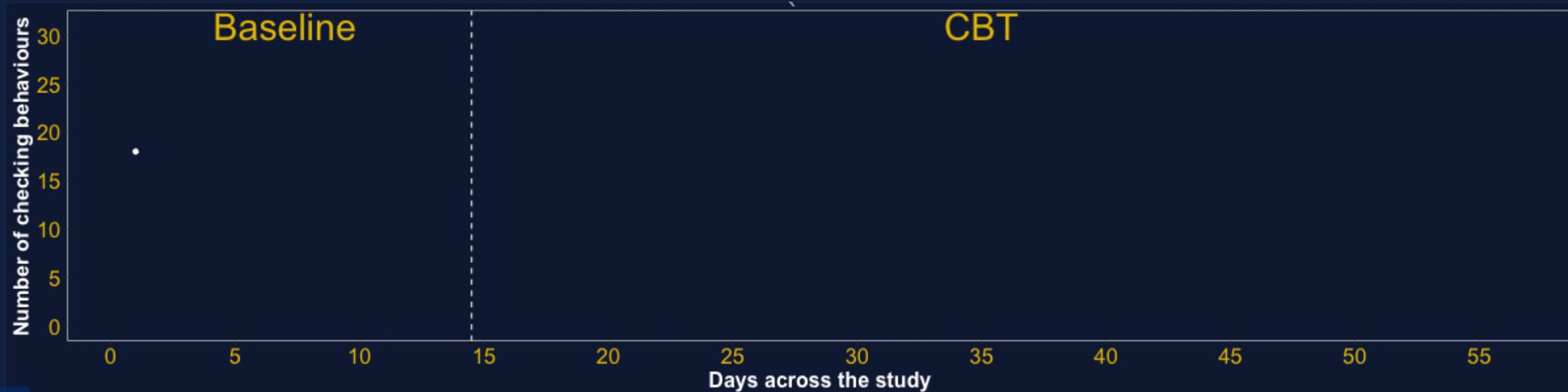




# Single Case Experimental Design #1

A workshop for routine clinicians - Day 1: planning, conducting and reporting

University of Sheffield - Clinical and Applied Psychology Unit





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# ① Navigating these slides



Note: all underlined **white** and **blue** text are hyperlinks!

Day 1

Aims + Intro

Why

Measures

Designs

Setting it up

Day 2

Analysis

Practice

Resources



# 🧭 Navigating these slides

⌨️ Keyboard shortcuts - Press 'h'.

📍 Overview slides - Press 'o'.

✍️ Scribble on slides - Press 's'.

📄 This presentation is also available as a [pdf](#) and [powerpoint](#)

✉️ If you find any problems with these slides then e-mail [Chris](#).



Slides made using Xaringan and R Markdown.



# Aims of the workshop

- Become **familiar** with the requirements of the SCED.
- Appreciate links between **practice-based evidence** and SCED methodology.
- To **understand** the basic features of the available designs.
- To consider ways of engaging clients in SCED.
- To appreciate the **potential** of SCED methodology.



# Aims of the workshop

- Review the application of SCED methodology within clinical research and practice.
- Consider potential practical difficulties in implementation of SCED.
- Provide practical experience of design and analysis.
- Foresee potential difficulties and trouble-shoot.



# Is change important?

Q. Why is change (across treatment) important?

Q. What are the ways in which we can demonstrate if change has occurred?

Q. What are the implications of not attempting to establish if change has occurred?

Q. What is my relationship to outcome measurement, questionnaires, assessments etc.?

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\*10 minute discussion task in pairs



# Hopes for the workshop

Include

- Write
- Here
- And
- We
- Will
- Come
- Back

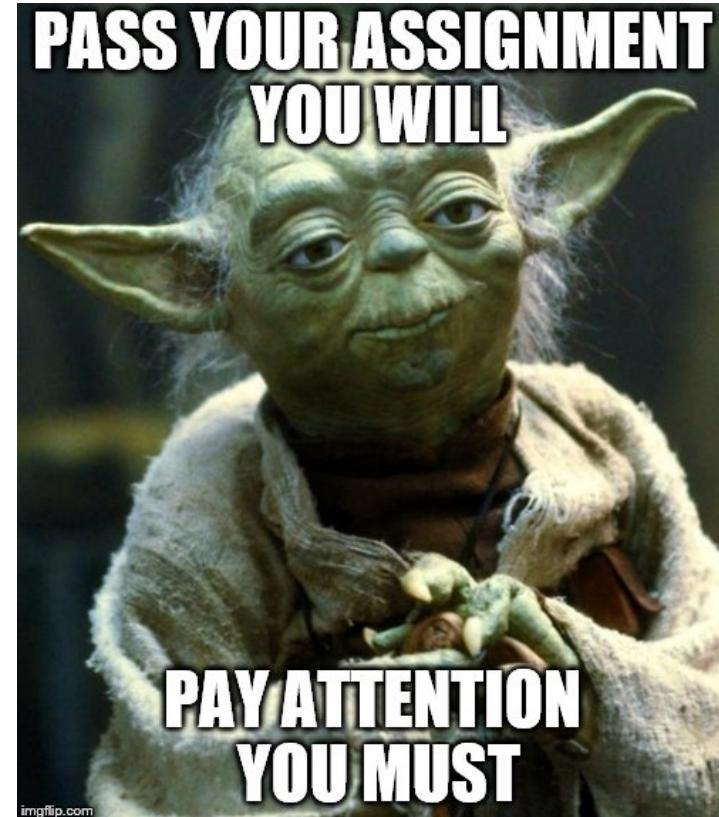
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# A note on the assignment

- Conduct a SCED of psychological treatment.
- Any design is permissible (we will teach you all the methods).

We are going to give you everything you need in order to be able to pass your assignment.





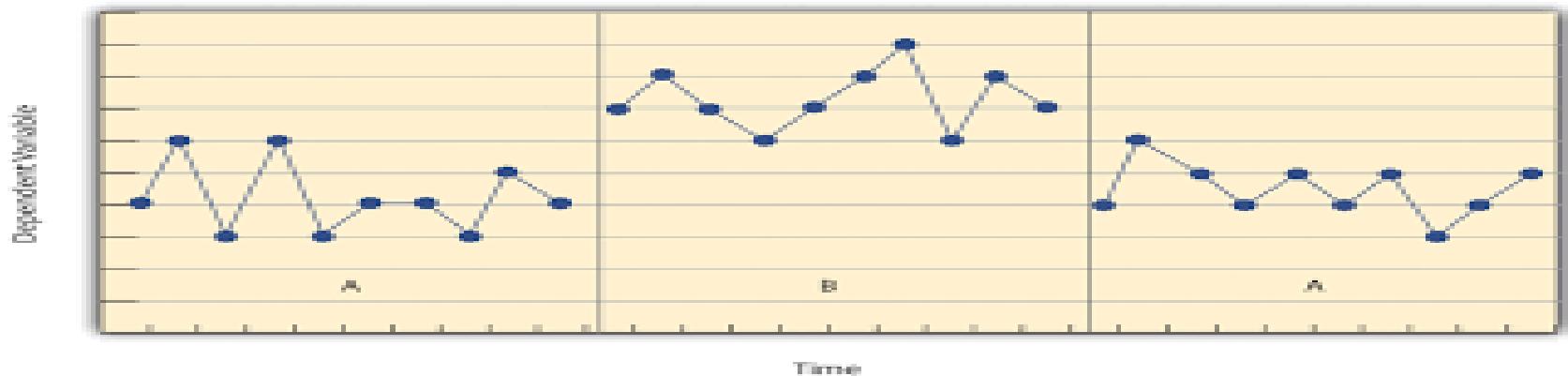
# Introduction to SCED

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# Single case involves:

- Time-series measurement (quantifiable + over time).
- Baseline period.
- Experimental manipulation of an IV.
- Focus on within-subject variability.



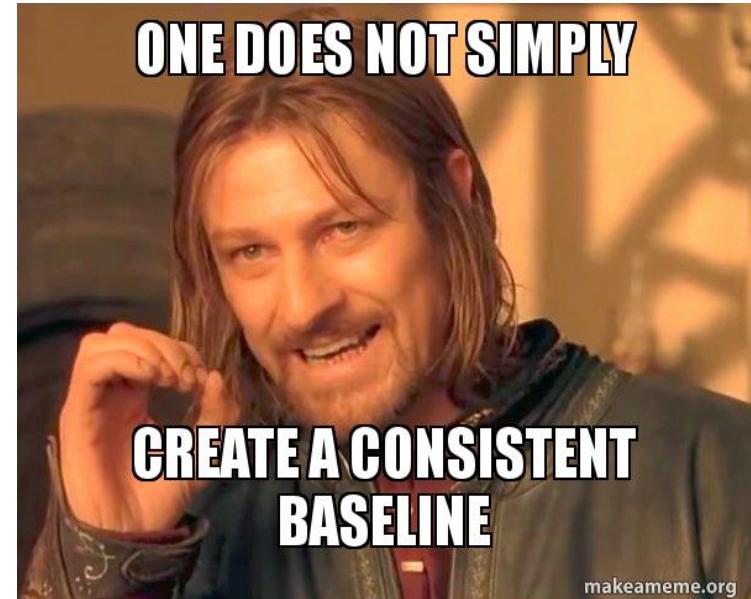


# What is a baseline?

- Repeated measurements before treatment is introduced.
- The ideal is long and stable baselines.

However:

- Not common
- Some disorders have inbuilt variability.
- Are neutral baselines are a fallacy?





# The focus?

- Your **individual** service user.
- **You**, the clinician.
- Why and what leads to change?
- Within client change rather than across client change.



# Why use SCEDs?

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# So why use SCEDs?

 **Clinical research:** Testing clinical hypotheses and contributing to knowledge.

 **Practice philosophy:** Being a scientist practitioner.

 **Accountability and evaluation:** Being a effective practitioner and auditing your work.

 **Education and training:** Learning SCED skills for the rest of your career



# Status of SCED as a research tool?



Quantified Self



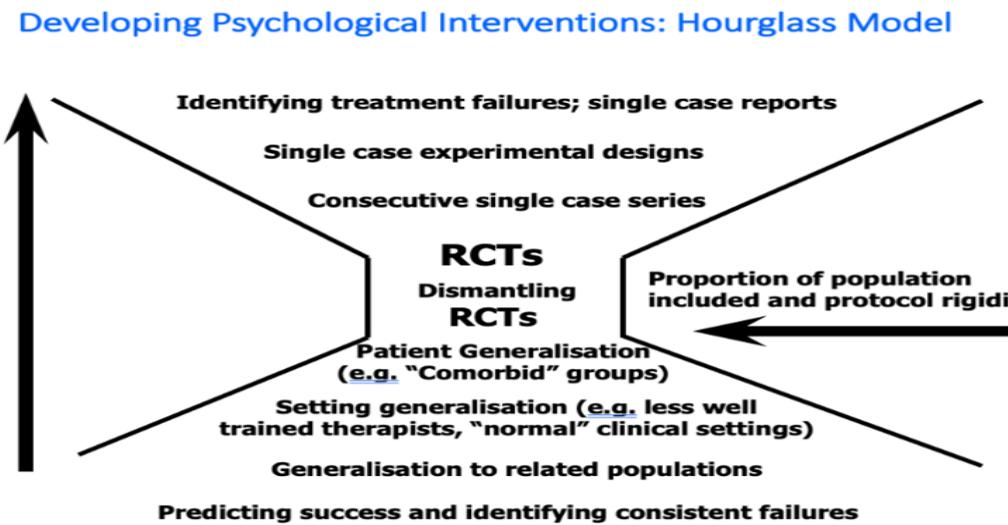
- Highly accessible for clinicians.
- Growing popularity.
  - Single case texts/books regularly published.
  - No longer restricted to ABA.
  - Health user movements.
- Appropriate for novel or emerging areas.
  - e.g. CBT and panic/psychosis rooted in SCED evidence.
  - RCTs are not the only option.
- Rapidly developing field.
  - New analytical methods + designs.



# Hour Glass Model

Three stage research cycle for evidencing treatment (Salkovskis, 1995):

1. Practice based pilot studies on small  $n$  in routine services.
2. Highly controlled trials efficacy studies (e.g. RCTs).
3. Implementation studies (return treatment to routine settings.)





# Clinical Practice

- Accountability and evaluation.
- Demonstrating treatment effectiveness.
- Monitoring progress (or deterioration).
- Training in single case methods makes more effective practitioners?
- Referral on following ineffective treatment – you will really know this.
- Inviting patient to be part of evaluation.





## Being a Scientific Practitioner

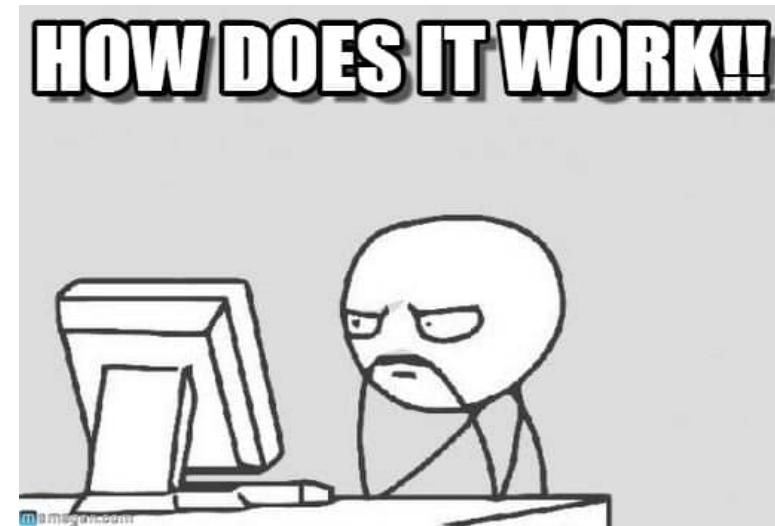


# Scientific Practitioner

Most useful contribution of SCED?

Ability to answer questions that are **clinically relevant variants on those of evidence-based practice.**

“Does this evidence-based treatment work for this particular client, who differs in some way from the sample characteristics of the evidence base?".





# What's the advantage of SCED?

- Low cost
- Low infrastructure
- Small 'turning circle'
- Easily adaptable + flexible
- Collaborative (if done right)

**Available for all clinicians to use! □**



# Why don't clinicians use it?

- Lack of confidence
- Lack of knowledge
- Can be messy in practice - The ideal described in the classic texts on the design seems a far cry from what is possible in the real world.
- Perception that it is too much for the recipient to handle -  
Theory of Spun Glass (Meehl, 1973)

A photograph of a light-colored wooden desk surface. On it are several tools used for measurement and drawing: a large compass at the top left, a ruler, a protractor, and a set square. In the bottom left corner, there is a pair of black-handled pliers or a similar tool. The background shows more of the desk and some papers.

# Approaches to Measurement



## Nomothetic Measures

Traditional questionnaire approaches used in services.

## Idiographic Measures

Unique measures applied in an individualised manner.

## Qualitative Approaches

Qualitative approaches to assessment (e.g. interviews).

- Attempts to generalise people.
- Uses objective knowledge.
- Based on data that is categorical or numerical.

- Focuses on recognition of uniqueness.
- Uses subjective experience.
- Based on study of uniqueness at an individual level.

- like ideographics, focuses on subjective judgement and experience.
- Traditional methods: interviews, focus groups, soft outcomes.

Adapted from



# Ideographic or nomothetic?

SCED seeks to balance focus on nomothetic and idiographic approaches to measurement.

A funnel approach from nomothetic to idiographic target measures

“Different but complementary approaches to accumulating a broader base of evidence... So, when asked by clinical trainees, what two outcome measures I would recommend, my response invariably is: one nomothetic and one idiographic”.

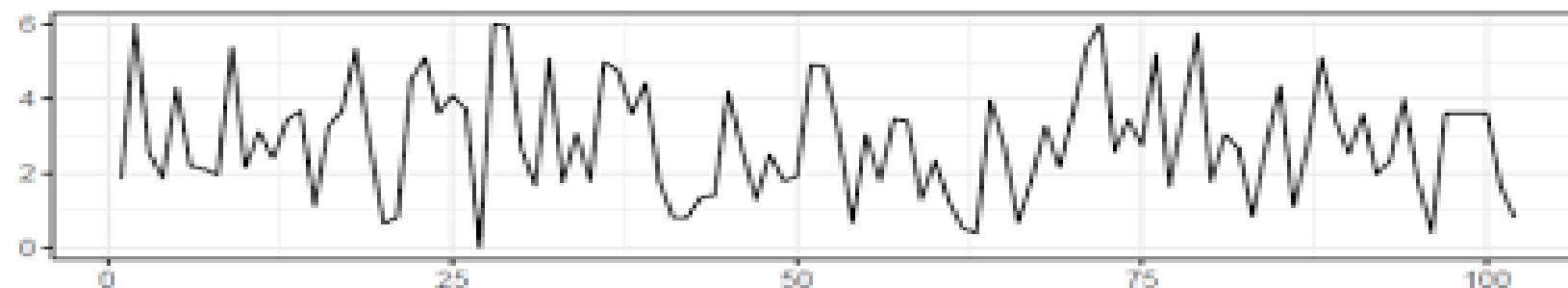
— Barkham, 2016

Nomothetic and ideographic has long tradition within psychotherapy Sheffield University (e.g., Barkham, Stiles, & Shapiro, 1993).

[Barkham commentary \(2017\)](#)

# Time series measurement

- Frequent and systematic measurement of outcome measures that are key to the maintenance of the clinical problem
- In essence, you then ask to what extent the observed variation in the measures is consistent with change occurring?
- The repeated measures provide data on the variation across time in these outcome. With this information the search can begin for the causes of that variation





# Using nomothetic measures

- These are the questionnaires that are 'off the shelf' and often used for pre-post change.
- Use them:
  - at the start/end of each phase.
  - at the end of follow-up (if you have that in your design).
- Try to match one the nomothetic measure to the presenting problem
- Is the measure you are using one of **Effectiveness**
  - General psychological distress (e.g. CORE-OM, SCL-90, BSI, OQ-45, K-10).
  - Disorder specific (e.g. BDI, PHQ-9, GAD-7, YBOCS, IES).
  - Functioning (e.g. WSAS).
- Supplement with other measures?
  - Process?
  - Assimilation?
  - Quality of life?
  - Clinician rated?



# Choosing a generalisation measure

- Whilst the intervention should influence the target of the intervention, an important issue is whether the intervention generalises to other aspects of the client's life.
  - These measures are good test of the external validity of your work.
  - You take these measures (e.g. quality of life) occasionally and often in tandem with the nomothetic outcomes measures.



# Qualitative approaches

- Qualitative approaches can also be profitably applied to the single-case design. The collection of rich, detailed qualitative information throughout the course of treatment can prove useful in helping to rule out alternative hypotheses



# Setting up ideographic measures





# Designing idiographic measures: tips

## What to measure?

- Anything! (anything that matters).
- Design it collaboratively (ask your patient).
- From the start of the first appointment keep your eyes peeled.
- What does the patient, the family, the referrer want?
- Miracle Question...?
- Dont be afraid to offer suggestions or recommendations.

## Types of measure?

- Could be a cognition, behaviour, affect or interpersonal process.
- Anchored and scaled effectively – let the client define this.
- Intensity measures; Frequency measures; Duration measures;



# Designing idiographic measures: tips

## When to measure?

- Daily? More than?

## Who measures?

- Can be anyone (doesn't have to be just one person).
- Patient? Relative? Carer? Staff team?

## Recording procedures?

- Write it down for them?
- Diary? Excel sheet? Phone 'notes'? Microsoft Forms?



# Baseline requirements

What is a suitable number of measurements (observations) for a baseline?

Some argue that there should be stability (5% variability around mean) before progressing to intervention however this is not always essential (or realistic).

When does the baseline end? (should be at a defined, planned point). A good place may be when providing the formulation (if using one).

**Remember!** Your ideiographic measures go from the start to end of the work.



# Are baseline trends an issue?

- A worsening baseline (worsening of symptoms) may represent a temporary change that would dissipate regardless of any intervention.
- An improving baseline may prevent confidence in saying whether subsequent improvement is due to intervention or natural remission.
- Stability also shows it's not spontaneous recovery

Ideally the baseline should be stable (mean level) with low variability. Problems arise if baselines display: ( i ) Linear trends: (ii) Higher order trends (iii) High variability. Presence of these makes visual or statistical analysis more difficult (**but still possible**).

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# Control measure

- These are an idiographic measure, not expected to change due to the intervention
- If there is change in the target idiographic measures and not the control is shows the intervention working.



# How to engage clients

- Not a must do aspect of your work
- Good rationale
- Have a relaxed attitude
- Display interest in their plight
- Be flexible
- This is an aspect of your normal practice
- Encourage reflectivity
- Keeping an eye on progress
- Promise feedback

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# Modelling and role play

Lets decide as a group what the client will be presenting with and in what context

What the demonstration and then we can critique it

Then you will get to practice in 2s – you both have a go.



# Designs

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## Designs

A-B

A-B-FU

A-B-A-B

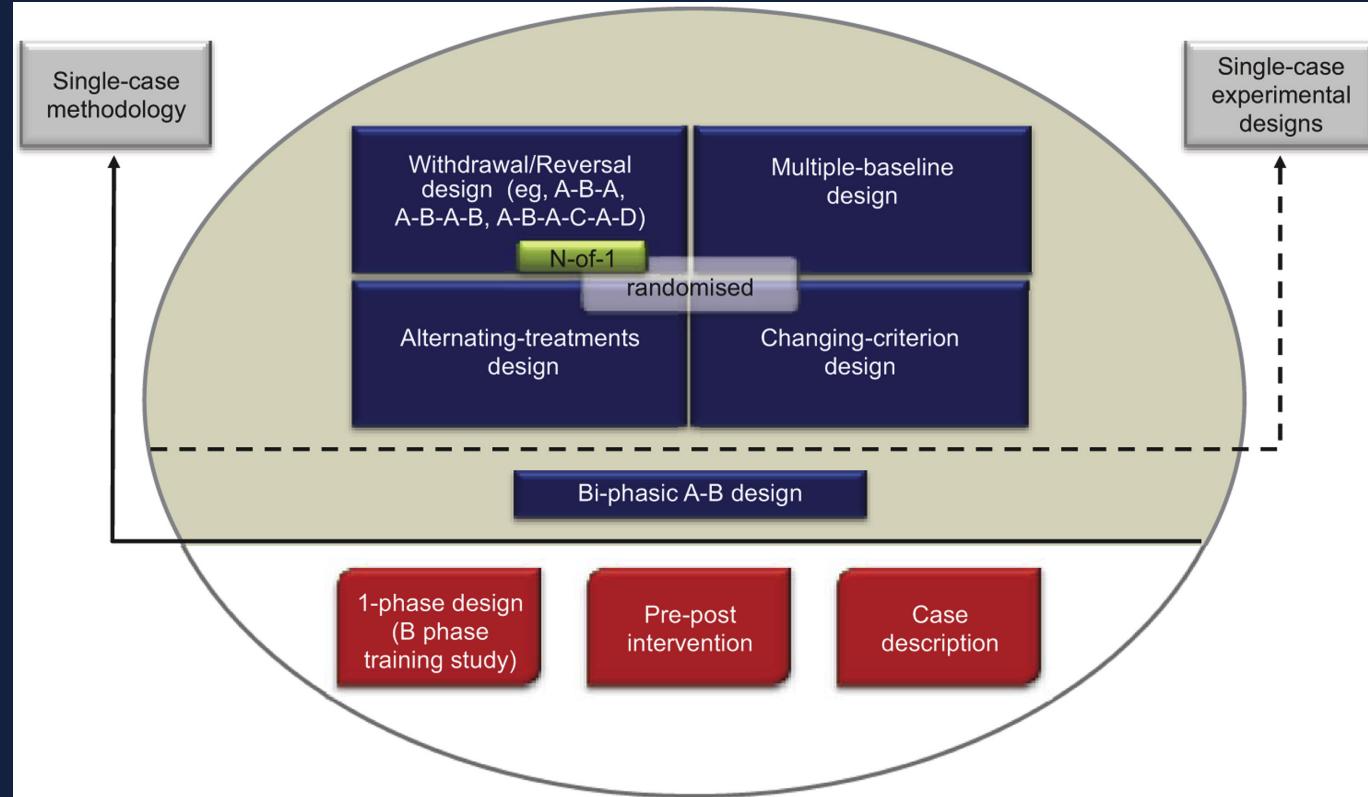
A-B-A-C

Numerous SCED  
designs

- A = Baseline
- B = Intervention
- A<sub>2</sub>/W = Withdrawal
- C = Alt. treatment
- FU = Follow up

Important to consider  
ethics and feasibility.

Design influences  
strength of validity.





Designs

A-B

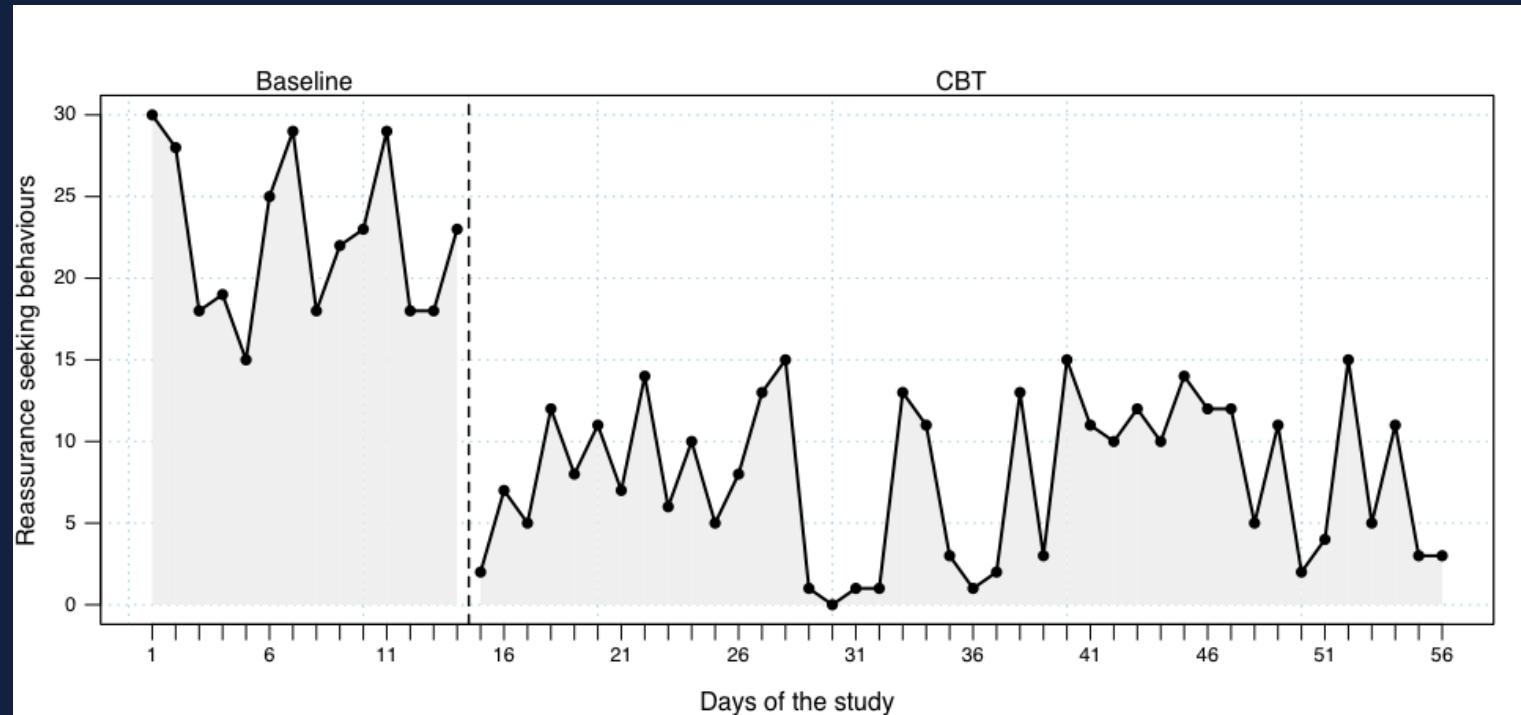
A-B-FU

A-B-A-B

A-B-A-C

- Most basic & accessible.
- Improvement on simple pre-post
- Low validity.
- Quasi-experimental.
- Leaves open many alternative explanations for observed change.

## Classic A-B Design



For examples of studies using AB designs see [\(Hague, 2015\)](#) or [\(Gaskell, 2021\)](#).



Designs

A-B

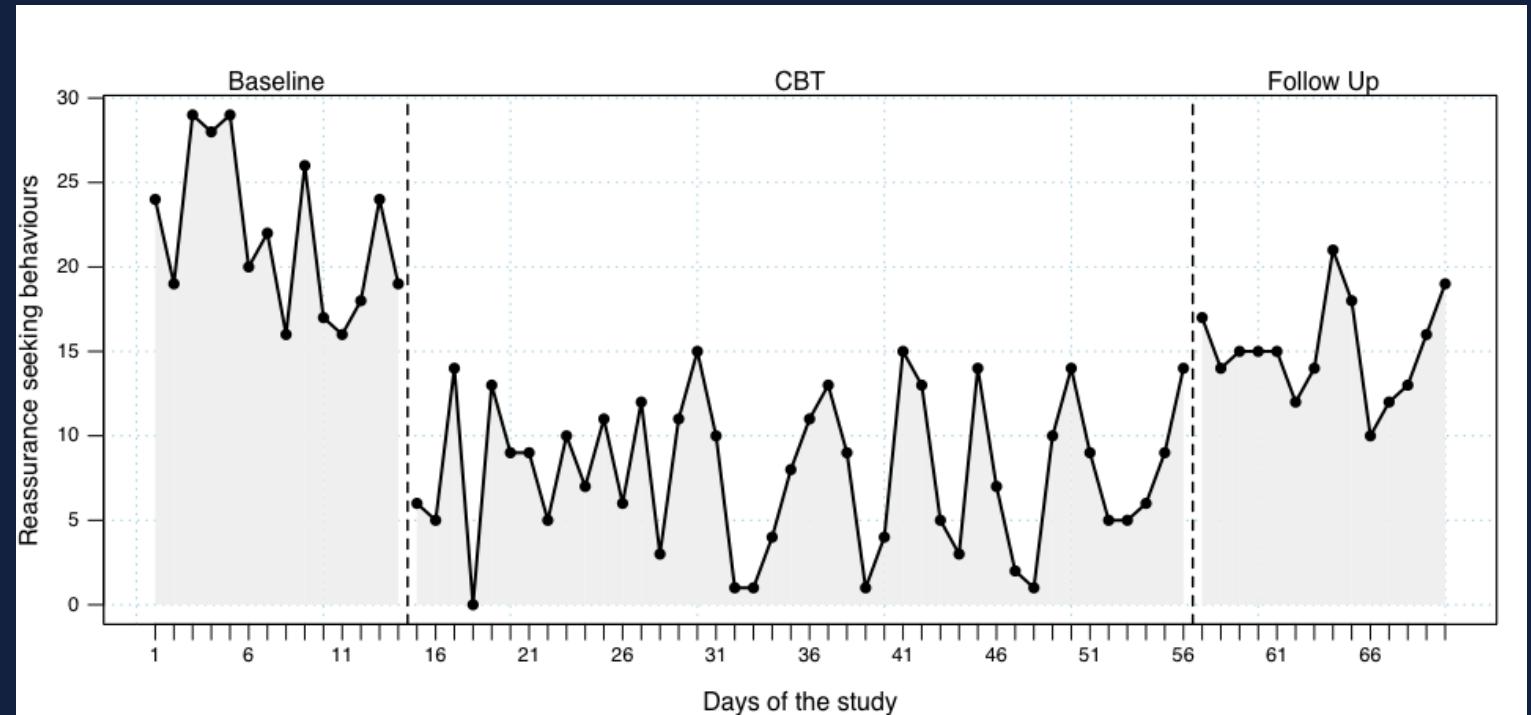
A-B-FU

A-B-A-B

A-B-A-C

- Multiple comparisons possible.
- Can assess maintenance of gains.
- stronger than A-B design.

## Integrating a follow-up



For an example study using an AB follow up design see [\(Kellett, 2021\)](#).



Designs

A-B

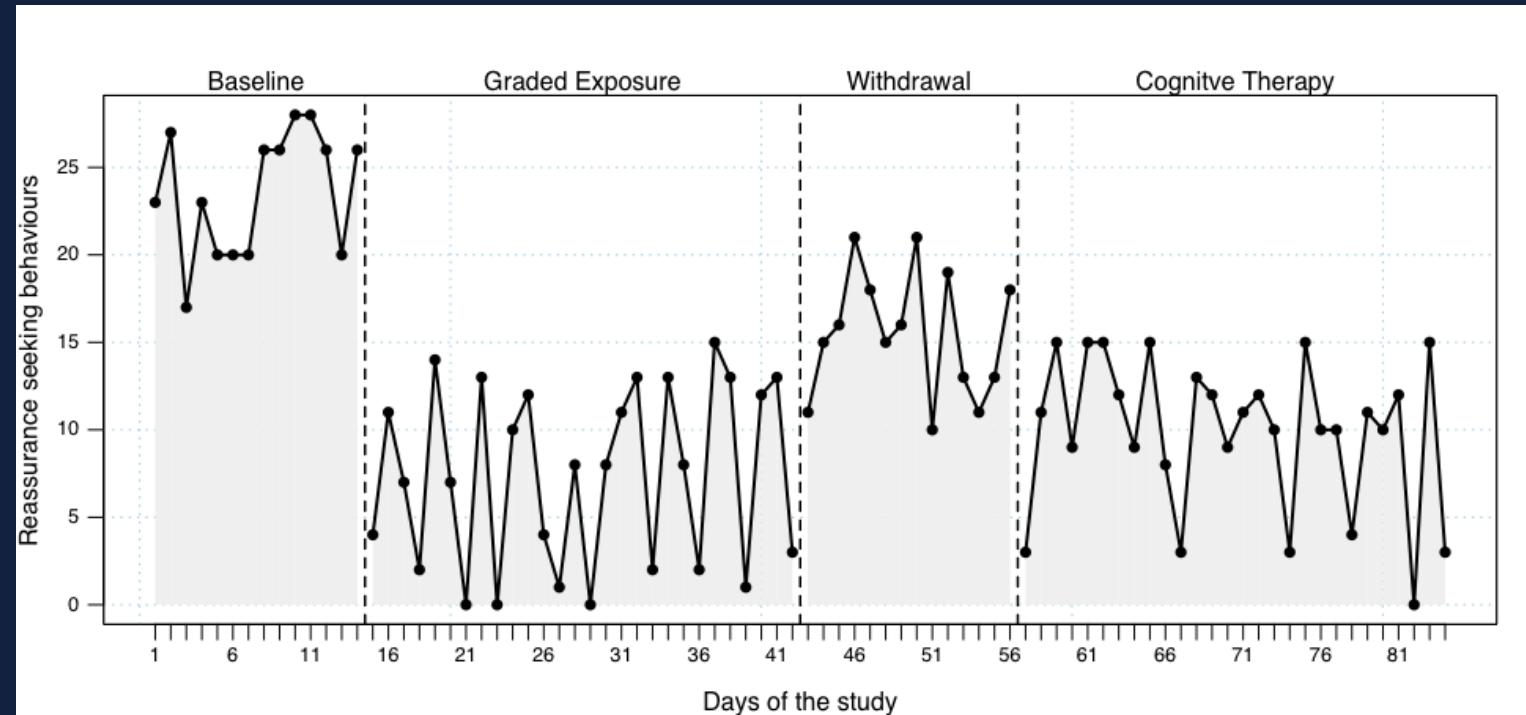
A-B-FU

A-B-A-B

A-B-A-C

- Are the effects of the intervention durable?
- What happens if the treatment is withdrawn?

## Using a withdrawal phase



For an example study using an ABAB design see [\(Kellett, 2021\)](#).



Designs

A-B

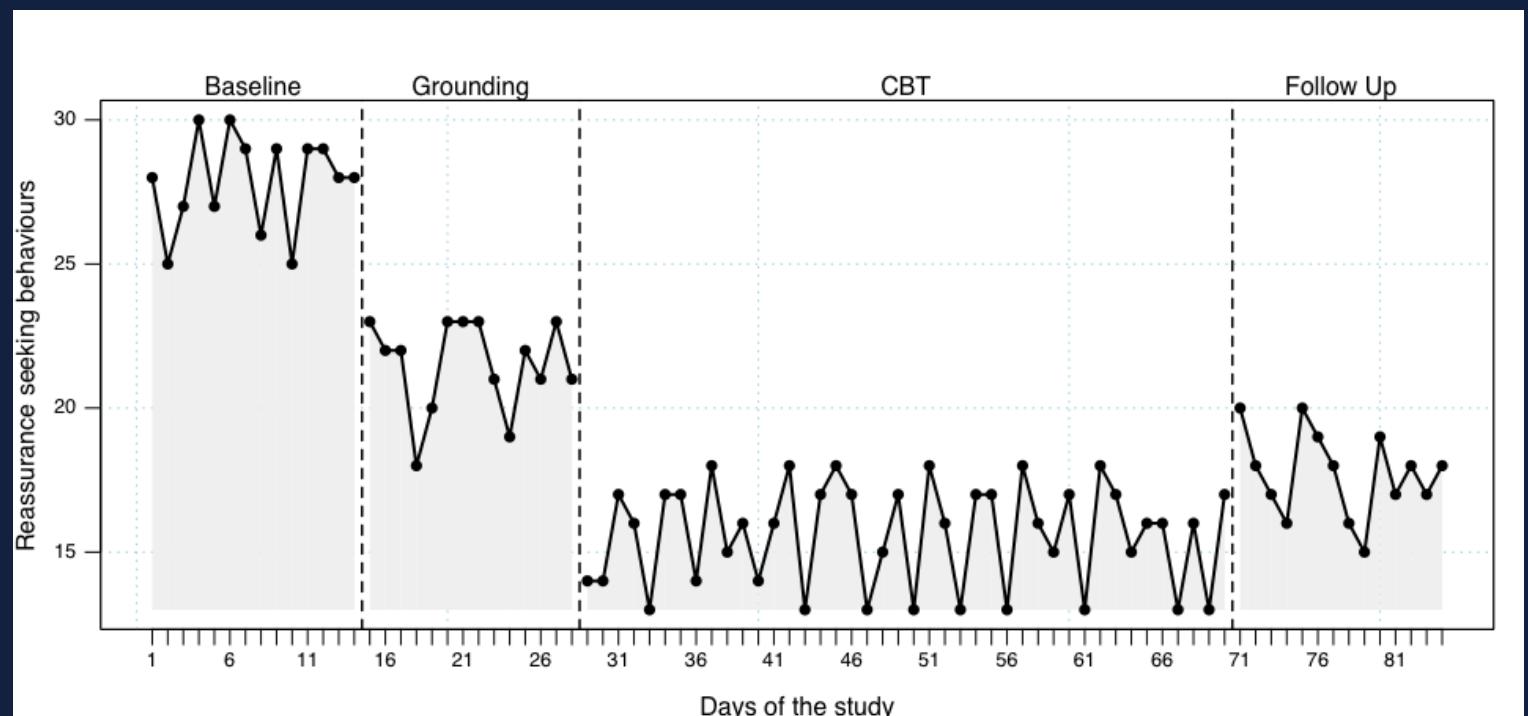
A-B-FU

A-B-A-B

A-B-A-C

- Comparing treatment effectiveness. – Seldom employed in psychotherapy
- .

## Alternating the treatment



For an example study using an ABC design see [\(Kellett, 2021\)](#).



# Considerations with withdrawal designs

Ask yourself "am I being ethical and so are reversals or withdrawals appropriate?".  
Important to know the methodological features before you start (see the later planning slide)

## Theoretical considerations

- Are treatments reversible?
- Carry-over effects.
- Therapeutic instructions (e.g. self-control / management strategies)
- long-acting pharmacological interventions;
- altered environments & staff attitudes.

## Ethical considerations

- Prior agreement with client/staff needed, along with consent.
- Brief withdrawal phase and rapid re-instatement of treatment
- Client's expectations and adherence to withdrawal
- Treatment holidays?



# Threats to validity

1. History (extraneous concurrent events)
2. Maturation (spontaneous recovery)
3. Testing (reactivity and the mere measurement effect)
4. Instrumentation (reliability)
5. Multiple intervention problems (can a psychotherapy be withdrawn)?
6. Instability



# Mini interventions

- Borkovec and Castonguay (2006) point out, the use of mini-interventions in which circumscribed components of treatment are actively manipulated is an underused research strategy, but one that offers the opportunity to increase our knowledge of basic change mechanisms in psychological treatments.
- Separate out the modules on the time series graphs and test for an effect.

For assignment submit the excel sheets as part of the submission showing each module and the scores on the idiographic measures during the phases

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# Planning your design

- Start planning and designing from the referral letter.
- Write a plan and take it to supervision

Things to consider:

- The type of design
- The number of sessions in each phase and module
- How the phases will be sequenced with the modules
- Frequency of the idiographic measures
- Frequency of the nomothetic and generalisation measures
- Frequency, duration, place and time of sessions
- Baseline fidelity (be able to describe in full detail)
- Treatment fidelity (how to keep everything the same bar starting treatment).



# Stages of SCED

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# The stages of a SCED

1. Identify question and hypothesis.
2. Select appropriate design and measures.
3. identify materials and resources.
4. Collect data/supervise study.
5. Analysis (covered in day 2)
6. Interpretation.
7. Communication/dissemination.

These stages may need to be considered collectively and not in isolation. For example. The level of communication of findings may determine the level of analysis adopted.



# Identify clinical question and hypotheses

Hypotheses can be developed as soon as you have any sense of what the subject of change could be (referral letter? Clinical notes? First session?).

## Considerations:

- How do the hypotheses fit the psychological formulation?
- Are there any treatment textbooks that are going to be important?
- Is the clinical problem compatible with the therapy as described in the treatment manual?
- State the hypotheses clearly!
- State any therapeutic predictions clearly!

**Example:** That CBT will lead to a reduction in 'hurting myself' (idiographic) as measured daily, and also a reduction in overall depression as measured through the PHQ-9 (nomothetic).



# Identify measures

- What measures are required to assess the therapeutic aims and goals?
- Nomothetic before/after each phase?
- Idiographics daily throughout?

Ensure measures are suitable for SCED. In practice this usually means:

- Observational measures such as time sampling and staff checklists on in-patient ward
- daily diaries of symptoms, functioning, problem resolution
- Regular use of short psychometric questionnaires etc.
- Ensure rating scales are unambiguously worded and are anchored and well described.



# Identify measures

- Ensure that diaries are well laid out and well presented.
- Scraps of paper do not value people and are seldom completed!
- 1 page per day? per week? per month?
- Consider using a combination of measures targeted at both symptoms and functioning.
- Consider several sources of measurements: client and partner/carer, child and parent,
- Consider use of follow ups phase; A/B-FU design



# Materials & Resources

Ensure measures are acceptable/appropriate for client, or staff or carer or partner.

Plan for study to be feasibly matched to realities of NHS clinical practice:

- baseline collected across sessions 1-2?
- Intervention starts session 3, 16 sessions of therapy contracted
- follow ups at 6 weeks and 6 months?

Ensure quality of adequate resources

Staff need to be properly briefed:

- Patients need to know what they need to do.
- Supervisor aware of coursework.
- Any involved staff on wards are briefed.



# Materials & resources

If staff are collecting the data do they understand the design rationale and do they need any training?

Data should be recorded and stored reliably (i.e. it is being written down in a retrievable manner, it is not missing and is confidential).

If appropriate, staff should receive ongoing feedback about progress of the case (i.e. regular review meetings) and this be reported in the method.

What are the consequences of diverting resources to this project in relation to other ongoing clinical work?

Is it feasible in the setting your working in?

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# Interpretation

- What are the main changes or effects?
- How do they correspond to predictions?
- Are they valid given the design?
- What alternative explanations (i.e. threats to validity) are there?
- Are the effects reliable or clinical significant? Are they noticeable to therapist, client or others?
- Are they generalizable or clinically replicable?
- If effects are clinically nonsignificant - what explanations exist?



# Communication and dissemination

- Share the findings with the client and/or the staff member.
- Thank client and staff.

There are robust research findings demonstrating that...

Feeding back outcomes to patients during treatment leads to greater outcomes.

**Particularly** for patients who are not on track.



# Conclusions

- SCED can be used in a wide variety of situations and these range across service users and settings.
- As trainee scientist-practitioners – a good place to be.
- Integrate the methods into your practice – don't be anxious.
- Always start with the baseline - the design can evolve and be flexible
- This is still all about your client. Your job is to help them, not merely manipulate variables and phases.
- Play around with the methodology



# End of Day one

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