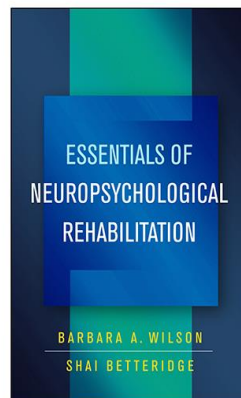


Research for Clinicians: How to make your clinical work your research

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Introduction

- Research is not something extra that is added on to our work, it is an essential part of clinical practice
- If we prepare for our clients/patients and write notes about their response to treatment then this can be the basis of research
- When therapy sessions are designed to treat patients and answer questions then research is under way.

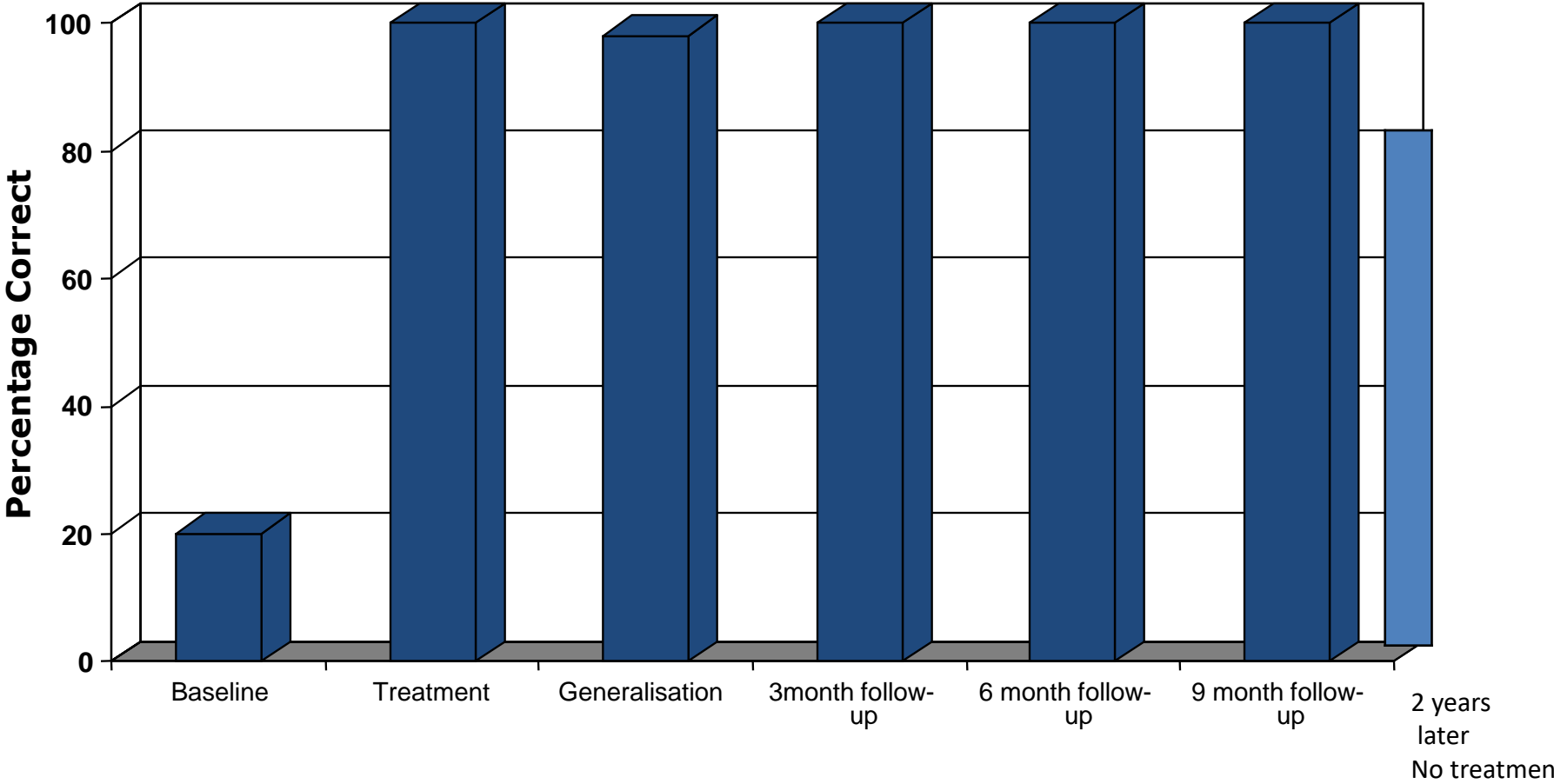
Research is:-

- A procedure that enables us to answer questions
- Different methods must be employed to answer different questions

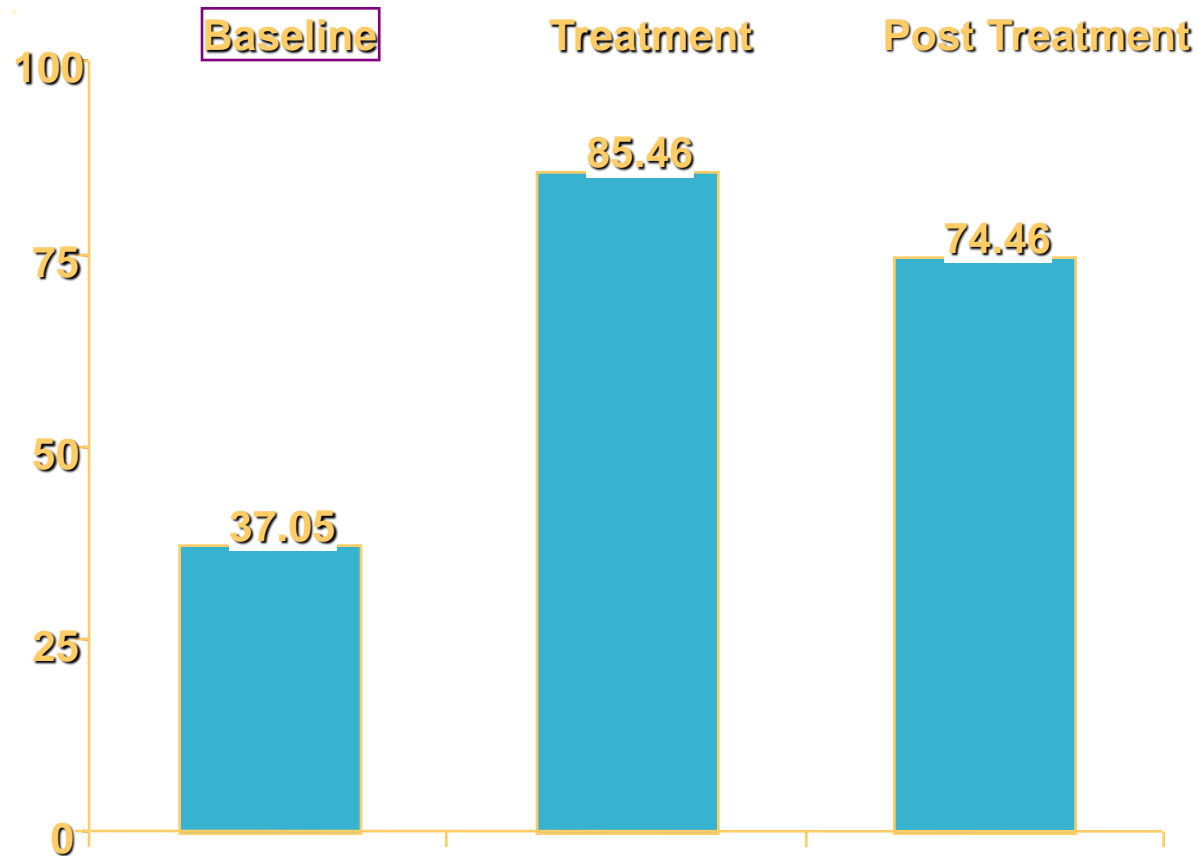
There is no one single right way to conduct research

- Depends on
 - - the questions to be answered
 - - the facilities available
 - - time available
 - - ethical considerations etc.

Name Recall VJ



Pilot study of Reminding System



Getting the question right

- We must pose a question that is answerable
- NOT “Does rehabilitation work?” or “Is therapy worthwhile?”
- Better to ask questions like “Do brain injured people with problem solving deficits improve their scores on neuropsychological tests following specific problem solving training” (Von Cramon et al 1991) cont...

Three main kinds of research

- Surveys
- Observations
- Experiments

Survey

- “The act of examining or inspecting in detail especially for some purpose”

Main reasons for conducting a survey

To identify a problem in a preliminary study (e.g. how many children develop autism after the MMR vaccine?)

To establish the size and extent of a problem (e.g. what percentage of TBI patients are vegetative after a year?)

To provide a baseline so that the effects of a subsequent intervention programme can be monitored (e.g. how many TBI patients each year before the introduction of seat belts?) cont...

Further reasons for conducting surveys

- To evaluate treatment when an RCT is impossible (e.g. coma stimulation)
- To provide data for audit purposes (e.g. how many clients are refused funding for rehabilitation?)

Observations

- Can be carried out to generate a hypothesis
- Or to confirm or disconfirm a hypothesis
- They can be helpful in evaluating the effects of treatment procedures
- They can be carried out in natural or simulated settings
- And by dependent or independent observers
- Video recordings can be useful

Observations may:-

- Reveal behaviour unreported in interviews, checklists, questionnaires or tests
- Avoid interference, inherent in many assessment procedures
- Be less subject to bias than other measures

Naturalistic or Simulated Settings?

Naturalistic

- As rehabilitation is about getting people back to their own environments it is often important to observe them in their own environments
- Not always practical
- Can be difficult with infrequent behaviours
- Time consuming

Simulated

- Useful when short of time
- Behaviours are infrequent
- can only observe in a limited range of settings
- Analogue settings (e.g. mock office)
- Role playing (e.g. social skills training)
- Must be cautious in assuming this really reflects real life behaviour

Examples of questions to be answered by observations

- “What is the nature and frequency of accidents sustained by right hemisphere stroke patients in a rehabilitation ward over the course of a month?”
- “How frequently do memory impaired people use memory aids during the course of a week before and after specific training?”
- “What behaviours emerge first as people recover from coma?”

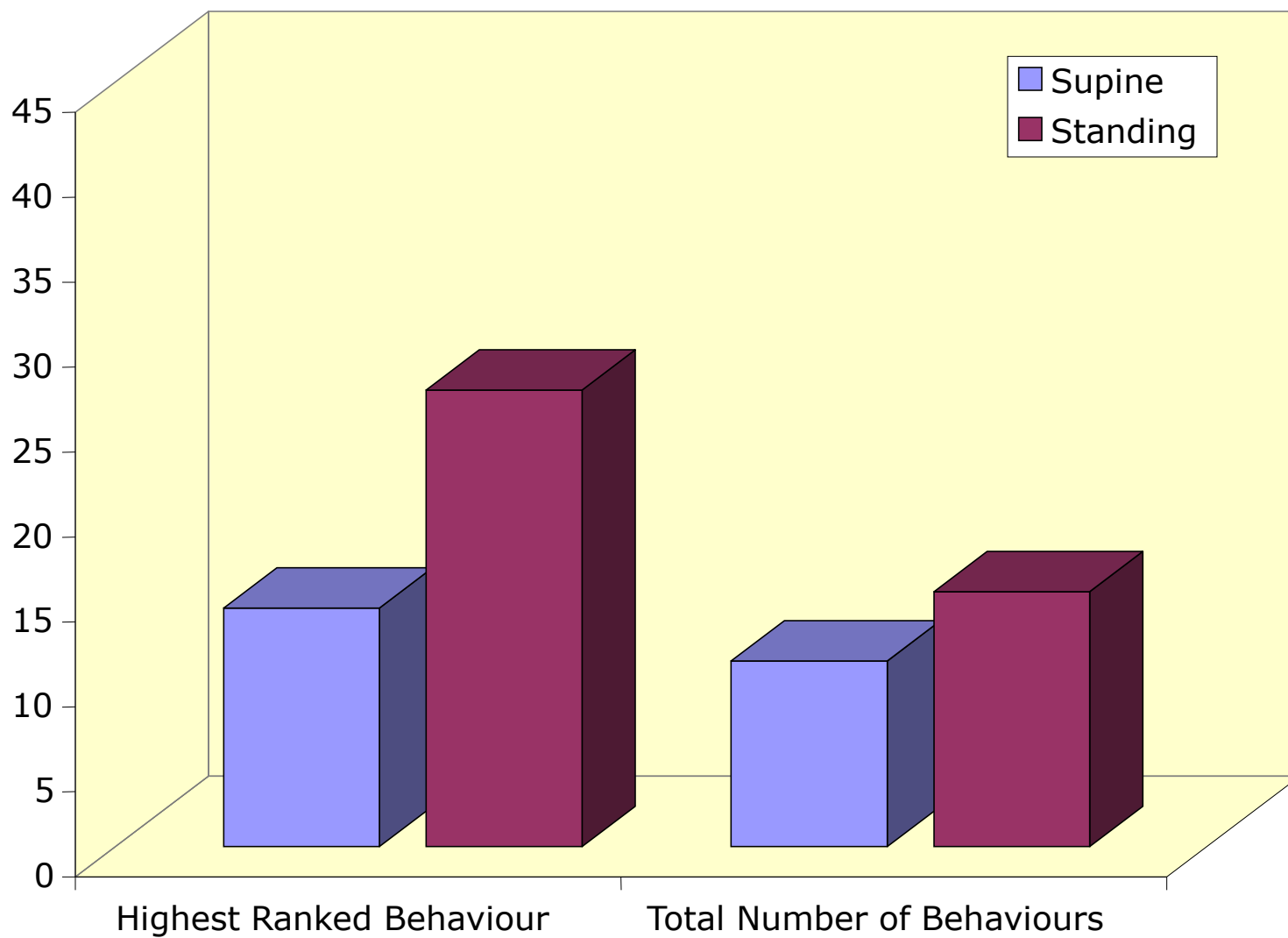
The effect of posture on arousal and awareness

- Data collected from 21 patients
 - 10 vegetative
 - 11 minimally conscious



WHIM Highest ranked behaviour: supine vs. standing

Supine	Standing	Difference	Highest ranked behaviour increased in 75% of patients Wilcoxon test: p= 0.008
1	49	+48	
5	26	+21	
20	36	+16	
8	23	+15	
14	26	+12	
18	28	+10	
26	34	+8	
42	43	+1	
43	43	—	
14	14	—	
4	4	—	



Wilson B.A, Dhamapurkar S, Tunnard C, Watson P & Florschutz G (2013) The effect of positioning on the level of arousal and awareness in patients in the vegetative state or the minimally conscious state: a replication and extension of a previous finding (*2013 Brain Impairment*)



Experiments

- An experiment is a test or trial set up to demonstrate a fact or test a hypothesis
- For example Lorge (1930) wanted to find out if people learned a motor task better with massed or distributed practice
- (20 trials: a) consecutive b) 5 trials with breaks between each set c) two minute break between each trial). Which group did best?
- Another study (Baddeley and Longman 1978) wanted to find out the best regime for teaching postman to type
- Both these studies used three groups of subjects but experiments can be carried out with any number of groups and with individuals.

Single Group (within subjects) Designs

- One group under two or more conditions
- Sometimes before and after design (e.g. before and after treatment) but...
- Need to be careful that change isn't due to some non specific factor like recovery, practice effects or extra attention
- If practical can assess several times to ensure stability or can
- Counterbalance conditions

Counterbalancing

- For example if comparing errorless versus errorful learning in a group of memory impaired people half would have errorful condition first and half errorless condition first.
- Also the material to be learned would be counterbalanced so that for half the trials half the material (e.g.names) would be in one condition and for half the trials it would be in the other condition.

Baddeley and Wilson (1994)

“Do people with amnesia learn more if prevented from making mistakes while learning?”

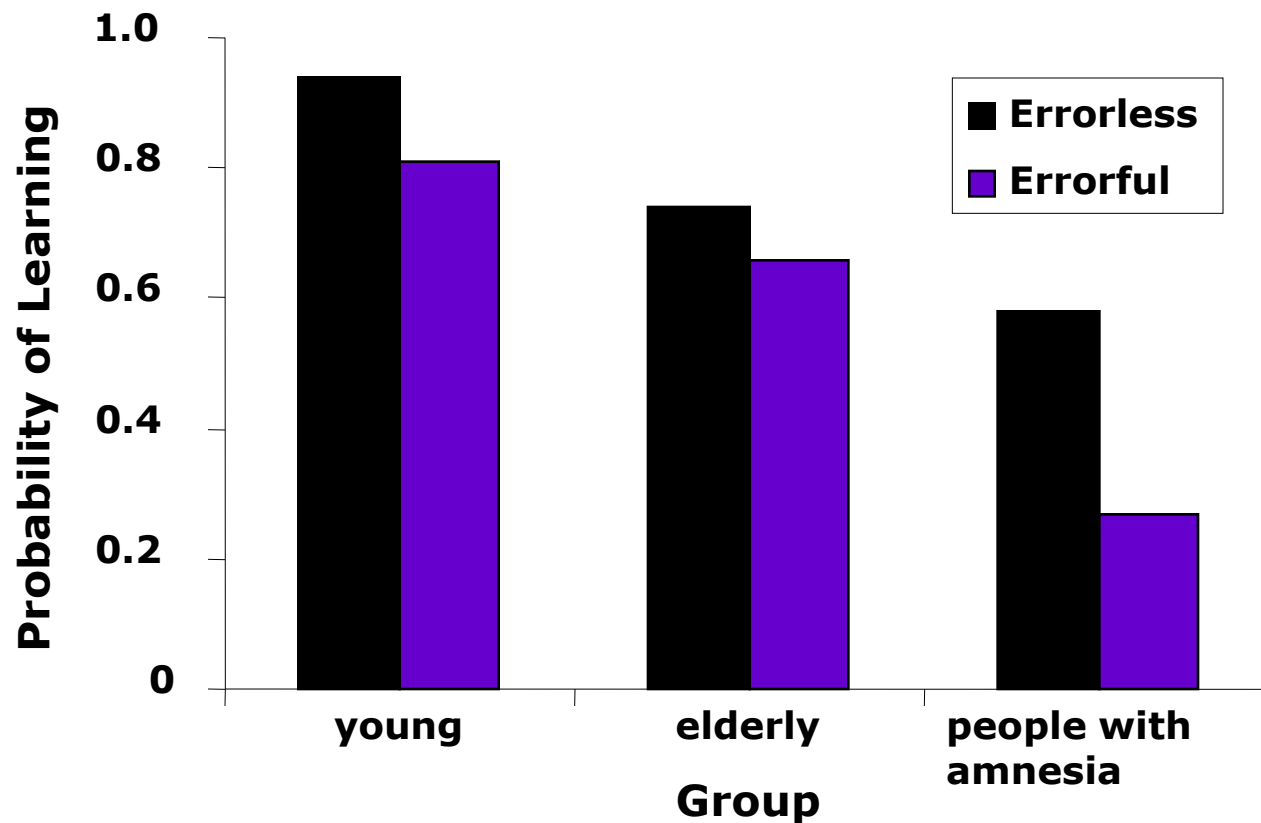
Three groups

- 16 Young controls
- 16 Elderly controls
- 16 People with dense amnesia

Stem completion procedure used under two conditions - errorful and errorless

- Errorful** – Forced to make mistakes, e.g. “guess word beginning with QU”
- Errorless** – Prevented from making mistakes, e.g. “word beginning with PR is PRIZE”
(Everything counterbalanced)

P (Learning) by group



Limitations of Group Studies

- “How many subjects improved?” This is a question about groups, results apply to groups and we need a group design to answer the question.
- “Is this patient improving”? “Is the change because of our intervention or would it have happened anyway”? This is a question about an individual and we cannot answer that with a group study.

Limitations of Group Studies

- Results apply to groups not necessarily to individuals
- May confuse clinical and statistical significance
- Statistical sign. Doesn't mean that **every** person does better
- Nor that the results are clinically important
- Easy to confuse numbers who change with amount of change (e.g 75% change)
- Certain theoretical questions can only be answered with single cases & double dissociations
- Rare syndromes (e.g. Balint's Syndrome) can't get groups
- Detailed longitudinal studies (e.g. "The man with the shattered world")
- Individual's response to treatment

Individual's response to treatment

- Individual patient may be unlike people in group study (averaged results in group studies)
- Can't see **pattern** of change throughout treatment
- Can't adjust during treatment (e.g. allow extra time)
- Can't tailor the treatment to the individual (e.g. provide written rather than verbal instructions)

Single Case Experimental Designs

Not single case reports but
experiments

Single Case Experimental Designs

- Avoid many of the problems inherent in group studies
- Often the method of choice when evaluating an individual's response to treatment
- Perfectly respectable scientific methods
- Provide complementary information to group studies

Horses for Courses

- Neither single case nor group studies “better”
- Large group studies need many people to share out individual differences
- Small groups do not have to concern themselves with this as **each subject is his/her own control**
- Baselines are used instead of control groups

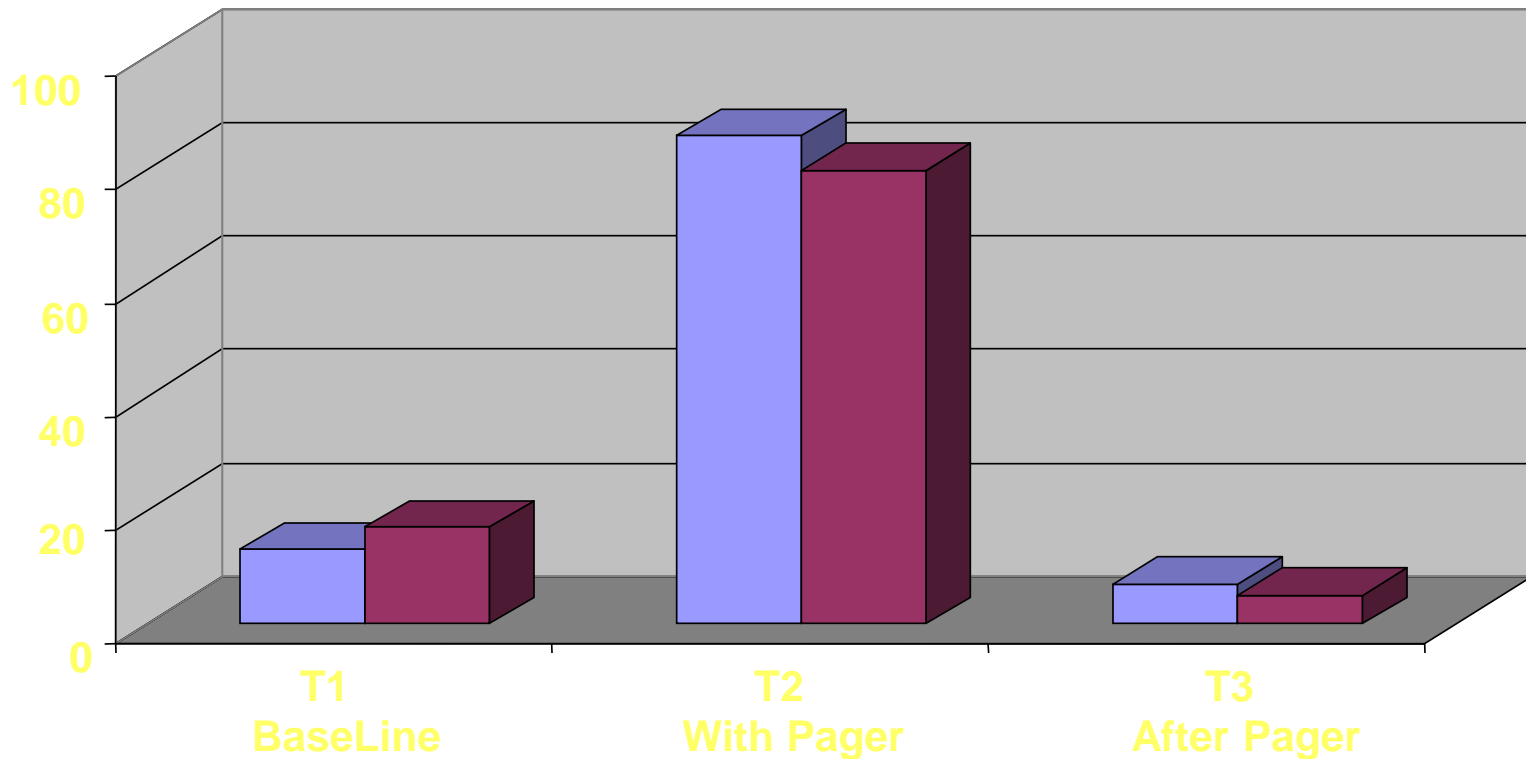
Types of single case experimental designs

- ABAB (and variations on this) or reversal designs
- Multiple baseline designs (across problems/ behaviours, settings and subjects)
- Mixed designs
- Variations on group designs

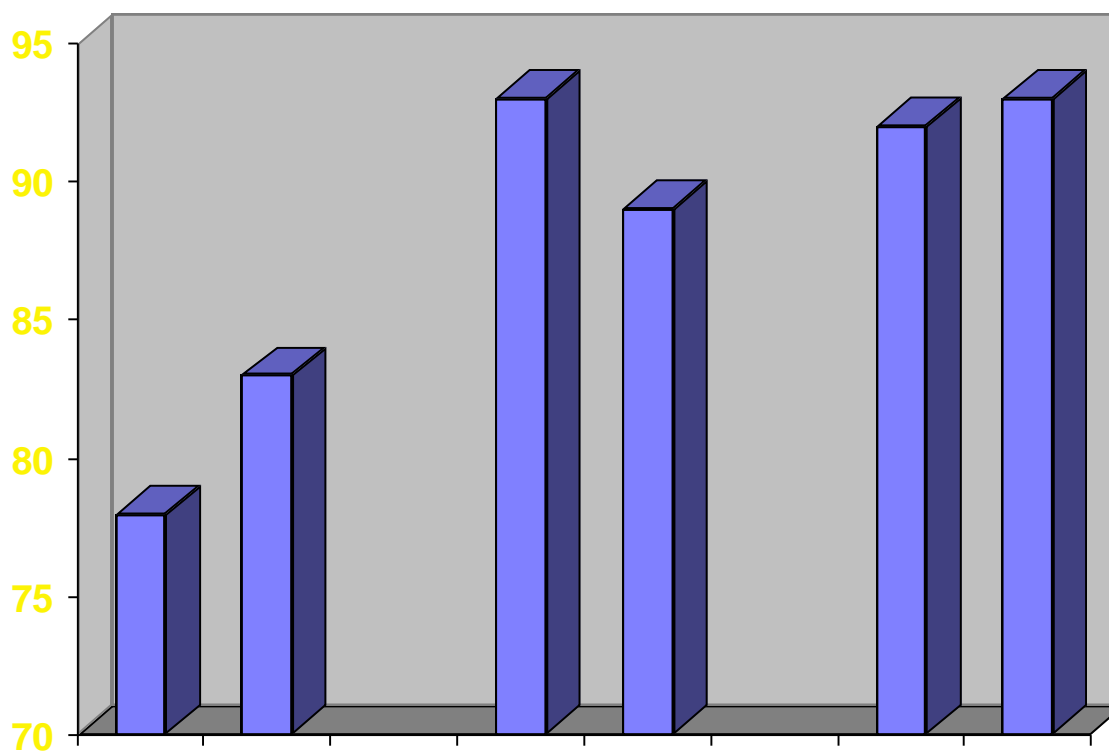
ABAB or Reversal Designs

- A = BASELINE 1
- B = TREATMENT 1
- A = RETURN TO BASELINE CONDITIONS
- B = RETURN TO TREATMENT
- (Many variations on this design)

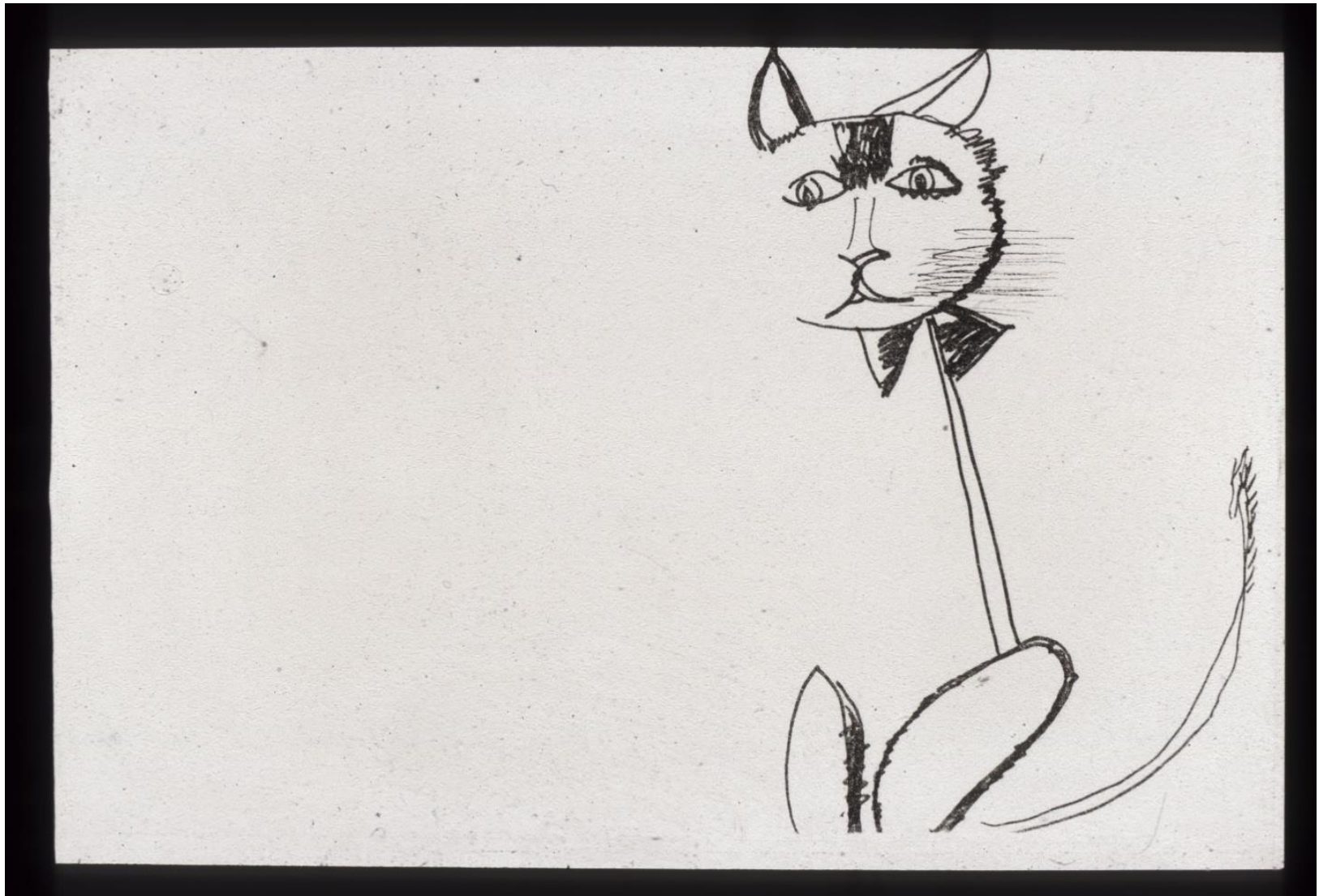
P.N. % Success



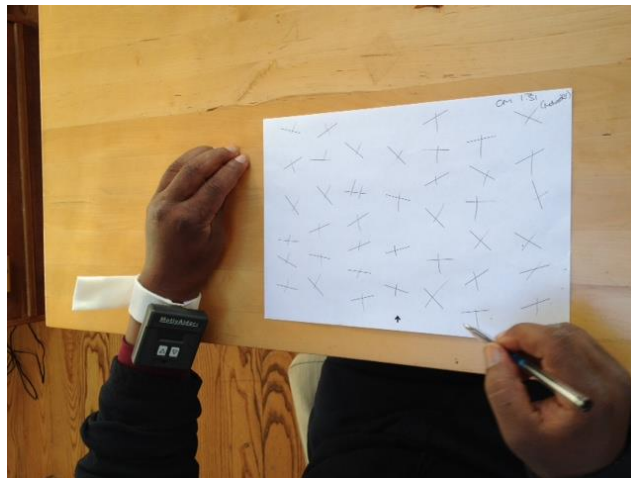
Peter: % Success for Targets



Unilateral Neglect

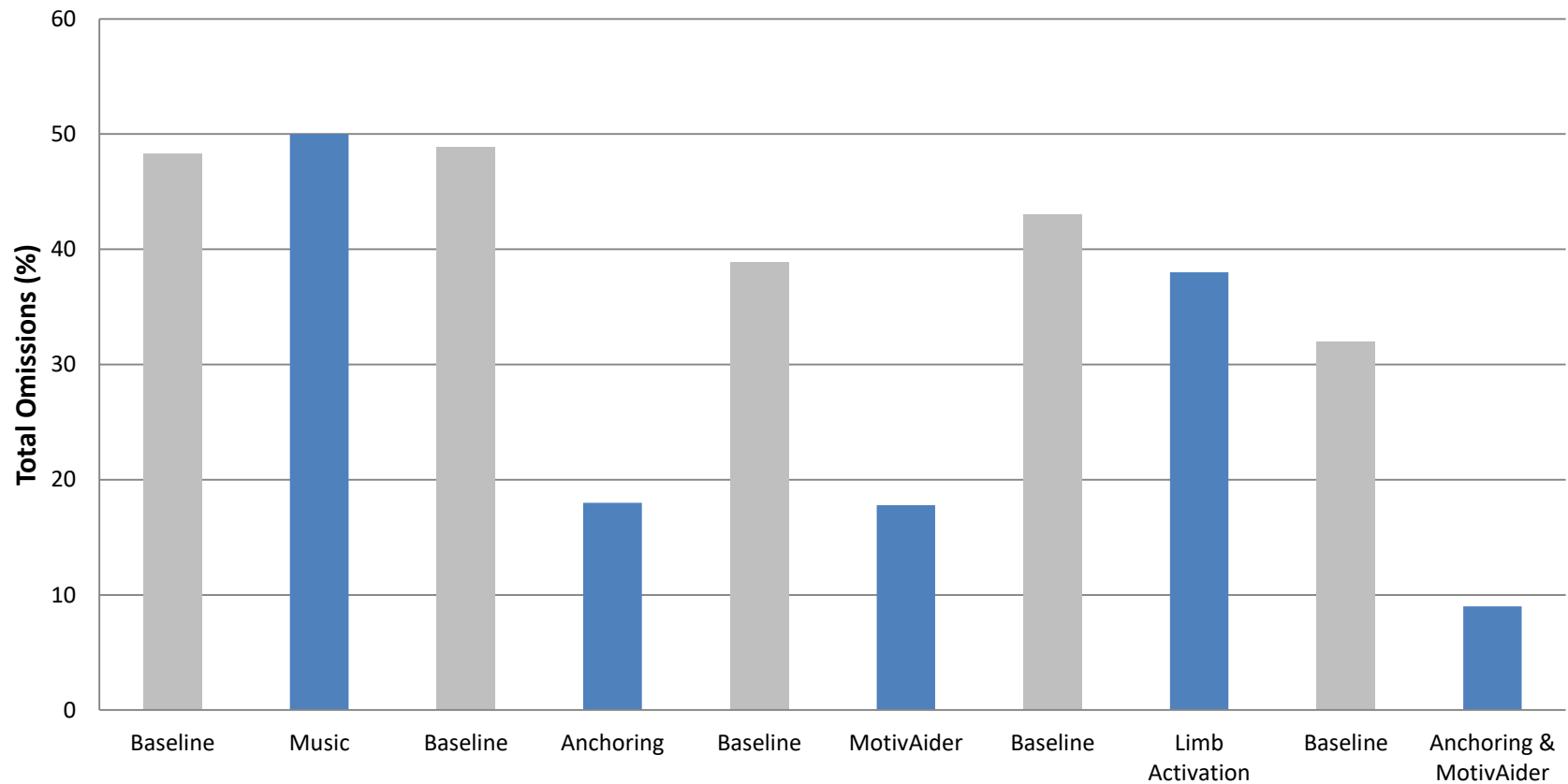


1 A Dutch oil tanker sank ten miles off the
2 Norfolk coast last night. The crew were
3 picked up by coast-guard patrol boats.
4 An oil slick is already forming and
5 conservationists are worried about the
6 effects on wildlife. Local enthusiasts are
7 mounting an operation to save any birds
8 found stranded on the beaches.



ABACADAEACD Design to compare different treatments for reducing neglect (Tunnard and Wilson 2014)

Line Crossing Test



Limitations of Reversal Designs

Can't always revert back (e.g. "if teach someone to walk or remember a name then can't "unteach" this)

Not always ethical (e.g. if stop severe injurious behaviour)

Not always practical (e.g. if stop a person shouting in therapy sessions, therapists won't thank you for starting him/her shouting again)

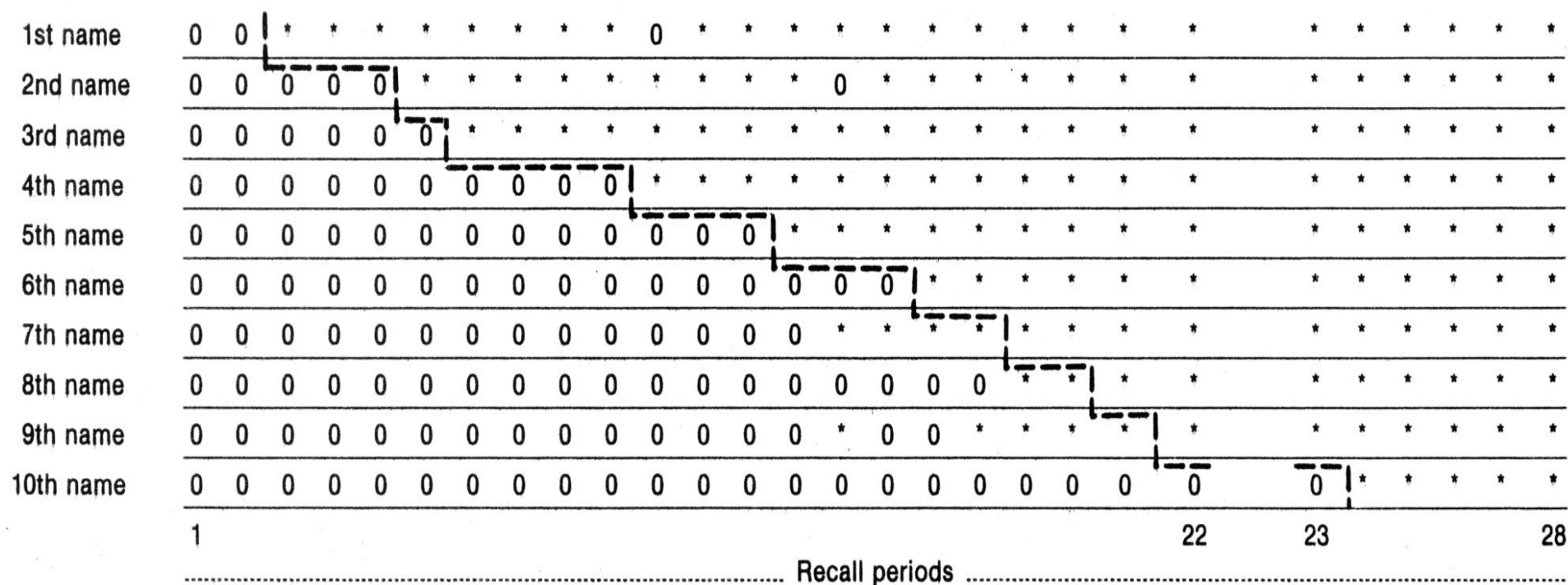
Multiple Baseline Designs

- Adaptable to a wide range of problems and situations in rehabilitation
- Main characteristic is that the introduction of treatment is staggered
- Three main types of multiple baseline designs.

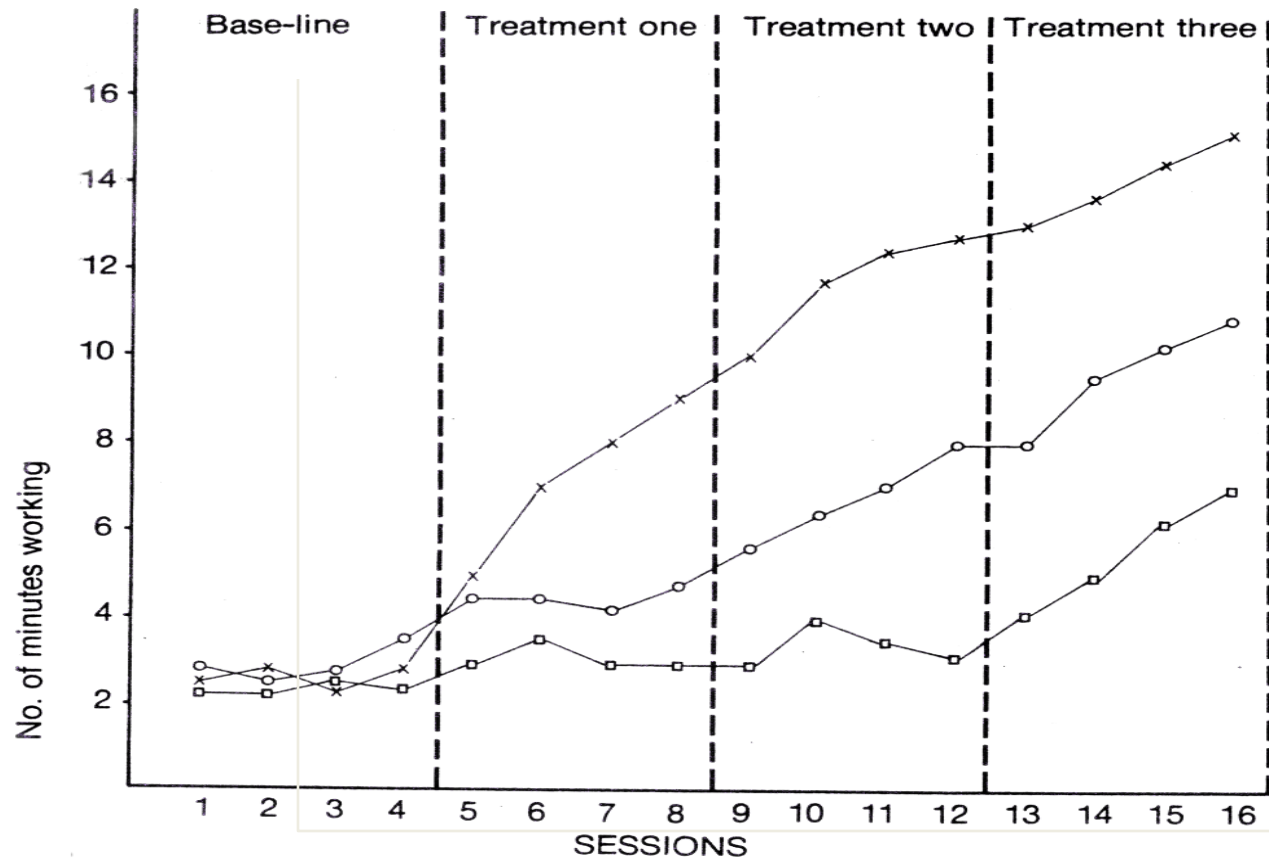
Multiple Baseline Across Problems (or Behaviours)

- Several problems/behaviours are selected for treatment
- Baselines taken on all problems (usually 3 or 4)
- One problem at a time is treated.
- Treatment for second problem comes later, then third and so on.
- Improvement should only occur **After** the treatment is introduced.

Multiple baseline across “behaviours” (names)



A multiple baseline procedure for physiotherapy



○ = Trunk rotation.

× = Long sitting.

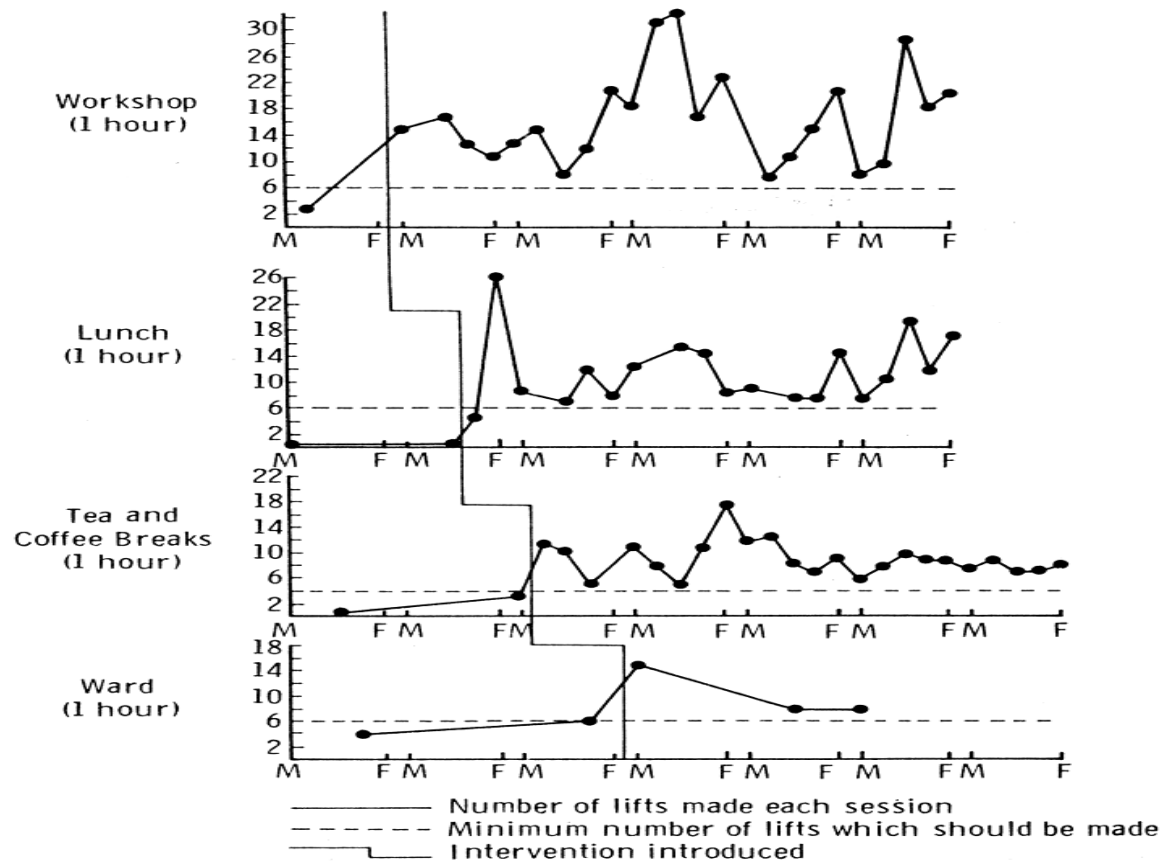
□ = Bridging.

Multiple Baseline Across Settings

- Baselines for a particular problem are taken in different settings
- Problems are treated in one setting at a time
- So, again, the introduction of treatment is staggered

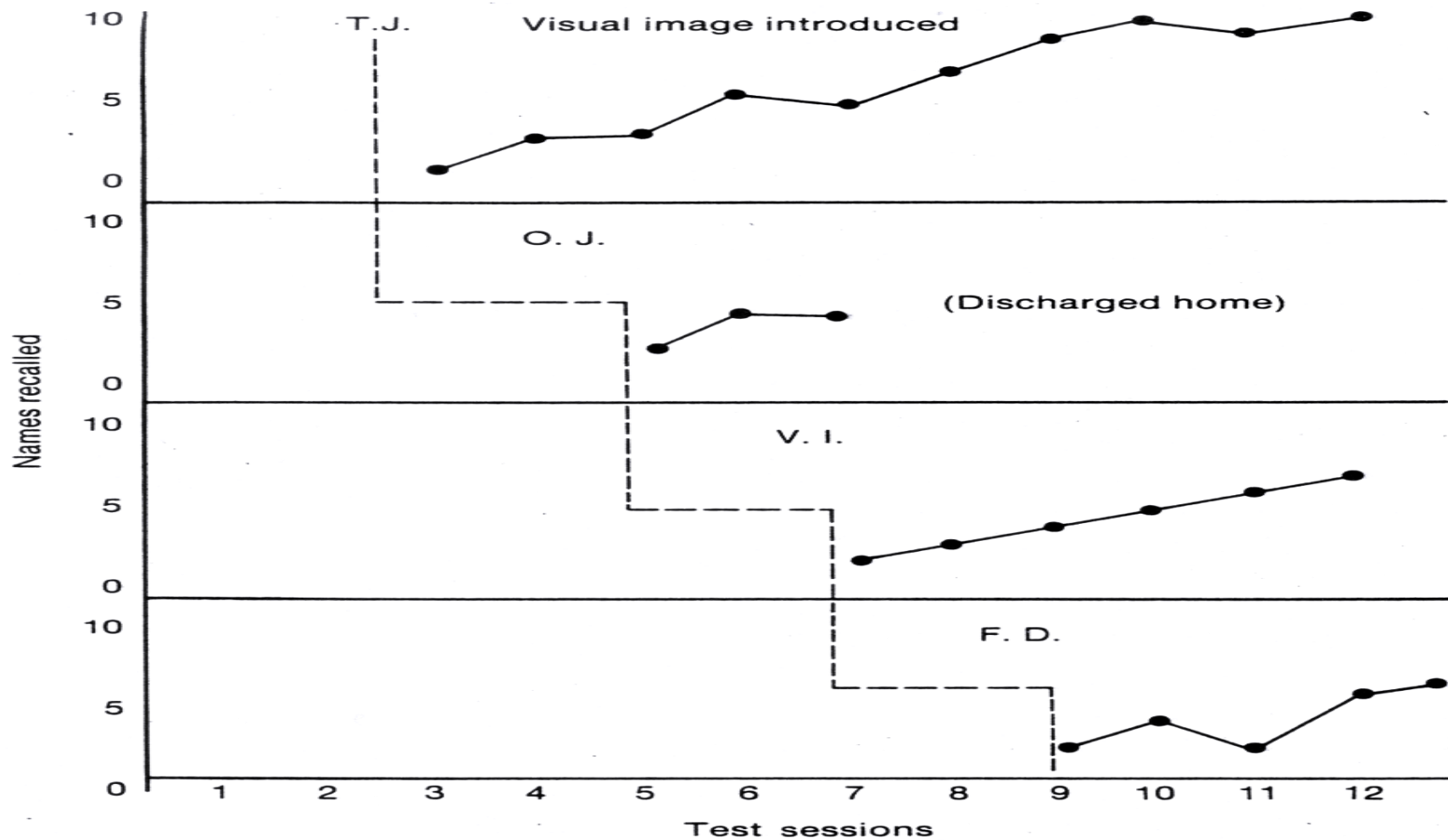
Multiple baseline across settings used to teach a man with a spinal injury to lift from his wheelchair

SINGLE CASE DESIGNS



Multiple Baseline Across Subjects

- Really a small group design
- Can be used to evaluate a particular procedure across a small group of people
- Once again, the introduction of treatment is staggered



Variations on Group Studies

- Can compare two or more treatments directly just as one would in a group study
- Instead of two groups, one can compare two procedures on a number of occasions

A Comparison of Two Strategies To Enhance Verbal Recall

- PQIRST

• Immed	Delayed
• 75	50
• 75	50
• 100	50
• 75	75
• 25	0
• 100	50
• 75	50
• 75	50
• $X = 77.7$	47.1

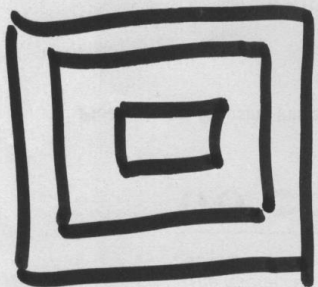
- Rote Rehearsal

• Immed	Delayed
• 25	0
• 100	25
• 75	25
• 75	50
• 50	25
• 25	0
• 75	0
• 75	0
• $X = 62.5$	15.6

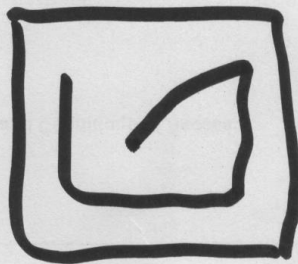
Statistically Significant Difference
Between Delayed Recall Conditions
($P < .05$)

Bill a 70 year old man

- Had a stroke 5 years earlier
- Severe global dysphasia
- Several tries at speech and language therapy
- Referred because of increasing number of rows at home
- Joint programme with SALT
- Visual symbol system taught in three weeks
- Compared pictorial and abstract symbols for different parts of speech
- Communication improved and rows decreased.



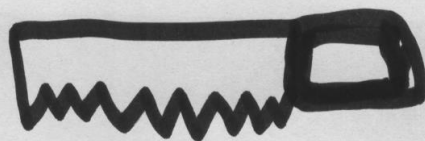
BILL



Barbara



Pills



saw



shaving (shave)

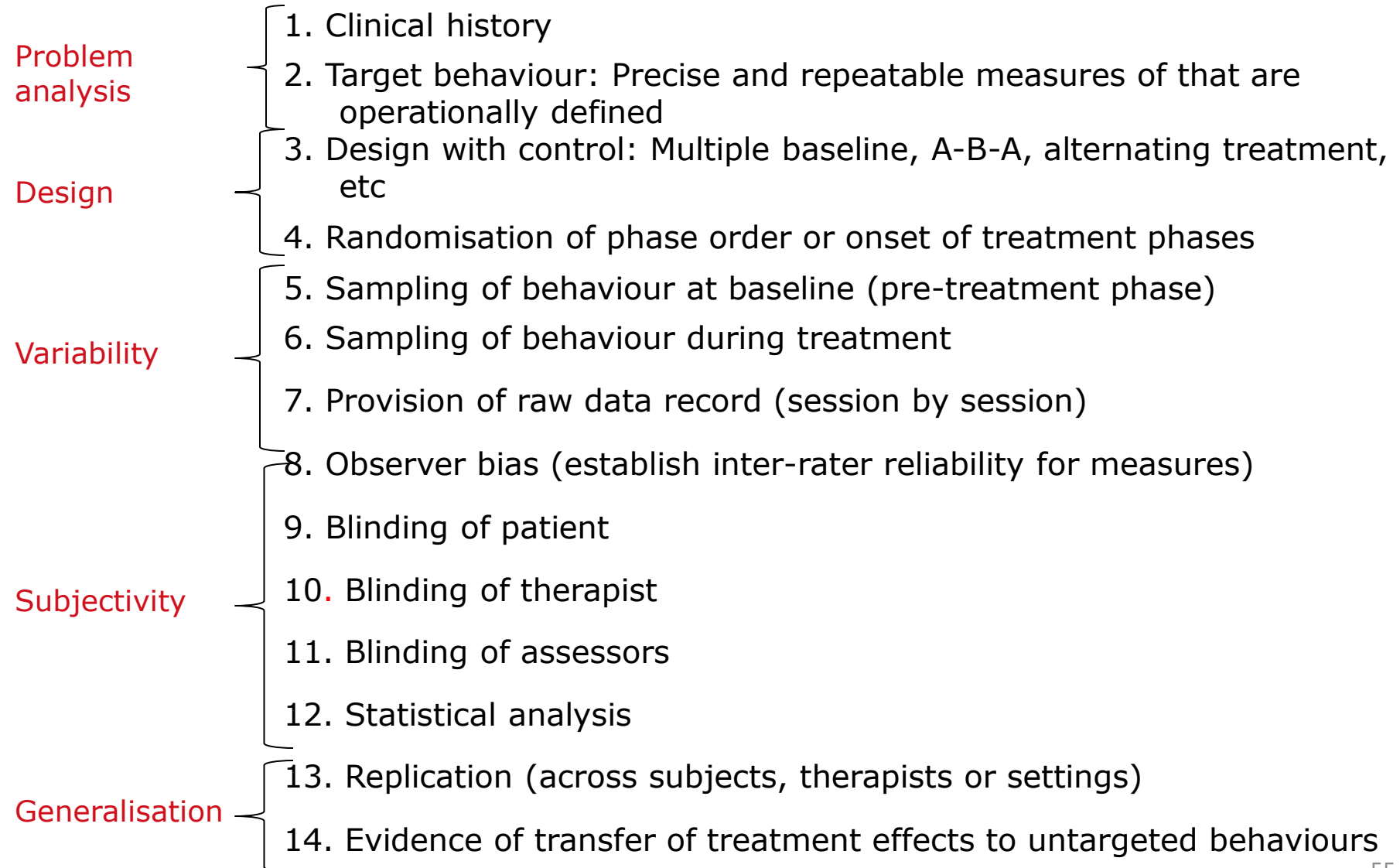


sitting (sit)

Total words learned by a man with a severe global aphasia

	Pictorial Symbols	Abstract Symbols	Total Learning
Nouns	18	13	31
Verbs	17	8	25
Adjectives	18	7	25
Total	53	28	81

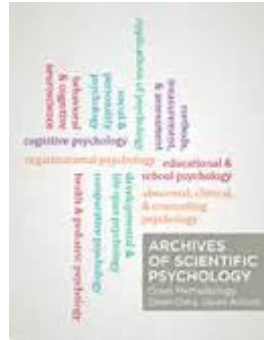
Risk of Bias in N-of-1 Trials (RoBiN-T) scale



- The SCED Scale is merely a guide to determining the **methodological** quality of single-subject designs.
- Indeed, a high score does not necessarily reflect the value or quality of the findings for clinical practice or the meaningfulness of the trial.
- Nor does a high score indicate that investigators have conducted appropriate statistical analyses or drawn appropriate conclusions from their data.
- Results of the SCED Scale need to be interpreted in the context of the above types of issues.

SCRIBE Paper (Tate et al 2016)

- The Single-Case Reporting Guideline In BEhavioural Interventions (SCRIBE) 2016: Explanation and Elaboration.
- Tate R.L, Rosenkoetter U, Vohra S, Kratochwill T, Sampson M, Togher L, Backman C, Evans J.J, Manolov R, Nickels L, Ownsworth T, Schmid C.H, Perdices M, Shadish W, Barlow D.H, Kazdin A, McDonald S, Shamseer L, Albin R, Douglas J, Gast D, Mitchell G, Nikles J, Rose R & Wilson B.A (2016)
- *Archives of Scientific Psychology* 4 1-9 (and 9 other journals!)



SCRIBE provides guidelines for those using SCEDs

- These designs commonly used in the behavioural sciences
- Present 26 items that authors need to address when writing about SCED research for publication in a scientific journal.
- Each item is described, a rationale for its inclusion is provided, and
- examples of adequate reporting taken from the literature are quoted.
- It is recommended that the SCRIBE 2016 is used by authors preparing manuscripts describing SCED research for publication
- as well as journal reviewers and editors who are evaluating such manuscripts.



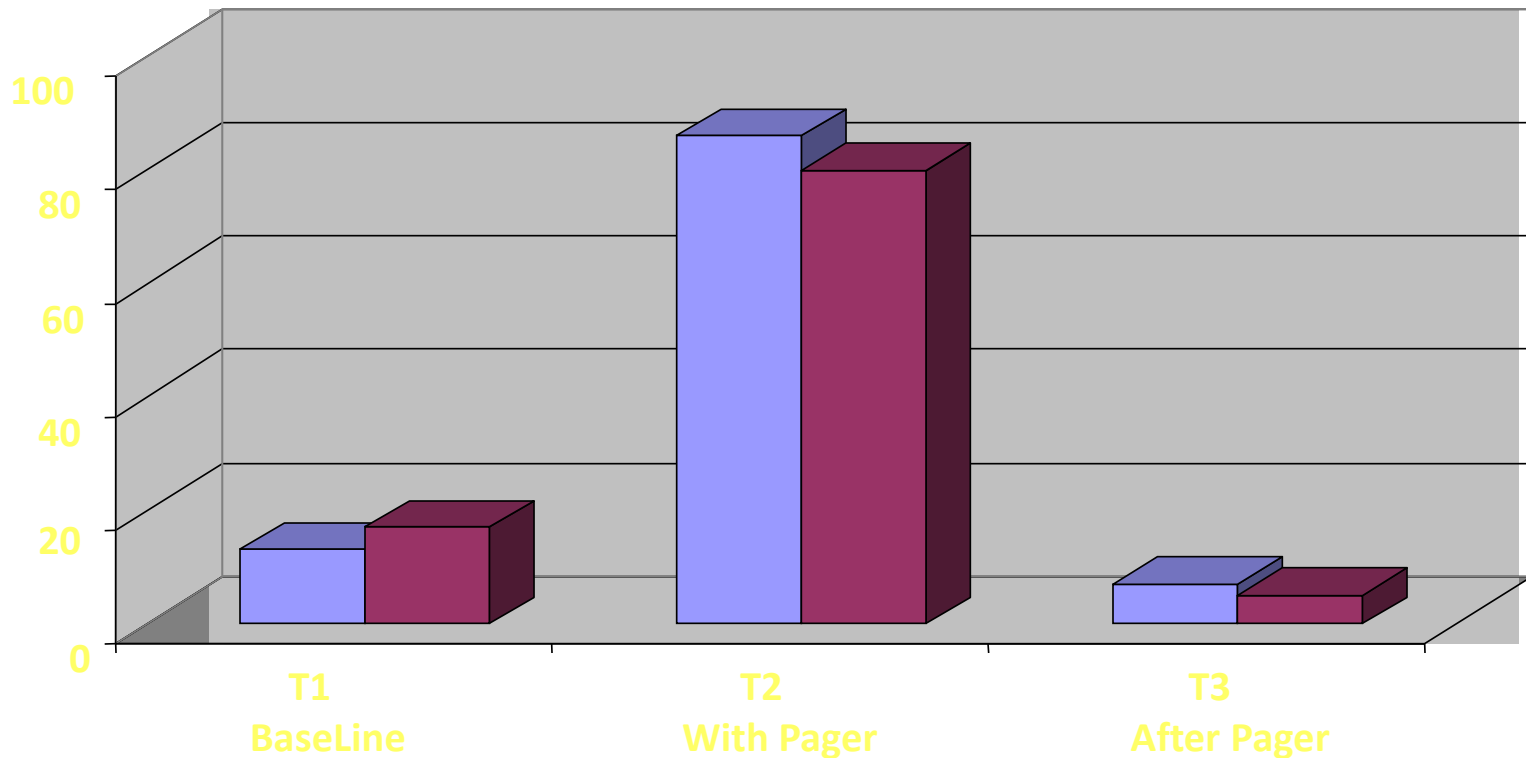
Statistics In Single Case Experimental Designs

- Are they necessary?
- Non Parametric Statistics (Mann-Whitney; Wilcoxon; Chi-Square; Time Series Analysis etc)

Visual Analysis

- Has been the traditional method of evaluating single-subject designs
- Some have proposed that this is the only method that should be used
- If change is visually obvious in the data then statistical analysis is not necessary (Parsons & Baer 1986)

P.N. % Success



ABACACD design to reduce repetitive speech in a woman with a TBI

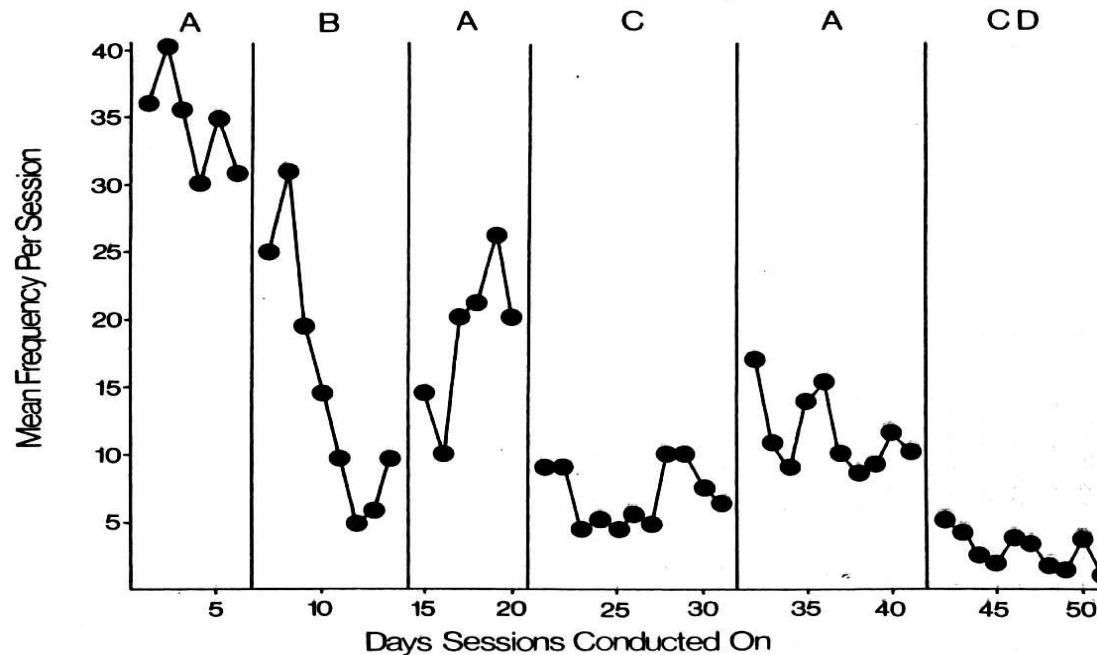


FIG. 1 Treatment of repetitive speech using response cost and cognitive overlearning. A, no treatment; B, response cost; C, modified response cost; CD, modified response cost and cognitive overlearning.

Statistical Analysis

- Kadzin (1982) identifies four situations where statistical analysis is valuable:
- i) when the baseline is not stable,
- ii) when a new treatment is being evaluated,
- iii) when the treatment effect is not well understood, and
- iv) to control for extraneous factors.

In many cases need both clinical & statistical significance

- It is difficult, if not impossible, to determine clinical significance by statistical approaches alone. A statistically significant difference in outcome measures between the baseline and treatment phases does not necessarily mean that treatment has had a clinically significant impact, particularly if the effect size is small.
- Neither p values associated with standard statistical tests nor effect sizes are appropriate measures of clinical significance.
- Even if the effect size is large, treatment may not produce improvement of any practical value to the patient.

Generalisability

- Can't always generalise from group studies
- Famous single case studies e.g “H.M”, “Tan”
- Can use systematic generalisation from single case experimental designs
- Can assess for this across subjects, settings, behaviours, therapists etc

THANK YOU VERY MUCH FOR YOUR ATTENTION

Feb/March 2020 December 2019

