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Let's meet CATE!
Aphasia and AoS interventions
inspired by the Complexity Account of Treatment Efficacy

Agenda

Background
- Generalisation effects
- CATE's prediction

Two single case studies
- Semantic impairment
- Apraxia of Speech

Wrap Up

Evaluating the effectiveness of SLT

Training effects

- improvement for trained material

Generalisation effects

- improvement for untrained materials and/or untrained tasks
- expansion of what has been learned

Transfer effects

- improvement in an everyday situation

Generalisation effects

- strong evidence for the effectiveness of a treatment

- if (only if!) it is predicted <u>beforehand</u> what kind of generalisation can be expected due to the treatment

- prediction is theory-driven or evidence-based

Webster et al. 2015

ePrints
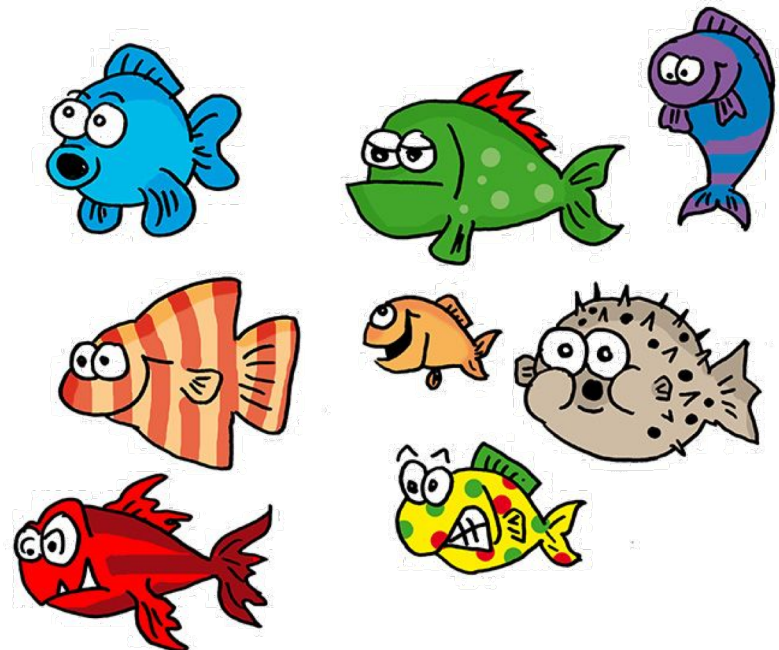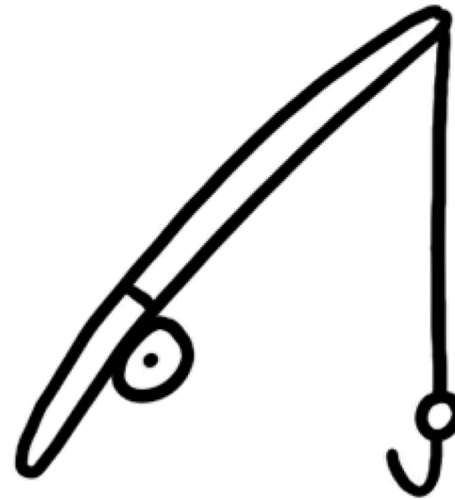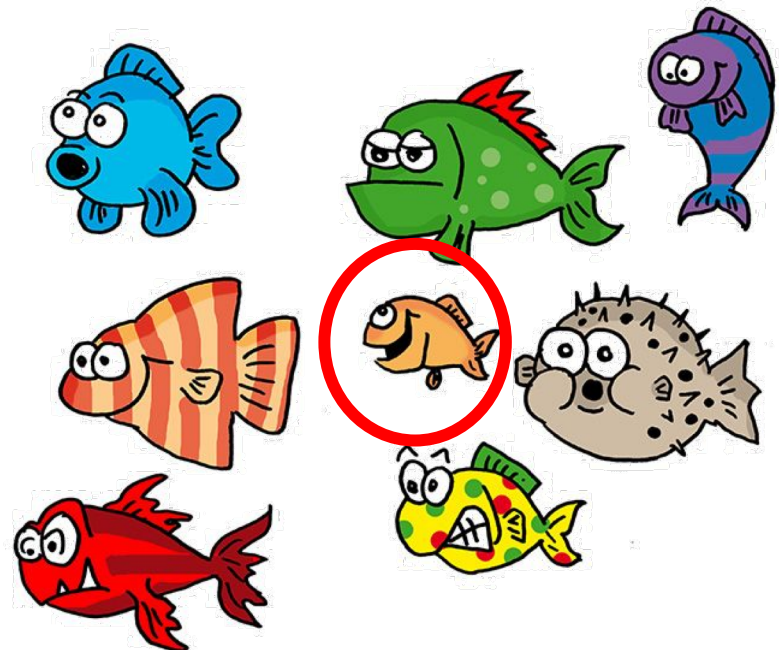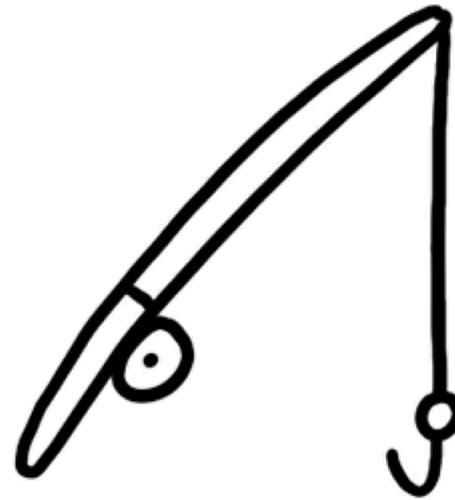
Generalisation effects

- untrained task improves for trained items
  oral picture naming → *naming by definition*

- untrained items improve in a trained task
  sentence production: passive sentences → *active sentences*

- untrained language improves for trained materials

Webster et al. 2015

Complexity Account of Treatment Efficacy

"Training complex structures results in generalization to less complex structures when untreated structures encompass processes relevant to (i.e., are in a subset relation to) treated ones." (Thompson et al., 2003, p. 11)

According to CATE
- we should use complex items for treatment
- as less complex, comparable items then improve, too
- predicted generalisation from complex to simple

Thompson et al. 2003

Subset relation

Complex Structures

Simpler Structures
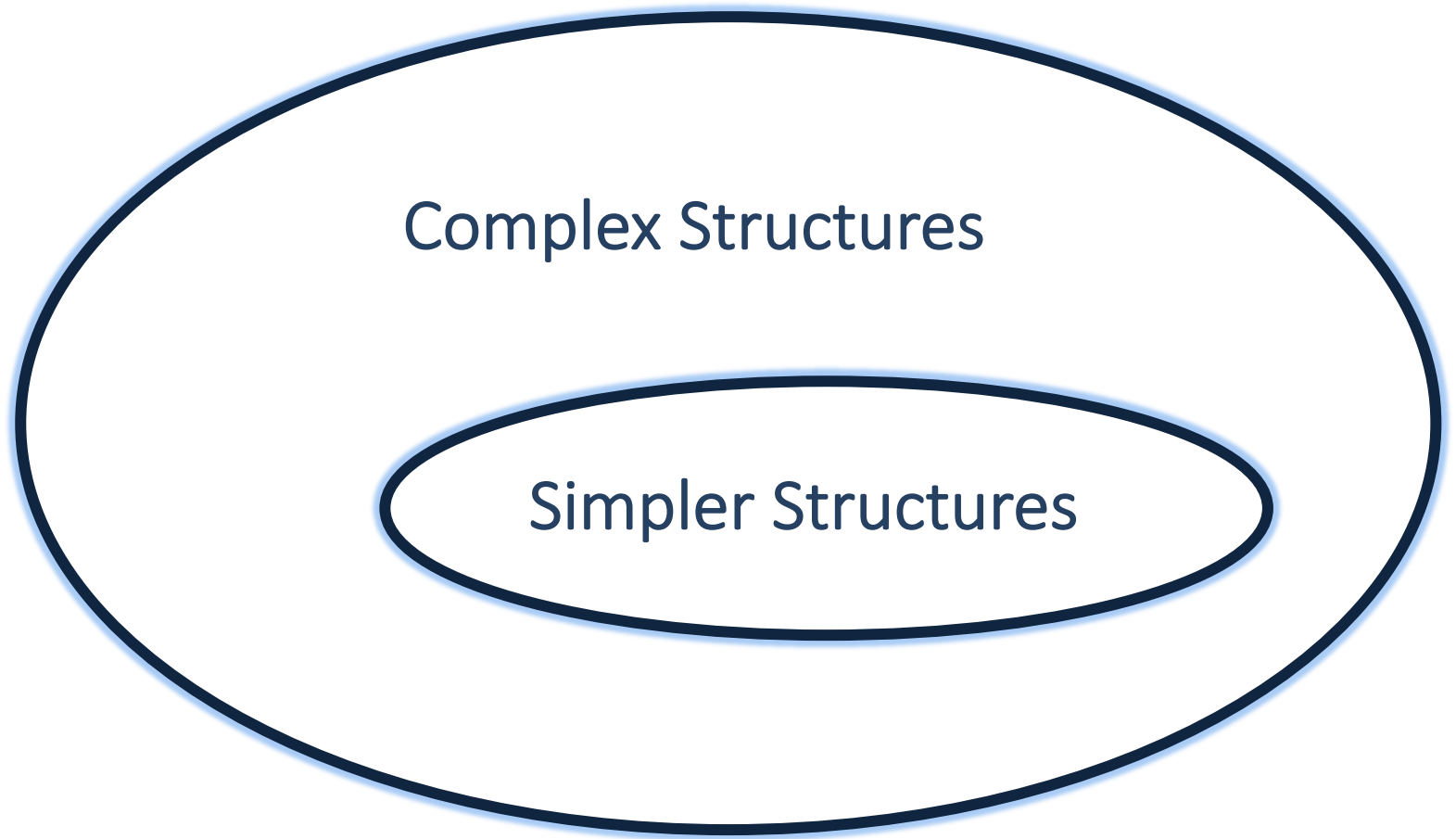
CATE: Not intuitive, but effective!

• CATE contradicts classic didactic principles

• effectiveness has be shown for

  • agrammatism z.B. Thompson et al. 2003; Thompson et al. 2007; Stadie et al. 2008
  • semantic impairment z.B. Kiran & Thompson 2003; Kiran et al. 2009
  • apraxia of speech Maas et al. 2002; Schneider & Frens 2005
  • SLI Gierut 2007; Levy & Friedmann 2009

• learning process might be even faster with complex material

Evaluating CATE's prediction: A-B-A

A: BASELINE BEFORE	B: TREATMENT	A: BASELINE AFTER

Franklin 1997; Stadie & Schröder 2009; Stadie 2016

Evaluating CATE's prediction: A-B-A

A: BASELINE BEFORE	B: TREATMENT	A: BASELINE AFTER
complex items TO BE TREATED	☑	complex items TRAINING EFFECT?

Franklin 1997; Stadie & Schröder 2009; Stadie 2016

Evaluating CATE's prediction: A-B-A

A: BASELINE BEFORE	B: TREATMENT	A: BASELINE AFTER
complex items TO BE TREATED	✅	complex items TRAINING EFFECT?
simpler items WILL NOT BE TREATED	❌	simpler items GENERALISATION? CATE!

Franklin 1997; Stadie & Schröder 2009

CATE meets Semantic Impairment

Semantic Complexity

- concreteness effect: abstract > concrete

- typicality effect: atypical > typical

e.g. Kiran et al. 2009; Kiran & Thompson, 2003

Typicality

Typicality

Members of a category are defined by

- core features *lays eggs, has a beak*
- prototypical features *can fly, builds a nest*
- atypical features *can run fast, eats fish*

Typical members

- share prototypical features
- have only few distinctive features

Atypical members

- have many distinctive features
- reflect the full range of the semantic category

penguin
peacock
owl
duck
dove
canary
toucan
robin
parrot
sparrow
pheasant
ostrich
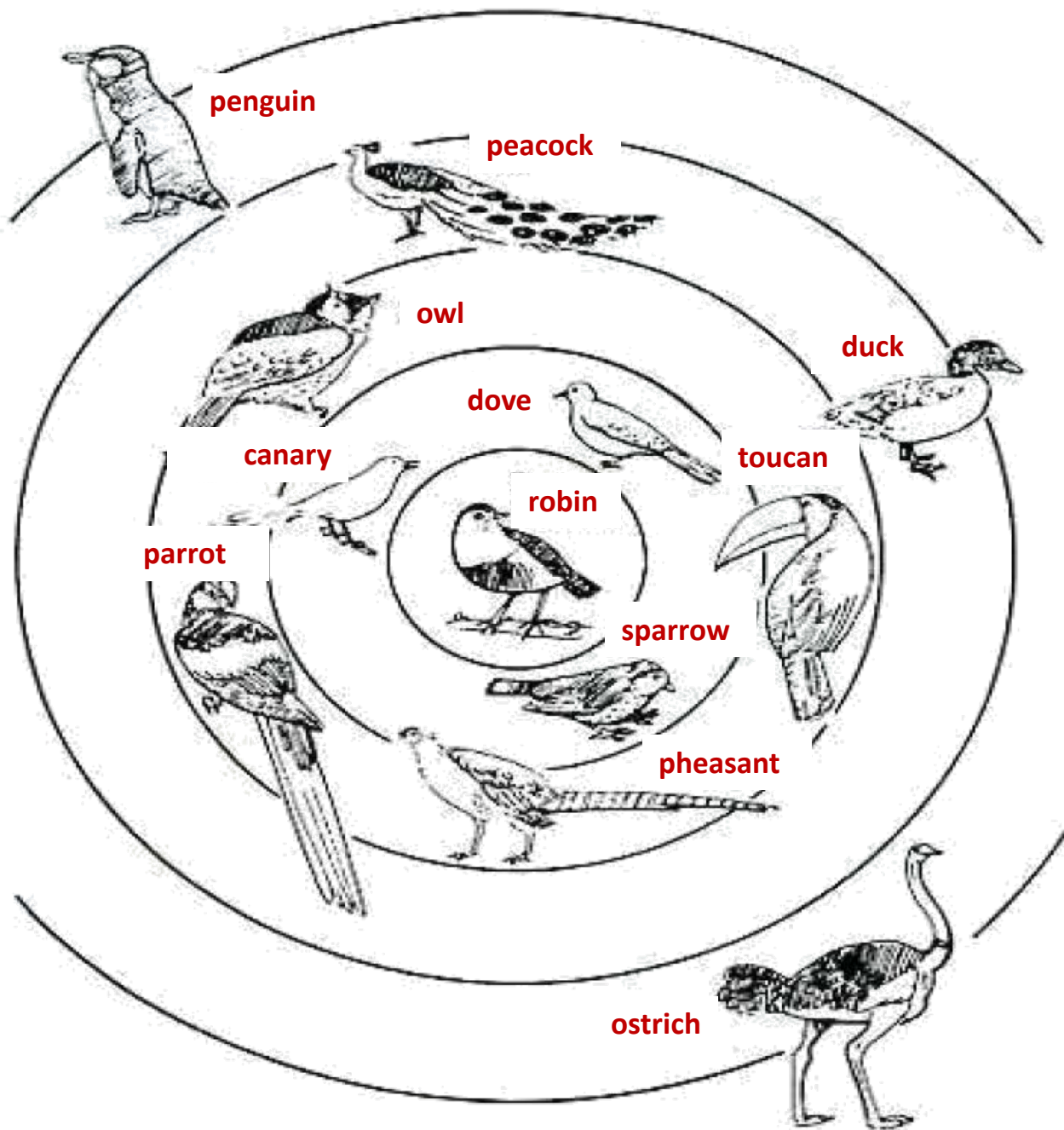
Single case study: Mr. A.

- 54 yrs old, 3;6 yrs p.o., left parietal hemorrhage
- impaired word retrieval due to a semantic disorder

Aim

- refine representation in the semantic system
- establish/stabilise semantic features
- improve naming accuracy

Thieke et al. 2010

A-B-A Design

A: BASELINE BEFORE	B: TREATMENT	A: BASELINE AFTER
atypical animals TO BE TREATED	✅	atypical animals TRAINING EFFECT?
typical animals WILL NOT BE TREATED	❌	typical animals GENERALISATION? CATE!
atypical vegetables WILL NOT BE TREATED	❌	atypical vegetables GENERALISATION?
typical vegetables WILL NOT BE TREATED	❌	typical vegetables GENERALISATION?

Thieke et al. 2010

A-B-A Design

A: BASELINE BEFORE	B: TREATMENT		A: BASELINE AFTER
atypical animals 4/10		✅	atypical animals TRAINING EFFECT?
typical animals 3/20		❌	typical animals GENERALISATION? CATE!
atypical vegetables 0/10		❌	atypical vegetables GENERALISATION?
typical vegetables 3/20		❌	typical vegetables GENERALISATION?

Thieke et al. 2010

Treatment (7 sessions)

- oral naming
- semantic categorisation *air or water? flat or tall?*
- select semantic features
  water / green / tall / air / arms / trunk / orange / flat
- YES/NO decision on semantic features *water? → yes*
- oral naming

Thieke et al. 2010

A-B-A Design

A: BASELINE BEFORE	B: TREATMENT		A: BASELINE AFTER
atypical animals 4/10		✅	atypical animals 10/10*
typical animals 3/20		❌	typical animals 13/20*
atypical vegetables 0/10		❌	atypical vegetables 2/10
typical vegetables 3/20		❌	typical vegetables 15/20*

- generalisation atypical → typical animals (CATE's prediction)
- cross-category generalisation to typical but not atypical vegetables

Thieke et al. 2010
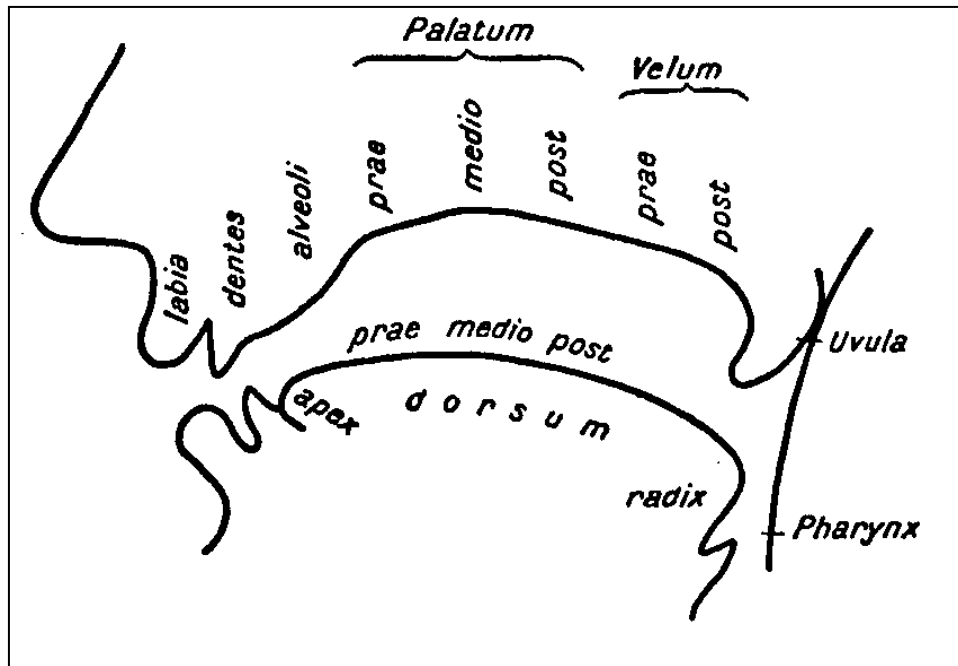
CATE meets Apraxia of Speech

Phonological complexity

clusters > singletons

- onset:

  broek > boek

  Brand > Band *(fire/ribbon)*

- coda:

  hals > hal

  Hals > Hall *(neck/echo)*

Phonological complexity

$$\sigma$$

(Onset)   Rhyme

$0 - 3$
$0 - 3$

Nucleus   (Coda)

$0 - 5$
$0 - 3$
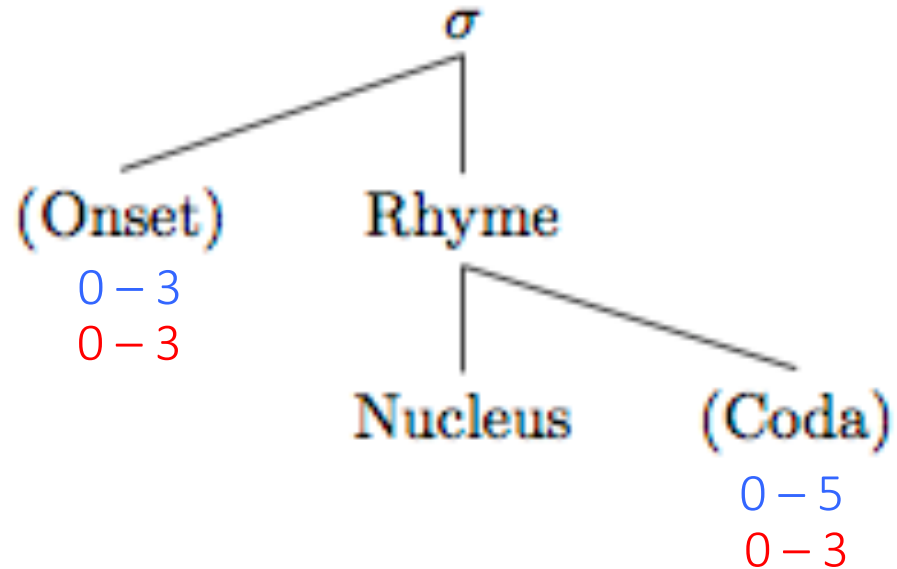
str	o	p
pr	o	mptst
Str	u	mpf

(sock)

Phonological complexity

$$\sigma$$

(Onset)   Rhyme

0 − 3
0 − 3

Nucleus   (Coda)
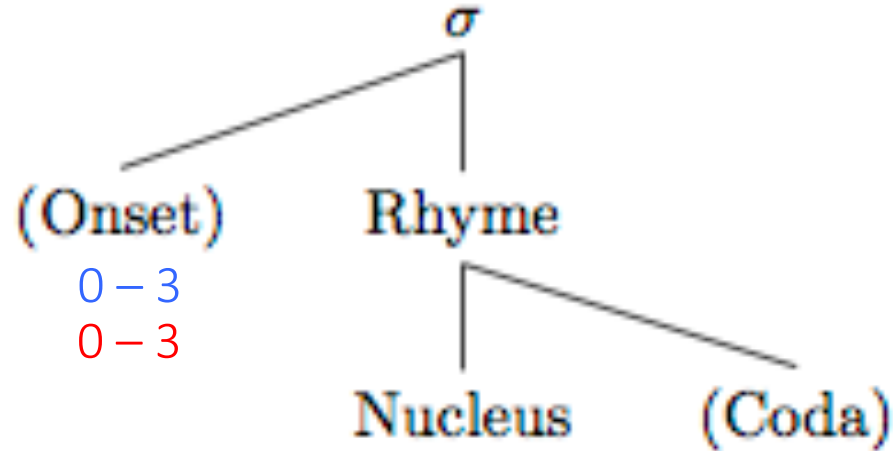
Treatment of sound errors in aphasia and apraxia of speech: Effects of phonological complexity

E. Maas, J. Barlow, D. Robin, and L. Shapiro

San Diego State University, CA, USA

Phonological complexity

syllable contacts: xCCC.CCx > xV.Cx

a<u>ngstzw</u>eet > aut<u>ow</u>eg

A<u>ngstschw</u>eiß > Aut<u>ob</u>ahn

Dutch examples from https://taalportaal.org

Single case study: Mrs. B.

- 44 yrs old, 8 yrs p.o., left ACM infarction
- mild aphasia
- mild to moderate apraxia of speech
    - inconsistent error pattern
    - phonetic and phonological errors
    - effects of phonological complexity, lexicality, and length
    - scanning speech

Aim
- correct production of clusters
    - precise articulation
    - fluent speech

A-B-A Design

A: BASELINE BEFORE	B: TREATMENT	A: BASELINE AFTER
xCCC.CCx	✅	xCCC.CCx
xCC.CCCx		xCC.CCCx
TO BE TREATED		TRAINING EFFECT?

Kunst.zahn – *Salz.brief
Palm.zweig – *Last.strunk

A-B-A Design

	A: BASELINE BEFORE	B: TREATMENT	A: BASELINE AFTER
⬭	xCCC.CCx xCC.CCCx TO BE TREATED	☑	xCCC.CCx xCC.CCCx TRAINING EFFECT?
⬭	xCC.CCx xCCCx xCx WILL NOT BE TREATED	☒	xCC.CCx xCCCx xCx GENERALISATION? CATE!

Ferchland et al. 2016

A-B-A Design

	A: BASELINE BEFORE	B: TREATMENT	A: BASELINE AFTER
⬭	xCCC.CCx xCC.CCCx 3/40	✅	xCCC.CCx xCC.CCCx TRAINING EFFECT?
⬭	xCC.CCx xCCCx xCx 13/60	❌	xCC.CCx xCCCx xCx GENERALISATION? CATE!

Ferchland et al. 2016

Treatment (10 sessions in 5 weeks)

kunst.tsa:n
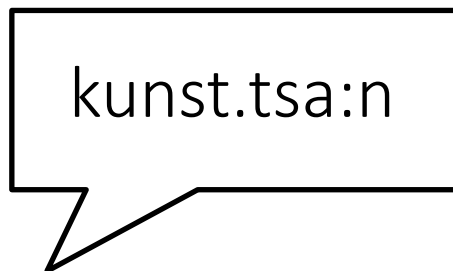
- repetition (w/o mouth gesture)
- assessment ⭕ ⭕ ⭕
- ⭕ → embed word in sentence
- ⭕ ⭕ → practice
  - repetition (mouth gesture visible)
  - slowed presentation
  - phonetic instructions
  - backward chaining of the phonemes

Ferchland et al. 2016

Results

	A: BASELINE BEFORE	B: TREATMENT	A: BASELINE AFTER
	xCCC.CCx xCC.CCCx 3/40	☑	xCCC.CCx xCC.CCCx 17/40*
	xCCCCx xCCCx xCx 13/60	☒	xCCCCx xCCCx xCx 27/60*

- generalisation complex clusters → simpler clusters (CATE)
- still room for improvement

Ferchland et al. 2016

Wrap Up

Summary

- two interventions inspired by CATE
  - semantic impairment/ naming
  - apraxia of speech/ syllable contact

- generalisation: complex $\rightarrow$ simpler items

- materials based on linguistic criteria
- A-B-A intervention design for systematic evaluation

CATE@work

- theory-driven prediction on generalisation effects: CATE does not fish!

- material-centered account: CATE recommends how to choose and structure the items (treated vs. untreated)

- no specification of the treatment/task

- CATE challenges patients

- helpful: make treatment transparent to the patient
  - explain idea of complexity
  - set a time frame (e.g. 10 sessions)
  - announce baseline testings

Thank you!

A somewhat different example ☺

Level 1	Level 2	Level 3	Level 4
RUN	RUN JUMP	RUN JUMP FLY	RUN JUMP FLY CLIMB
1 attempt	4 attempts	6 attempts	11 attempts
1 attempt	1 attempt	1 attempt	17 attempt

Evaluating treatment effects: A-B-A

A: BASELINE BEFORE	B: TREATMENT	A: BASELINE AFTER
complex items TO BE TREATED	complex items	complex items TRAINING EFFECT?
simpler items WILL NOT BE TREATED		simpler items GENERALISATION? CATE!
communication EVERYDAY SITUATION		communication TRANSFER EFFECT?
control task UNRELATED, UNTRAINED		control task EFEECTS DUE TO TREATMENT?

Franklin 1997; Stadie & Schröder 2009; Stadie 2016