Teaching “learning how to learn”: a functional analysis of curriculum programming for children with autism

Francesca degli Espinosa
Ph.D., BCBA-D, CPsychol.
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Topics

- Curriculum development: historical and theoretical underpinnings
- Curricula in behavioural intervention for children with autism: a structural analysis
- Curriculum development in behavioural intervention: a functional analysis
- Defining skills: generalised vs cumulative
- Discriminative learning: simple vs conditional in early learners
- The speaker as its own listener: naming

What is education?

Many of the subjects may be unrecognisable, however. It has often been remarked than an educated man has probably forgotten most of the facts he acquired in school and university. Education is what survives when what has been learned has been forgotten. We teach "subjects" partly because teachers are hired as subject-matter specialists and partly because competence in a given subject is convenient proof of successful teaching. But we may eventually learn how to teach the things which comprise the important marks of an education. The specific intellectual skills, abilities, attitudes, and tastes which are now taught mainly as by-products of content instruction may, if the experimental analysis of behaviour is fully exploited, occupy the focus of attention in 1984.

Skinner (1964, p.484)

To run

- From the Latin word for the “course of a race”, originally derived from “currere”, to run.
- “All the learning which is planned and guided by [a] school, whether it is carried on in groups or individually, inside or outside the school” (Kelly, 1983, p. 10).
- ABA and autism: to accelerate learning and modify developmental trajectory

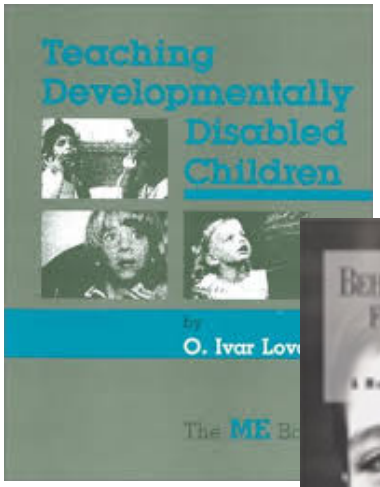
Evolution of curriculum development theory

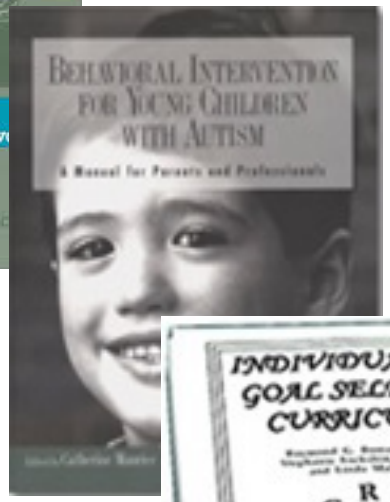
- Curriculum as transmission of knowledge and as a product: sequence of objectives, definition and measurement of attainment (Tyler, 1949)

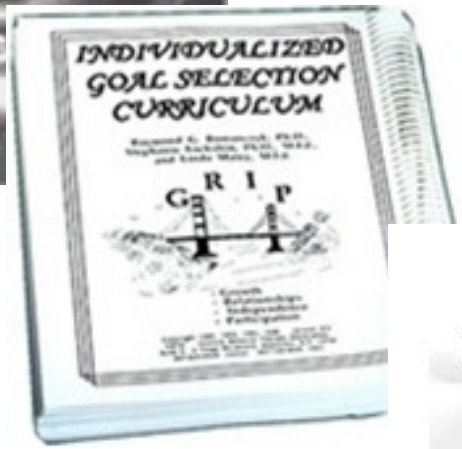
- Curriculum as a process (Stonehouse, 1974): not a syllabus to be followed, but a proposal to be tested. Emphasis on empiricism: selecting content, developing teaching strategies, sequencing learning experiences, and assessing student strengths and weaknesses with an emphasis on empiricism.

- Curriculum as a praxis: a commitment to curriculum development and the context in which it is implemented. Emphasises curriculum as a social process marked by the interactions within the learning environment and the concept of “assisted performance” (Wildman, 2007) or Vygotskian scaffolding.

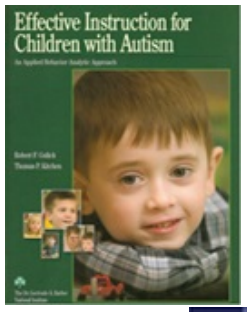
History of curricula in EIBI



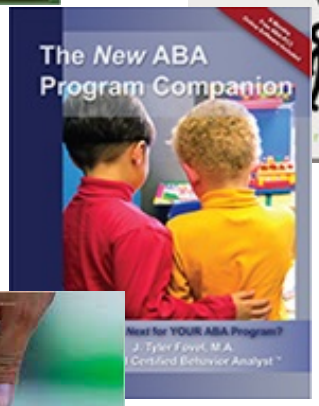


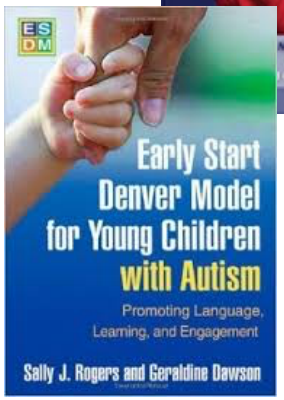


Since then…


Effective Instruction for Children with Autism


Teaching Individuals with Developmental Delays


The New ABA Program Companion

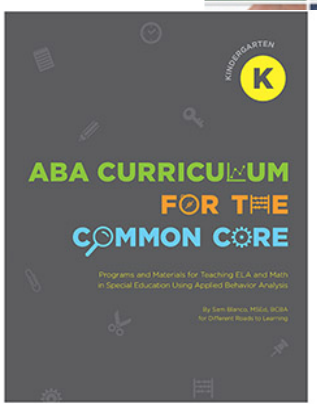

ESDM
Early Start Denver Model for Young Children with Autism
Promoting Language, Learning, and Engagement
Sally J. Rogers and Geraldine Dawson

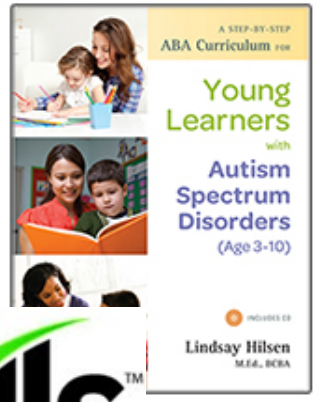

ACE


The New England Center for Children®
A leader in autism research and education


PEAK
Dr. Mark R. Dixon


eden
SCHOOL SERIES: CURRICULUM
INFANT & TODDLER
YES
NO


KINDERGARTEN
K
ABA CURRICULUM FOR THE COMMON CORE


A STEP-BY-STEP ABA Curriculum
Young Learners with Autism Spectrum Disorders
(Age 3-10)
Lindsay Hilsen


Skills™
THE EFFECTIVE PROGRAM FOR AUTISM RECOVERY
SYSTEM

‘That is, the curriculum is not simply a set of plans to be implemented, but rather is constituted through an active process in which planning, acting and evaluating are all reciprocally related and integrated into the process’

Grundy (1987, p.115)

Tyler, 1949

1. What educational purposes should the school seek to attain?
2. What educational experiences can be provided that are likely to attain these purposes?
3. How can these educational experiences be effectively organised?
4. How can we determine whether these purposes are being attained?

A structural analysis

1. Clear definition of learning objectives.
2. Descriptions of teaching procedures for acquisition and generalisation.
3. Sequential organisation of learning objectives within and across curricular domains.
4. Data-based evaluation of mastery and generalisation of learning outcomes.

General organisation of all curricula

- Curricular domains
- Programme or task
- Items or responses
- Mastery criteria

“Since the real purpose of education is not to have the instructor perform certain activities but to bring about significant changes in the students' pattern of behaviour, it becomes important to recognize that any statement of objectives […] should be a statement of changes to take place in the students”

Tyler (1949, p. 44).

A shift in stimulus control for curriculum design

- Behavioural curricula have been almost exclusively concerned with the nature and structure of curriculum content
- Need for transition to the design and arrangement of teaching procedures that will ensure the greatest gains in novel, untaught, skills from the minimum amount of direct teaching
- Learning how to learn: a common goal for all educators

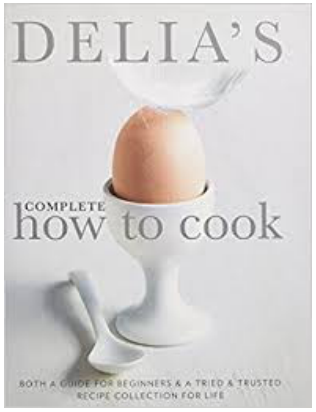
“Learning should not only take us somewhere; it should allow us to go further more easily… The more fundamental the idea, the greater will be its breath of applicability to new problems”

(Bruner, 1960, p.17-18)

A functional analysis

- Understanding the type and function of the skill
- Understanding stimulus control for that skill
- A framework for understanding skills regardless of manual or theoretical orientation

Interpretative framework



- Curriculum as a syllabus vs curriculum as a process
- How vs what

Tasks and items

- A task, a programme, an activity: an arrangement of teaching contingencies to facilitate the development of a skill
- Item: the specific stimulus (e.g., visual or auditory) to which responding is established within that task

Skills and responses

- Skill: a change in stimulus control of selected stimuli over a response class, the establishment of which is demonstrated by specific topographies
- Skill: a class of responses.
- Target response: a specific topography contingent on the presentation of specific stimuli

Mastery criteria

- When is a skill mastered?
- If accurate performance is displayed to all stimuli in the set?
- If performance occurs outside the teaching context?
- If the child demonstrates a response not previously taught?
- When the skill is generalised? How do we define generalisation of a skill?
- When is a target topography or response mastered?
- When it is performed without prompts on a specific criterion (e.g., a probe trial over 3 consecutive days)?
- But what kind of a response is it? What kind of discrimination?

Defining skills

- Generalised skills
- More than one novel response (no direct teaching) can be established as a result of teaching individual responses within the same class
- Example: motor imitation, visual-visual match to sample, naming, descriptions, recalling past events

- Finite or cumulative skills
- At least one teaching trial (one instance of reinforcement) is required to establish any novel response within that skill.
- Example: receptive labelling.

Cumulative skills

- Limited number of items
- A specific number of items.
- Example: prepositions, possessive pronouns

- Unlimited number of items
- Speed of acquisition, the minimum number of trials to demonstrate errorless discriminative responding (i.e., three)
- Transfer across operants (e.g., listener to tact/ naming, tact to intraverbal control)

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Early Intensive Behavioral Intervention: Outcomes for Children With Autism and Their Parents After Two Years

Bob Remington
University of Southampton, UK

Richard P. Hastings
University of Wales, Bangor, UK

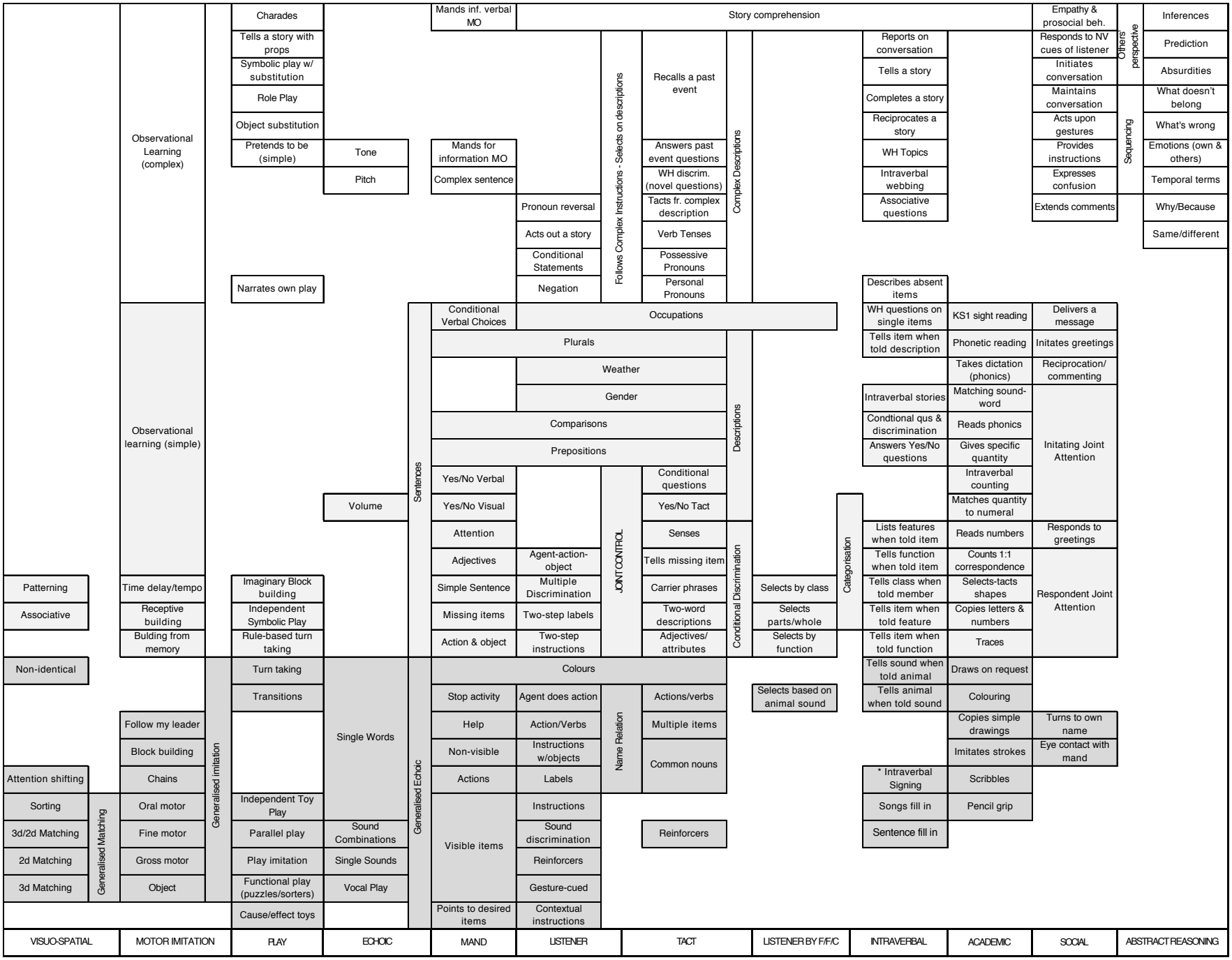
Hanna Kovshoff and Francesca degli Espinosa
University of Southampton, UK

Erik Jahr
Akershus University Hospital, Norway

Tony Brown, Paula Alsford, Monika Lemaic, and Nicholas Ward
University of Southampton, UK

Abstract

An intervention group (n = 23) of preschool children with autism was identified on the basis of parent preference for early intensive behavioral intervention and a comparison group (n = 21) identified as receiving treatment as usual. Prospective assessment was undertaken before treatment, after 1 year of treatment, and again after 2 years. Groups did not differ on assessments at baseline but after 2 years, robust differences favoring intensive behavioral intervention were observed on measures of intelligence, language, daily living skills, positive social behavior, and a statistical measure of best outcome for individual children. Measures of parental well-being, obtained at the same three time points, produced no evidence that behavioral intervention created increased problems for either mothers or fathers of children receiving it.


VISUO-SPATIAL
MOTOR IMITATION
PLAY
ECHOIC
MAND
LISTENER
TACT
LISTENER BY F/F/C
INTRAVERBAL
ACADEMIC
SOCIAL
ABSTRACT REASONING
Observational Learning (complex)
Observational learning (simple)
Charades
Tells a story with props
Symbolic play w/ substitution
Role Play
Object substitution
Pretends to be (simple)
Narrates own play
Tone
Pitch
Volume
Mands inf. verbal MO
Mands for information MO
Complex sentence
Conditional Verbal Choices
Sentences
Generalised Echoic
Story comprehension
Follows Complex Instructions - Selects on descriptions
Pronoun reversal
Acts out a story
Conditional Statements
Negation
Recalls a past event
Answers past event questions
WH discrim. (novel questions)
Tacts fr. complex description
Verb Tenses
Possessive Pronouns
Personal Pronouns
Complex Descriptions
Occupations
Plurals
Weather
Gender
Comparisons
Prepositions
Descriptions
Yes/No Verbal
Yes/No Visual
Attention
Adjectives
Simple Sentence
Missing items
Action & object
Agent-action-object
Multiple Discrimination
Two-step labels
Two-step instructions
JOINT CONTROL
Conditional questions
Yes/No Tact
Senses
Tells missing item
Carrier phrases
Two-word descriptions
Adjectives/ attributes
Conditional Discrimination
Selects by class
Selects parts/whole
Selects by function
Categorisation
Colours
Stop activity
Help
Non-visible
Actions
Visible items
Points to desired items
Agent does action
Action/Verbs
Instructions w/objects
Labels
Instructions
Sound discrimination
Reinforcers
Gesture-cued
Contextual instructions
Name Relation
Actions/verbs
Multiple items
Common nouns
Reinforcers
Selects based on animal sound
Reports on conversation
Tells a story
Completes a story
Reciprocates a story
WH Topics
Intraverbal webbing
Associative questions
Describes absent items
WH questions on single items
Tells item when told description
Intraverbal stories
Condtional qus & discrimination
Answers Yes/No questions
Lists features when told item
Tells function when told item
Tells class when told member
Tells item when told feature
Tells item when told function
Tells sound when told animal
Tells animal when told sound
* Intraverbal Signing
Songs fill in
Sentence fill in
Empathy & prosocial beh.
Responds to NV cues of listener
Initiates conversation
Maintains conversation
Acts upon gestures
Provides instructions
Expresses confusion
Extends comments
Others' perspective
Sequencing
Inferences
Prediction
Absurdities
What doesn't belong
What's wrong
Emotions (own & others)
Temporal terms
Why/Because
Same/different
KS1 sight reading
Phonetic reading
Takes dictation (phonics)
Matching sound-word
Reads phonics
Gives specific quantity
Intraverbal counting
Matches quantity to numeral
Reads numbers
Counts 1:1 correspondence
Selects-tacts shapes
Copies letters & numbers
Traces
Draws on request
Colouring
Copies simple drawings
Imitates strokes
Scribbles
Pencil grip
Delivers a message
Initates greetings
Reciprocation/ commenting
Initating Joint Attention
Responds to greetings
Respondent Joint Attention
Turns to own name
Eye contact with mand
Patterning
Associative
Non-identical
Attention shifting
Sorting
3d/2d Matching
2d Matching
3d Matching
Generalised Matching
Time delay/tempo
Receptive building
Bulding from memory
Follow my leader
Block building
Chains
Oral motor
Fine motor
Gross motor
Object
Generalised imitation
Imaginary Block building
Independent Symbolic Play
Rule-based turn taking
Turn taking
Transitions
Independent Toy Play
Parallel play
Play imitation
Functional play (puzzles/sorters)
Cause/effect toys
Single Words
Sound Combinations
Single Sounds
Vocal Play

Example of score sheet

TACT

	Number	Type	Skill	Probe	Start	End	Items	Level	Trained	Mastered	Score
B	**81**	F/UN	Reinforcers								
B	**82**	F/UN	Common Nouns								
			objects								
			2d								
			people								
			locations								
			animals								
			Body parts								
B	**83**	G	Multiple items								
B	**84**	G	Naming								
B	**85**	F/UN	Action/verbs								
B	**86**	F/L	Colours								

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I	**87**	F/L	Adjectives								
I	**88**	G	Two-word desctiptions								
I	**89**	G	Carrier phrases								
I	**90**	G	Conditional discrimination (tact)								
I	**91**	G	Tells missing item								
I	**92**	G	Senses								
I	**93**	G	Yes/no tact								
I	**94**	G	Conditional Questions								
I	**95**	F/I	Prepositions								
I	**96**	G	Comparisons								
I	**97**	G	Gender								
I	**98**	F/L	Weather								
I	**99**	G	Plurals								
I	**100**	F/L	Occupations								

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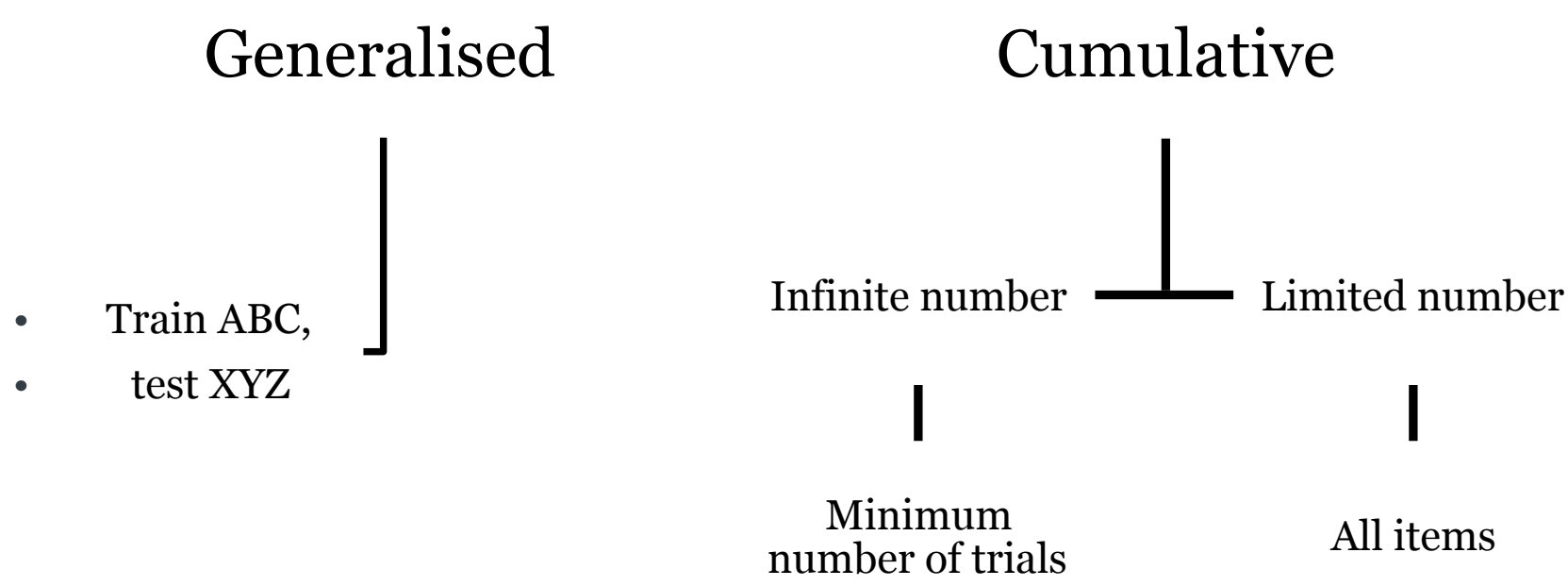
From “Verbal behaviour development for children with autism” (degli Espinosa, 2011, PhD thesis, University of Southampton)

Skill acquisition criteria



Generalised or cumulative?

- Tacting common items
- Discriminating what colour/what is it questions
- Oral motor imitation
- Play scenario imitation
- Receptive prepositions
- Inferences
- Recalling past events
- Identical matching
- Puzzles
- Object imitation
- Receptive instructions without objects
- Selecting common items (receptive labelling)
- Single word echoic
- Listing by category
- Sorting by category
- Sequencing
- Following two-step instructions
- Block building imitation

Response mastery criterion

- Accurate task performance on a single “item” or the emission of a single “response” does not constitute a skill
- Within same class discrimination: sample and comparisons within the same response class

Discrimination

- Fundamental to demonstrate acquisition
- Stimulus control over certain topographies
- How antecedent stimuli become SDs
- Simple and conditional

Simple and conditional

- Motor imitation
- Receptive instructions without objects
- Tacting common items
- Echoic
- Rote intraverbal responses

- Visual visual match to sample
- Auditory visual match to sample (receptive)
- Receptive instructions with objects

Overall objectives

	Beginner	Intermediate	Advanced
Social	People need to become S^Ds for delivery of S^Rs: Eye-contact as CMO-T and joint attention	Attention and shared activities as S^Rs: reciprocal commenting and comment extensions	Verbal interaction as the S^R: conversation
Verbal: function & structure	Conditional discriminations: visual and unmediated selection (receptive) Communication: mands Establishing basic noun and action vocabulary: tacts and receptive Generalised imitation Naming Structure: single words	Tact and intraverbal conditional discriminations: objects and ongoing events Listener (mediated selection, jointly controlled responding) Relations between nouns: and classes (categories), and actions (functions), and nouns (parts), properties (adjectives) Descriptions (tacts of compound stimuli): events and objects Structure: basic utterance (SVO, articles, and agreements)	Tact and intraverbal conditional discriminations: general topics and past events Descriptions of past events (remembering) Abstract reasoning: predictions, inferences, temporal relations/ sequences Problem solving and tacting private events of others (Theory of Mind) Structure: Multi-clause, connected sentences (discourse)
Academic	Drawing imitation and colouring	Textual (decoding), taking dictation, number/quantity relations	Story comprehension and story writing, maths, word problems, sums

Language instruction in EIBI

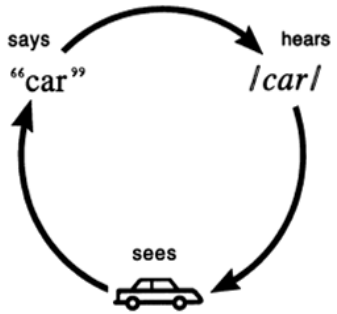
- Teaching programmes for language deficits remediation in autism: a focus of EIBI
- Acquisition of language skills during first few months of intervention correlated with better outcomes (Lovaas, 1993; Sallows and Graupner, 2006)

Transfer across operants

- Debate about the sequence of acquisition of tacts and receptive discrimination (Lovaas, 1993; Sundberg & Partington, 1998; Petursdottir & Carr, 2011)
- The issue of constructing sequences of objectives on the assumption that operants are separate
- Regardless of theoretical orientation

Verbal Behaviour

- The initial aim of many EIBI programmes is to establish a basic single-word repertoire in the primary operants and receptive discriminations
- Tacting: Saying the names of things visually presented under non-verbal stimulus control (i.e., the item)
- Content: common objects, animals, names of familiar people, rooms of the house, locations, actions, colours
- Debate about the sequence of acquisition of tacts and receptive discrimination (Lovaas, 1993; Sundberg & Partington, 1998; Petursdottir & Carr, 2011)



What is "Naming"?

- Horne and Lowe (1996) describe the critical steps in early language acquisition through which children acquire listener and speaker responding.
- Three repertoires are acquired between the ages of 9 months and 2 years:
  - Selection (e.g., pointing to or giving items)
  - Echoing (i.e., vocally repeating spoken words)
  - Tacting (i.e., vocally labelling items)

Development of Naming

- Children learn to select items in response to spoken words as a result of a history of differential reinforcement for such responding.

  e.g., “cup” points to cup “good girl!”

- During such child-carer interactions, closer echoic approximations are also differentially reinforced.
- Children thus become able to speak the names of items that they encounter in their environment.

Definition of Naming

- When a tacting repertoire has been established, children become able to demonstrate novel responses acquired as listeners to the speaker repertoire and vice versa, in the absence of specific reinforcement.
- Naming is thus established as a “higher order bidirectional relation” (Horne & Lowe, 1996).

Relationship between listener and speaker in EIBI

- Early applications (video)
- Few studies have focused on “cross-modal generalisation” (transfer across operants)
- Limited investigations specifically adopting Naming account as the theoretical framework from which to derive interventions
- Important to consider in language curriculum planning

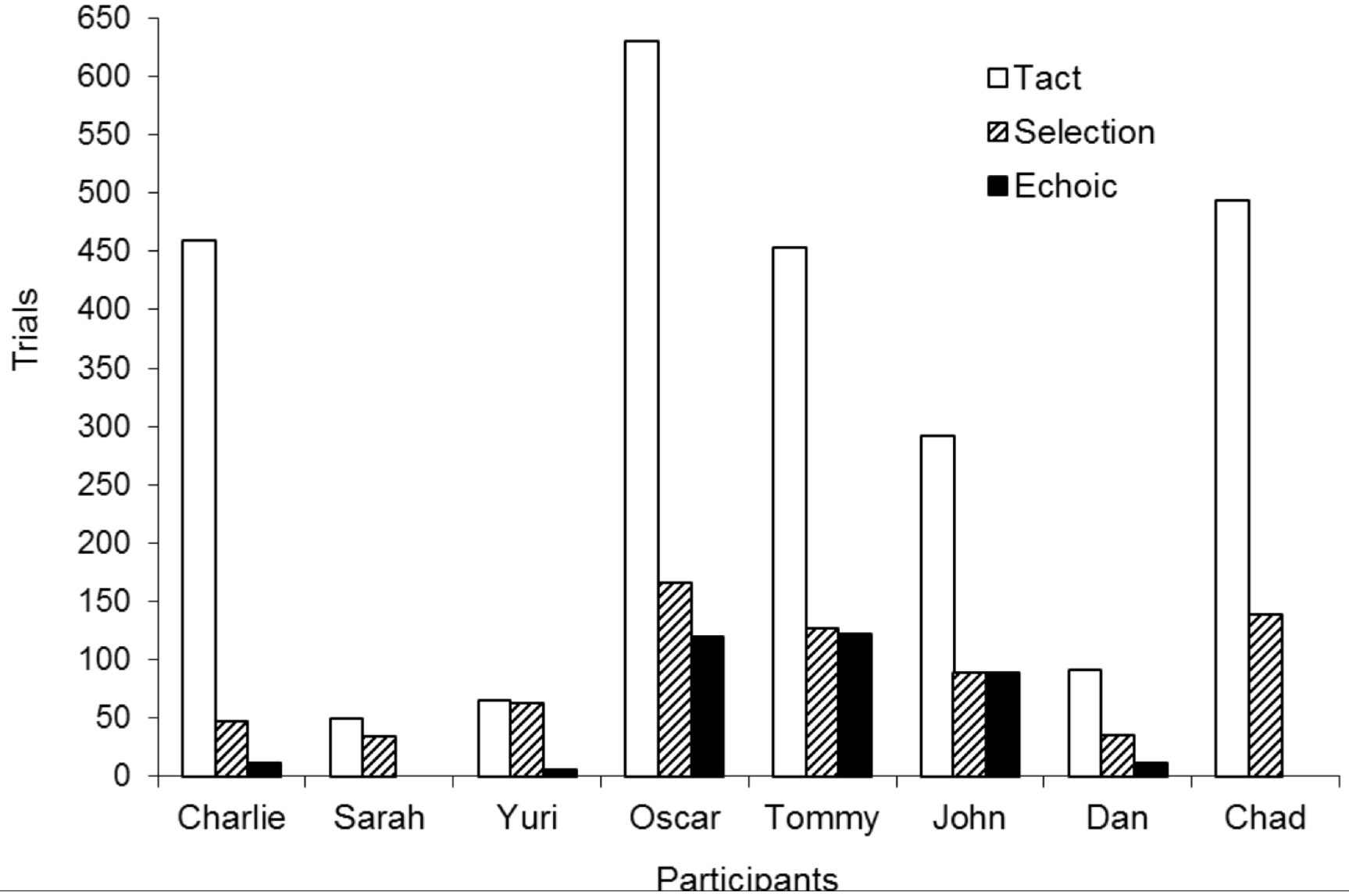
Teaching naming

- The current research sought to provide controlled investigation of a verbal transfer procedure to evoke naming as a generalised skill in children with autism.
- Eight children with autism (age 6 to 9 years), each able to echo single words, point to common items, and tact 50 to 100 items.
- 2 parts of the study:
  - Assessment of naming in potential participants
  - Teaching of verbal transfer procedure

Assessment Procedure

- Phase 1:
  - Establish selection of three items
  - Establish tacting of three other items.
- Phase 2:
  - Test tacting of the three items to which selection had been previously established
  - Test selection of the three items to which tacting had previously been established.

Assessment of naming



Results

- Although participants showed transfer to selection responding, to be able to suggest that Naming occured, participants needed to demonstrate transfer from listener to speaker.

- An analysis of errors showed that echoic responding did not occur for all participants during the teaching of selection responding and that in those who did, it was never emitted simultaneously with the selection response, but only immediately after the experimenter's instruction. This suggests participants possibly engaged in echolalia rather than echoic verbal behaviour

Verbal Transfer Procedure

- All participants were taught to echo and select the requested item simultaneously
- Only simultaneous selection and echoic responding was reinforced
- Immediately after correct independent selection, participants were asked to tact the same item
- An increasing number of distracter trials were delivered in between target tacts
- Multiple probe baseline across participants

Procedure

1.Teach all participants three selection responses

2. Test all participants for tact transfer

3. Teach transfer strategy to participants S and Y

4. Teach all participants three selection responses

5. Test all participants for tact transfer and S and Y for tact responses on previously learned set of items

6. Teach transfer strategy to participants C and O

7. Teach all participants three selection responses

8. Test all participants for tact transfer and C and O for tact responses on previously learned set of items

9. Teach transfer strategy to participants T and J

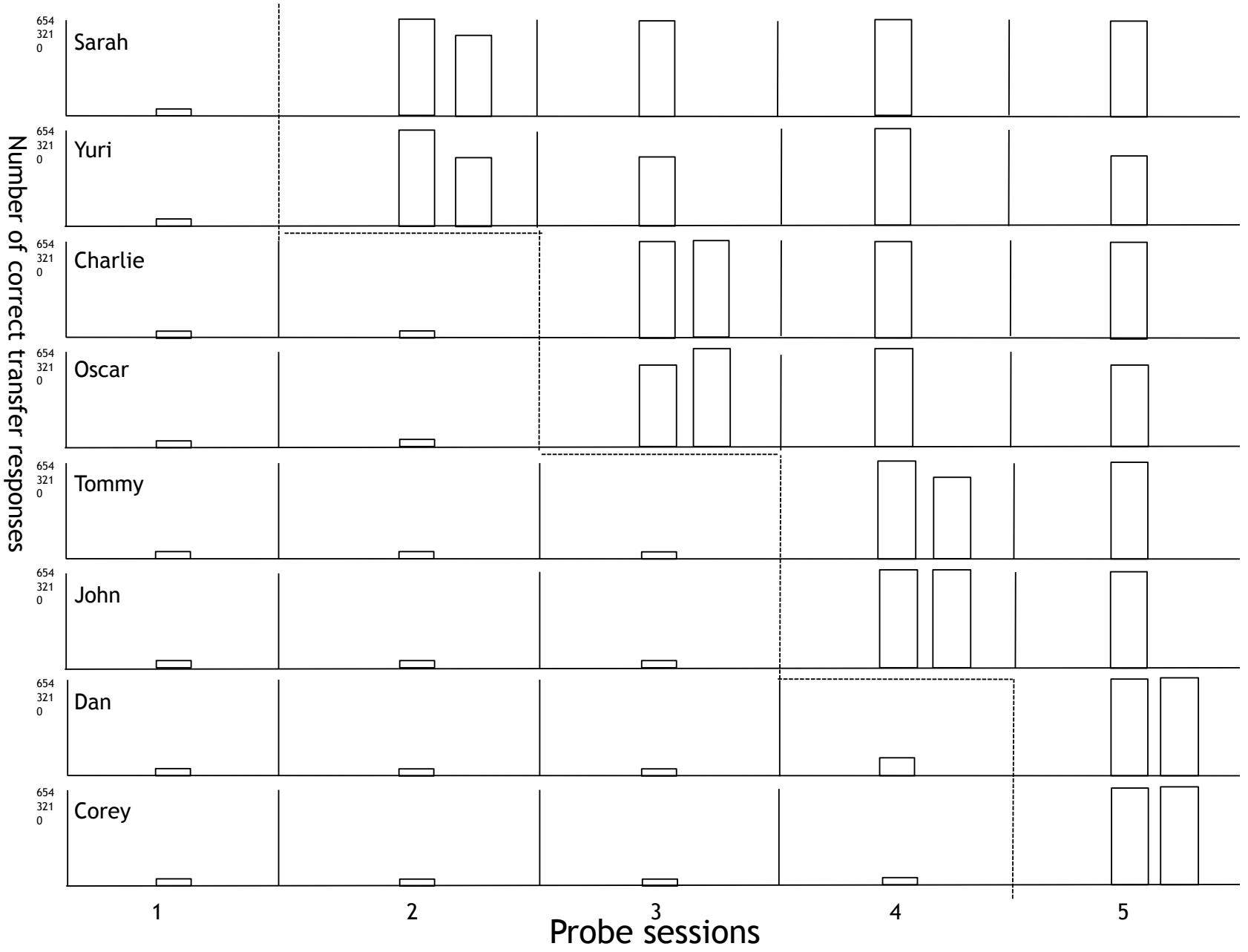
9. Teach all participants three selection responses

10. Test all participants for tact transfer and T and J for tact responses on previously learned set of items

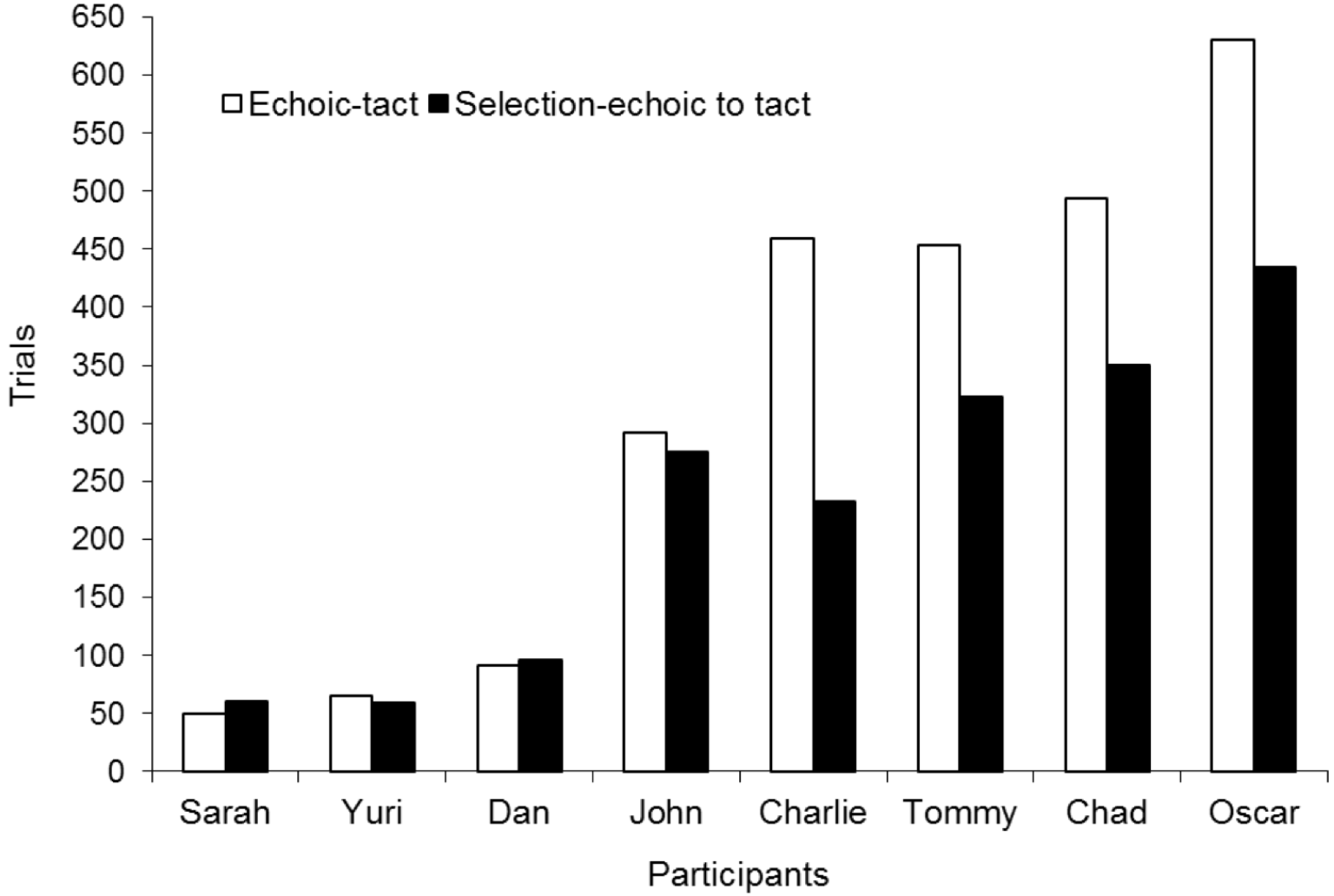
11. Teach transfer strategy to participants D and C2

12. Teach all participants three selection responses

13. Test all participants for tact transfer and D and C2 for tact responses on previously learned set of items


Number of correct transfer responses
654
321
0
Sarah
Yuri
Charlie
Oscar
Tommy
John
Dan
Corey
1
2
3
4
5
Probe sessions

Trials to criterion



Naming as generalised skill

- Naming as the first verbal generalised skill in early learners
- Learning new speaker behaviour through listening to oneself
- Listener and speaker within the same skin: being able to speak the name of stimuli presented under one source of stimulus control (i.e., tacting) as a result of hearing oneself say the name of stimuli presented under another source of stimulus control (i.e., selection) (Horne & Lowe, 1996; Skinner, 1957),
- Naming unlikely to emerge without specific intervention.

Learning how to learn

- “If generalization is considered as a response itself, then a reinforcement contingency may be placed on it, the same with any other operant. Informally, teachers often do this when the urge a student who has been taught one example of a general principle to “see” another example as “the same thing”. (Stokes and Baer, 1977, p. 362)

degliespinosa@gmail.com

Thank you!