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Child and Family Research Outcomes from The Irish Centre for Autism and Neurodevelopmental Research

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Irish
Centre for
Autism and
Neurodevelopmental research



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Launched 2012
Research Developments:
Practical and Scientific Benefits for the Field of Behaviour Analysis and
People with Autism Spectrum Disorder



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AUTISM SPEAKS™
It's time to listen.

www.AutismSpeaks.org



Irish Centre for Autism and Neurodevelopmental Research
National University of Ireland, Galway

2nd International Conference on Autism Spectrum Disorders:
from Research to Practice
June 11-12, 2013



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Purpose and Goals

- As the first dedicated Centre for Autism research, education and training in Ireland, ICAN provides a pivotal presence in the domain of **research, training and policy evaluation** in the expanding field of autism and neurodevelopmental research.

Research on representative samples

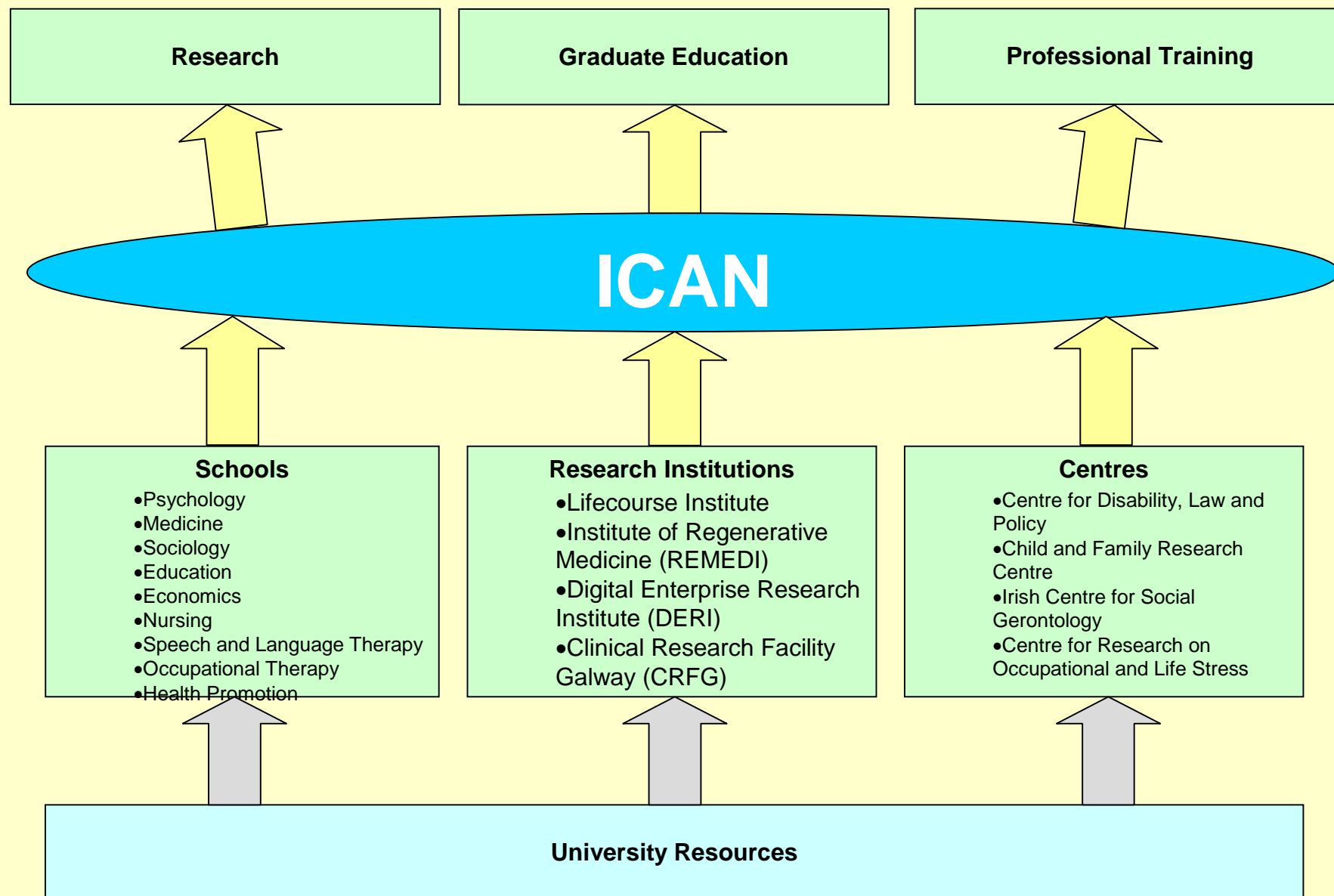
Intervention

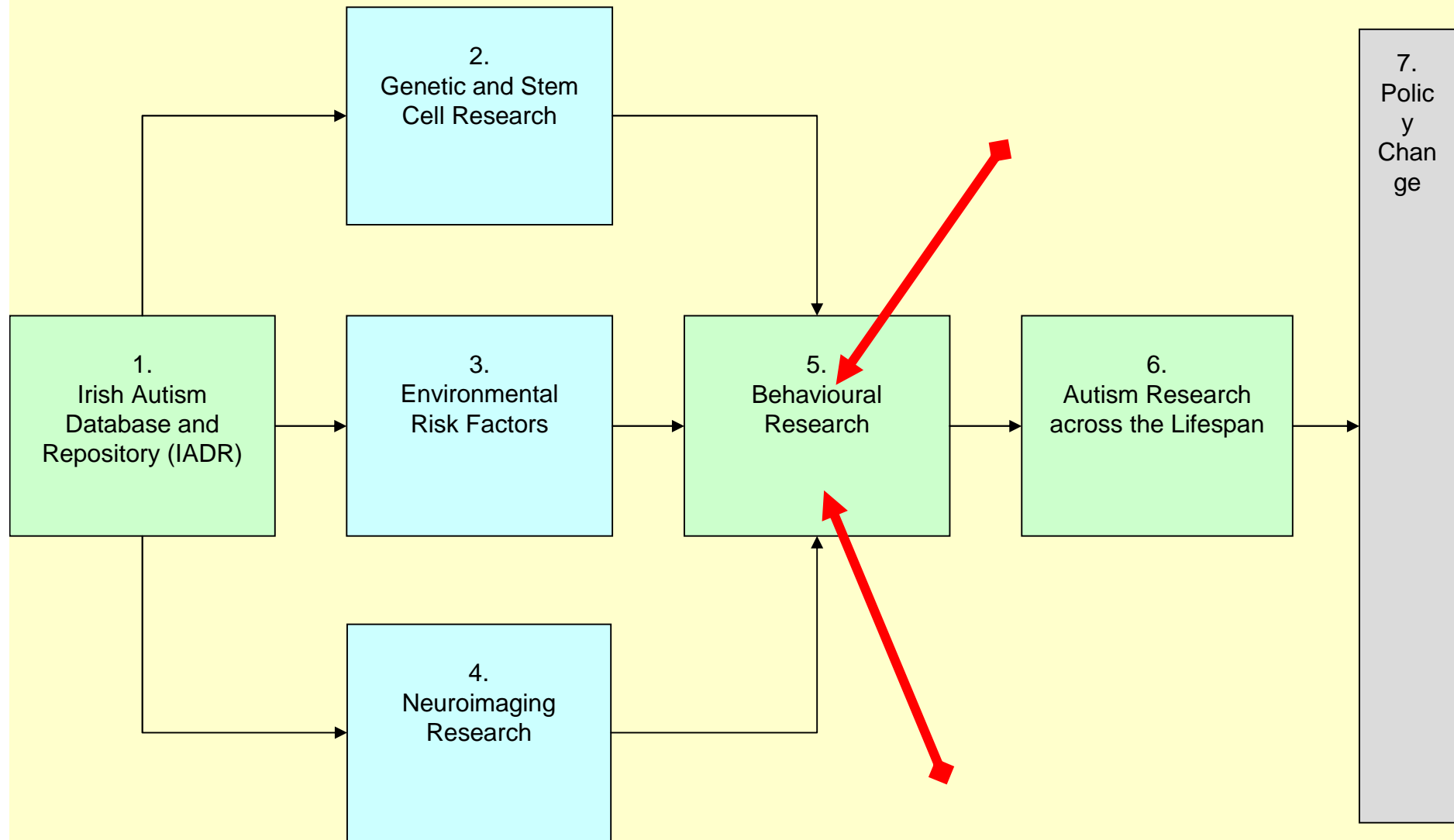
Policy Change

Rapid injection of expertise within services



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First Prevalence Study in Ireland Launched

April 2nd 2013

Population of 4.7 million ---

**Over 200,000 diagnosed with
Autism**

Many argue that parents are denied access to an effective science for dealing with the condition.



Autism Speaks has recognised the urgent need at the national level to create a national register and database for all individuals on the spectrum. **The Irish Autism Database and Repository (IADR)** will be transformative in accelerating the pace of ASD research, by providing large datasets which will be shared among researches



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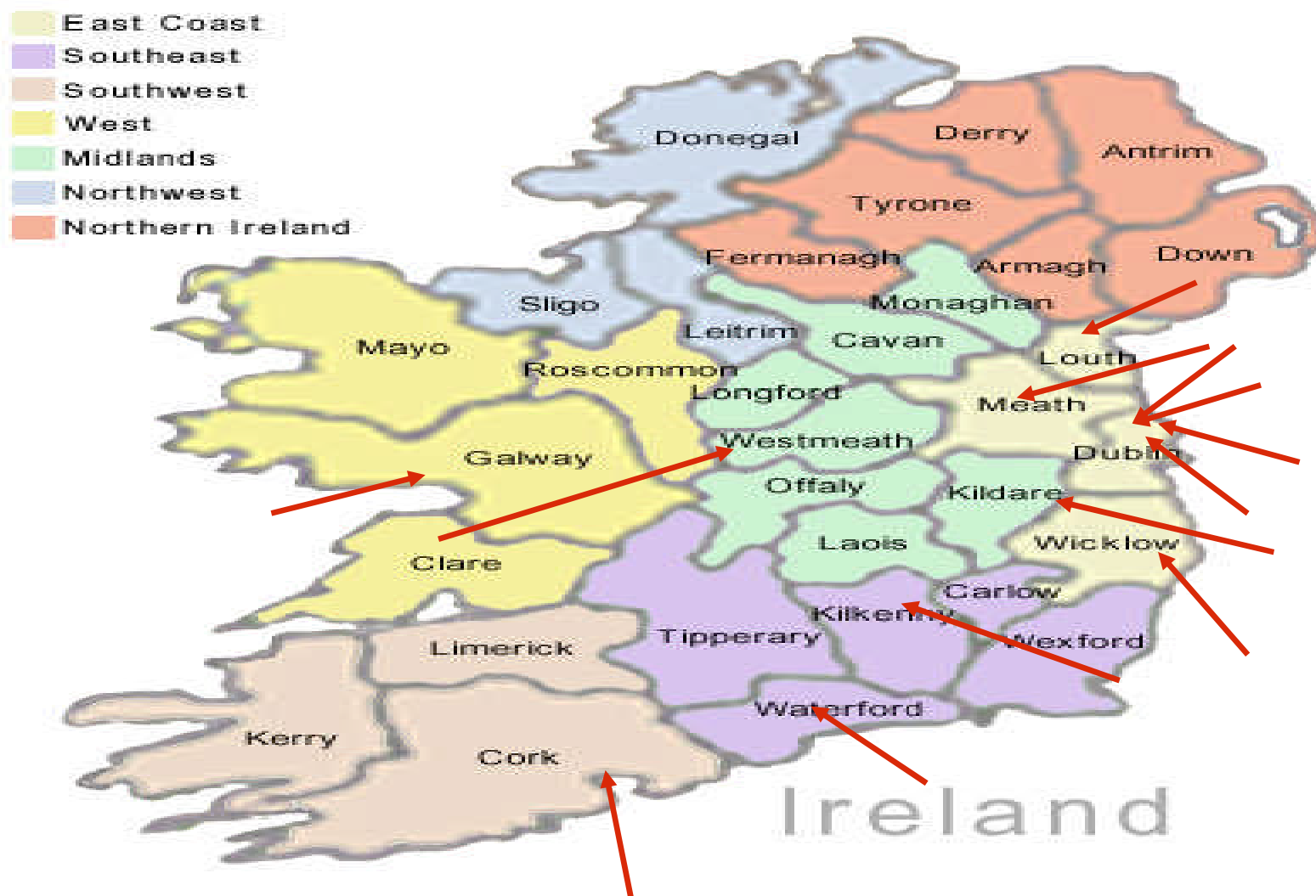
In collaboration with Autism Speaks ICAN will establish the Irish Autism Database and Repository Launch in June 2103

Two principle components:

- (1) An interactive electronic research database that will link researchers with individuals affected by ASD all over Ireland and
- (2) a bio-repository which will facilitate Irish researchers to conduct genetic and stem cell research



ABA Schools for Autism 1998-2012



Irish Government- Department of Education and Skills

- “My Department supports a **multi-skills approach** in regard to the education of children with ASD where a range of teaching methods are available e.g., Treatment and Education of Autistic and Related Communication Handicapped Children (TEACCH), Applied Behaviour Analysis (ABA), Picture Exchange Communication System (PECS) etc.” (Minsiter Hanafin, Department of Education, Government of Ireland, 2006).
- "The Department of Education and Science's refusal to recognise the merit of the ABA method has more to do **with institutional rigidities and conservatism within the civil service** than a real honest and open evaluation of the effectiveness of the ABA method...We urge the Minister for Education [Mary Hanafin] to recognise the error of her ways and to take courage in her personal judgement and not be bullied by teachers' interests and civil service conservatism (Oppositional Minister, 2010)



Story from the Republic of Ireland by Pat McCormack, parent of a child with autism and qualified teacher living in Dublin

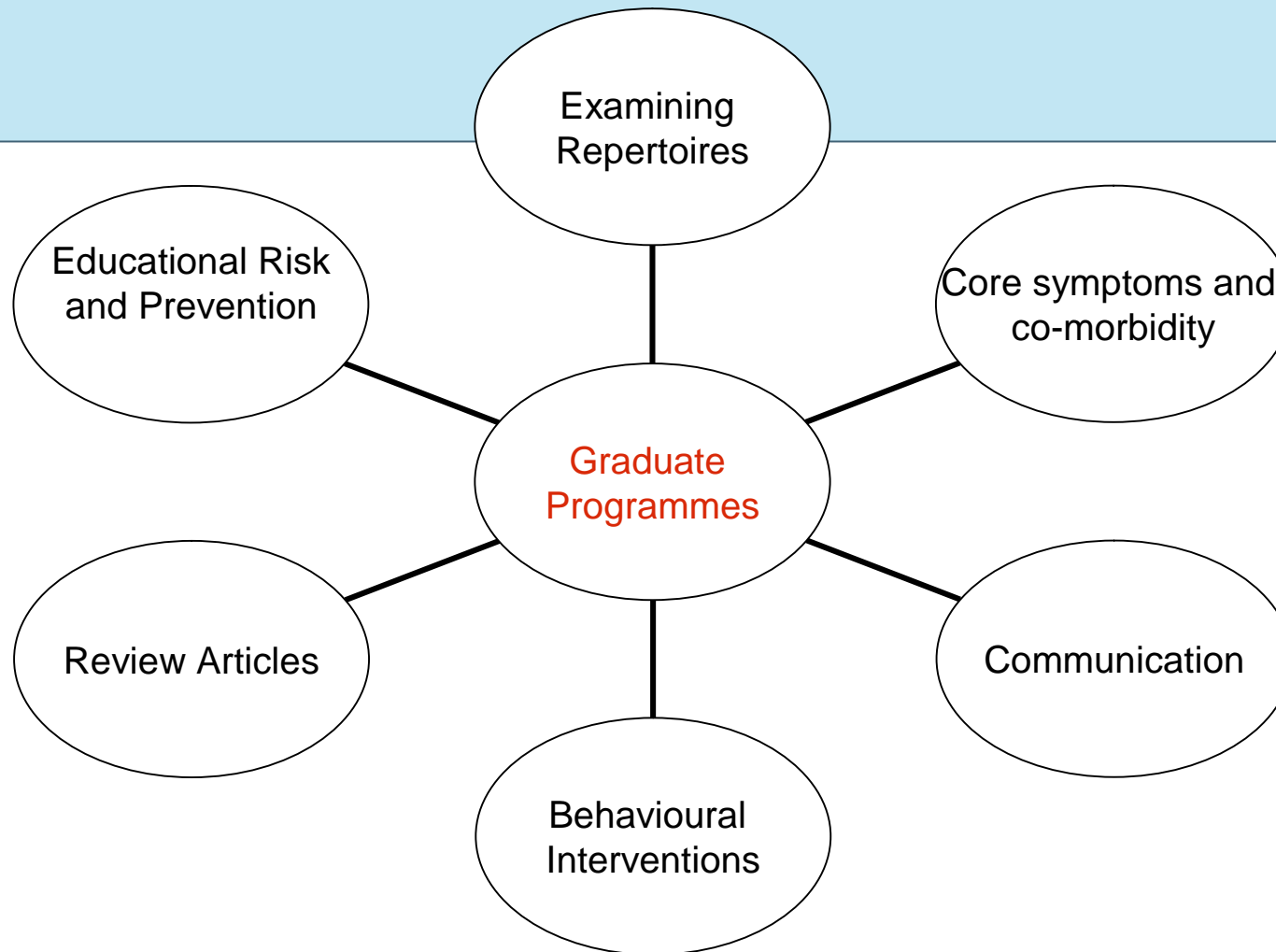
From The Current Repertoire, Fall 2012, Newsletter of the Cambridge Center for Behavioral Studies

“Why have they abandoned children with autism and denied them the right to ABA? Why has Ireland, when it stood on the cusp of making a great advance, turned back the clock? Why, almost twenty years after we had a Minister for Education stressing the need for "up to date data" is the current government following the example of its predecessor and pointedly ignoring the "data", the depth of international research that supports the effectiveness of ABA as an intervention for children with ASD as reflected in reports such as Maine and the National Standards Project”?



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Thematic Areas of Research within ICAN



Impact of Research from ICAN

Policy Change- Health Service Executive,
Department of Education

Screening,

Behaviour Support,

Awareness and Training in EBP

Training in ABA technologies

Sustaining ABA in special education



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Examination of Repertoires, Skills and Deficits in Autism



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Patterns of Reading Ability in Children with Autism Spectrum Disorder

Nally & Healy, 2012

- We investigated the heterogeneous nature of reading skills in children with ASD (N=95).
- Four components of reading skill were assessed:
 - **word recognition,**
 - **Non-word decoding,**
 - **text reading accuracy and**
 - **text comprehension.**

What are the levels of component reading skills?

- accuracy and comprehension
- ability to decode novel words
- discrepancy between chron. age and reading age
- do component reading skills have a tendency to develop out of step with each other?



Measures

Reading Accuracy:

- **Decoding:** *The Graded Nonword Reading Test*
- **Word Recognition:** *The British Ability Scales*
- **Connected Text:** *Neale Analysis of Reading Ability-II (NARA-II)*

Reading Comprehension:

- *NARA-II* : Some of the questions tapped literal understanding of the passage, whereas others required an inference to be made.

Oral Language:

- **Receptive vocabulary:** *British Picture Vocabulary Scale-II*
- **Comprehension:** subtest of WISC-IV
- **Nonverbal Ability:** Block Design subtest from the WISC-IV



Patterns of Reading Performance were determined by:

- ability to read aloud single words
- presented out of context, the ability to decode non-words,
- the ability to read connected text accurately and the ability
- to comprehend text.



Table 1 shows the correlation between the four components of reading skill. Although the tests inter-correlated at a statistically significant level, the correlations were modest in size and were smaller than those observed in samples of typically-developing children.

	Word Reading	Nonword Reading	Text Reading	Comp.
Word Reading	-	.39** (.83**)	.69** (.92**)	.275** (.75**)
Nonword Reading		-	.310* (.79**)	.202* (.60**)
Text Reading			-	.368** (.87**)
Comprehension				-

* $P < .05$; ** $P < .01$



Word recognition (word reading) and phonological decoding (non-word reading) are not well linked in this group.

18.9% (N=18) Word Reading levels
in normal range

2% Reading Comp. in normal range

Reading Comprehension:

12% 1SD below population norm

68% 2SD below norm

Decoding:

15% 1SD below population norm

58% 2SD below norm



Current Research, NUIG Millennium Grant Funded: Nally & Healy based on statistics from previous sample:

A multisite cluster randomized design is underway examining the impact of behavioural reading curricula- Edmark Reading Programme (Manual & CAI) and MimioSprout (CAI) compared to usual reading intervention in Special Ed. schools.



Risk factors for challenging behaviors among 157 children with autism spectrum disorder in Ireland[☆]

Olivia Murphy, Olive Healy^{*}, Geraldine Leader

National University of Ireland, Galway, Ireland

- **The presence of co-occurring problems, such as conduct or behaviour disorders, can greatly impact the complexity of the core symptoms of the condition.** It has been demonstrated that behavioural problems in autism are prevalent with a large number of studies identifying at least half of participants with autism engaging in one or more challenging behaviours.
- The mean age of the sample was 8.5 years (S.D. = 2.17) with the age ranging from 3 to 14.2 years.



Murphy, Healy & Leader, (2009)

82% of participants (n = 144) displayed challenging behaviour

Table 1

Full sample characteristics.

Behavior group	Frequency	Percentage (%)
No challenging behavior	→ 13	8.2
SIB, aggressive behavior and stereotyped behavior	→ 51	32.5
SIB/aggressive behavior	5	4
SIB and stereotyped behavior	17	11
Aggression and stereotyped behavior	28	18
Stereotyped behavior only	43	27.3



- **Self-biting** was the most common form of SIB reported.
- **Hitting others/kicking others/grabbing/pulling others** were the most frequent aggressive behaviours reported.
- **Waving/Shaking arms/Having repetitive hand movements/rocking back and forth** were the most common repetitive behaviours.



Analysis of risk factors and early predictors of challenging behavior for children with autism spectrum disorder[☆]

Aoife McTiernan, Geraldine Leader^{*}, Olive Healy, Arlene Mannion

School of Psychology, National University of Ireland, Galway, Ireland

- 174 participants with a diagnosis of autism
- The mean age of the sample was 8 years ($SD = 2.38$) ranging from 3 to 14 years.
- The mean age at diagnosis was 3 years ($SD = 0.91$) and ranged from 1 to 5 years.



Table 1

Full sample characteristics.

Challenging behavior	Frequency	Percentage
At least one behavior	163	93.7%
All three behaviors	→ 62	35.6%
SIB	→ 85	48.9%
Stereotyped behaviors	160	92%
Aggressive behaviors	98	56.3%
SIB and aggression	63	36.2%
SIB and stereotyped behaviors	85	48.9%
Aggression and stereotyped behaviors	94	54%
No challenging behaviors	→ 11	6.3%



- Of the total sample (n=174) 148 **did not emit** challenging behaviour at diagnosis.
- Parents reported that these problem behaviours emerged subsequently and worsened when the children began school.

Surprising???



- We analysed challenging behaviours among participants with regard to **type of intervention received at diagnosis**.
- Results showed that those who received “eclectic” interventions at diagnosis scored **significantly higher** on the frequency and severity of self-injurious and stereotyped behaviours.
- We also analysed challenging behaviours among participants with regard to **change in intervention** received (intervention at diagnosis and current intervention).
- Results showed **significant differences in frequency and severity** of self-injurious, aggressive and stereotyped behaviours with those who had moved from “eclectic” interventions at diagnosis to ABA interventions currently having the highest rank score for all. Those who had moved from ABA to “eclectic” interventions scored the lowest.



Healy & Holloway, 2012

Oral Hygiene and Risk for Dental Disease in Autism

- The oral health status of children with Autism in Ireland (n=537) was examined and showed the current level of oral and dental care available to these children to be inadequate resulting in serious health consequences in terms of oral diseases
- Children and adolescents with special needs had greater need for oral hygiene support than their peers;
- **Almost 50% of 12- and 15-year olds with special needs required assistance with daily tooth brushing;**
- Approximately 15% required urgent professional attention to their oral hygiene to avoid irreversible damage to the tissues;.
- the levels of **untreated dental trauma** and treatment needed for dental trauma were higher among children with Autism than in the general population;
- 22% of the children required **sedation and/or general anaesthesia (GA)** to receive dental treatment



As a result of these data...

Current Research

- (1) the effect of **parent training** in Behavioural Guideline Techniques (BGT) in increasing child participation in routine oral, dental care and problem prevention;
- (2) the evaluation of BGT to improve **child independence** with daily oral hygiene in the home,
- (3) the evaluation of BGT manuals and training protocols for **dental professionals** to improve knowledge of autism and compliance with dental examination and treatment in clinics.



These data were useful in convincing policy makers of the need for Applied Behaviour Analysis

- There is extensive evidence that behavioural approaches can bring about short and medium-term reductions with long-term effects also documented.
- Empirically validated ABA procedures have been demonstrated to be highly effective in managing such challenging behaviour.
- **42 of our graduates now work as BCBA specialists within the Health Service Executive assessing and treating challenging behaviour.**
- These Behaviour Specialists are now being employed to improve curriculum content and teaching skills within Special Ed. schools.



- **Screening instruments for Autism** have been adopted for the first time in the West of Ireland. GPs and Public Health Nurses are administering the BISCUIT and POEMS in order to identify early signs.
- Children are referred to ICAN for further assessment, intervention and parent training.





Behavioural Interventions for Problem Behaviour in Autism



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Determining Treatment Efficacy for Stereotypy/Repetitive Behaviour

Boyd, McDonough and Bodfish (2011) suggest that these behaviours can be categorized as follows:

stereotyped motor movements such as body rocking or hand flapping, repetitive object manipulation, repetitive vocal or vocal stereotypy,

high-level repetitive behaviour such as ordering, lining up,

repetitive self-injurious behaviour, dyskinesia and akathisia and obsessions and compulsions.

- The authors also suggest that interventions and treatment of these behaviours can be determined by topography rather than function.



Mulligan, Healy & Lydon, 2103

- We conducted a review to determine treatment efficacy for stereotyped, repetitive, ritualistic, obsessive and compulsive behaviours in Autism along with an evaluation of function-based and non function-based treatment approaches to reduce these target behaviours.
- Nineteen studies were identified for inclusion and were categorized as either function-based (n=10) or non function-based (n=9) .



Function-based interventions: Non-Function Based Interventions:

- RIRD
 - NCR
 - DR
 - FCT
 - Environmental Enrichment
 - Functional Play
- RIRD
 - Weighted Vests
 - SIT
 - Antecedent exercise
 - Choice of activity and non-contingent attention
 - Discrimination training and self management



Treatment Outcomes.

- Studies which used function-based treatments showed a mean reduction in stereotypy and repetitive behaviour of 58.64% (range: -25.75%-100%).
- **80% percent of the studies which used function-based treatments demonstrated at least a 50% reduction in behaviour.**
- The mean reduction in stereotypy and repetitive behaviour in studies which did not base their intervention on outcomes from a functional analysis was 27.79%.
- A further 63.64% (n=7) were identified as using treatments which were less than 50% effective.
- An increase in target behaviour was reported in 36.6% (n=4) studies.



Treatment Efficacy

Mean Percentage reduction of the target behavior from baseline to treatment phases

DRO using high preference, high competition items as reinforcers for the absence of stereotypy	95.31%
Non-contingent access to toys combined with prompts and response blocking	93.33%.
Differential reinforcement combined with discrimination training and self monitoring	84.53%.
Response interruption and redirection	82.07%.
DRA with extinction	81.58%
Choice of activity plus social attention	78.72%.
Increase functional play skills	78.39%
Functional communication training	78.25%.
Environmental enrichment	65.48%
Non-contingent access to matched stimulation	62.93%

non-contingent access to toys	18.22%
antecedent jogging	36.98%
antecedent walking (-1%);	-1%
non-contingent access to high competition items	49.71%
non-contingent access to high preference items	-25.75%
Non-contingent access to music played at high volume	30.21%
weighted vests	9.45%
weighted vest with no weight	22.45%



Despite such findings it is still very common to see recommendations in practice that do not adhere to a functional assessment/analysis !! ??



Sensory Integration Therapy and Autism

- Green et al. (2006) surveyed 552 parents of children with Autism and reported that 38.2% of parents said their child currently was in receipt of SIT and an additional 33.2% reported that their child had received SIT at some point in the past.
- Speculation continues in relation to how effective SIT is with children with ASD



Lydon & Healy, 2012

- We aimed to provide an analysis of the use of SIT by a sample of families of children with ASD within Ireland. Specifically, the aim was to determine the prevalence of specific SI techniques, their popularity and perceived efficacy.
- Additionally, the reasons parents seek Sensory Integration Therapy as an intervention for their children was examined along with child factors including age and frequency of challenging behaviour.
- 124 families participated



- The most commonly used techniques currently in use were: **Trampoline; Gross Motor Activities; Oro-Motor Exercises; and Deep Pressure.**
- The treatments which were no longer in use but which were reported to be used in the past included: **Weighted Vest; Wilbarger Brushing Programme; Tactile Stimulation; and Joint Compressions**
- From the informants 91% were currently using SI techniques. **The mean number of techniques “currently in use” was 5, ranging from 1 to 14.**
- Sensory Integration was predominantly reported by informants to be a treatment sought **in the early years of the child’s life.** Participants began receiving SIT from two years of age with the average at five years of age



Table 3.1. Rank order of Sensory Integration Techniques in terms of percentage of current use

No	Technique	Percentage of use	
		Currently using	Used in the past
1	Trampoline	67.6	14.7
2	Gross Motor Activities	50.0	19.1
3	Oro-Motor Exercises	38.2	17.6
4	Deep Pressure	35.3	22.1
5	Rocking	33.8	19.1
6	Swing/Hammock	32.3	23.5
7	Tactile Stimulation	30.1	27.9
8	Joint Compressions	27.9	26.5
9	Vibratory stimulation	22.1	17.6
10	Chewy Tube	20.6	13.2
11	Bean Bag Compressions	17.6	8.8
12	Spinning in a chair	16.2	13.2
13	Wilbarger brushing	14.7	29.4
14	Balancing on a Beam	10.3	4.4
15	Hot Dog Wrap	7.4	7.4
16	Weighted Vest	7.4	30.9
17	Sit N' Move cushion	5.9	10.3
18	Hitting a swinging ball	5.9	5.9
19	Hug Machine	2.9	2.9
20	Scooter Board	2.9	1.5
21	Theraband	1.5	
22	Ankle Weights		1.5
23	Weighted Blanket		1.5



Sensory Integration Techniques and Behavioural Targets

- Our findings show that addressing problem behaviour issues, specifically stereotyped behaviours, was the main reason that families of children with ASD sought SIT.
- It is often assumed that stereotyped behaviour serves a function of automatic reinforcement for the individual and therefore practitioners often presume that SIT is the most appropriate treatment to address this problem behaviour.
- **Indeed, the terms stereotypy and “self-stimulatory” behaviour (or “stimming”) are often used synonymously (Rapp & Vollmer, 2005).**



- Similarly, it was also found in the current study that practitioners (both OT's and psychologists) recommended SIT for problem behaviours (aggression/SIB/Stereotypy).
- These findings are in accordance with Smith and Antolovich (2000) who reported that parents typically learned about Sensory Integration from service providers for their child (i.e., speech therapists and educators).



An Example of Functional and Arbitrary Reinforcement.

- A small number of comparative studies (Mason & Iwata, 1990; Devlin et al., 2009; 2011) have employed robust experimental designs to compare SIT and behavioural intervention (BI) as treatment approaches to challenging behaviour. In each of these studies the researchers subjected both interventions to the same measures of empirical data collection.



Comparison of Behavioral Intervention and Sensory-Integration Therapy in the Treatment of Challenging Behavior

Sarah Devlin • Olive Healy • Geraldine Leader •
Brian M. Hughes

- Four Participants with Autism all presenting with aggressive behaviours, self-injury, tantrums and non-compliance.
- Alternating treatments design with initial baseline and final best treatment phase across 10 daily sessions.
- SIT and the Behavioural Interventions were alternated across daily sessions. The sequence of treatments was randomized for each of the participants.



- The theoretical underpinnings of SIT believe that problem behaviour results from an inability to process complex sensory information effectively due to a lack of organisation of the senses (Ayres, 1972; Ayres & Tickle, 1980; Schaaf & Miller, 2005).
- **SIT often does not account for the variables maintaining the challenging behaviour**, and typically entails the delivery of SI techniques either contingent on challenging behaviour or non-contingently during a 30-minutes session (Reisman, 1993).



Behavioural Interventions:

Designed from **prior functional analysis** for each participant
Problem behaviour was maintained by **negative reinforcement** as a result of escaping or avoiding demand situation and by positive reinforcement in the form of accessing preferred tangible items.

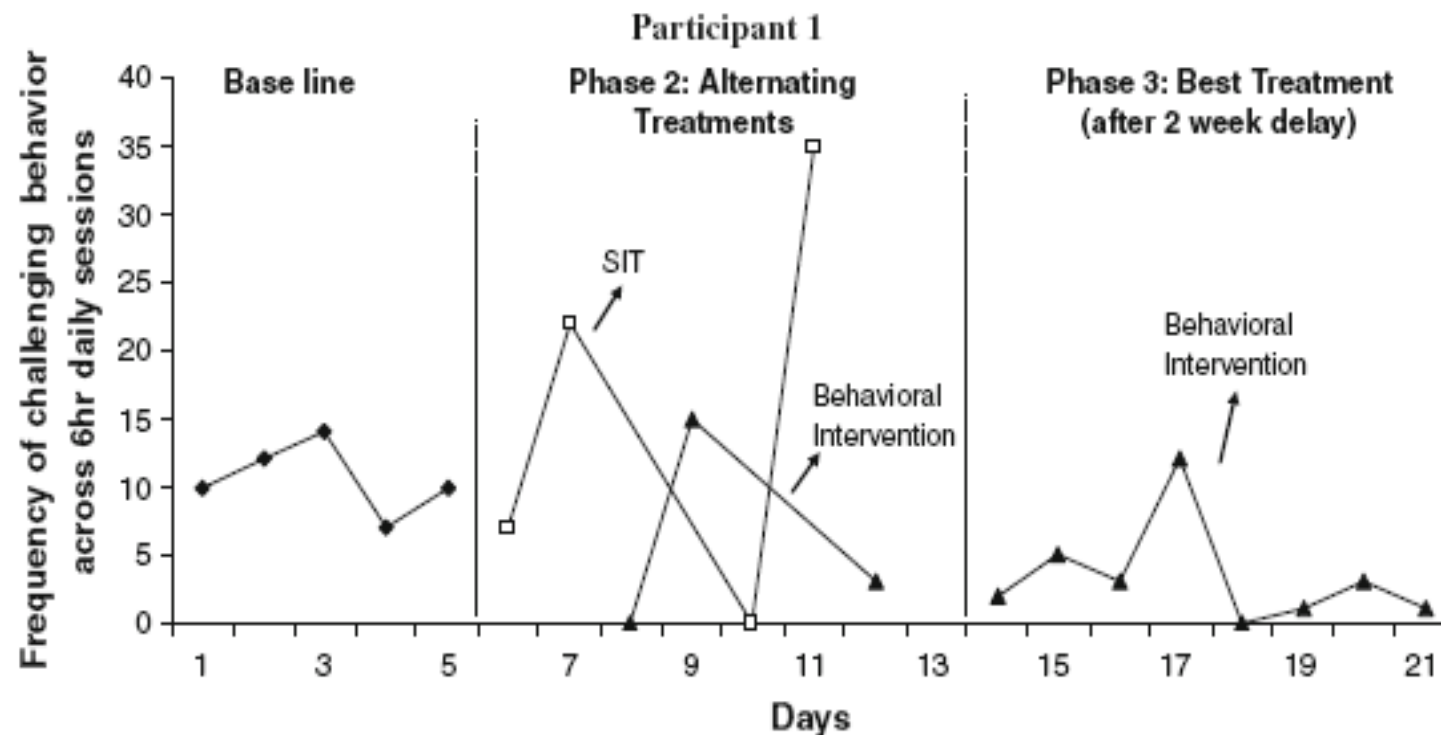
- DR + Extinction
- FCT Mand Training
- Interspersal of learned operants
- Errorless learning
- Positive practice



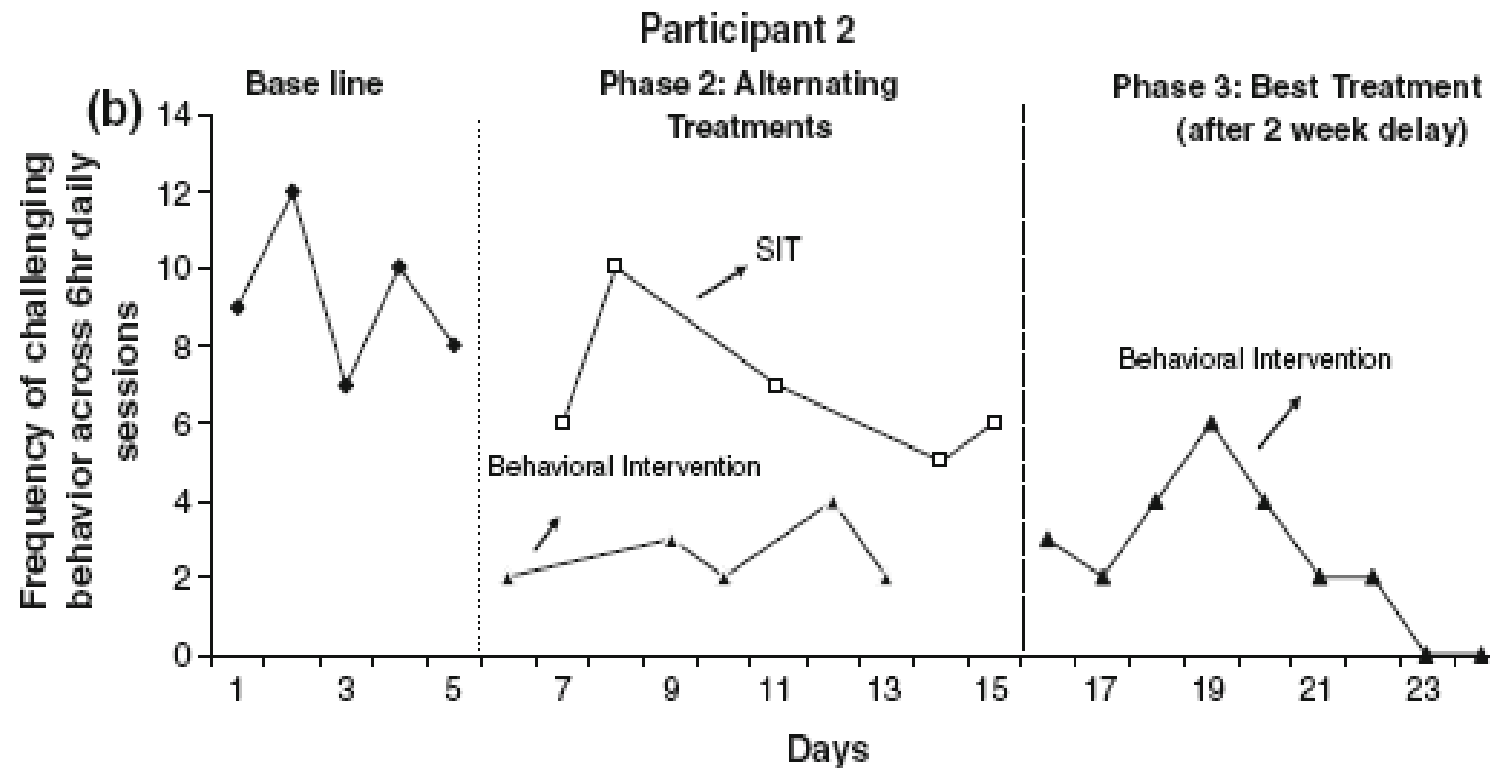
Target Behaviours: Hitting self, hitting others, kicking, stomping, screaming

Function: Negative Reinforcement- Escape

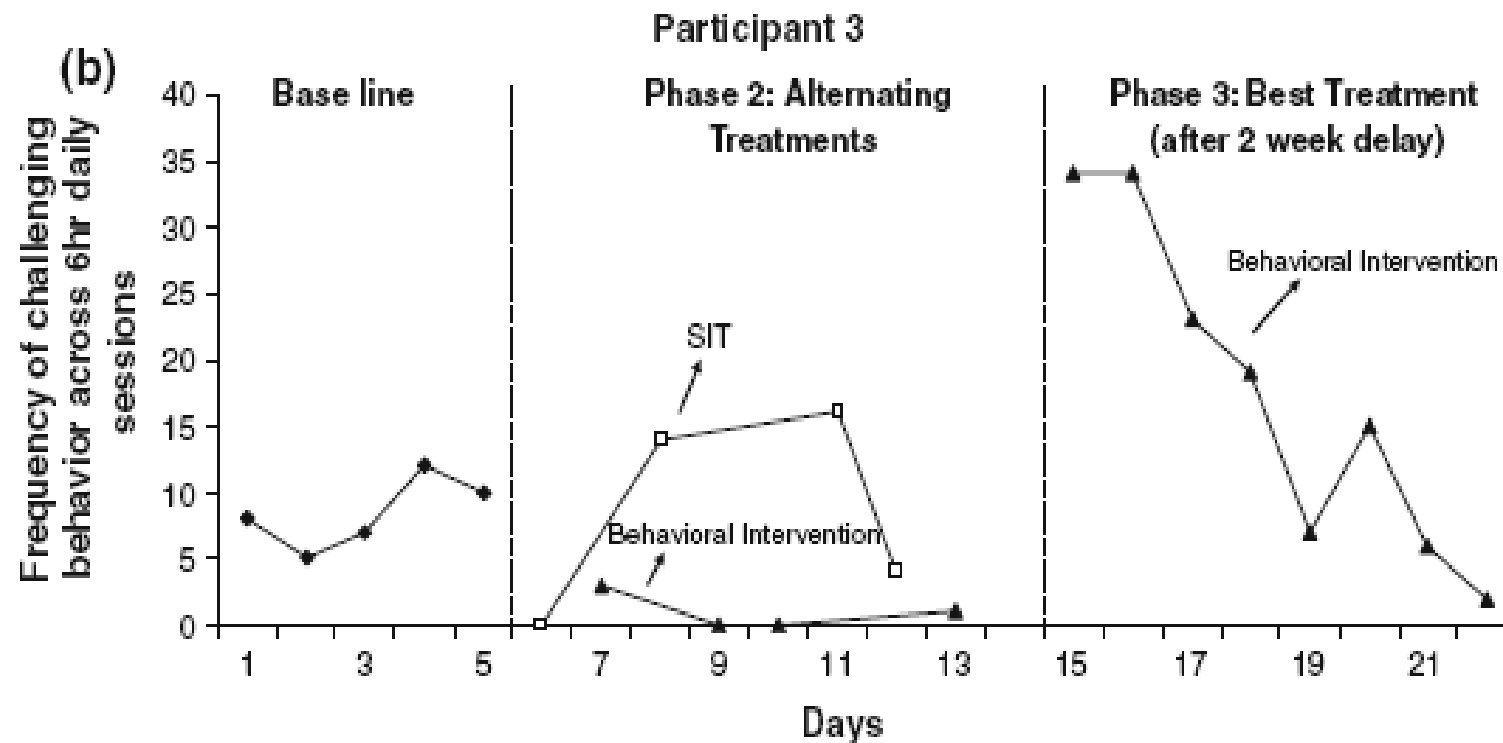
Positive Reinforcement- access to tangibles



Target Behaviours: Crying, stomping, body tensing, squeezing
Function: Negative Reinforcement- Escape, Highest frequency during transition

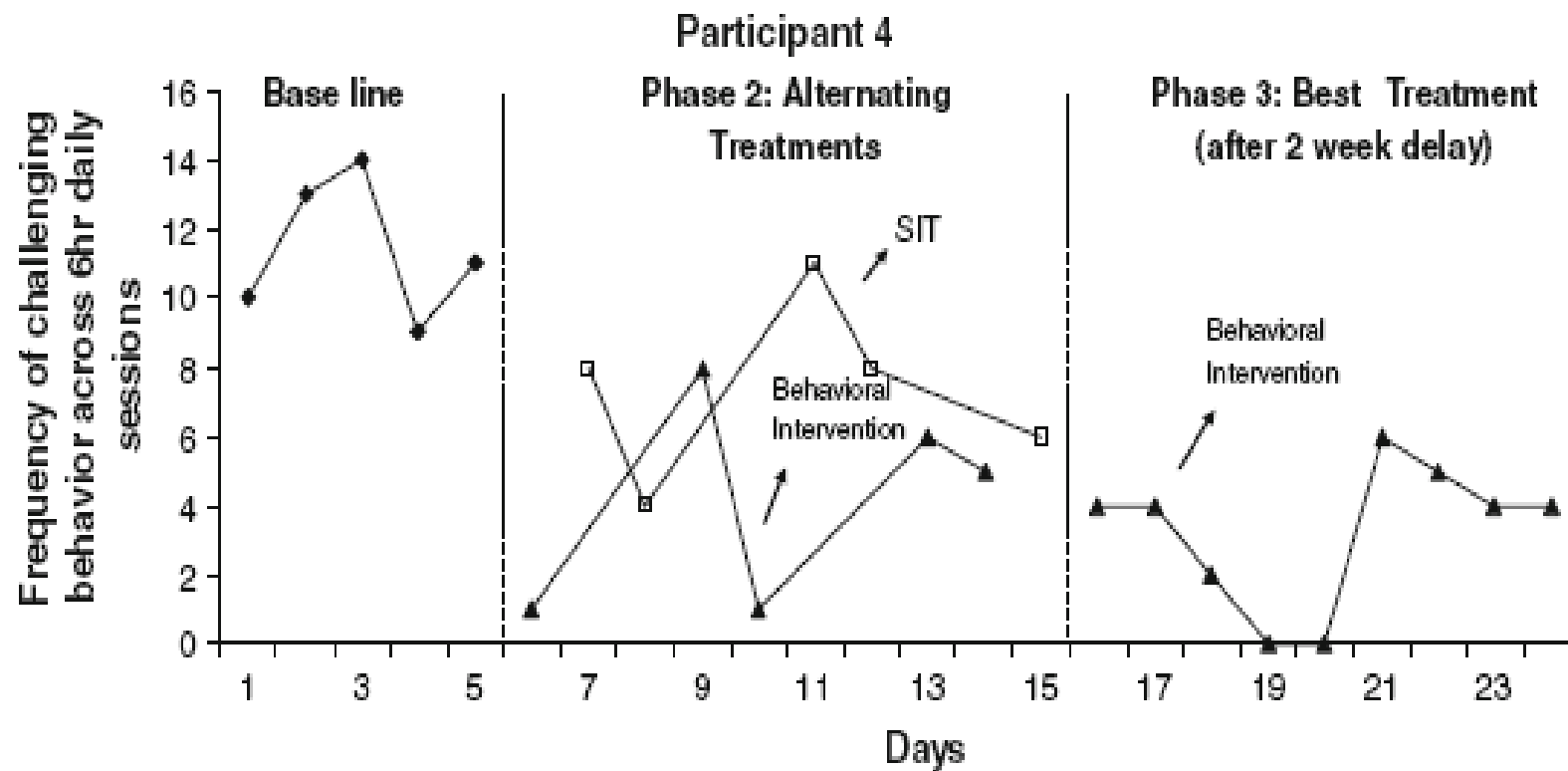


Target Behaviours: hand mouthing, scratching, hand biting, hair pulling
Function: Negative Reinforcement- Escape
Positive Reinforcement- access to tangibles



Target Behaviours: Finger biting

Function: Negative Reinforcement- Escape



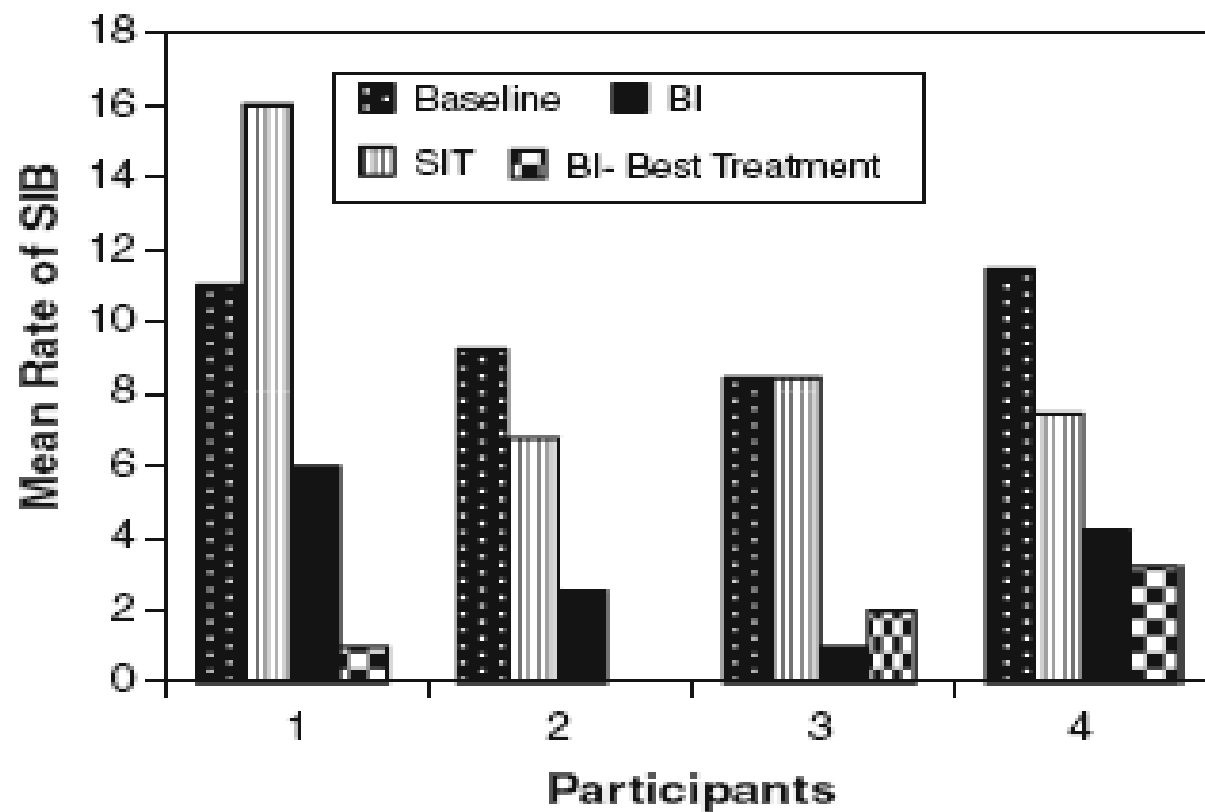


Fig. 1 Mean rate of occurrence of SIB and challenging behavior observed in baseline, alternating treatments and best treatment phases



Findings...

zero levels during a behavioral intervention phase. Together these studies demonstrate the importance of providing function-based treatment for challenging behavior. In each of these studies the behavioral intervention was designed based on a functional analysis or a thorough functional assessment of the problem behavior presented. The behavioral intervention was successful in reducing and eliminating the target behavior. However, during sensory-integration therapy, techniques were applied without an analysis of the function of the behavior under investigation. As a result the behavior may have been reinforced through positive social reinforcement.



POLICY STATEMENT

Sensory Integration Therapies for Children With Developmental and Behavioral Disorders

“One recent small study (Devlin et al., 2011) cautions health care practitioners about the possible negative behavioral effects of sensory integration therapy in certain populations”, (Pediatrics, 2012)

“Results from this study clearly demonstrated that the behavioral intervention was more effective in reducing challenging behavior and self-injurious behavior than was the sensory integration therapy. Finally, in the best treatment phase, only the behavioral intervention was implemented, and further reduction was observed in the frequency of challenging behavior and self-injurious behavior”.

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RECOMMENDATIONS:

- At this time, pediatricians should not use sensory processing disorder as a diagnosis.
- Pediatricians should recognize and communicate with families about **the limited data on the use of sensory-based therapies** for childhood developmental and behavioral problems
- The family, pediatrician, and other clinicians should work together to prioritize treatment on the basis of the effects the sensory problems have on a child's ability to perform daily functions of childhood.



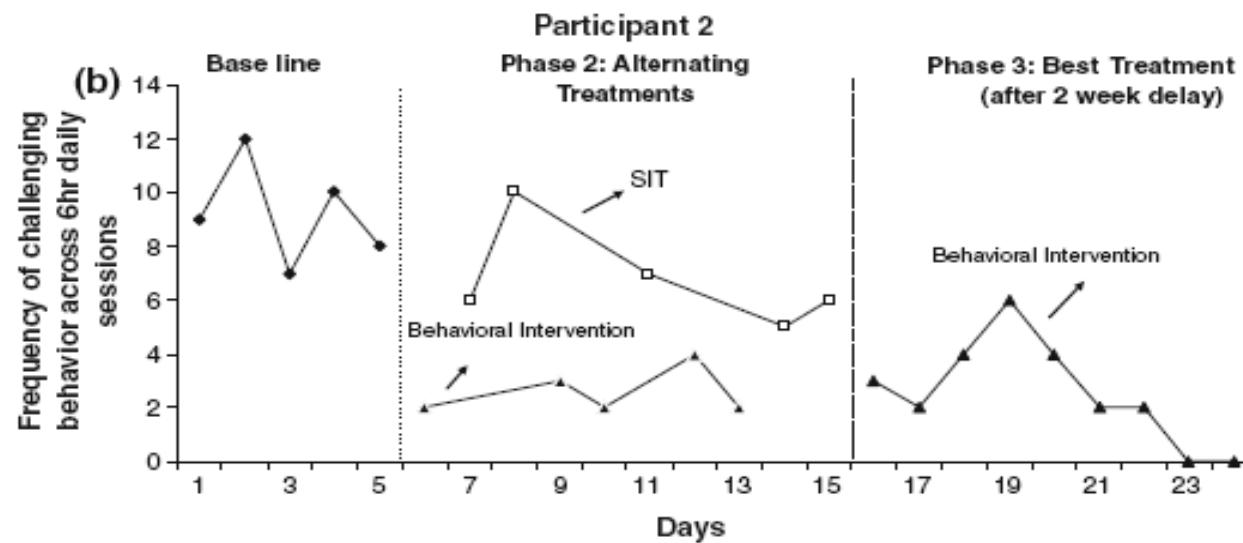
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However... in Devlin et al., 2011

the nature of sensory integration therapy, it is often proposed as a necessary treatment option for stereotypy or behaviors maintained by automatic reinforcement. In the current study, the functional assessments did not identify an automatic function for the behaviors displayed by any of the participants. Future research should examine the efficacy of SIT for behaviors that potentially have a sensory function as opposed to those maintained by environmental events.



The Alternating Treatments Design drew some attention...



- Some practitioners and researchers believed that there may be **a latency** involved with respect to observing the benefits of SIT.
- Kay and Vyse (2005) specified that “the effect of brushing and joint compressions would be most noticeable in the two hours after treatment” (p.270).



In Further Studies we Decided to Address these Issues...

Lydon and Healy, 2012

- The current research aimed to evaluate the effects of SIT on **various topographies** of aberrant behaviours, as well as self-injury/aggression in persons with autism diagnoses.
- Furthermore, such challenging behaviours presented with **differential functions** across participants and allowed for the analysis of SIT in relation to such functions.
- **An AB cross-over design** was selected to control for a sequence effect from the order of treatment delivery.
- This enabled the evaluation of a more extended application of both SIT and BI across **a block of time** with two groups of participants receiving both interventions.
- **A 10 day period** was selected as the duration for each treatment based on Schreck and Miller's (2010) recommendation that a two week period was an appropriate duration to assess the effectiveness of behaviour change from an alternative treatment.



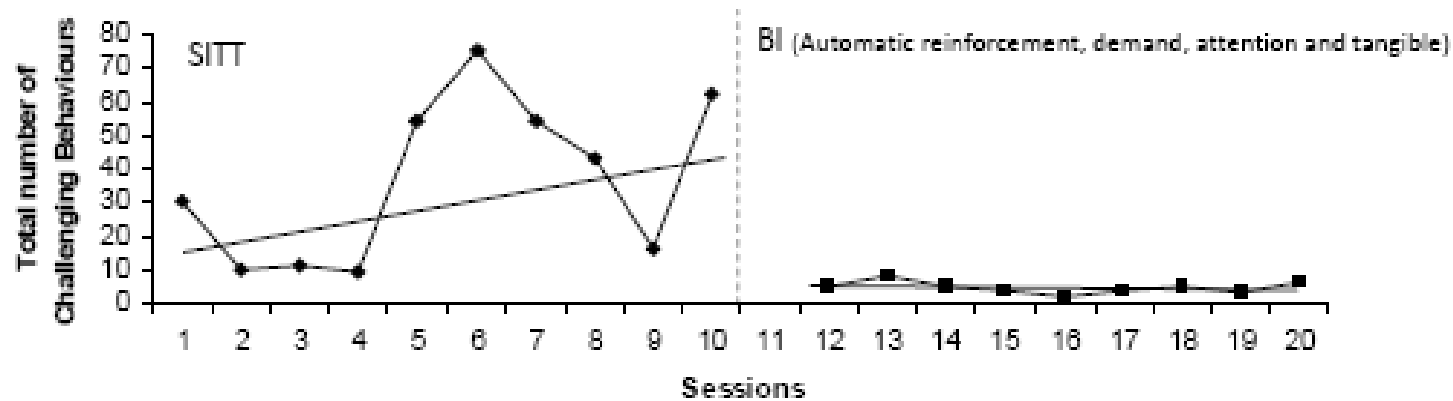
A-B Crossover

- Participants 1-5 received Sequence 1, which involved delivery of SIT for 10 days followed by BI for 10 days.
- Participants 6-10 received Sequence 2, which involved delivery of BI for 10 days followed by SIT for 10 days.

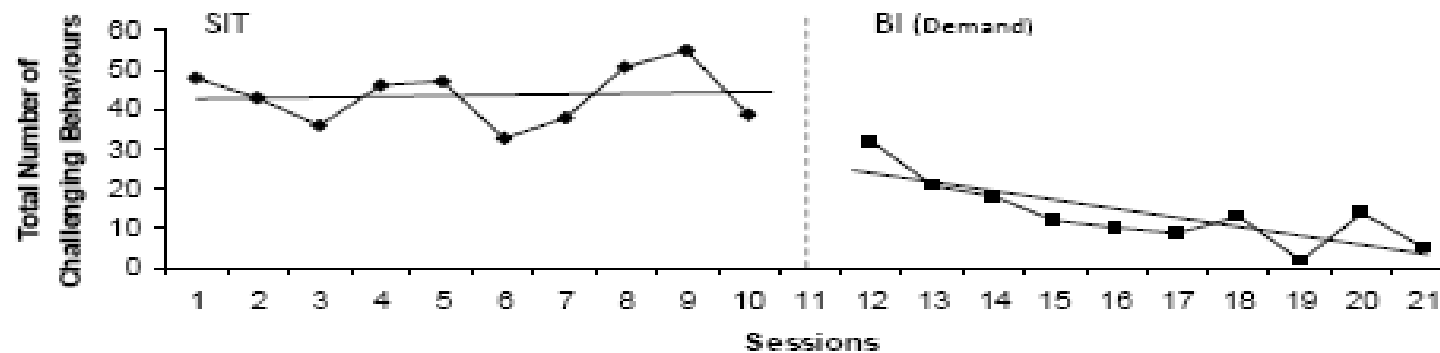


SIT -> BI Sequence

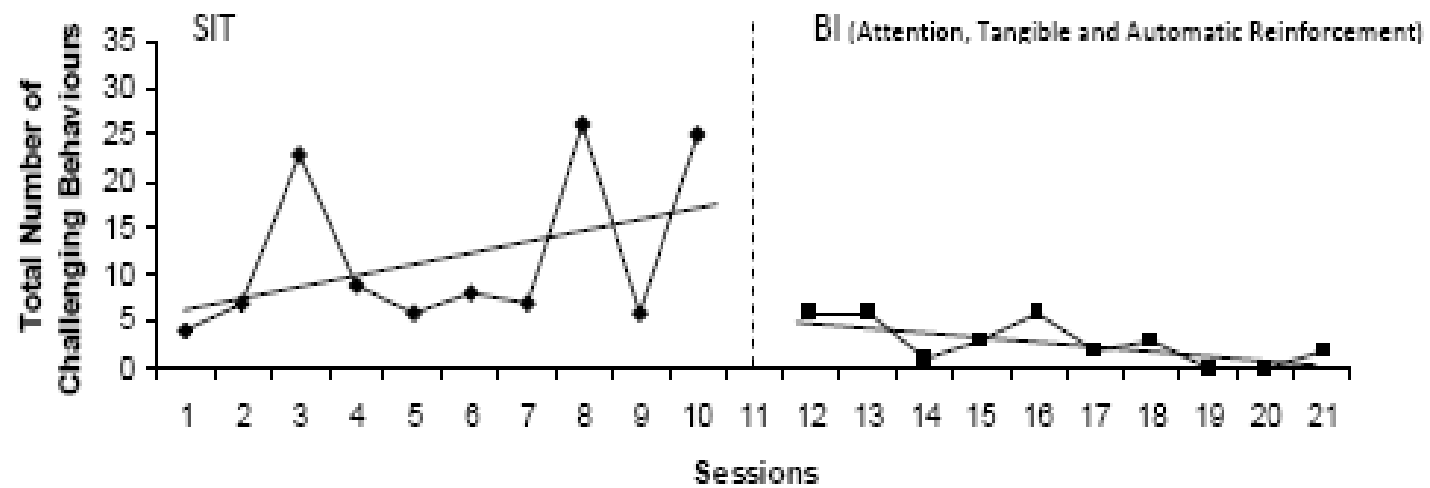
Participant 1 Total Challenging Behaviours



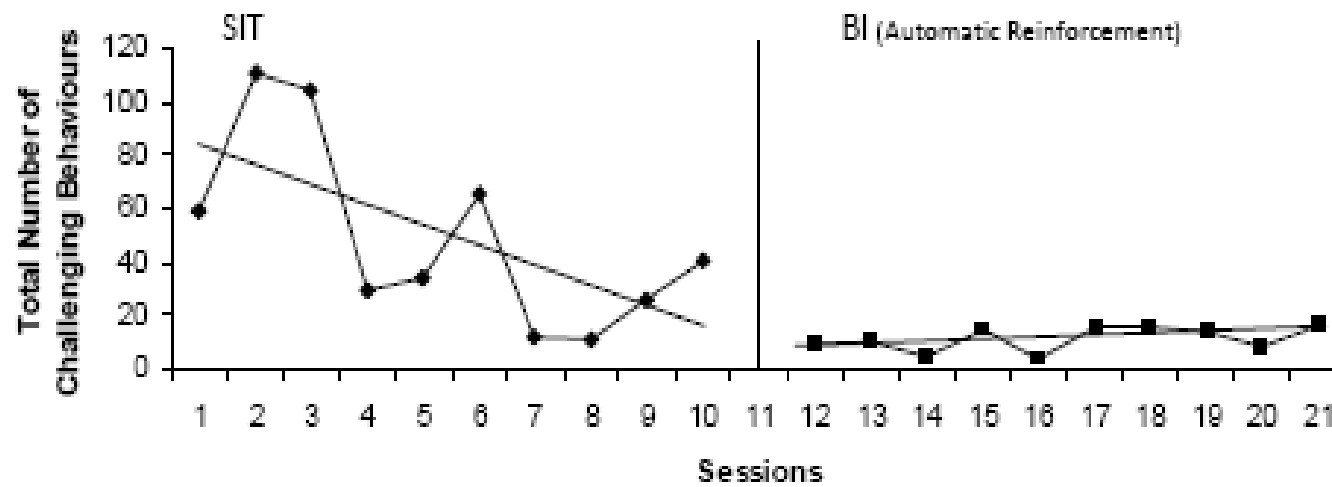
Participant 2 Total Challenging Behaviours



Participant 3 Total Challenging Behaviours

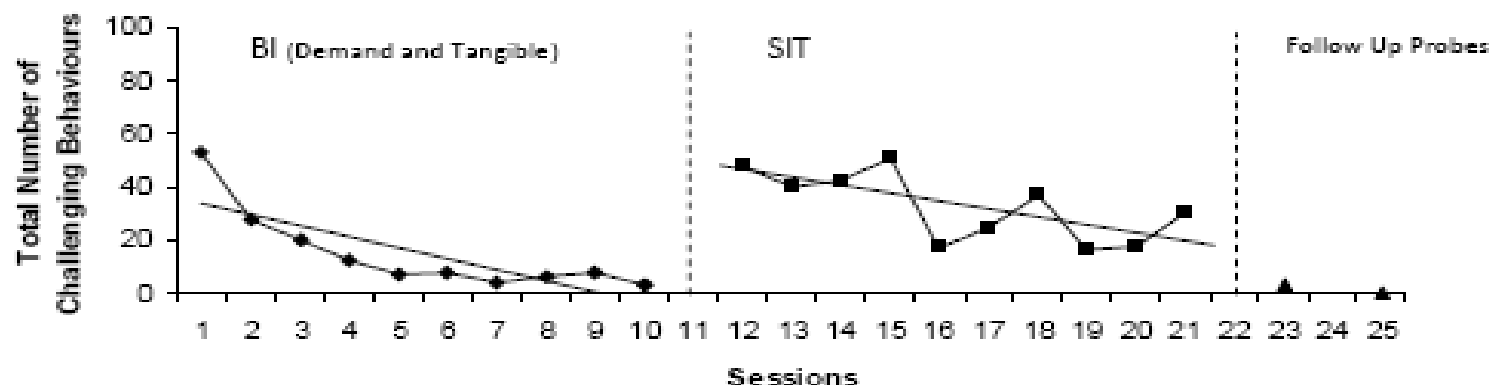


Participant 4 Total Challenging Behaviours

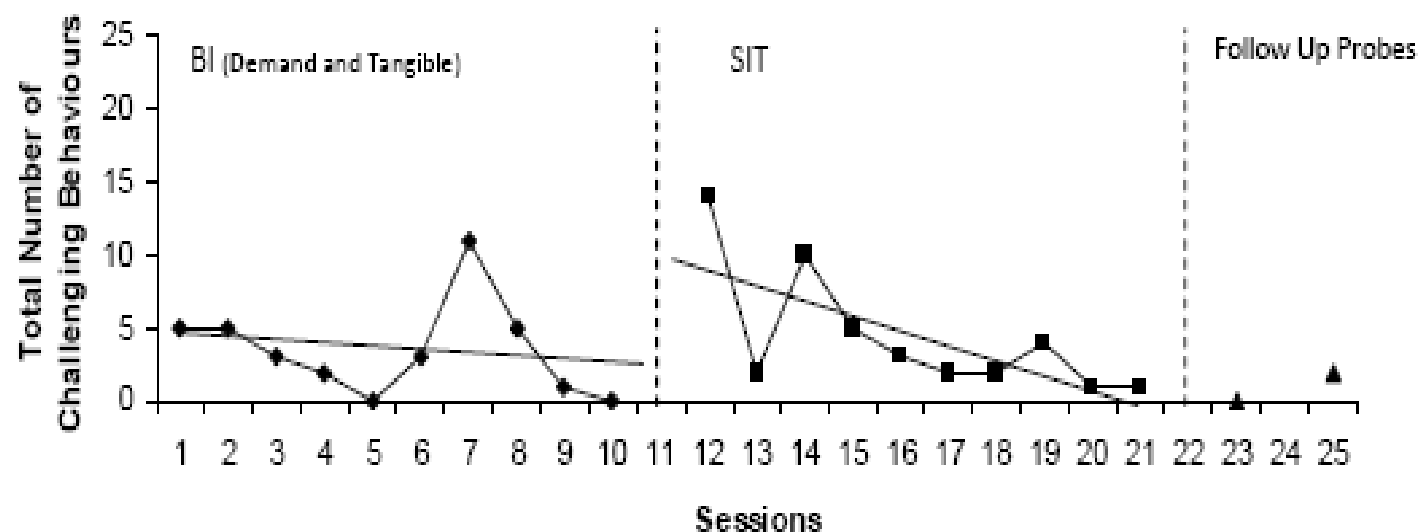


BI-> SIT Sequence

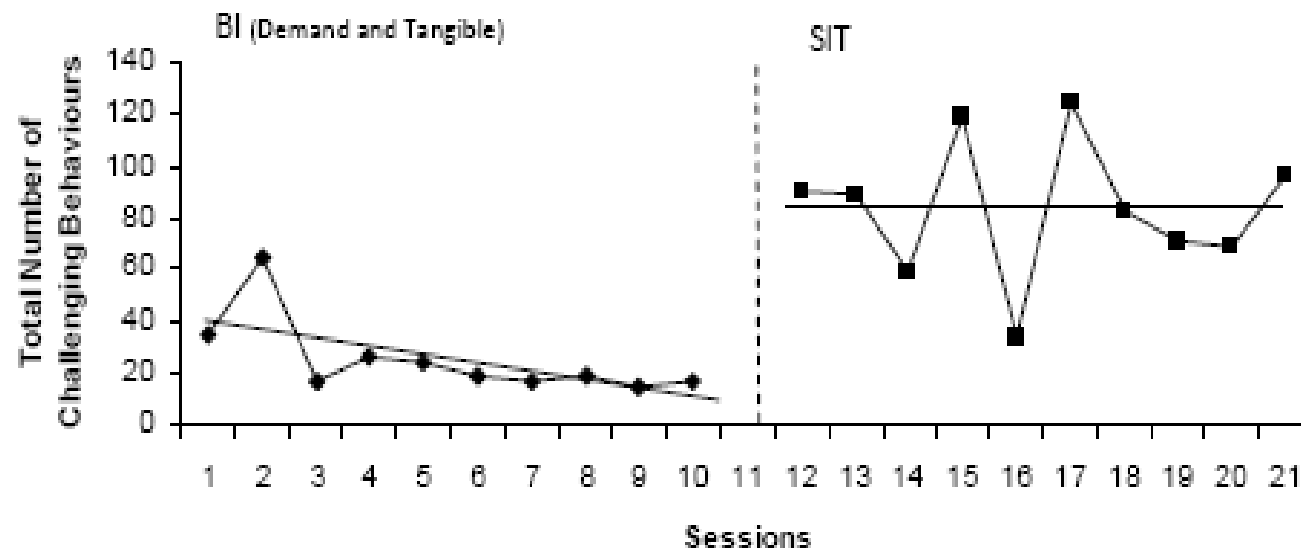
Participant 6 Total Challenging Behaviours



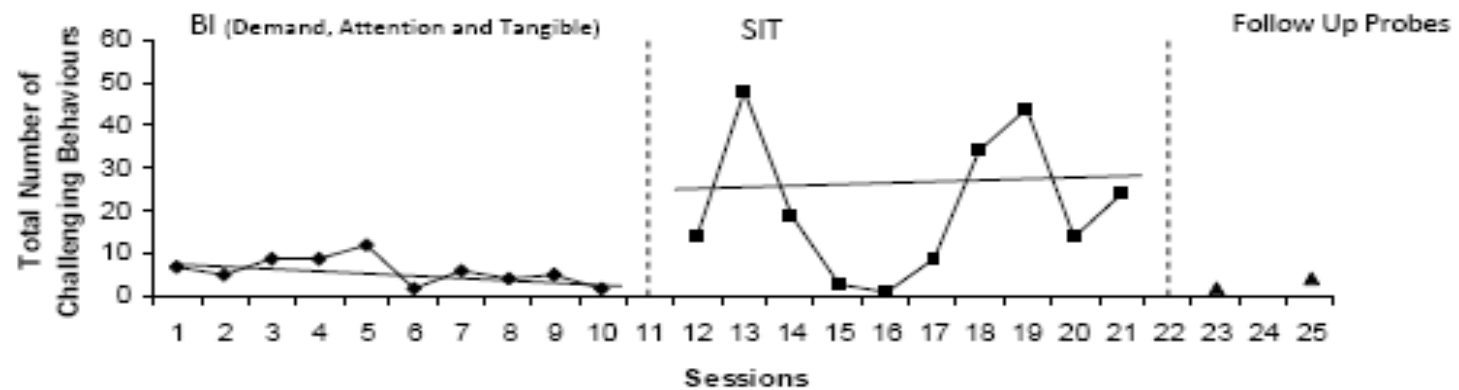
Participant 7 Total Challenging Behaviours



Participant 9 Total Challenging Behaviours



Participant 10 Total Challenging Behaviours



The importance of function...

During SIT, contingent on the occurrence of challenging behaviour, participants **accessed a sensory technique, which also, concurrently, provided social positive reinforcement or escape from demands**, which were the maintaining variables for their target behaviours e.g.,

Participant 1: Escape from demand and Attention;

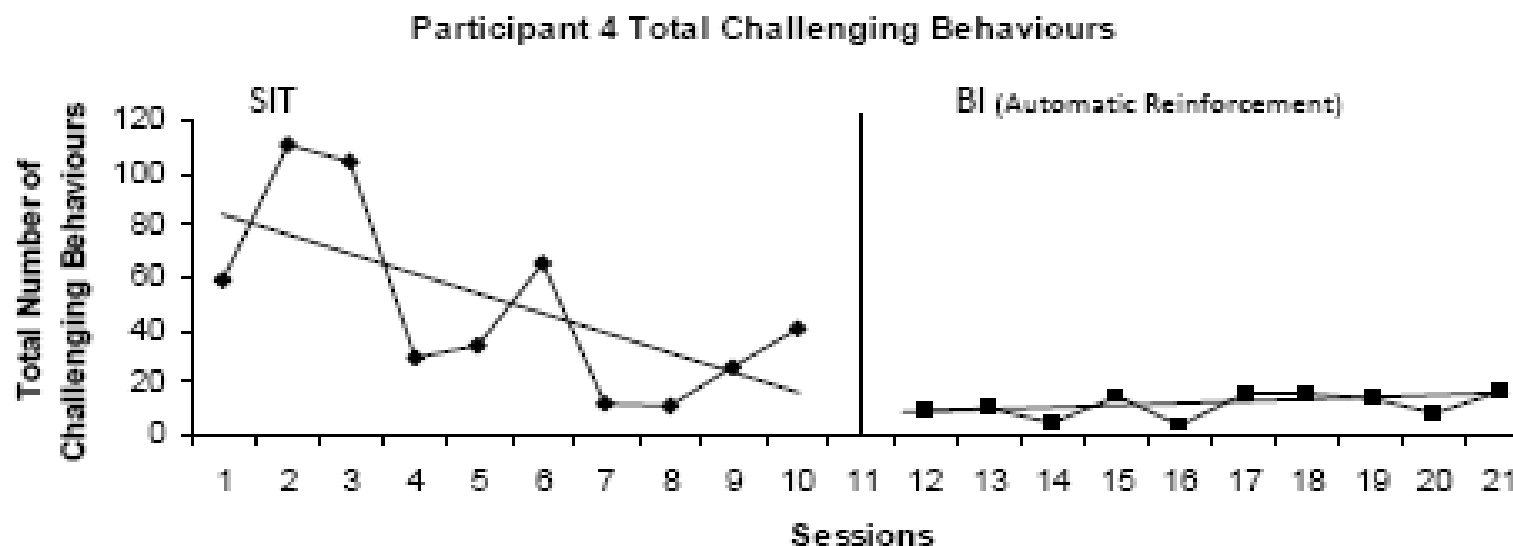
Participant 3: Attention;

Participant 9: Escape from demand;



Automatically reinforcing behaviour?

A function of competing stimulation, rather than actual therapeutic benefits ? (Mason & Iwata, 1990)



We decided to investigate this...

Lydon & Healy, 2012

- We employed a multiple baseline design, across participants, to evaluate the application of Sensory Integration Therapy to behaviours maintained by **automatic reinforcement** and to compare the effects of **functional versus arbitrary** reinforcement typically employed in SIT.
- All three participants demonstrated repetitive behaviour/stereotypy maintained by a single function of automatic reinforcement.



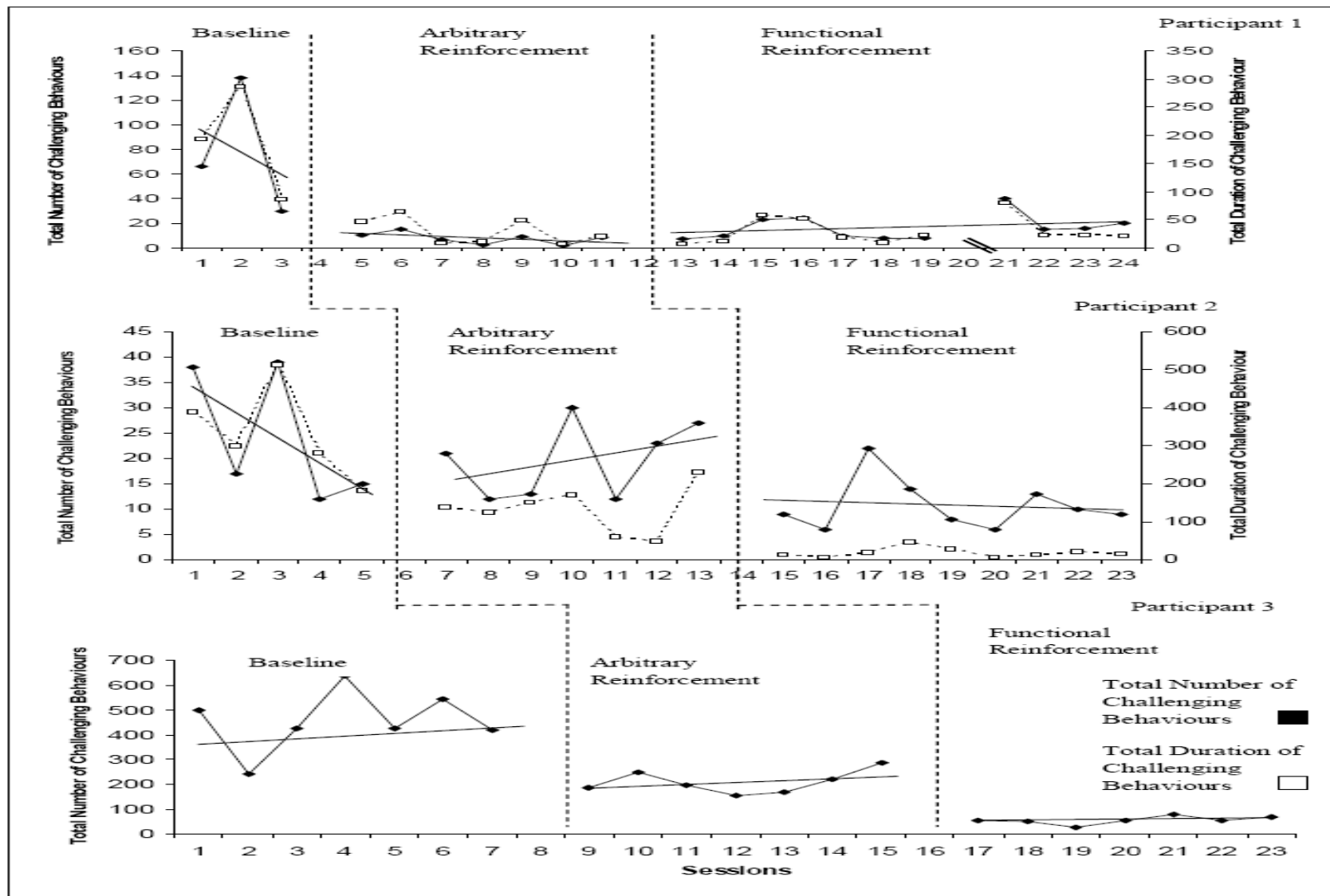


Figure 5.10 Multiple Baseline of Challenging Behaviour across Participants



An Examination of Inhibitory Stimulus Control on Echolalia.

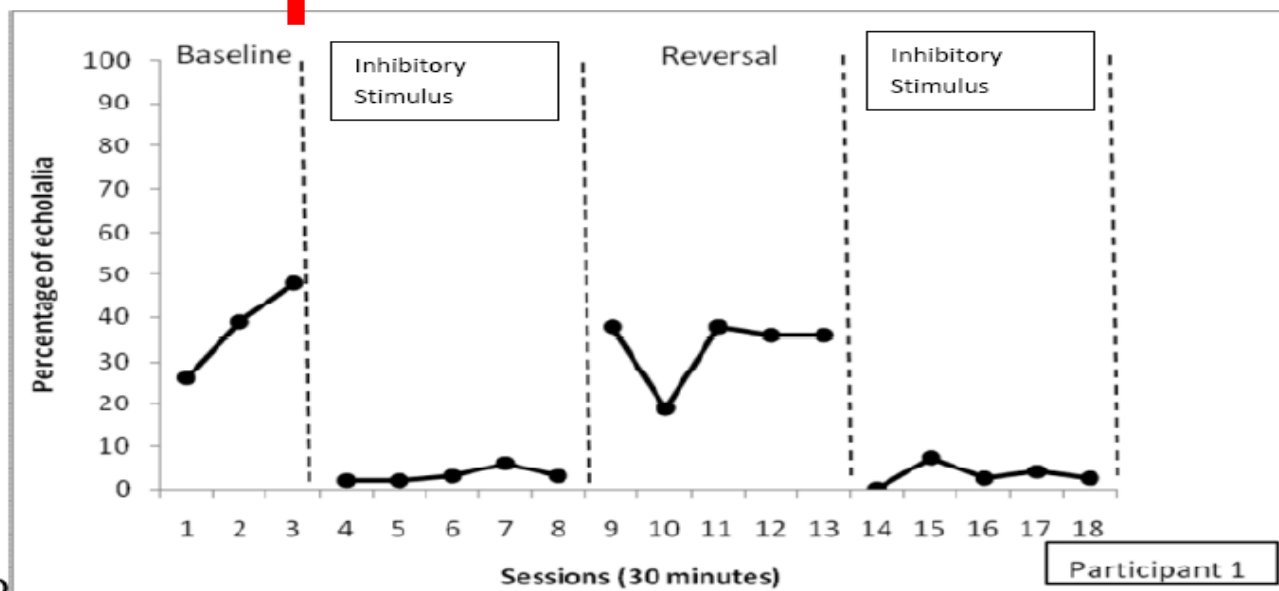
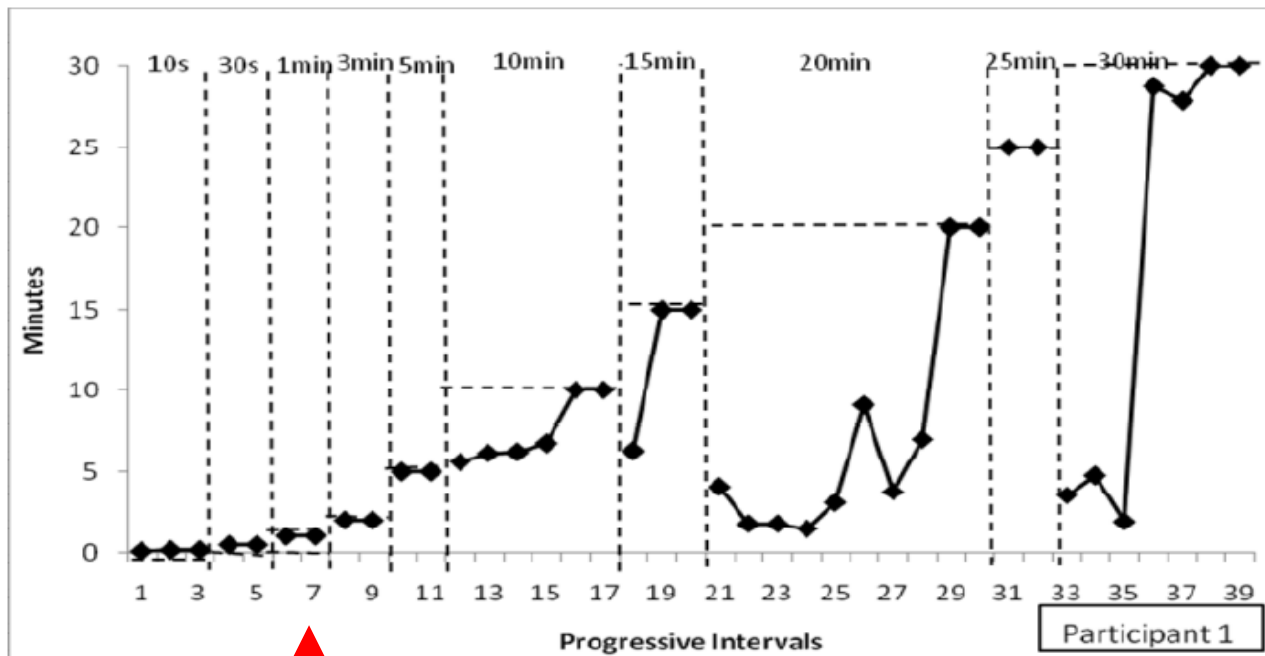
Healy, Brady & Holloway, 2013

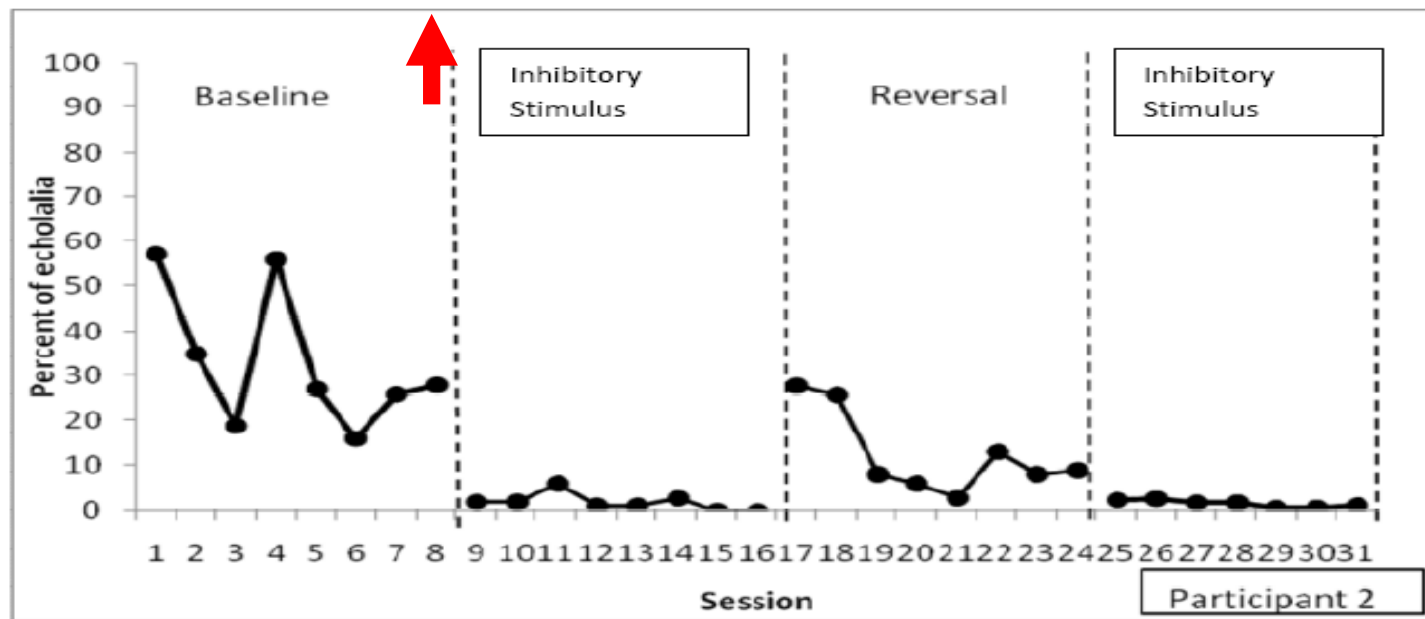
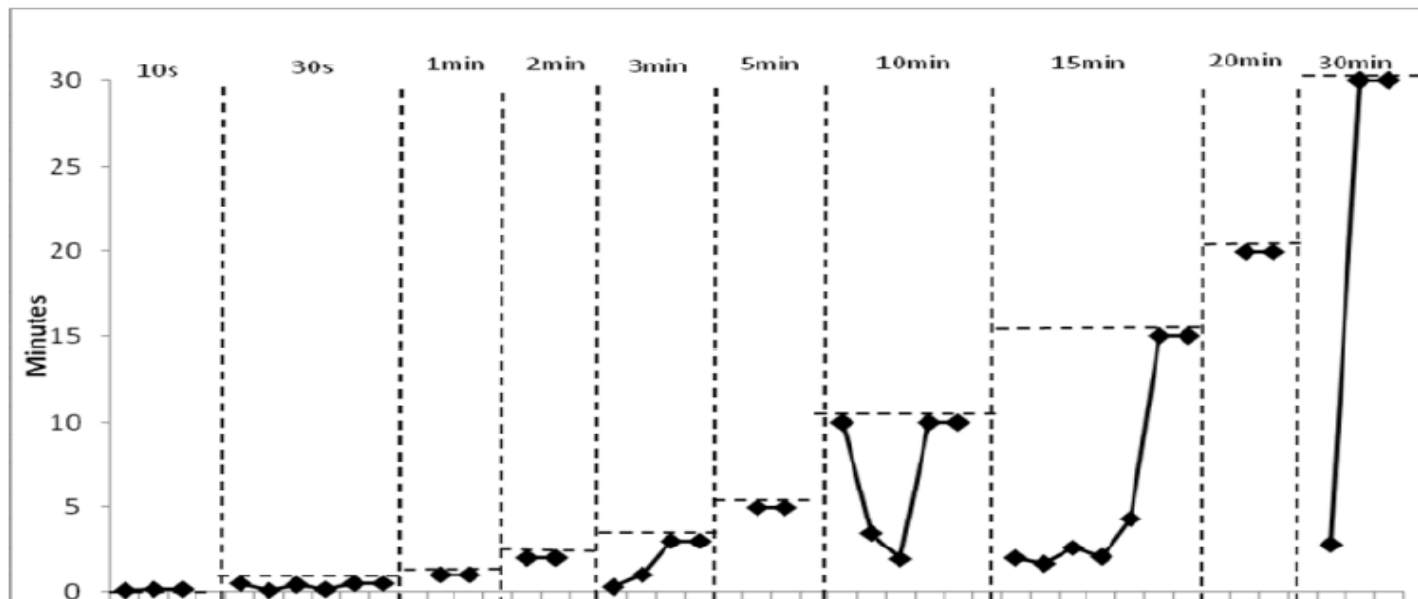
- Stimulus control is an emerging popular area of research that is reflecting promising results in the treatment of stereotypy.
- Control of behaviour by antecedent stimuli is ubiquitous in the natural setting. Therefore, it is necessary and crucial that future research in behavioural interventions for automatically reinforced stereotypy continues to harness the power of stimulus control in designing and evaluating interventions for stereotypy based on the principle of stimulus control.

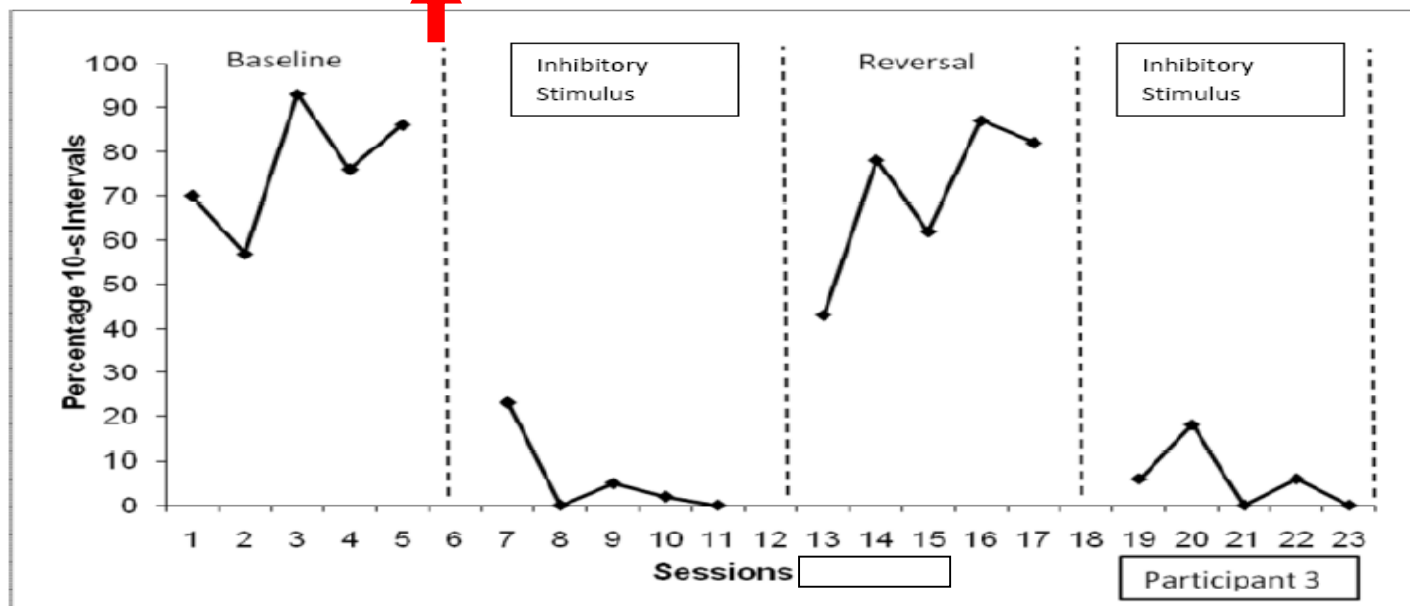
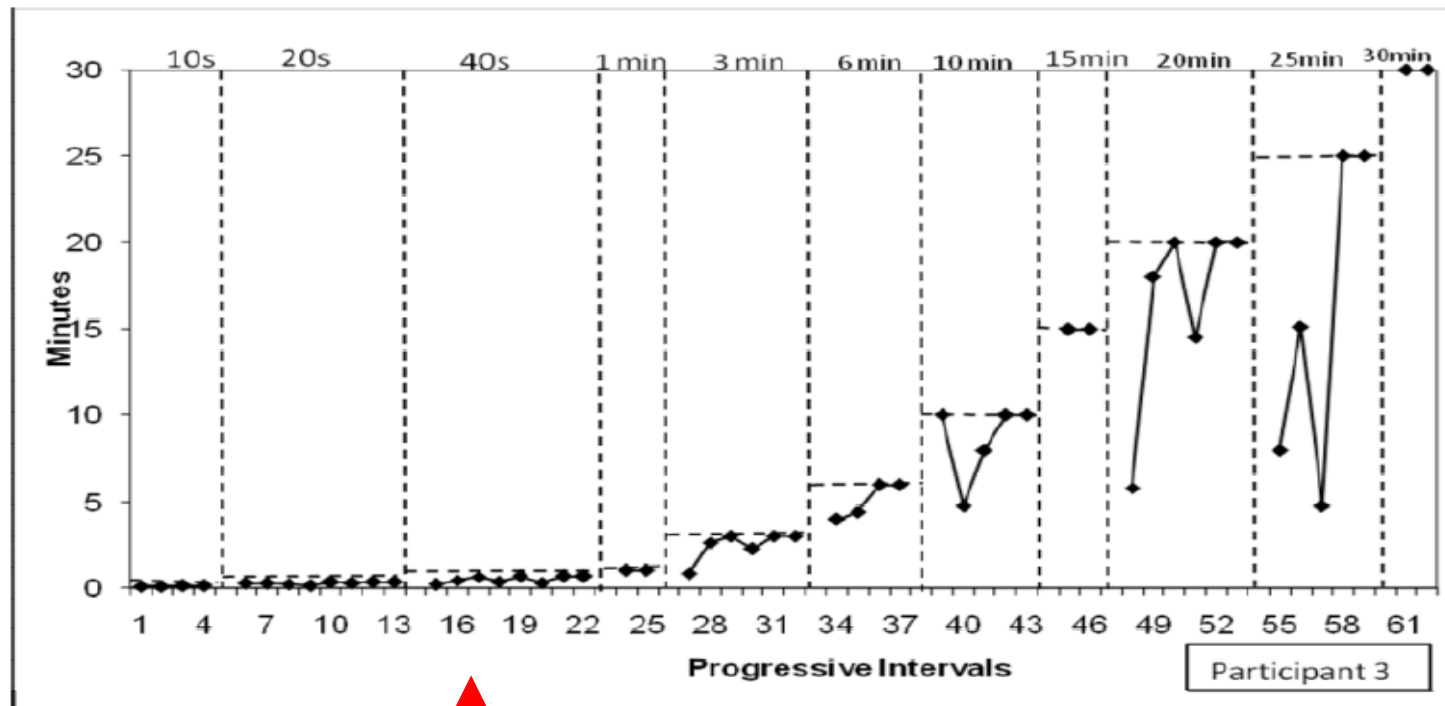


- An ABAB design with an embedded changing criterion design was used to demonstrate functional control of an inhibitory stimulus on vocal stereotypy (shown to be maintained by automatic reinforcement during functional analysis) in three participants with autism.











Communication Repertoires and Interventions in Autism



NUI Galway
OÉ Gaillimh

A dyadic analysis of the effects of setting and communication partner on elicited and spontaneous communication of children with Autism Spectrum Disorder and typically developing children

Ita Forde, Jennifer Holloway *, Olive Healy, Julie Brosnan

- We examined spontaneous and elicited communication in children with ASD in comparison to age matched typically developing children. N=18 (nine children diagnosed with Autism and nine typically developing children).
- Each participant was video recorded for 2 h 15 min periods across two conditions (academic activity and free-time).



Table 2

Mean number of communication operants for spontaneity of communication emitted to a communicative partner and diagnosis.

ASD	Communicative partner	Spontaneity	Mean
ASD	Peer	Spontaneous	→ 1.23
ASD	Peer	Elicited	0.12
ASD	Teacher	Spontaneous	→ 5.91
ASD	Teacher	Elicited	5.64
Typically developing	Peer	Spontaneous	→ 10.44
Typically developing	Peer	Elicited	3.49
Typically developing	Teacher	Spontaneous	2.30
Typically developing	Teacher	Elicited	1.29



Table 3

Mean number of functions of communication emitted in each condition and diagnosis.

Function of communication	Condition	Mean ASD	Mean typically developing
Request	Academic	→ 10.17	5.00
	Free time	1.72	3.67
Mands for information	Academic	2.89	→ 7.03
	Free time	0.75	3.28
Mands for attention	Academic	2.09	2.03
	Free time	1.11	2.61
Greetings	Academic	1.39	0.028
	Free time	0.333	0.167
Terminate an activity	Academic	0.528	0.056
	Free time	0.028	0.111
Comment	Academic	→ 19.528	20.611
	Free time	6.361	17.972
Negotiation	Academic	→ 4.917	0.944
	Free time	0.139	1.333
Autoclitics	Academic	→ 1.944	5.361
	Free time	0.139	5.222
Reject	Academic	1.639	1.500
	Free time	0.639	1.972

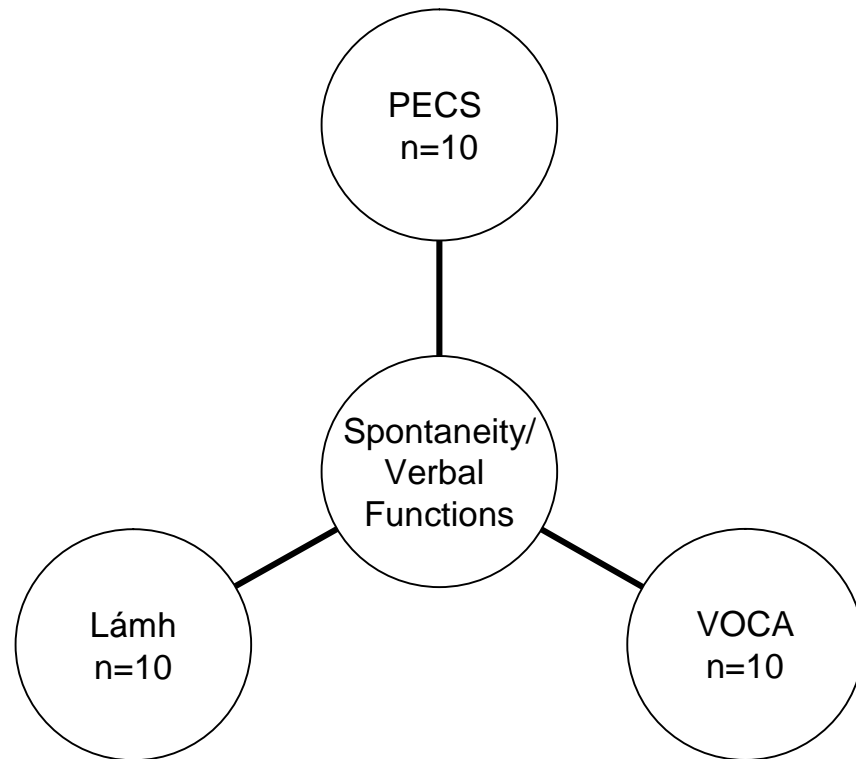


- There was a **significant difference for communication partner** whereby the main communication partner for children with ASD was an adult in contrast to typically developing children who communicated more frequently with their peers.
- Typically developing children had **more spontaneous communication** overall than children with ASD and this was mostly directed to their peers.
- Typically developing children **specified far more** using autoclitics, mands for information, mands for attention and emitted more tacts across particular conditions than children with ASD.



An Analysis of Spontaneous and Elicited Communication Functions across Topographical Communication Systems in ASD (Dwyer & Healy, 2012)

- 30 children with ASD with no vocal language (i.e., not exceeding vocalisations).
- 9 observation sessions (30 min each) across a *lunch time* setting, a *teacher-led* setting and a *free time* setting.
- Spontaneous and elicited communication were further analysed in terms of verbal behaviour functions



- All participants had a minimum of 30 acquired symbols/gestures within their communication system used without physical prompts.
- Mean age 9.3, Range 4-11 years



A significant interaction was seen between verbal operant function and group ($F_{3.636, 49.084} = 4.547, p < .05$, partial $\eta^2 = .252$).

Signers were more likely to mand for information, mand for attention, emitted more greetings and negotiation operants and descriptive autoclitics, emit intraverbals and show rejection.

Mean values:

Verbal Operant	PECS	Sign	VOCA
Request (Mands)	71.7	54.4	27.7 ←
Mand information	1.4	1.7	0
Mand attention	0.9	1.2	0.1
Greetings	4	8.5	0.6 ←
Negotiation	7.5	9.6	0.6
Relational autoclitics	1.6	1.3	2 ←
Descriptive autoclitics	4.7	13.3	2.3 ←
Tacts	17.7	17.4	4.5
Reject	4.1	9.9	2 ←
Intraverbals	17.4	25.7	3.7



A significant interaction effect was found for verbal operant and setting ($F_{714.313, 63.610} = 11.230, p < .001$, partial $\eta^2 = .294$).

Mean values below

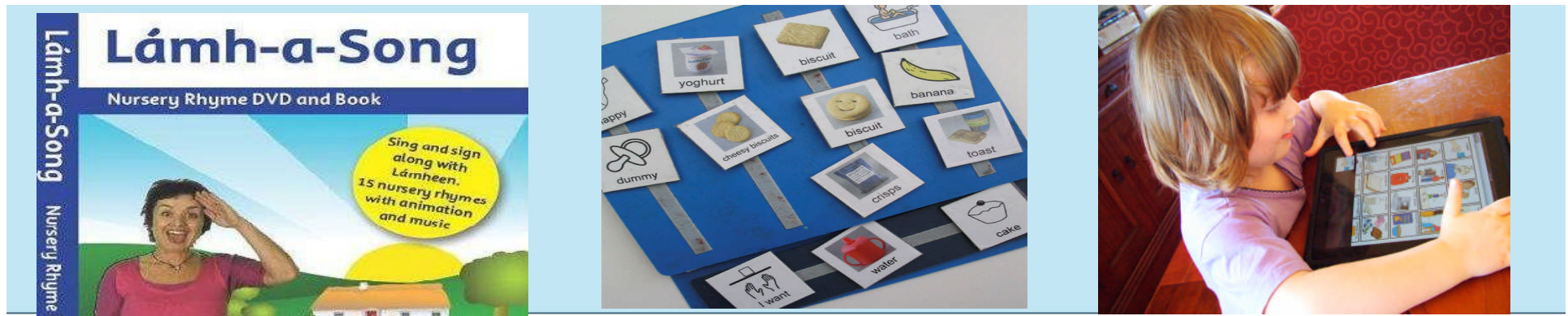
Verbal Operant	Teacher-led	Free-time	Lunch
Mand information	0.3	0.2	0.53
Mand attention	0.23	0.17	0.33
Negotiation	0	0	3.23 ←
Tact	10.53	0	0
Reject	10.53	0	0
Intraverbals	11.73	0.07	3.8 ←



The interaction between communication partner and group was statistically significant ($F_{2,27} = 4.078$, $p < .05$, partial $\eta^2 = .232$).

Comm. Partner	PECS	Sign	VOCA
Peer Directed	1.53	2.8	0.13
Adult Directed	42.13 ←	44.86 ←	14.86





- Results from this study illustrate a significant difference in frequency of communication in nonverbal children with Autism according to the type of alternative and augmentative communication used.
- **Children using sign language emitted the most instances of communication over the course of the study, followed by PECS users and finally VOCA users.**



Interventions for Increasing Behavioural Variability in ASD

- In recent years, research has been growing in the area of autism spectrum disorder and operant variability.
- Many individuals with autism spectrum disorder behave in a characteristically rigid manner.
- It has been argued that this may reflect the absence of effective reinforcement contingencies (Baron-Cohen, 1992). For this reason, increasing variability is often a goal within this population.



Lag Schedules of Reinforcement

lag reinforcement schedules (n=5)	Esch et al., 2009; Lag1 phoneme speech production	Heldt & Schlinger, 2012; Lag3 novel tacts	Lee & Sturme, 2006; Lag1 intraverbals	Napolitano et al., 2010; Lag1 variant block form and colour	Susa & Schlinger, 2012; Lag3 intraverbals
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- All of the studies examined led to an overall increase in variability of the target behaviour in question.
- **Experimental control** was evident in the reported magnitude and rate of change in variability in three of the studies (Heldt & Schlinger, 2012; Napolitano et al., 2010; Susa & Schlinger, 2012).
- Two studies showed issues with **reinforcer effectiveness** (Lee & Sturmey, 2006; Esch et al., 2009).



Variability and Verbal Behaviour

Connolly & Healy, 2013

- While communication deficits form part of the diagnostic criteria for ASD, repetitive and fixed verbal behaviour is noted as prevalent amongst this population (Susa & Schlinger, 2012).
- Growing focus on the use of lag schedules of reinforcement to increase vocal variability in children with a diagnosis of ASD (Esch, Esch and Love, 2009).



Intervention

Following Baseline:

Tact-Mand Contingency:

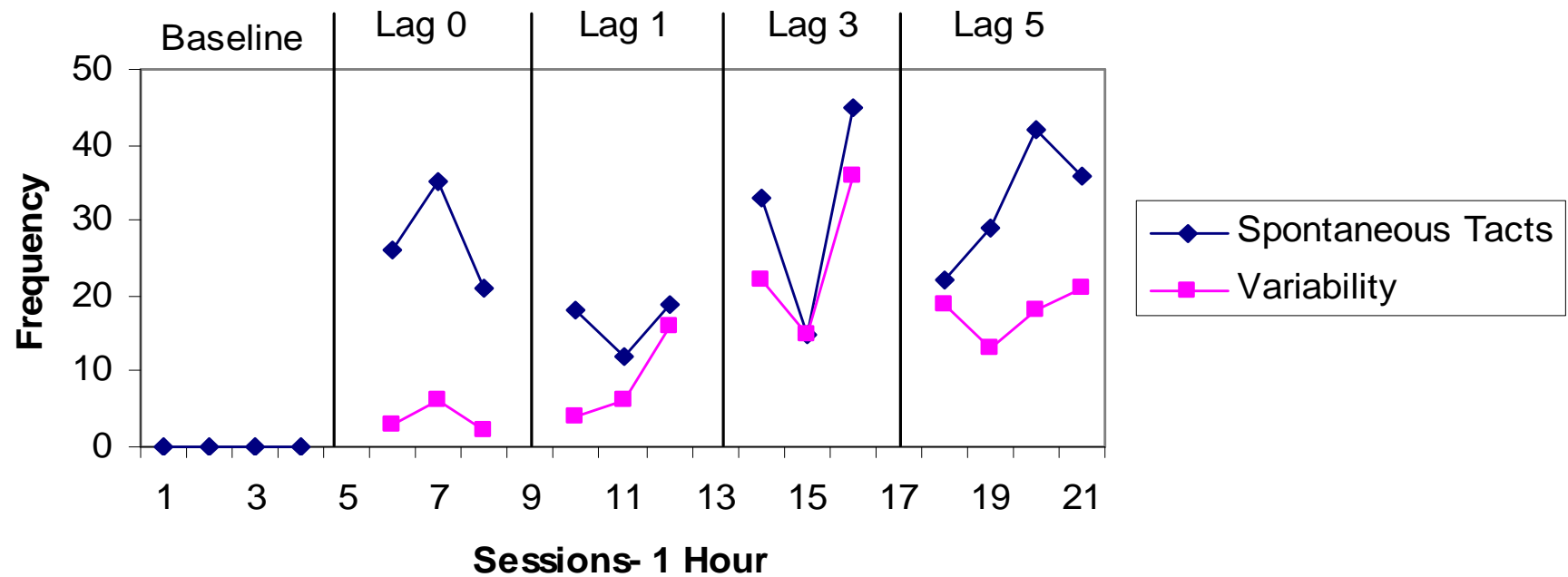
- Preference Assessments
- Training Phase- Prompt Fading
- FR1 Access to Preferred Items
- Environmental Enrichment

Lag Schedules of Reinforcement:

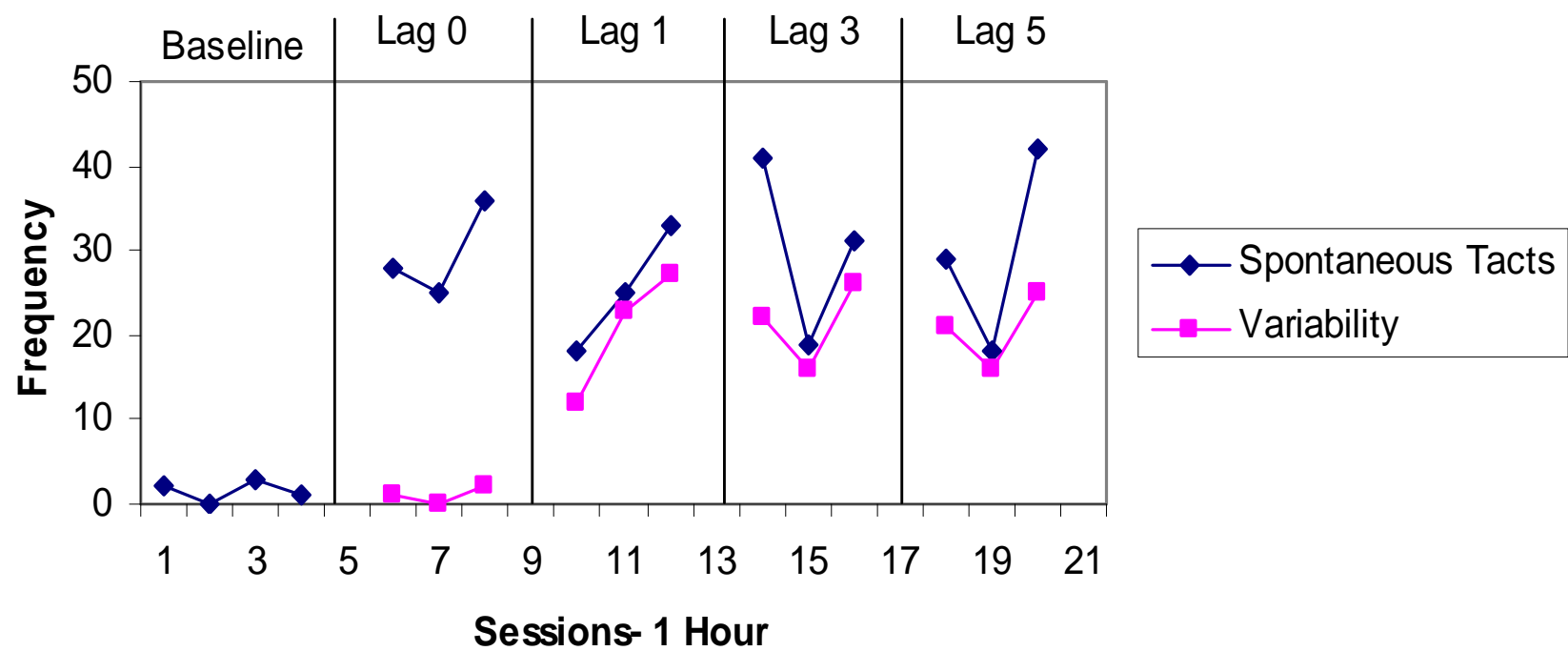
- Lag 0
- Lag 1
- Lag 3
- Lag 5



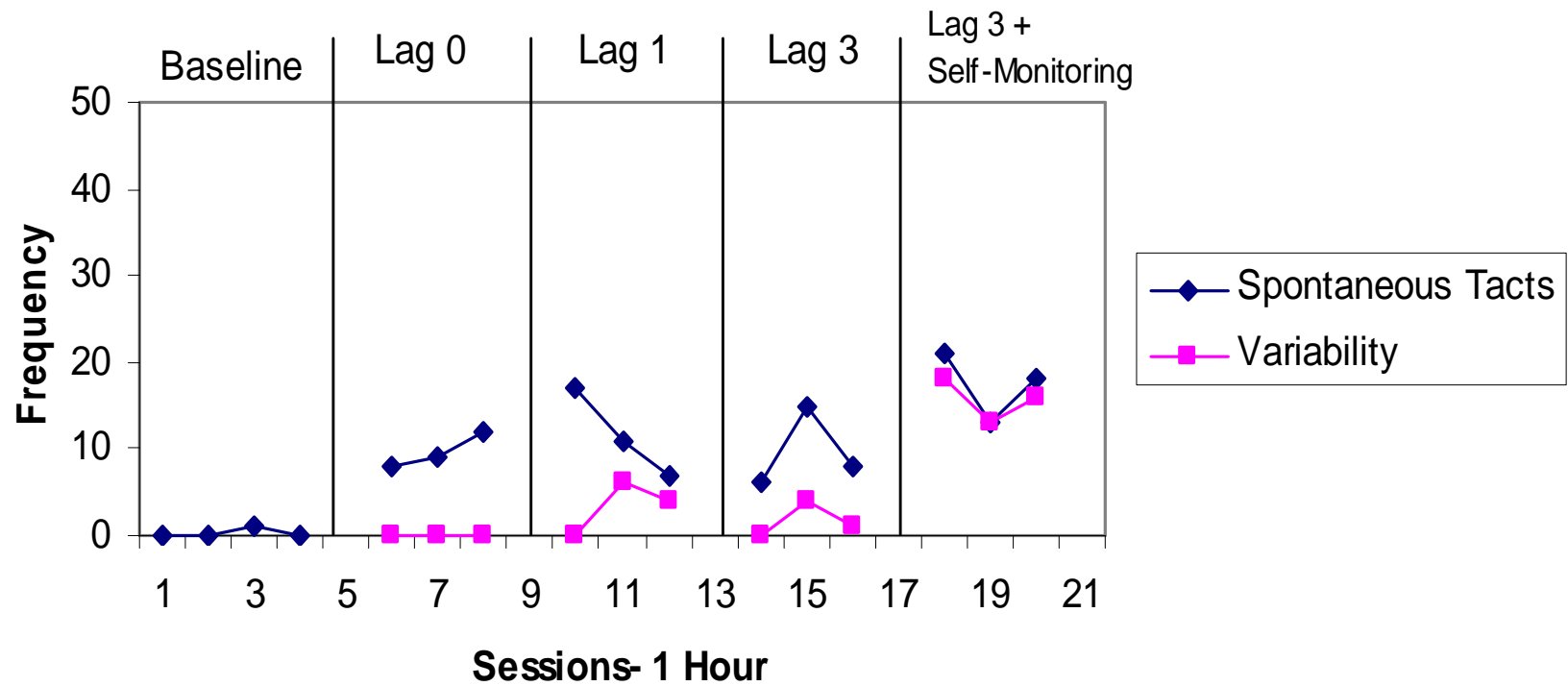
Participant 1



Participant 2



Participant 3



The End...
Thank You !!



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