

DIAGNOSIS AND TREATMENT OF CO-OCCURRING CAS AND ASD: Research Review + Practical Tips

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WELCOME!



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Received a grant from TU to complete a study related to treatment for children with CAS and ASD (ACT4CAS)

No financial disclosures

CHILDHOOD APRAXIA OF SPEECH (CAS)

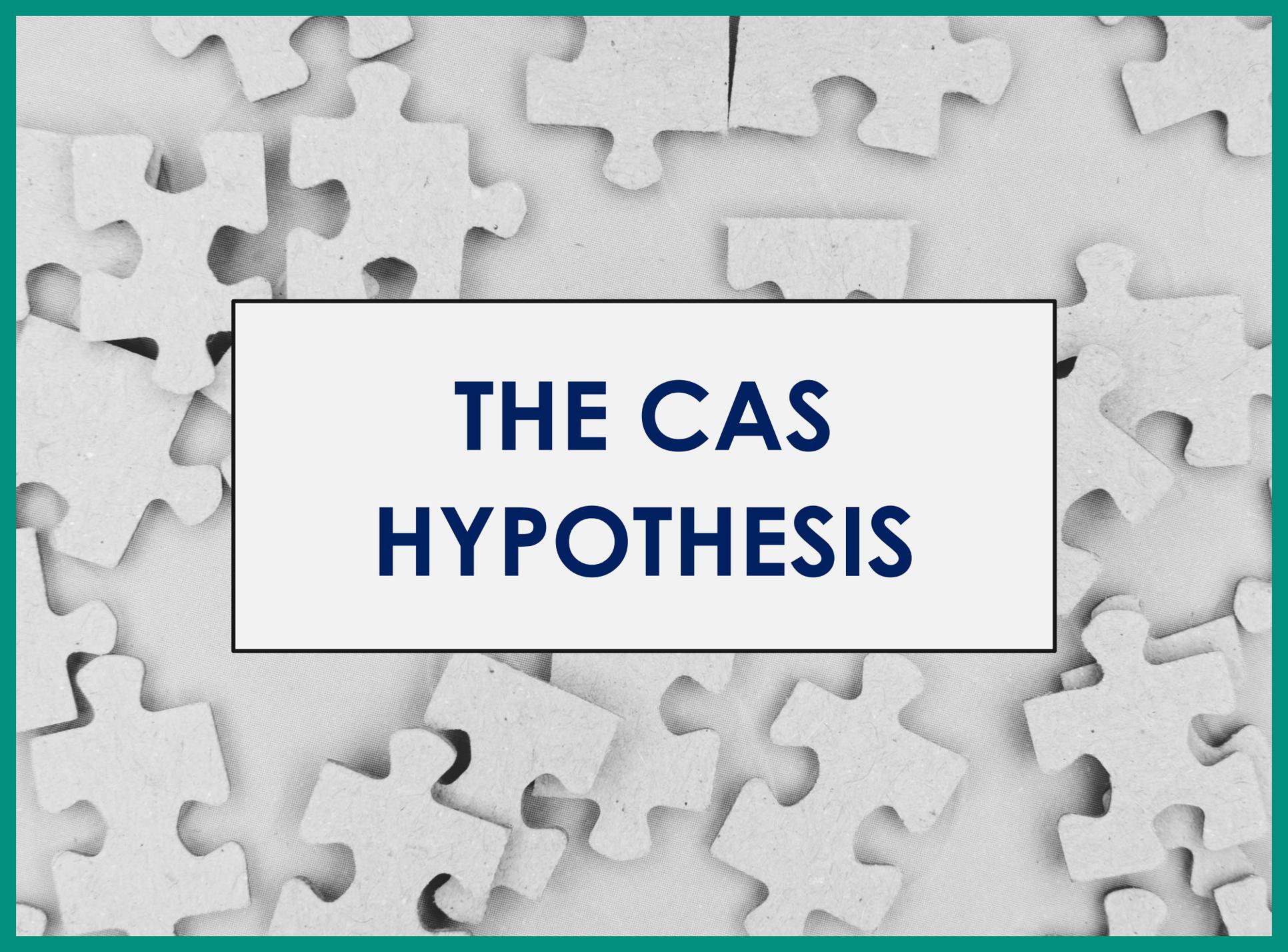


- CAS is a type of SSD that impacts the ability to effectively plan and program speech movements (ASHA, 2007)
- Occurs in 1 to 2 per 1,000 children (Shriberg et al., 2011)
 - More common in males than in females (Hall et al., 1993; Lewis et al., 2004)
- Gold standard for diagnosis remains expert judgement, based on core features (ASHA, 2007)
- Nonspeech sensory and motor problems can co-occur (e.g., gross and fine motor delays, oral apraxia; Teverovsky et al., 2009; Tükel et al., 2015) particularly among those who also have language disorders (Iuzzini-Seigel, 2019)

AUTISM SPECTRUM DISORDER (ASD)

- About 1 in 54 children diagnosed with ASD (1 in 34 boys; Maenner et al., 2020)
- Many are late talking (Mitchell et al., 2006), up to one third are minimally verbal (Rose et al., 2016; Howlin et al., 2014)
 - Communication difficulties often stem from poor language, but a subset of children with ASD has speech sound disorders (SSD; Cleland et al., 2010; Rapin et al., 2009; Shriberg et al., 2001)
 - Early motor development linked to communication development (Belmonte et al., 2013; Bhat et al., 2012; Gernsbacher et al., 2008)





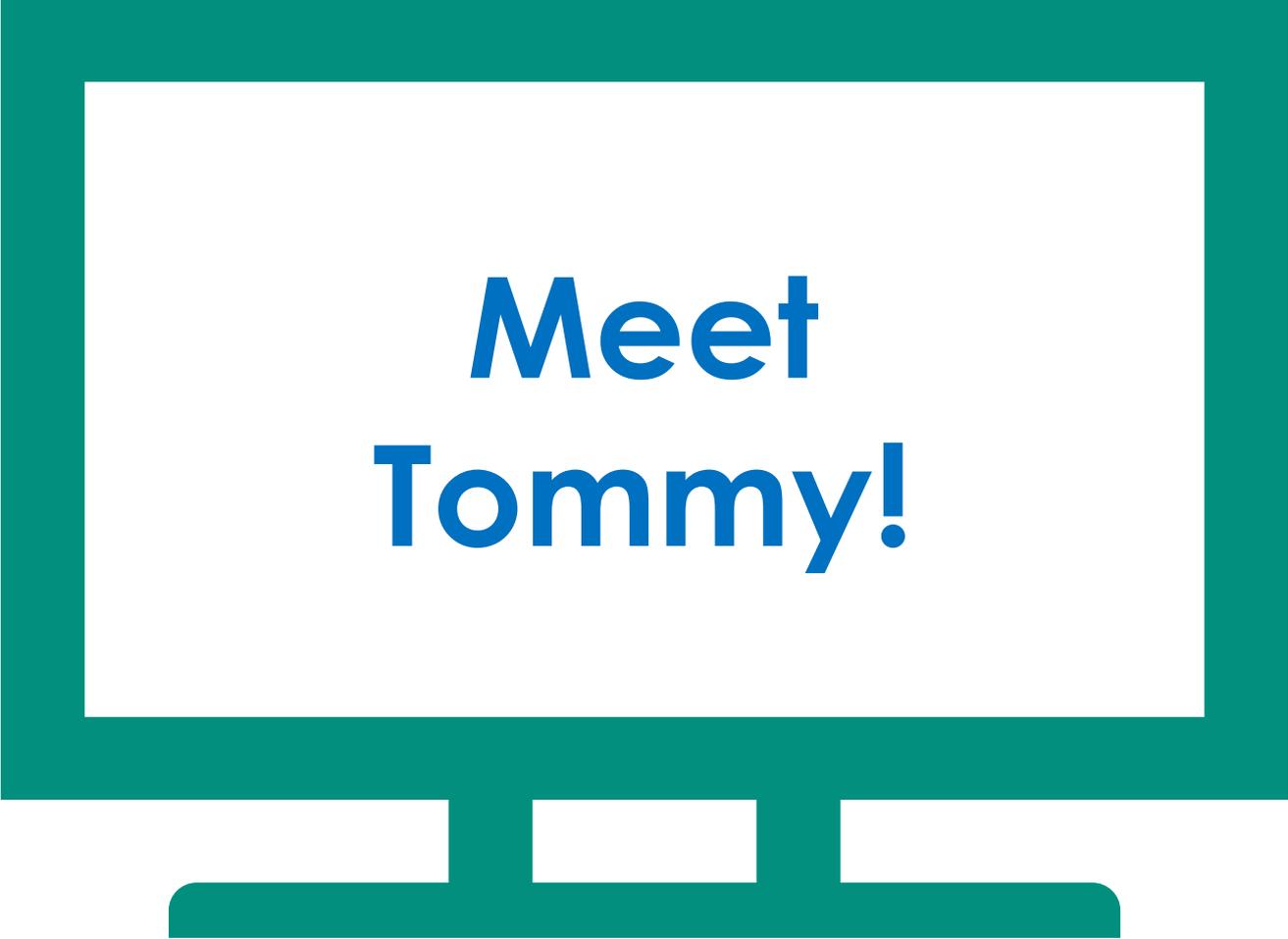
THE CAS HYPOTHESIS

CAS + ASD



Conflicting reports of degree of comorbidity, but documented cases exist (Chenausky et al., 2019)

- Estimates of comorbid CAS + ASD range from none to most (Shriberg et al., 2011; Tierney et al., 2015)
- Preliminary genetic evidence for a shared phenotype (Peter et al., 2019)
- SLPs suspect CAS in 1 in 6 children with ASD on their caseloads (Dawson, 2010)



**Meet
Tommy!**



ADVICE FOR PARENTS

Ask questions:

Is it possible that my child has ASD?

Is it possible that my child has CAS?

Gather information:

I want a comprehensive evaluation!

DIAGNOSIS:

Selecting the
Right Tools



SPEECH ASSESSMENT

1. **Case history**, parent/client interview
2. **Hearing assessment**
- ➔ 3. **Oral mechanism exam**, to rule out structural or functional abnormalities
4. **Standardized assessment** (typically spontaneous production of single words, e.g., GFTA)
- ➔ 5. **Dynamic motor speech assessment** (informal or formal, e.g., DEMSS)
 - Including targets with varying sounds, syllable shapes, and stress patterns
- ➔ 6. **Conversational speech sample analysis**
 - Phonemic repertoire, PCC, syllable shapes, intelligibility, prosodic features

Multiple sampling methods are recommended for comprehensive speech assessment (McLeod & Baker, 2014, Stoel-Gammon & Williams, 2013)

SPEECH ASSESSMENT

Broome et al (2017) conducted a systematic review of the speech assessments used with children with ASD in research studies...

1. Case history
2. Hearing assessment
3. Oral mechanism exam
4. Standardized assessment
5. Dynamic assessment
6. Conversational speech sample

Multiple sampling methods are recommended for comprehensive speech assessment (McLeod & Baker, 2014, Stoel-Gammon & Williams, 2013)



ADVICE FOR PARENTS

Ask for a speech assessment:

Is it possible that my child has CAS?

Review the assessment plan:

What kind of tools will you use to evaluate my child's speech?

- Both standardized and informal tasks?
- Conversational speech sample analysis?
- Dynamic testing?



CHALLENGES TO SPEECH ASSESSMENT

All the typical challenges of diagnosing CAS (e.g., lack of a single, validated list of discriminative features) PLUS:

- Limited **joint attention** (Dawson et al., 2004)
- Difficulty using **eye gaze** to interpret models (Drysdale et al., 2018; Vivanti et al., 2008)
- **Adverse behaviors**, particularly when challenged (Koegel et al., 1992)
- **Sensitive to touch**
- **Minimally verbal** or nonverbal →
- Atypical **prosody** (McCann & Peppe, 2003; Paul et al., 2005, Peppé et al., 2011, Shriberg et al. 2011)
- **Self-directed or stereotyped speech** (Charman et al., 2003; Paul et al., 2008)

Among MV children with ASD, intelligence ranges from profoundly impaired to average. About half have higher NV intelligence (Hus Bal et al., 2016)

ASSESSMENT PLAN

Broome et al. (2017)

1. Case history, interviews
2. Oral mechanism exam and hearing screening



**Oral Mech
Exam**

ASSESSMENT PLAN

Broome et al. (2017)



1. **Case history, interviews**
2. **Oral mechanism exam** and **hearing screening**
 - Minimize verbal directions
 - Plan to assess over multiple sessions
 - Involve the parent if they are more comfortable with a familiar adult touching their face
 - Observe nonspeech function during “fun” activities (e.g., snack, blocking bubbles, playing with a flashlight)
 - Assess motor speech ability separately from nonspeech

ASSESSMENT PLAN

Broome et al. (2017)



1. Case history, interviews
2. Oral mechanism exam and hearing screening
3. Standardized assessment

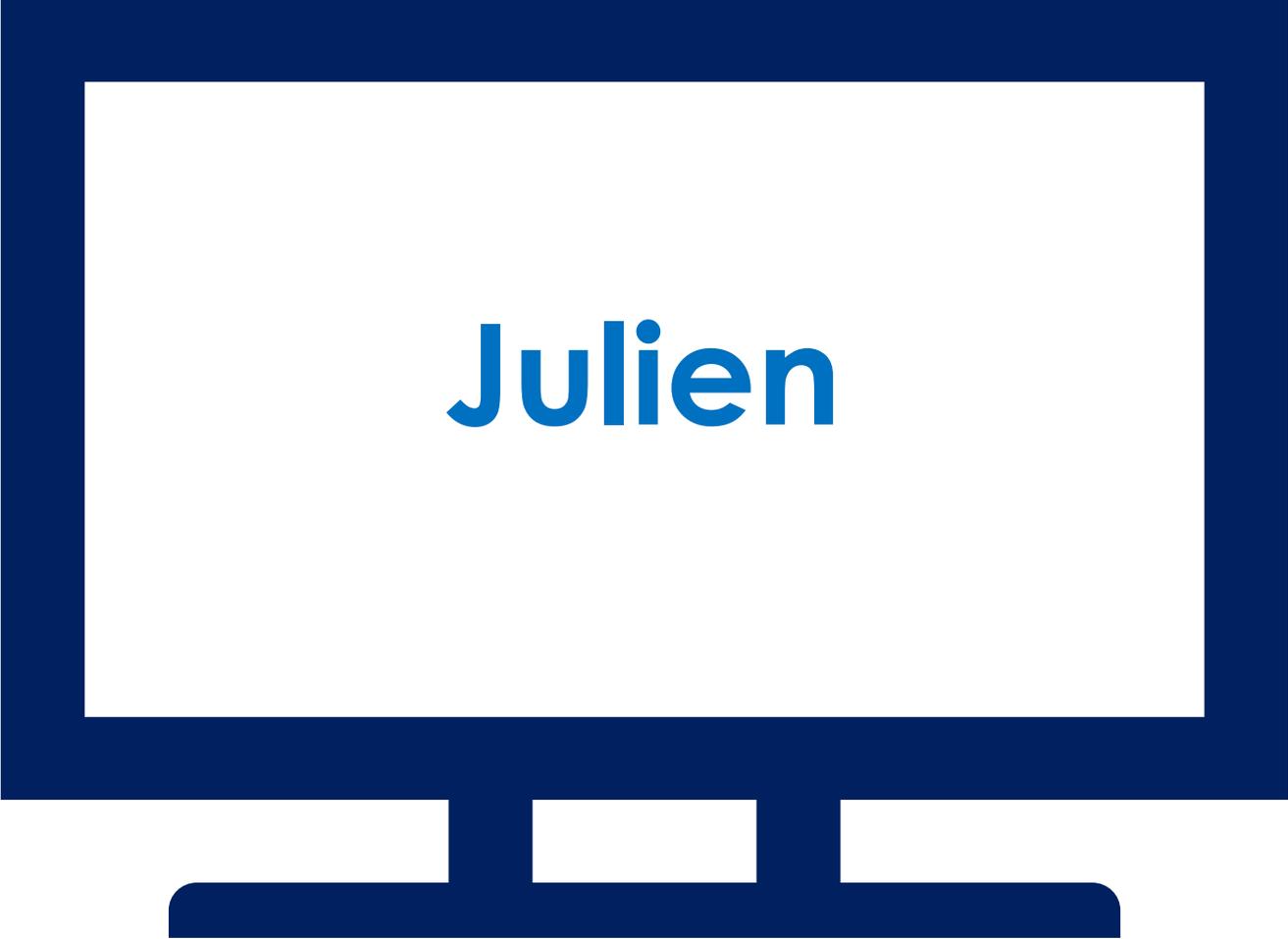


ASSESSMENT PLAN

Broome et al. (2017)



1. Case history, interviews
2. Oral mechanism exam and hearing screening
3. Standardized assessment
4. **Dynamic motor speech assessment**
 - Dynamic Evaluation of Motor Speech Skills (DEMSS; Strand & McCauley) or informal tasks



Julien

ASSESSMENT PLAN

Broome et al. (2017)



1. Case history, interviews
2. Oral mechanism exam and hearing screening
3. Standardized assessment
4. **Dynamic motor speech assessment**
 - Dynamic Evaluation of Motor Speech Skills (DEMSS; Strand & McCauley, 2019) or informal tasks
 - Include multisyllabic targets – gives more insight into planning, stress
 - Try out different types of cueing (e.g., tactile, live models, video-recorded models, verbal prompts)
 - Make it functional

ASSESSMENT PLAN

Broome et al. (2017)



1. **Case history, interviews**
2. **Oral mechanism exam and hearing screening**
3. **Standardized assessment**
4. **Dynamic motor speech assessment**
5. **Spontaneous speech sample**, with descriptive analysis
 - Speech/speech-like or nonspeech (cries, grunts)?
 - Commonly used syllable shapes
 - Phonemic inventory, *including vowels*
 - Error analyses - phonological error patterns, PCC (Shriberg et al., 1997)
 - Prosodic features (e.g., stress, intonation, rate)
6. **Severity and intelligibility ratings** (e.g., FOCUS; McLeod et al., 2013)

ASSESSMENT TIPS



Does your plan include the tasks and assessments needed to rule out structural/functional issues and differentially diagnose the type of SSD?

1. Plan for the assessment to take several sessions
2. Break assessments into discrete tasks, followed by reinforcement (informed by preference assessment)
3. Embed task in play and reference the meaning of words when possible
4. Minimize verbal directions
5. Use visual strategies to facilitate attention

TREATMENT:

Comprehensive,
strengths-based,
dynamic



TREATMENT FOR ASD

- **Naturalistic developmental behavioral interventions** (NDBIs; Schreibman et al., 2015; e.g., Early Start Denver Model; Rogers & Dawson, 2010, Preschool Autism Communication Trial; PACT; Green et al, 2010)
 - Implemented in naturalistic settings
 - Utilize natural contingencies
 - Shared control between child and adult
 - Teach developmental prerequisites to communication (e.g., joint attention)
- Potential drawbacks: May not yield enough practice opportunities



TREATMENT FOR ASD

- **Applied Behavior Analysis (ABA) techniques** (e.g., discrete trial training; DTT; Smith, 2001)
 - Breaks skills into discrete components
 - Operant-based teaching; clear antecedent and consequent
 - Short, frequent, clearly-defined practice
- Potential drawbacks: lack generalization to new environments and communication partners, increased problem behaviors, overdependence on prompts

TREATMENT FOR ASD

- **Naturalistic + Behavioral** (e.g., Pivotal Response Training (PRT; Koegel, 2016)
 - Uses ABA techniques in a more naturalistic way
 - Focuses on prerequisites to communication (e.g., social motivation)
 - Systematic plan for reducing prompts

TREATMENT FOR ASD

- Naturalistic developmental behavioral interventions (NDBIs; Schreibman et al., 2015; e.g., Early Start Denver Model; Rogers & Dawson, 2010, Preschool Autism Communication Trial; PACT; Green et al, 2010)
 - Applied Behavior Analysis (ABA) techniques (e.g., discrete trial training; DTT; Smith, 2001)
 - Naturalistic + Behavioral (e.g., Pivotal Response Training (PRT; Koegel et al., 2016)
- Largest gains in spoken language outcomes when intervention is implemented by parent and clinician (Hampton & Kaiser, 2016)





ADVICE FOR PARENTS

Experience + Data:

Is the treatment working?

Is it time for a new approach?

Pinpoint problems:

Compliance → more play-based

Generalization → more family involvement

Stamina → shorter, more frequent sessions

SPEECH TREATMENT FOR ASD

- Very few speech treatment studies include children with ASD, especially those with minimal verbal ability
- Nature of speech deficits are largely under-defined (Broome et al., 2017) – unclear whether participants have CAS or another kind of SSD



SPEECH TREATMENT FOR ASD

Most SLPs report using AAC to treat children who have CAS and ASD (Dawson, 2010)

Augmentative and Alternative Communication (AAC)

- Communication using picture symbols or voice output devices
- More support for approaches that focus on flexible use of language (e.g., Core vocabulary) than request-based systems (e.g., picture exchange)
- Does not impede speech production (Schlosser & Wendt, 2008)
- Buy-in and frequent modeling and practice in multiple environments is critical

friend	boy	girl	mother	father	brother	sister	head	hand	foot	feet
I	me	what	where	now	later	today	same	diff'nt	big	little
my/mine	is / am are	to	first	next	last	all gone	ready	busy	happy	sad
it	can	have	come	feel	know	give	angry-mad	messy	good	bad
you	do	eat	drink	finish	get	sing	that	a	the	and
your	don't-not	go	help	open	put	see	again	in	away	on
here	there	like	play	read	stop	walk	show	out	up	off
yes	no	want	take	tell	turn	watch	write	front	down	with

EVIDENCE BASE:

Koegel (1998)



Design: Single-subject ABA design

Participants: Five English-speaking children, aged 3;8 to 7;6

- Diagnosed with autism using the DSM-IV criteria
- Referred due to “poor speech intelligibility;” all scored <18th percentile on a standardized test (type of SSD was not specified)
- All had language delay or disorder, some had behavioral issues

Treatment:

- Three target sounds individually selected for each participant.
- Baseline measures obtained in the clinic, home, and school
- Baseline followed by naturalistic or analog treatment for 2 x per week for 45 minutes, for about 20 sessions (or 80% correct for in conversation for four consecutive sessions)

Results:

- Low/no correct usage in conversation after analog treatment (and more adverse behaviors in one child); high correct usage following naturalistic treatment
- Overall improvements during treatment and in intelligibility

EVIDENCE BASE:

Rogers et al (2006)



Design: Single subject ABA design; participants matched and randomly assigned to one of two treatments

Participants: Ten nonverbal children, aged 20-65 months (5;5)

- Diagnosed with autism using the DSM-IV criteria
- Used < 5 functional words per day; vague speech profiles

Treatment:

- Either PROMPT (Chumpelik, 1984) or play-based intervention (Denver Model; Smith et al., 2008)
- 12 x 1-hr weekly sessions + daily 1-hr parent-delivered sessions

Results:

- Eight developed some speech; four developed phrase speech
- Gains in integration of verbal and nonverbal communication, as well as initiation (Denver) and functional play (PROMPT)
- Best responders: mild-moderate ASD, higher nonverbal IQ, better motor imitation skills, emerging joint attention at baseline
- High parent-reported efficacy and satisfaction

EVIDENCE BASE

Chenausky et al. (2016)



Design: Group design with some participants randomly assigned to one of two treatments; seven matched pairs

Participants: 23 minimally verbal children, aged 3;5-9;8

- Diagnosed with autism using ADOS or CARS assessments
- Minimally verbal (<20 intelligible words, no productive syntax), but no information about specific type of SSD

Treatment:

- 25 sessions of Auditory-Motor Mapping Treatment (AMMT) or Speech Repetition Therapy (i.e., drill-based practice)
- Both involved a practice hierarchy with fading support; AMMT added a musical component to highlight prosodic structure
- Targets: Bisyllabic words or phrases; 15 trained, 15 untrained

Results:

- Both treatments were effective; higher gains as a result of AMMT
- Improvement associated with baseline ability to imitate sounds

TREATMENT FOR CAS

Children with CAS tend to make slow and laborious progress in conventional therapy and have difficulty maintaining and generalizing progress (ASHA, 2007; Campbell, 1999)

What works for children with CAS without ASD?

- Integral stimulation (Strand, 1995) or Dynamic Temporal and Tactile Cueing (DTTC; Strand et al., 2006; Strand, 2002)
- Nuffield Dyspraxia Program (NDP3; Williams & Stephens, 2004)
- Rapid Syllable Transition Treatment (ReST; Ballard et al., 2010)



POTENTIAL TREATMENT CHALLENGES

- Limited **joint attention** (Dawson et al., 2004)
- Difficulty using **eye gaze** to interpret models (Drysedale et al., 2018; Vivanti et al., 2008)
- **Interfering behaviors**, particularly during repetitive, drill-based practice (Koegel et al., 1992)
- **Sensitivity to touch**
- Poor **language comprehension**
- Difficulty **generalizing and maintaining** skills (Brown & Odom, 1994)

EVIDENCE BASE:

Beiting & Maas (2020)



Design: Single subject design with multiple baselines within and across participants

Participants: 3 minimally verbal boys with ASD, aged 4;6, 7;0 and 7;3.

- Diagnosed with CAS based on dynamic speech testing
- Minimal verbal ability (<30 spoken words)

Treatment: Novel treatment approach (ACT4CAS)

- Individually selected, functional treatment targets
- Each session included play-based and drill-based practice, with unique modifications (e.g., models via iPad)
- Caregiver involved in play-based portion of treatment

Results:

- Only 1/3 participants completed the treatment
- Children who dropped out did not show clear improvement; other child made significant gains on 1/2 of treated targets at follow-up
- Treatment intensity and disorder severity likely influence outcome



**Treatment -
Julien**



ADVICE FOR PARENTS

What are your goals?

Think in terms of *communicative functions* (e.g., requesting, getting help) as well as *key words or phrases* that are important for your child to say.

CONCLUSIONS:

Assessment

1. Do a **comprehensive speech and language evaluation!** Make sure to gather the kind of data you need to differentially diagnosis SSDs:
 - **Oral mechanism exam and hearing screening**
 - **Dyanamic motor speech evaluation** including targets that have a variety of sounds, syllable shapes, and stress patterns
 - **Conversational speech sample analysis**
2. Plan for the assessment to take several sessions and **break tasks into smaller chunks with lots of reinforcement**
3. **Embed tasks in play** when possible
4. **Highlight the meaning of words** with picture support, actions, and real objects
5. **Minimize verbal directions and use visual strategies** to support receptive language and facilitate attention

CONCLUSIONS:

Treatment

1. Use an **evidence-based CAS treatment approach** if it works for the client
2. If needed, consider **modifications to CAS treatment based on what we know works from the ASD literature** (e.g., combination of drill and naturalistic practice, parent involvement)
3. If needed, work on **prerequisite skills** first (e.g., imitation, joint attention, sound repertoire)
4. Target motor speech in conjunction with **language – AAC** will be part of the approach for children with ASD + CAS and minimal verbal ability
5. **Re-evaluate often** and change the plan as new strengths and weaknesses emerge

Questions?

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