

## Choosing the best therapies: Bottom-Up and Top-Down

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JAMES COPLAN, M.D. *Author and Speaker*  
*Making Sense of Autistic Spectrum Disorders*



## Learning Objectives

Upon completion of this presentation, the participant will be able to:

- Define and describe the Natural History of ASD
- Define and give examples of Bottom-Up and Top-Down instructional methods
- Describe the long-term outcome for persons with ASD and explain the role of IQ as a driver of outcome

## Disclosures

- Dr. Coplan is author of *Making Sense of Autistic Spectrum Disorders: Create the brightest future for your child with the best treatment options* (Bantam-Dell, 2010), and receives royalties on its sale



- This presentation will include a discussion of off-label drug use

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## Outline

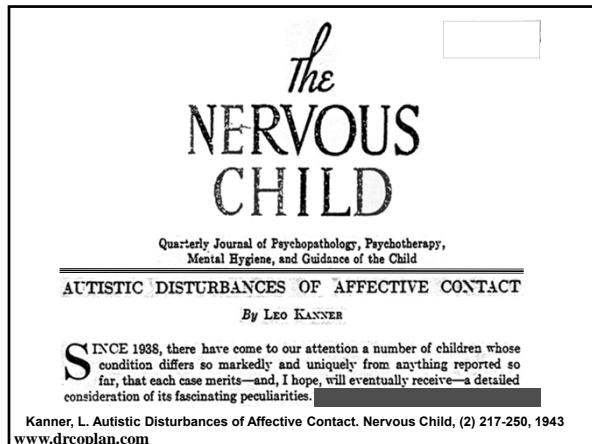
- Natural History of ASD
- Impact of IQ on Prognosis
- Bottom-Up & Top-Down
- Long-term outcomes
- Summary

**Natural History: "The temporal course  
a disease from onset to resolution"**

Center for Disease Control & Prevention

*ASD has a Natural History*

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## Kanner, 1943

- N = 11 (M 8; F 3)
- Age: 2 to 8 yr.
- Clinical Features:
  - Impaired socialization
  - Idiosyncratic language
  - Repetitious behaviors
  - Unusual responses to sensory stimuli

Kanner, L. Autistic Disturbances of Affective Contact. Nervous Child, (2) 217-250, 1943  
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## Impaired Socialization

- "Aloof"
- "Withdrawn"
- Limited eye contact
- Indifferent to others

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## Idiosyncratic Language

- Echolalia
- Delayed Echolalia
- Pronoun Reversal
- Odd inflection

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## Repetitious Behaviors

- Rigid Routines
- Stereotypies
- Lining up / spinning objects

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## Unusual sensory responses

- "Petrified of vacuum cleaner"
- Drawn to, or afraid of, spinning objects
- Mouthing behavior
- Ingesting inedible materials
- Food selectivity

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### Kanner, 1938 → 1943

- Gradual improvement in early childhood
  - Social skills
  - Language
  - Cognitive flexibility
  - Sensory Aversions

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### Kanner, 1938 → 1943

**“Between the ages of 5 and 6 years, they gradually abandon echolalia and learn spontaneously to use personal pronouns.**

**“Language becomes more communicative, at first in the sense of a question-and-answer exercise, and then in the sense of greater spontaneity of sentence formation....**

Kanner, L. Autistic Disturbances of Affective Contact. Nervous Child, (2) 217-250, 1943

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### Kanner, 1938 → 1943

**“Food is accepted without difficulty. Noises and motions are tolerated more than previously. The panic tantrums subside. The repetitiousness assumes the form of obsessive preoccupations...**

Kanner, L. Autistic Disturbances of Affective Contact. Nervous Child, (2) 217-250, 1943

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### Kanner, 1938 → 1943

**“Reading skill is acquired quickly, but the children read monotonously, and a story or a moving picture is experienced in unrelated portions rather than in its coherent totality...\***

\* “*Central coherence*”

Kanner, L. Autistic Disturbances of Affective Contact. Nervous Child, (2) 217-250, 1943

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### Kanner, 1938 → 1943

**“Between the ages of 6 and 8, the children begin to play in a group, still never with the other members of the group, but at least on the periphery alongside the group.**

Kanner, L. Autistic Disturbances of Affective Contact. Nervous Child, (2) 217-250, 1943

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### Kanner, 1938 → 1943

**“People are included in the child's world to the extent to which they satisfy his needs...**

Kanner, L. Autistic Disturbances of Affective Contact. Nervous Child, (2) 217-250, 1943

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## Kanner, 1938 → 1943

All of this makes the family feel that, in spite of recognized 'difference' from other children, there is progress and improvement.

Leo Kanner, 1943

Kanner, L. Autistic Disturbances of Affective Contact. *Nervous Child*, (2) 217-250, 1943  
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## Kanner, 1971

- Deceased: 1
- Lost to follow-up: 2
- Institutionalized: 5
- Living on work farm: 1
- Living at home: 2
  - BA degree / bank teller
  - Sheltered workshop / machine operator

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## Kanner's contributions

- **Clinical Description**
  - Social, Language, Repetitious behavior, & Sensory aversions / attractions
- **Attribution: An "inborn error of affective contact"**
- **Described the *Natural History* of improvement over time**

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## The Natural History of ASD - 1

Clinical Domain ↓	Decreasing Atypicality / Increasing Age ⇒		
	Severe / Youngest	Moderate / Older	Mild / Older
1. Social Interaction	<ul style="list-style-type: none"> <li>•No eye contact</li> <li>•No physical affection</li> <li>•Cannot be engaged in imitative tasks</li> </ul>	<ul style="list-style-type: none"> <li>•Intermittent eye contact</li> <li>•Seeks affection "on his own terms"</li> <li>•May invade personal space of others (not true affection)</li> <li>•Engageable in imitative tasks, although with difficulty</li> </ul>	<ul style="list-style-type: none"> <li>•Good eye contact</li> <li>•Shows interest in others, but often does not know how to join in</li> <li>•Easily engaged in imitative activities</li> <li>•Rigid; has difficulty if perceives that rules have been broken</li> <li>•Difficulty with "Theory of Mind" tasks</li> </ul>

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## The Natural History of ASD - 2

Clinical Domain ↓	Decreasing Atypicality / Increasing Age ⇒		
	Severe / Youngest	Moderate / Older	Mild / Older
2. Language •Pragmatics •Prosody	<ul style="list-style-type: none"> <li>•Nonverbal</li> <li>•No response to voice; may "act deaf"</li> <li>•No use of gestures as a means of compensating for absence of spoken language</li> <li>•May use "hand-over-hand" to guide caregiver to desired objects</li> </ul>	<ul style="list-style-type: none"> <li>•Echolalia, Delayed echolalia</li> <li>•Verbal Perseveration</li> <li>•Odd Inflection (stilted, sing-song, ↑↓ volume)</li> <li>•May use stock phrases in an attempt to communicate</li> <li>•Makes use of visual communication modalities (symbol cards; sign language)</li> </ul>	<ul style="list-style-type: none"> <li>•Speaks fluently, but literal; lacks understanding of verbal nuance</li> <li>•Difficulty with Pragmatics (framing, turn-taking, topic maintenance; conversational repair; talks "at" rather than "with" others) and Theory of Mind language tasks (fibbing; humor, verbal make-believe)</li> </ul>

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## The Natural History of ASD - 3

Clinical Domain ↓	Decreasing Atypicality / Increasing Age ⇒		
	Severe / Youngest	Moderate / Older	Mild / Older
3. Repetitious Behaviors  <i>Cognitive</i>	<ul style="list-style-type: none"> <li>•Extreme distress if routines are changed or when required to transition from one task to another</li> <li>•Fascination with odd objects (tags, wheels, fans, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>•Same, but with diminishing level of distress; able to accept verbal preparation for changes in routine</li> <li>•Complex repetitious play (lining up objects, memorizes numbers, letters, etc)</li> </ul>	<ul style="list-style-type: none"> <li>•May demonstrate conscious awareness of preference for routines; easier to self-modulate</li> <li>•Play remains repetitious, but repetitive quality is more subtle; preoccupation with arcane topics</li> <li>•Problems with Central Coherence</li> </ul>
<i>Motoric</i>	<ul style="list-style-type: none"> <li>•Frequent, intense stereotypical movements (flapping, spinning, toe-walking, finger twiddling)</li> </ul>	<ul style="list-style-type: none"> <li>•Motor stereotypies occasional; may re-emerge when excited</li> </ul>	<ul style="list-style-type: none"> <li>•Motor stereotypies rare or absent</li> </ul>

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## The Natural History of ASD - 4

Clinical Domain ↓	Decreasing Atypicality / Increasing Age ⇒		
	Severe / Youngest	Moderate / Older	Mild / Older
4. Sensorimotor: • Intense aversion or attraction to specific classes of stimuli • Clumsiness	• Auditory: Hyperacusis, covers ears, acts deaf • Visual: self-stimulation (lights/patterns); looks at objects from odd angles • Tactile: rubbing, licking, mouthing, deep pressure; averse to light touch • Olfactory: Sniffing • Extreme food selectivity • ↑ Pain threshold • Fears: Heightened / blunted	Same, but diminishing intensity	Same, but diminishing intensity

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## "The Spectrum": ASD in One Dimension



Atypical features can range from severe to mild

Coplan J Atypicality, intelligence and age: a conceptual model of autistic spectrum disorder. Dev Med Child Neurol 45(10):712-6

## Outline

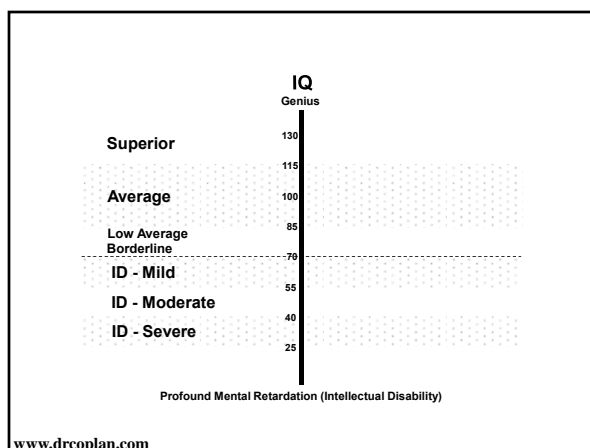
- Natural History of ASD
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## Influence of IQ on Prognosis

- "In terms of scholastic progress, social competence, and work opportunities, the child's IQ level is as influential as the presence of autism."\*
- 1973-2005: > 10 studies; >1000 subjects

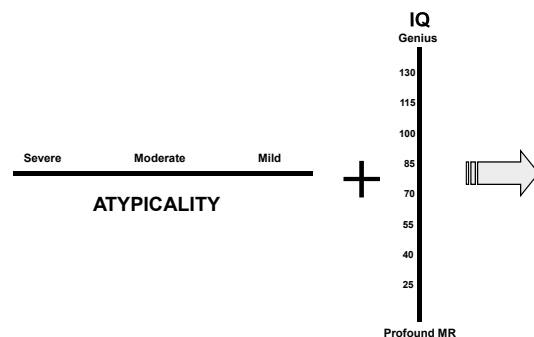
\* Bartak, L. and M. Rutter, Differences between mentally retarded and normally intelligent autistic children. Journal of Autism & Childhood Schizophrenia, 1976. 6(2): p. 109-20

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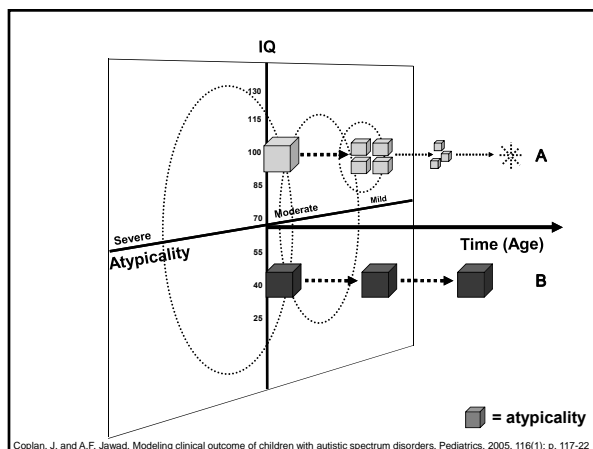
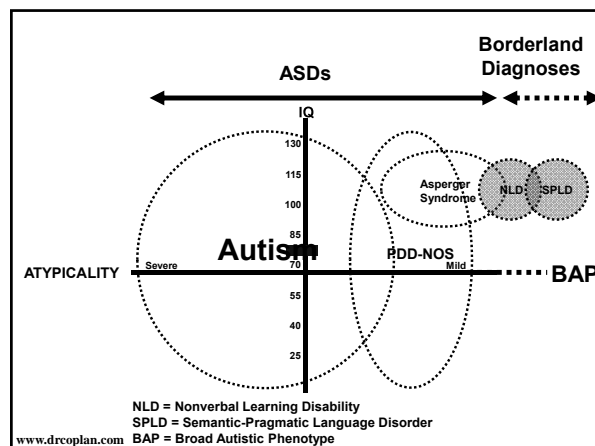
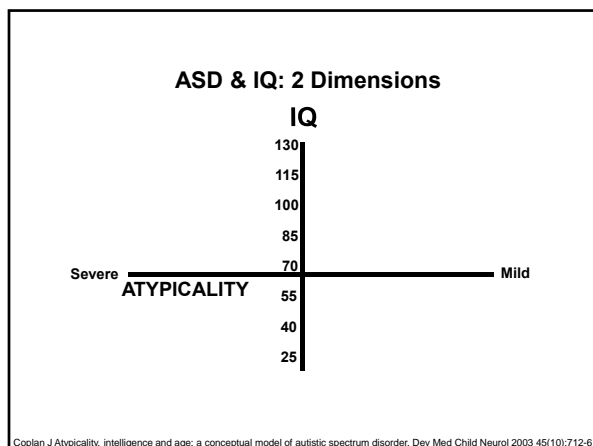


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## Combine atypicality and IQ scales.....

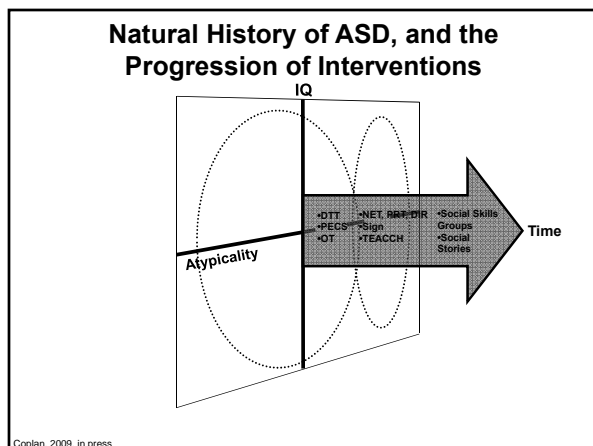


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## Outline

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## Therapies for ASD: A Modest Proposal

- Therapies for ASD should be matched to the natural history of ASD itself
  - As the child's symptoms evolve, so should the forms of therapy
  - It's not a matter of right vs wrong; It's a matter of what & when

## Interventions: Issues

- **Lack of controlled studies**
  - What is the best therapy?
  - How much therapy is “enough”?
  - How much progress is due to therapy, and how much to natural history of ASD?
- **Therapeutic dogmatism**
  - The blind men and the elephant

### THE BLIND MEN AND THE ELEPHANT (Traditional Indian folk tale)

It was six men of Indostan,  
To learning much inclined,  
Who went to see the Elephant,  
(Though all of them were blind,) That each by observation  
Might satisfy his mind.

The First approached the Elephant,  
And happening to fall  
Against his broad and sturdy side,  
At once began to bawl:  
“God bless me! but the Elephant  
Is very like a wall!”

The Second, feeling of the tusk,  
Cried “Ho! what have we here  
So very round and smooth and sharp?  
To me ‘t is mighty clear  
This wonder of an elephant  
Is very like a spear!”

The Third approach the animal,  
And, happening to take  
The squirming trunk with in his hands,  
Thus boldly up and spake:-  
“I see,” quoth he, “the Elephant  
Is very like a snake!”

The Fourth reached out his eager hand,  
And felt about the knee;  
“What most this wondrous beast is like  
is mighty plain,” quoth he;  
“’T is clear enough the Elephant  
Is very like a tree!”

The Fifth, who chanced to touch the ear,  
Said “Even the blindest man  
Can tell you what this resembles most:  
Deny the fact who can,  
This marvel of an Elephant  
Is very like a fan!”

The Sixth no sooner had begun  
About the beast to grope,  
Than, seizing on the swinging tail  
That fell within his scope,  
“I see,” quoth he, “the Elephant  
Is very like a rope!”

And so these men of Indostan  
Disputed loud and long,  
Each in his own opinion  
Exceeding stiff and strong,  
Though each was partly in the right,  
And all were in the wrong!

*Clever Stories of Many Nations, Rendered in Rhyme*  
John Godfrey Saxe, 1865



*Clever Stories of Many Nations, Rendered in Rhyme*  
John Godfrey Saxe, 1865

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## Therapeutic Dogmatism

(Six Blind Men and the Elephant)

Is ASD:

- a sensory processing disorder...
- a language disorder...
- a social disorder...
- a behavioral disorder...
- a learning disorder...
- a neurological syndrome...?

Answer: All of the Above (and More)

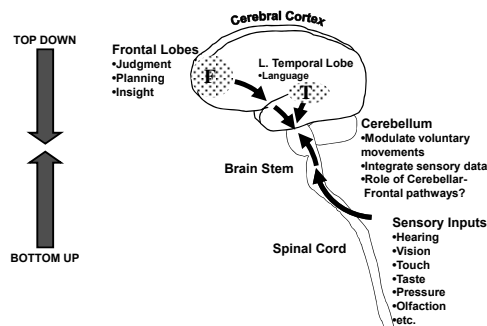
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## Therapies for ASD

Organize therapies:

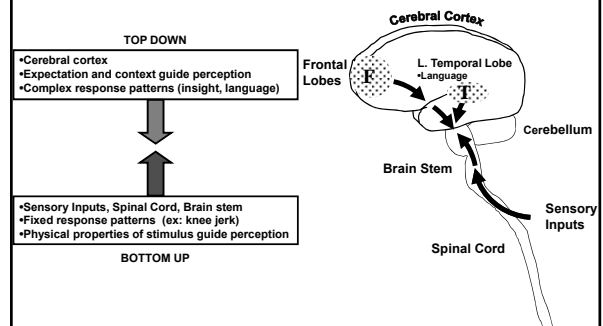
- According to functional areas (“blind men”)
  - Social
  - Language
  - Behavioral
  - Sensory
- According to cognitive orientation:
  - “Bottom-Up” vs. “Top-Down”

### “Bottom Up” versus “Top Down” - 1



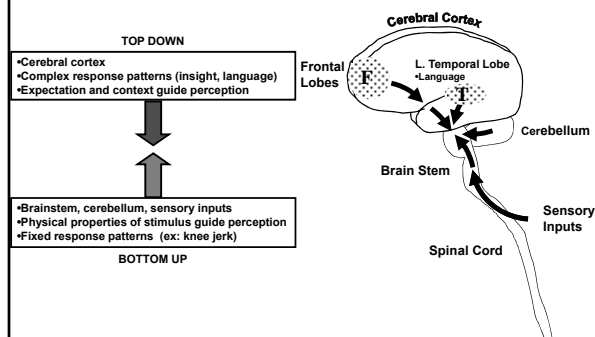
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### “Bottom Up” versus “Top Down” - 2



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### “Bottom Up” versus “Top Down” - 3



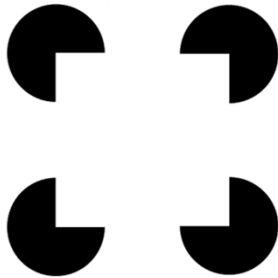
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### Visual Perception: Bottom-Up





Visual Perception: Top-Down



Language: Bottom-Up vs Top Down  
(Literal meaning, vs. Context)

***“The chicken is ready to eat.”***

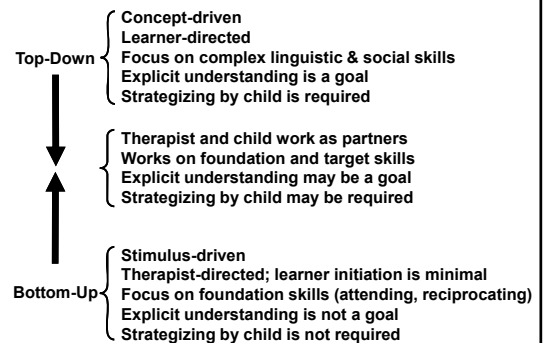
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***“The chicken is ready to eat.”***

[www.drcoplan.com](http://www.drcoplan.com)

Cognitive Orientation of Therapy



Therapy Goals



**Top-down therapies  
*teach concepts***

**Bottom-up therapies  
*shape behavior***

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Moving from One Stage  
to the Next

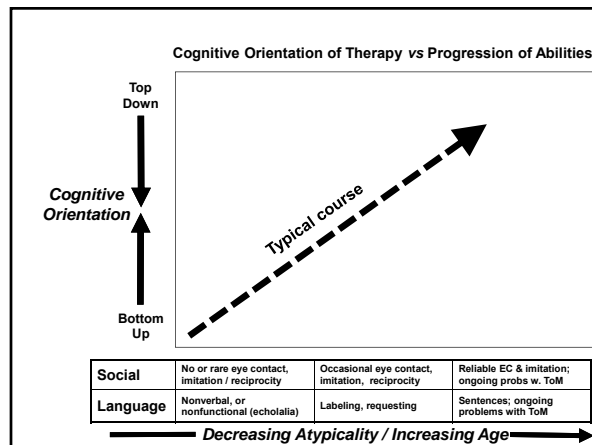
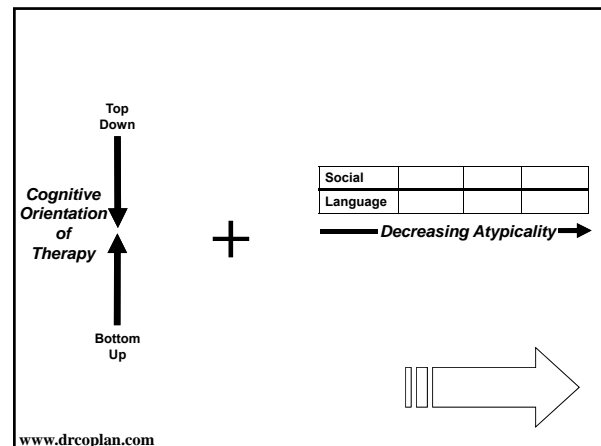
- **Social Reciprocity**
  - *Attending to others*
  - *Imitation of others*
  - *Initiation of interaction with others*

**Degree of Atypicality**

	Severe	Moderate	Mild
<b>Social</b>	No or rare eye contact, No social reciprocity (imitation; initiation)	Occasional eye contact & social reciprocity	Reliable EC & reciprocity; Ongoing problems with Theory of Mind (personal space, rules, etc.)
<b>Language</b>	Nonverbal, or nonfunctional (Echolalia, delayed echolalia)	Labeling, requesting; +/- commenting, reciprocating	Commenting, reciprocating; Ongoing problems with Theory of Mind (humor, make-believe, fibbing, etc.)

→ Decreasing Atypicality →

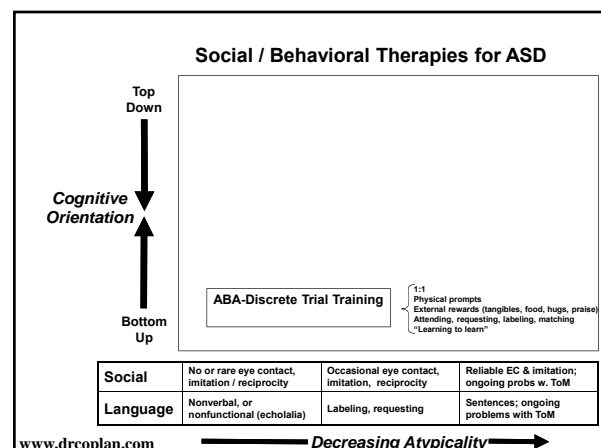
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## Social and Behavioral Therapies

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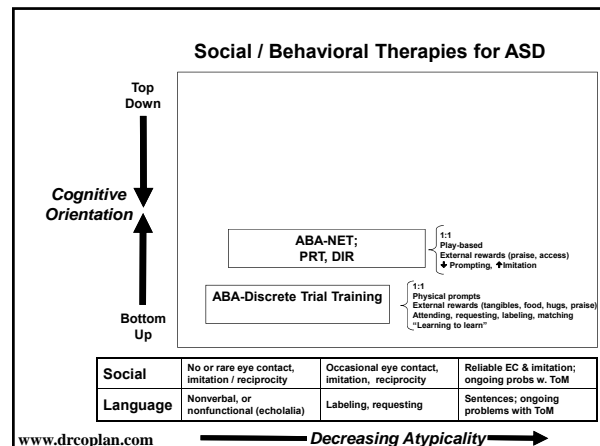
- Applied Behavior Analysis – Discrete Trial Training (ABA-DTT)**
- **Therapist-driven**
    - 2:1 ➔ 1:1
    - Physical prompts ➔ Verbal prompts
    - Initiation by child = 0
  - **Rewards: External**
    - Food, tangibles, hugs, praise
  - **Goals: Attending, matching, labeling**
  - **Meta-goal: “Learning to learn”**
- www.drcoplan.com



**ABA-Natural Environment Training (NET);  
Pivotal Response Treatment (PRT)  
Floor Time (DIR)**

- **Child-driven / Play-based**
  - Therapist playfully obstructs child's activities
- **Rewards: Internal**
  - Child regains access to desired object or activity
- **Goals:**
  - ↓ Prompting by adult
  - ↑ Initiation with adult

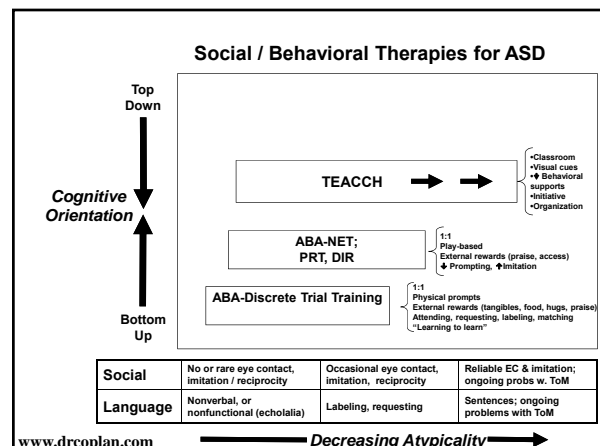
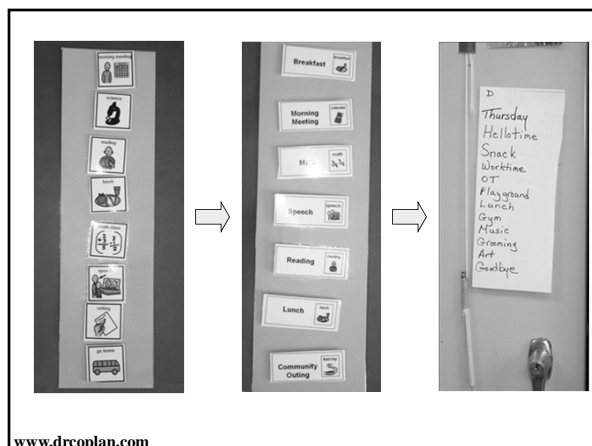
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**TEACCH**  
(Treatment and Education of Autistic and related Communication-handicapped Children)

- **Classroom-based**
- **Make expectations clear & explicit**
- **Visual cues**
  - Environmental organization
  - Visual schedules
- **Teacher available if child gets stuck**
- **Goals: Initiative, organization**

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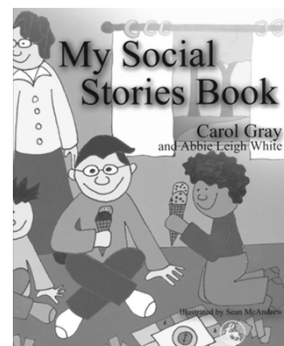
## Social Skills Training

- Recognize the thoughts & feelings of others (“Theory of Mind”)
- Narrative
  - Social Stories™
  - Social Skills Picture Book
  - Many others....
- Interactive
  - Social Skills Groups

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## “Will my friend use my toys?”

“A friend is coming to my home. My friend knows I have toys. My friend is hoping to have a turn playing with my toys. I may let my friend play with my toys for a short time. This is called sharing my toys. My friend knows my toys belong to me. He knows my toys stay with me when we are finished playing. Someday, my friend may share his toys with me.”



## The Social Skills Picture Book Jed Baker, PhD

- Enables child to see the thoughts of others, by clever use of “thought bubbles”



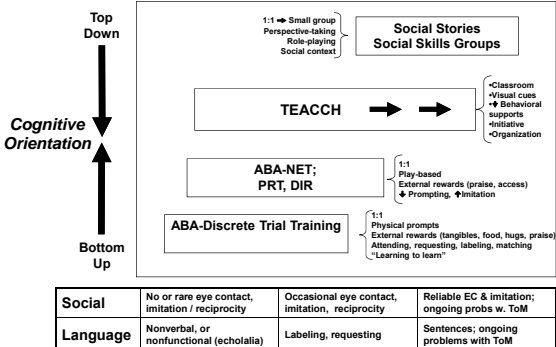
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## Therapies for ASD

- Social Skills Groups
  - Structured interaction with peers
  - Emphasis on language pragmatics & social interaction (sharing, turn-taking, empathy, co-operation, social “rules of the road”)
  - Usually run by Speech Language Pathologist, OT, Special Ed Teacher, or other trained child development specialist

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## Social / Behavioral Therapies for ASD



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Decreasing Atypicality →

## Language

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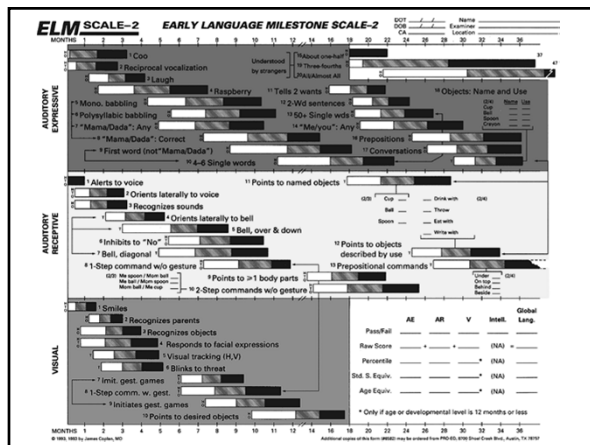
## Language

- **Language = a symbol system for the storage or exchange of information**
  - Spoken Languages
  - ASL
  - Morse Code
  - Binary Code
  - etc.

## Language: Modalities

- **Modalities**
  - Oral (auditory expressive, auditory receptive)
  - Visual / Manual
    - Sign
    - Picture exchange
  - Devices (+/- speech synthesis)
  - Reading & Writing

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## Language Function

- Cognitive Orientation**
- Top Down**
- Use of language: *Social*
    - Conversation
    - Humor
    - Fibbing
    - Make-Believe
  - Meaning is context-dependent
    - “The chicken is ready to eat”
- Bottom Up**
- Use of language: *Instrumental* (obtain goal)
    - “Want chip”
  - Meaning is invariant
    - “Touch square”

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## Language Therapy: Philosophies

- **Behaviorism**
  - ABA-Discrete Trial Training (DTT)
  - Verbal Behavior (VB)
- **Traditional speech-language therapy**

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## Behaviorism

- All behavior is the result of prior experience
- Behaviorists deny the existence of “understanding,” “thought,” “intuition,” etc.
  - Johnny says “I want an apple” not because “he knows what it means,” because the last 1000 times he emitted that behavior, he received an apple.
- The focus of behavioral therapy is to *shape behavior* (not to impart understanding)

### ABA-DTT: Receptive

- **Tacting (“Touch square”)**
  - 2:1 ratio initially
  - Full physical prompt ➔ Faded
  - External rewards (edibles, hugs, etc.)
- **Meta-Goals**
  - Attending to the therapist
  - Following verbal instructions
  - Discrimination within sets

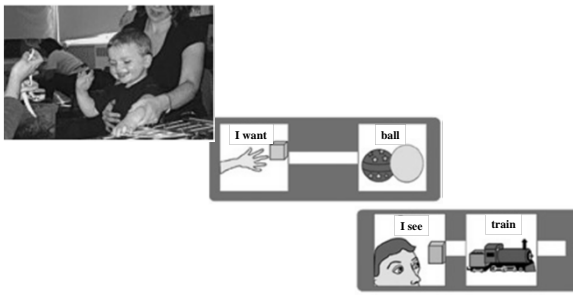
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### Discrete Trial Training: Expressive

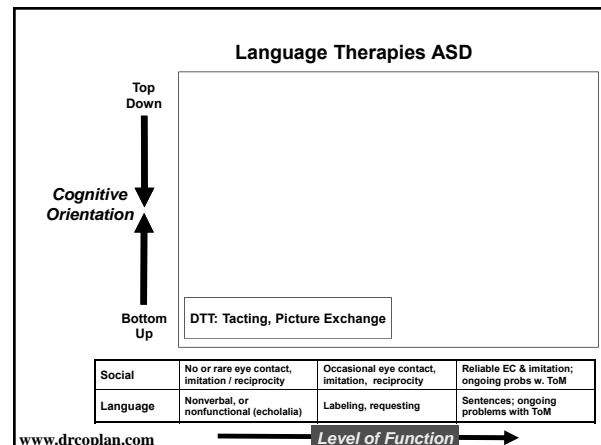
- **Manding (Picture Exchange)**
  - 2:1 ratio initially
  - Full physical prompt ➔ Faded
- **No verbalization required**
- **May enhance speech; data weak**
- **Requires cards / board / computer**

[www.drcoplan.com](http://www.drcoplan.com)

**Picture Exchange**  
Picture Exchange Communication System (PECS)  
Pyramid Educational Products, Inc.



[www.drcoplan.com](http://www.drcoplan.com) <http://www.pecsusa.com/pecs.php>



### Verbal Behavior (VB)

- **Begin immediately with focusing on the child's interests**
  - a. Gain control of “Echoic function” (verbal imitation)
  - b. Pair the child's utterance with a desired object
  - c. Requesting (“manding” for desired items)
    - Picture Exchange or Sign if nonverbal
- **Then move on to:**
  - a. Verbal labeling of objects (“tacting”)
  - b. Object matching by form, function & class
  - c. “Intraverbal behavior”

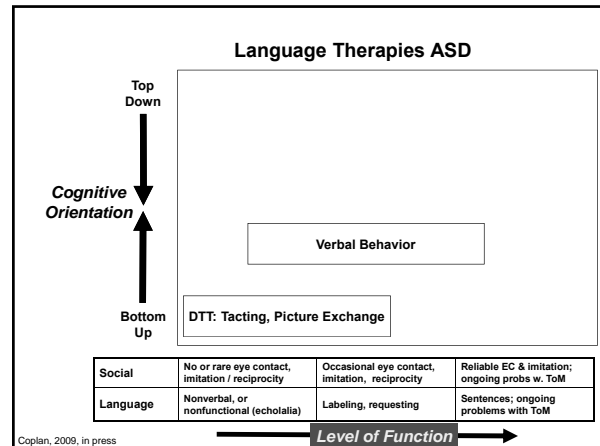
**Sign**



## SIGN

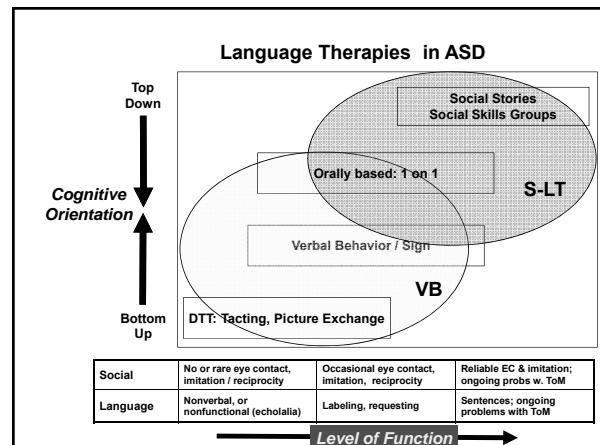
- **Pro's**
  - Easier to learn than speech
  - Enhances speech development
  - Can be taught hand-over hand
    - Children with ASD frequently rely on H-O-H
  - Does not require cards, boards, etc.
- **Con's**
  - Does require physical dexterity
  - Does require others to know Sign

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## Traditional Speech-Language Therapy

- 1-on-1 ➔ Pair with peer ➔ Small Group
- Often play-based
- Eclectic; no single method
- Requires child to attend and imitate
- Goals: Instrumental ➔ Social



## Behaviorism

"The analysis of skills for the purpose of diagnosis and treatment planning is linguistically based. This is handicapping because, despite linguistic information from the assessment, the therapist lacks the functional analysis of verbal behavior needed to effect *behavior change*, which is the *sole aim of therapy*." (Emphasis added)

Esch, LaLonde, and Esch. Speech and language assessment: A verbal behavior analysis. SLP-ABA, (5):2, 2011

## Behaviorism

"With all his (VB) training, I still think he sometimes doesn't understand what is being asked of him."

Mother of a 5 year old boy with mild ASD and normal nonverbal abilities. (MRN 09-0623)

## "Sensory Processing"

[www.drcoplan.com](http://www.drcoplan.com)

### Sensory-Based therapies for ASD

- **OT / Sensory Integration Therapy**
  - "Sensory Diet"
  - Desensitize to aversive stimuli
  - Use sensory-seeking behaviors to enhance cognitive/behavioral function (claimed)
  - Mirror neurons: The missing link between bottom-up and top-down therapies? (proprioceptive awareness → empathy?)

Coplan, 2008, in press

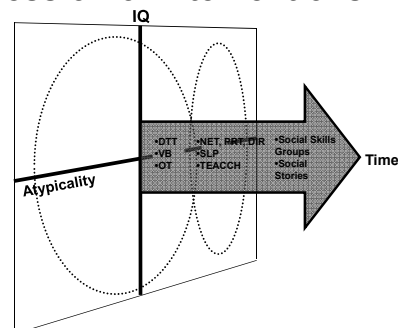
## The Neuroscientist

<http://nro.sagepub.com/>

**Altered Connectivity and Action Model Formation in Autism Is Autism**  
Stewart H. Mostofsky and Joshua B. Ewen  
*Neuroscientist* 2011 17: 437 originally published online 5 April 2011  
DOI: 10.1177/1073858410392381

The online version of this article can be found at:  
<http://nro.sagepub.com/content/17/4/437>

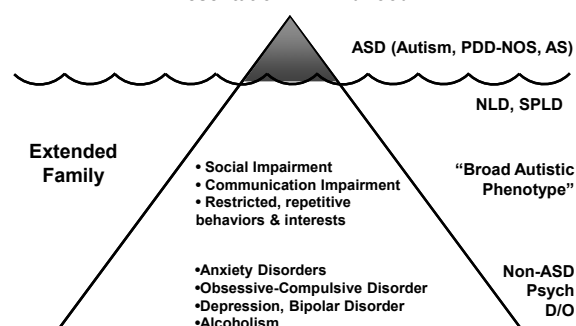
## Progression of Interventions



## Outline

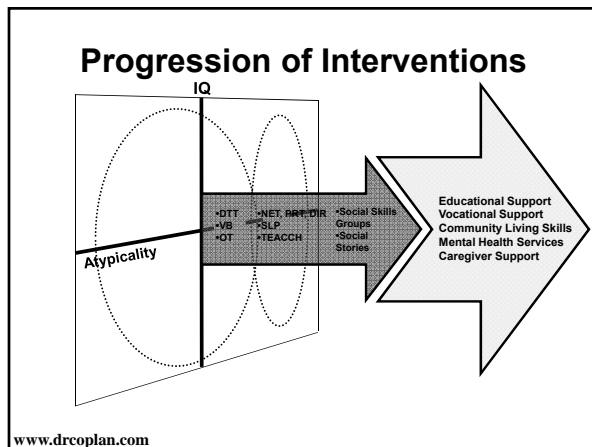
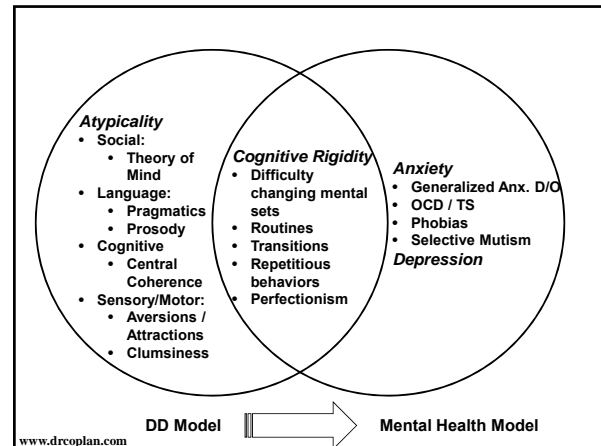
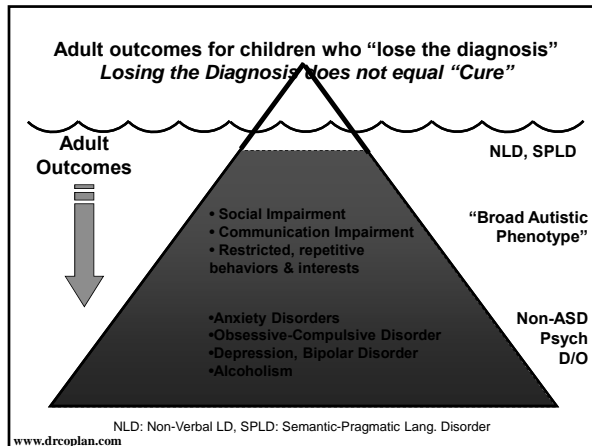
- Natural History of ASD
- Impact of IQ on Prognosis
- Bottom-Up & Top-Down
- Long-term outcomes
- Summary

### Presentation in Childhood



NLD: Non-Verbal LD, SPLD: Semantic-Pragmatic Lang. Disorder  
[www.drcoplan.com](http://www.drcoplan.com)





**Resources for Adults**

**ian** interactive autism network  
Linking the autism community and researchers

<http://www.ianproject.org/>

**OAR** ORGANIZATION FOR AUTISM RESEARCH

The Current State of Services for Adults with Autism  
[http://www.mo-feat.org/files/oar\\_survey\\_11309.pdf](http://www.mo-feat.org/files/oar_survey_11309.pdf)

## Outline

- Natural History of ASD
- Impact of IQ on Prognosis
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## Future Directions

- Unanswered questions
  - What is the best therapy / combination of therapies?
  - Is outcome better than predicted by Natural History alone?
    - Risk of harm
    - Placebo effect
    - Selective reporting
  - How much therapy is "enough"?
    - Limited resources

## Obstacles to Research

- **Ethical?**
  - Since all therapies are available “over the counter,” why should I not give my child everything I can find and afford?
- **Therapeutic Dogmatism**
  - Each “camp” of therapists sees the child through their own lens

[www.drcoplan.com](http://www.drcoplan.com)

## The need for science

**“Half of what we’ve taught you in medical school is incorrect. Unfortunately, we don’t know which half.”**

**William Osler, MD  
1849-1919**



The blind men and the elephant  
(wall relief in Northeast Thailand)

[http://en.wikipedia.org/wiki/Blind\\_men\\_and\\_an\\_elephant](http://en.wikipedia.org/wiki/Blind_men_and_an_elephant)

[www.drcoplan.com](http://www.drcoplan.com)

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JAMES COPLAN, M.D. *Author and Speaker*  
Making Sense of Autistic Spectrum Disorders

Welcome

**James Coplan, MD**  
-Internationally recognized clinician, author, and public speaker in the fields of early child development, early language development and autistic spectrum disorders.

Blog

MAKING SENSE OF AUTISTIC SPECTRUM

***Thank you!***