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

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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

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
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

Impaired Socialization

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- "Withdrawn"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

Idiosyncratic Language

- Echolalia
- Delayed Echolalia
- Pronoun Reversal
- Odd inflection

Repetitious Behaviors

- Rigid Routines
- Stereotypies
- Lining up / spinning objects

Unusual sensory responses

- "Petrified of vacuum cleaner"
- Drawn to, or afraid of, spinning objects
- Mouthing behavior
- Ingesting inedible materials
- Food selectivity
Kanner, 1938 → 1943

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

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

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, 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, 1940

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, 1940

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, 1940

Kanner, 1938 → 1943

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

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

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

The Natural History of ASD - 1

<table>
<thead>
<tr>
<th>Clinical Domain</th>
<th>Decreasing Atypicality / Increasing Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe / Youngest</td>
<td>Moderate / Older</td>
</tr>
<tr>
<td>1. Social Interaction</td>
<td></td>
</tr>
<tr>
<td>• No eye contact</td>
<td>• No physical affection</td>
</tr>
<tr>
<td>• Cannot be engaged in initiatory tasks</td>
<td>• May avoid personal space of others (not true affection)</td>
</tr>
<tr>
<td>• Engageable in initiatory tasks, although with difficulty</td>
<td>• Engageable in initiatory tasks, although with difficulty</td>
</tr>
</tbody>
</table>

The Natural History of ASD - 2

<table>
<thead>
<tr>
<th>Clinical Domain</th>
<th>Decreasing Atypicality / Increasing Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe / Youngest</td>
<td>Moderate / Older</td>
</tr>
<tr>
<td>2. Language &amp; Pragmatics</td>
<td></td>
</tr>
<tr>
<td>• Pragmatics</td>
<td>• Proxemic, paralanguage</td>
</tr>
<tr>
<td>• Verbal</td>
<td>• Expressive language</td>
</tr>
<tr>
<td>• Nonverbal</td>
<td>• Comprehends social gestures</td>
</tr>
<tr>
<td>• Rigid utterances</td>
<td>• Complies with request to initiate play</td>
</tr>
</tbody>
</table>

The Natural History of ASD - 3

<table>
<thead>
<tr>
<th>Clinical Domain</th>
<th>Decreasing Atypicality / Increasing Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe / Youngest</td>
<td>Moderate / Older</td>
</tr>
<tr>
<td>3. Repetitious Behaviors</td>
<td></td>
</tr>
<tr>
<td>Cognitive</td>
<td></td>
</tr>
<tr>
<td>• Extreme distress if routines are changed</td>
<td>• Reemergence of complex repetitive play</td>
</tr>
<tr>
<td>• Intense distress if transition from one task to another</td>
<td>• Complex repetitive play</td>
</tr>
<tr>
<td>• Fascination with odd objects</td>
<td>• Complex repetitive play</td>
</tr>
</tbody>
</table>

The Natural History of ASD - 4

<table>
<thead>
<tr>
<th>Clinical Domain</th>
<th>Decreasing Atypicality / Increasing Age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Severe / Youngest</td>
</tr>
<tr>
<td>4. Sensorimotor</td>
<td>• Auditory: Hyperacusis, covers ears, acts deaf • Visual: Self-stimulation (lights/patterns); looks at objects from odd angles • Tactile: Rubbing, licking, mouthing, deep pressure; avers to light touch • Olfactory: Sniffing • Extreme food selectivity • Pain: Heightened / blunted</td>
</tr>
</tbody>
</table>


Therapies for ASD: Bottom-Up & Top-Down
© James Coplan, MD

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

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


Combine atypicality and IQ scales......

Therapies for ASD: Bottom-Up & Top-Down

Outline

- Natural History of ASD
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- Summary

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 to '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;
"'Tis 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
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)

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

“Bottom Up” versus “Top Down” - 2

“Bottom Up” versus “Top Down” - 3

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

“The chicken is ready to eat.”

**Visual Perception: Top-Down**

**Cognitive Orientation of Therapy**

- **Top-Down**
  - Concept-driven
  - Learner-directed
  - Focus on complex linguistic & social skills
  - Explicit understanding is a goal
  - Strategizing by child is required
  - Therapist and child work as partners
  - Works on foundation and target skills
  - Explicit understanding may be a goal
  - Strategizing by child may be required

- **Stimulus-driven**
  - Therapist-directed; learner initiation is minimal
  - Focus on foundation skills (attending, reciprocating)
  - Explicit understanding is not a goal
  - Strategizing by child is not required

**Bottom-Up therapies**
- **shape behavior**

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

**Moving from One Stage to the Next**

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

<table>
<thead>
<tr>
<th>Social</th>
<th>Moderate</th>
<th>Mild</th>
</tr>
</thead>
<tbody>
<tr>
<td>No or rare eye contact, imitation / initiation</td>
<td>Reliable EC &amp; reciprocity: Ongoing problems with Theory of Mind (personal space, rules, etc.)</td>
<td></td>
</tr>
<tr>
<td>Language</td>
<td>Labeling, requesting; +/- commenting, reciprocating</td>
<td>Commenting, reciprocating; Ongoing problems with Theory of Mind (humor, make-believe, fitting, etc.)</td>
</tr>
<tr>
<td>Nonverbal, or nonfunctional (Echolalia, delayed echolalia)</td>
<td>Reliably EC &amp; initiation: ongoing problems with ToM</td>
<td></td>
</tr>
</tbody>
</table>

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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”**

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**Cognitive Orientation of Therapy vs Progression of Abilities**

- **Social**
  - No or rare eye contact, imitation / reciprocity
  - Reliable EC & imitation: ongoing problems with ToM
- **Language**
  - No or rare eye contact, imitation / reciprocity
  - Labeling, requesting; +/- commenting, reciprocating
  - Ongoing problems with Theory of Mind (humor, make-believe, fitting, etc.)
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

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

Social / Behavioral Therapies for ASD

- ABA-NET; PRT, DIR
  - Chemical compounds, food, hugs, praise
  - Avoiding, responding, labeling, matching
  - Learning to learn

- ABA-Discrete Trial Training
  - 1:1
  - Physical prompts
  - External rewards (tangibles, food, hugs, praise)
  - Attending, requesting, labeling, matching
  - "Learning to learn"

TEACCH

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

www.drcoplan.com
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

Social Skills Groups

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

The Social Skills Picture Book
Jed Baker, PhD

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

"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.”

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

ABA-Discrete Trial Training

1:1
- Physical prompts
- External rewards (tangibles, food, hugs, praise)
- Attending, requesting, labeling, matching
- "Learning to learn"

Social Stories

Social Skills Groups

1:1 ➞ Small group
- Perspective-taking
- Role-playing
- Social context

Social / Behavioral Therapies for ASD

Cognitive Orientation

Top Down

Bottom Up

ABA-Discrete Trial Training

Social Stories

Social Skills Groups

Decreasing Atypicality

Language
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

Language Function

– Use of language: Social
  • Conversation
  • Humor
  • Fibbing
  • Make-Believe
  • “The chicken is ready to eat”

– Use of language: Instrumental (obtain goal)
  • “Want chip”
  • Meaning is invariant
  • “Touch square”

Language Therapy: Philosophies

• Behaviorism
  – ABA-Discrete Trial Training (DTT)
  – Verbal Behavior (VB)

• Traditional speech-language therapy

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

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**

### Picture Exchange

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

- I want [picture of a ball]
- I see [picture of a train]

### 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

- **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

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)


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”

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?)

Progression of Interventions

Outline

- Natural History of ASD
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Presentation in Childhood

Extended Family

ASD (Autism, PDD-NOS, AS)
NLD, SPLD

“Broad Autistic Phenotype”

- Social Impairment
- Communication Impairment
- Restricted, repetitive behaviors & interests
- Anxiety Disorders
- Obsessive-Compulsive Disorder
- Depression, Bipolar Disorder
- Alcoholism

Non-ASD Psych D/O

NLD: Non-Verbal LD, SPLD: Semantic-Pragmatic Lang. Disorder

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: 10.1177/1073858410383381
The online version of this article can be found at:
http://nro.sagepub.com/content/17/4/437
“Broad Autistic Phenotype”

- Social Impairment
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Non-ASD Psych D/O

- Anxiety Disorders
- Obsessive-Compulsive Disorder
- Depression, Bipolar Disorder
- Alcoholism

NLD, SPLD

- Non-Verbal LD
- Semantic-Pragmatic Lang. Disorder

Adult Outcomes

Losing the Diagnosis does not equal “Cure”

Atypicality

- Social: Theory of Mind
- Language: Pragmatics
- Cognitive: Central Coherence
- Sensory/Motor: Aversions / Attractions

Cognitive Rigidity

- Difficulty changing mental sets
- Routines
- Transitions
- Repetitious behaviors
- Perfectionism

Anxiety

- Generalized Anx. D/O
- OCD / TS
- Phobias
- Selective Mutism

DD Model Mental Health Model

Progression of Interventions

IQ

Educational Support

Community Living Skills

Mental Health Services

Caregiver Support

Resources for Adults

http://www.ianproject.org/

The Current State of Services for Adults with Autism

Outline

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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

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

Thank you!