Adaptive Interventions

Module 1
Outline

• What are adaptive interventions?
• Why use adaptive interventions?
• Adaptive intervention design goals
• Summary & discussion
Outline

- What are adaptive interventions?
- Why use adaptive interventions?
- Adaptive intervention design goals
- Summary & discussion
Definition of an adaptive intervention

An intervention design (not an experimental design) in which intervention options are individualized to accommodate the specific and changing needs of individuals.

Sounds much like actual educational, clinical, policy or public health practice!

These interventions are known by many different names: adaptive health interventions, adaptive treatment strategies, dynamic treatment regimes, treatment algorithms, stepped care models, treatment protocols, individualized interventions...
Adaptive interventions: 5 Elements

1. Decision Points
2. Tailoring Variable
3. Decision Rule
4. Intervention Options
5. Proximal + Distal Outcomes
Example AI: Childhood ADHD Treatment
PI: Bill Pelham, Florida International University
Example AI: Childhood ADHD Treatment

PI: Bill Pelham, FIU

- Treatment with *low-dose medication*
  - Did the child respond?
    - yes: Continue
    - no: Add *behavioral modification*

Monthly, starting at 8 weeks
Example AI: Childhood ADHD Treatment
PI: Bill Pelham, FIU

- Treatment with \textit{low-dose medication}
- Did the child respond?
  - Yes: Continue
  - No: Add \textit{behavioral modification}
  - Monthly, starting at 8 weeks

\textbf{Non-Responder:}
Scored <75\% on Individualized List of Target Behaviors
\textit{-AND-}
Rated as impaired for $\geq 1$ domain on Impairment Rating Scale
Example AI: Childhood ADHD Treatment

PI: Bill Pelham, FIU

1. Decision Points
2. Tailoring Variable
3. Decision Rule
4. Intervention Options
5. Proximal + Distal Outcomes

**Decision Point:** A time(s) in which intervention options should be considered based on participant information

- Treatment with *low-dose medication*
- Did the child respond?
  - yes: Continue
  - no: Add *behavioral modification*
- Monthly, starting at 8 weeks
**Example AI: Childhood ADHD Treatment**

PI: Bill Pelham, FIU

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**Tailoring Variable:**
Participant information used to make intervention decisions

**Decision Points**
1. Did the child respond?
2. Treatment with low-dose medication

- **Yes**: Continue
- **No**: Add behavioral modification

**Intervention Options**
- Treatment with low-dose medication
  - Monthly, starting at 8 weeks

**Proximal + Distal Outcomes**

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**1. Decision Points**
2. Tailoring Variable
3. Decision Rule
4. Intervention Options
5. Proximal + Distal Outcomes
**Example AI: Childhood ADHD Treatment**

**PI: Bill Pelham, FIU**

- **Decision Points**
- **Tailoring Variable**
- **Decision Rule**
- **Intervention Options**
- **Proximal + Distal Outcomes**

- **Treatment with low-dose medication**
- **Decision Rule**
  - Did the child respond? Monthly, starting at 8 weeks
  - yes: Continue
  - no: Add behavioral modification

**Decision Rule**
Example AI: Childhood ADHD Treatment
PI: Bill Pelham, FIU

Treatment with **low-dose medication**

Did the child respond?

- **Monthly, starting at 8 weeks**

- **Yes**
  - Continue

- **No**
  - Add **behavioral modification**

**Intervention options:**
Type/Dose

1. Decision Points
2. Tailoring Variable
3. Decision Rule
4. Intervention Options
5. Proximal + Distal Outcomes
Example AI: Childhood ADHD Treatment

PI: Bill Pelham, FIU

Outcomes guiding the adaptive intervention

Distal
Long-term goal of the adaptive intervention
• Classroom rule violations

Proximal
Short-term goal of the adaptive intervention
• Reduced impairment and behavioral difficulties

1. Decision Points
2. Tailoring Variable
3. Decision Rule
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5. Proximal + Distal Outcomes
Example AI:
School-Based Autism Intervention

PI: Connie Kasari, UCLA
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1. Decision Points
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Playground-Level Interventions (Remaking Recess)

- First-stage: Remaking Recess Begins
- Second-stage: CS
- Third-stage: Peer
- Fourth-stage: Continue Peer, Peer + Parent

Intervention Options: Type/Dose

Week 0, Week 4, Week 8, Week 20, Week 28
**Example AI: School-Based Autism Intervention**

PI: Connie Kasari, UCLA

<table>
<thead>
<tr>
<th>Outcomes guiding the adaptive intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Distal</strong></td>
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<tr>
<td></td>
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<tr>
<td><strong>Proximal</strong></td>
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1. Decision Points
2. Tailoring Variable
3. Decision Rule
4. Intervention Options
5. Proximal + Distal Outcomes
Adaptive Interventions in Education
RTI: Identify/Support Students’ Learning and Behavior Needs

**Tier 1**
- Academic or behavioral concerns are noted.
- Parent/Teacher Meeting
  - Initiate Tier 1 Intervention
- **SUCCESSFUL**
  - Document intervention and continue as long as necessary
- **UNSUCCESSFUL**
  - Informal request for assistance from Consultant

**Tier 2**
- Consultant, Parent, & Teacher meet to assess the problem.
  - Initiate Tier 2 intervention
- Consultant, Parent, & Teacher Follow-Up to evaluate Tier 2 intervention
- **SUCCESSFUL**
  - Document intervention and continue as long as necessary
- **UNSUCCESSFUL**
  - Continue to Tier 3 Student Support Team Meeting

**Tier 3**
- Prepare for formal Student Support Team (SST) meeting.
- Convene SST
- Implement Intervention
- SST Review Meeting
  - Include specific program screening instruments when appropriate
- **SUCCESSFUL**
  - Document intervention and continue as long as necessary
- **UNSUCCESSFUL**
  - Should the student be referred to another program?
- NO
- YES
- Continue the plan for a predetermined time period or try a different intervention.

**Tier 4**
- Refer for other Programs or Services
- Refer to Dyslexia
- Refer to Special Education
- Refer to Section 504
RTI: Identify/Support Students’ Learning and Behavior Needs

**Tier 1**
- Academic or behavioral concerns are noted.
- **Parent/Teacher Meeting**
  - Initiate Tier 1 Intervention

**Tier 2**
- Consultant, Parent, & Teacher meet to assess the problem.
  - Initiate Tier 2 intervention
- **Consultant, Parent, & Teacher Follow-Up**
  - to evaluate Tier 2 intervention

**Tier 3**
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- **SST Review Meeting**
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**SUCCESSFUL**
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**UNSUCCESSFUL**
- Informal request for assistance from Consultant

**SUCCESSFUL**
- Document intervention and continue as long as necessary

**UNSUCCESSFUL**
- Continue to Tier 3 Student Support Team Meeting.

**SUCCESSFUL**
- Should the student be referred to another program?
  - NO
  - YES

- Continue the plan for a predetermined time period or try a different intervention.
Adaptive Intervention: 5 Elements

1. Decision Points → Trigger
2. Tailoring Variable
3. Decision Rule → Monitoring
4. Intervention Options → Individualizing
5. Proximal + Distal Outcomes → Delivering

Guide

Adaptation Process
Two Dimensions of Adaptive Interventions

**Dimension 1: Points of Individualization**

*Singular:* For each participant, treatment is individualized at most once (might still be offered a sequence).

*Sequential:* Treatment may be individualized multiple times.

**Dimension 2: Information Used to Individualize**

*Static:* Individualization based on information that is unlikely to change over time as a result of treatment (e.g., personality, baseline).

*Dynamic:* Individualization based on information that can change over time as a result of treatment (e.g., response status, engagement in treatment).
### Two Dimensions of Adaptive Interventions

**INFORMATION USED TO INDIVIDUALIZE**

<table>
<thead>
<tr>
<th>Static Information</th>
<th>Dynamic Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>At program entry:</strong></td>
<td></td>
</tr>
<tr>
<td><em>What is baseline risk?</em></td>
<td></td>
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<tr>
<td><strong>Intervention A</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Intervention B</strong></td>
<td></td>
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</table>

**POINT OF INDIVIDUALIZATION**

- **Singular**
  - low
  - high

- **Sequential**
## Two Dimensions of Adaptive Interventions

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<tr>
<td><strong>Singular</strong></td>
<td><strong>At program entry:</strong></td>
</tr>
<tr>
<td></td>
<td>Did person respond to A?</td>
</tr>
<tr>
<td></td>
<td>Then, at week 4:</td>
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<tr>
<td></td>
<td></td>
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<tr>
<td><strong>Sequential</strong></td>
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POINT OF INDIVIDUALIZATION
Two Dimensions of Adaptive Interventions

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<tr>
<td><strong>Sequential</strong></td>
<td></td>
</tr>
<tr>
<td>Intervention A</td>
<td></td>
</tr>
<tr>
<td><strong>Singular</strong></td>
<td></td>
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<tr>
<td>Intervention B</td>
<td></td>
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<tr>
<td>Intervention C</td>
<td></td>
</tr>
<tr>
<td>Intervention D</td>
<td></td>
</tr>
</tbody>
</table>

At program entry:
- What is baseline risk?
- What is age?

Then, at week 4:
Two Dimensions of Adaptive Interventions

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<td>Sequential</td>
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</table>

**POINT OF INDIVIDUALIZATION**

At program entry:
- What is baseline risk?
- Low: Intervention A
- High: Intervention B

Then, at week 4:
- What is response?
- No: Change Intervention
- Yes: Stay with Intervention
# Two Dimensions of Adaptive Interventions

**INFORMATION USED TO INDIVIDUALIZE**

## Static Information

At program entry:

- **What is baseline risk?**
  - Low
  - High

Intervention A

Intervention B

## Dynamic Information

At program entry:

- **Intervention A**

Then, at week 4:

- **Did person respond to A?**
  - No
  - Yes

Change to Intervention B

Stay with Intervention A

Then, at week 4:

- **What is baseline risk?**
  - High

Intervention A

Intervention B

Intervention C

Intervention D

Then, at week 4:

- **What is age?**
  - <18
  - 18+

Skills

Intervention A

Intervention B

Intervention C

Intervention D

Then, at week 4:

- **What is response?**
  - No
  - Yes

Change Intervention

Stay with Intervention
Examples of Tailoring Variables

**Static**
- Age, gender, personality, SES, baseline level of disability, comorbid conditions, past failed intervention, family background, baseline parent involvement

**Dynamic**
- Engagement with present intervention, parent involvement with present intervention, response to present intervention
Example Design Considerations

*About intervention timing:*

- How long should we implement the first intervention?
  - Before transitioning to a maintenance/relapse prevention intervention?
  - Before declaring non-response and moving to another intervention?

*About intervention engagement:*

- Do we try to re-engage participants who are non-adherent, or who are showing early signs of non-adherence/disengagement? If so, how?
More Design Considerations

*About intervention delivery:*

- Location of delivery?
  - Home vs. school
  - In-class vs. out-of-class

- Mode of delivery?
  - Internet vs. in-person vs. mobile device vs. telephone
Even More Design Considerations

About intervention tactics:

- For people who do not respond well to intervention A
  - Should we enhance the intensity of A or add B?
  - Should we enhance the intensity of A or switch to C?
  - Should we continue with A or step-up to D?

- For people who do respond well to intervention A
  - Should we continue or step-down?
  - Should we stop immediately or gradually?
  - Do we need a booster or not?
Summary

The objective of an AI is to guide clinical or educational practice, or public health policy (which are adaptive in nature).

- From the point of view of the **recipient**:  
  - AI is a sequence of (individualized) interventions.

- From the point of view of the **provider**:  
  - AI is a sequence of decision rules that recommend one or more intervention options at each critical decision point.
Outline

• What are adaptive interventions?
• **Why use adaptive interventions?**
• Adaptive intervention design goals
• Summary & discussion
Why Use Adaptive Interventions?

1. High *heterogeneity* in need for, or response to, a particular intervention

   o What works for one person may not work for another.

   o Thus, need to:

     • detect early signs of intervention failure
     • modify the intervention
     • work to prevent ultimate intervention failure
Why Use Adaptive Interventions?

2. Changing, chronic, or *waxing and waning* course of disorders

   - Improvement or decline is not linear

   - Need to identify:
     - intervals during which more intense intervention is required
     - interval in which less intervention is sufficient
     - adapt intervention intensity accordingly
Why Use Adaptive Interventions?

3. Intervention is **burdensome**

- Participant required to invest significant time/effort
- Burden leads to non-adherence
- Non-adherence reduces positive intervention effect

- Need to identify:
  - signs of burden
  - how to modify intervention intensity based on signs of burden
Why Use Adaptive Interventions?

4. Intervention is *costly*

- Certain treatments can be very expensive
- Resources are often limited
- Difficulties in scalability

- Perhaps need to:
  - Try less expensive intervention first
  - Offer more costly intervention to people who need it
  - Try most costly intervention up front and step-down intervention over time
Outline

• What are adaptive interventions?
• Why use adaptive interventions?
• **Adaptive intervention design goals**
• Summary & discussion
Motivating Example

Let’s build a non-traditional, tech-based AI for older children with autism who are minimally verbal.

Why older children with ASD who are minimally verbal?

• Interventions have overlooked older children with ASD
• >50% of children with ASD who receive traditional interventions at age 2 are minimally verbal at age 9
• Failure to develop language by age 5 = poor prognosis

What interventions options are available?

• One option is Joint Attention, Symbolic Play, Engagement and Regulation (JASPER) intervention
• One tech-based option is the use of speech-generating devices (think iPad)
Design Goals for Adaptive Interventions

1. Maximize the **strength** of the Adaptive Intervention
2. Maximize **replicability** of the Adaptive Intervention
Design Goals: Strength

Goal 1: Maximize the strength of the Adaptive Intervention

- This can be achieved through:
  - well-defined proximal and distal outcomes
  - effective intervention options
  - well-chosen tailoring variables
  - well-measured tailoring variables
  - well-formulated decision rules
  - well-implemented decision rules
Design Goals: Replicability

Goal 2: Maximize replicability of the Adaptive Intervention

-in the future experimental conditions, and
-in the real-world implementation conditions

We have confidence in an AI when its effects are replicable with different samples, clinical staff, locations, etc.

- This can be achieved by:
  - clear articulation of the AI
  - fidelity of implementation
  - thinking carefully about, and planning for, non-standard scenarios that may arise
Design Considerations

Recall the 5 elements of Adaptive Interventions:

1. Decision Points
2. Tailoring Variable
3. Decision Rule
4. Intervention Options
5. Proximal + Distal Outcomes

We can maximize the strength and replicability of an AI by carefully designing each element.
Design Considerations: Distal Outcome

Clearly define the ultimate goal of the intervention.

Examples:

- Increased number of social communicative utterances outside of therapy
- Enhanced treatment engagement (session participation)
- Prevention of relapse
- Improved school performance
Design Considerations: Proximal Outcome

*Proximal outcomes are pathways through which you want the intervention to achieve its ultimate goal.*

1. Response-based pathways are proximal measures that are part of the distal outcome.
   - Example: Social communicative utterances during therapy.

2. Performance-based pathways are mechanisms that predict the distal outcome.
   - Example: Play, not just about the words

3. Engagement/adherence-based pathways are indicators of engagement and adherence that predict the distal outcome.
   - Example: Receive intervention at least once per week
Design Considerations

Recall the 5 elements of Adaptive Interventions:

1. Decision Points
2. Tailoring Variable
3. Decision Rule
4. Intervention Options
   ✓ Proximal + Distal Outcomes

We can maximize the strength and replicability of an AI by carefully designing each element.
## Design Considerations: Intervention Options

### Possible Intervention Options

<table>
<thead>
<tr>
<th>Type of Proximal Outcome</th>
<th>JASPER (2x weekly)</th>
<th>JASPER + (3x weekly)</th>
<th>SGD</th>
<th>Parent observes session</th>
<th>Treatment at clinic</th>
<th>Treatment at home</th>
<th>Treatment via Tele-Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response (utterances)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Performance (play)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Engagement (attendance)</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
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Design Considerations

Recall the 5 elements of Adaptive Interventions:

1. Decision Points
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We can maximize the strength and replicability of an AI by carefully designing each element.
Design Considerations:
Decision Points and Intervention Options

- **When** do you need to make decisions?

- **What kind of intervention options are feasible** at each decision point?
## Design Considerations:
### Decision Points and Intervention Options

<table>
<thead>
<tr>
<th>When</th>
<th>Feasible Intervention Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program entry</td>
<td>1. Treatment at clinic</td>
</tr>
<tr>
<td></td>
<td>2. SG Device</td>
</tr>
<tr>
<td></td>
<td>3. JASPERR (2x/week)</td>
</tr>
<tr>
<td></td>
<td>4. Parent observes clinic treatment</td>
</tr>
<tr>
<td></td>
<td>5. Treatment via tele-health</td>
</tr>
<tr>
<td>Weekly</td>
<td>1. Continue JASPERR</td>
</tr>
<tr>
<td></td>
<td>2. Increase dose of JASPERR (3x/week)</td>
</tr>
<tr>
<td></td>
<td>3. SG Device</td>
</tr>
<tr>
<td></td>
<td>4. Parent Training</td>
</tr>
<tr>
<td></td>
<td>5. Treatment at home</td>
</tr>
<tr>
<td></td>
<td>6. Treatment via Tele-health</td>
</tr>
</tbody>
</table>
Design Considerations: Decision Points and Intervention Options

Which decisions are *critical* and need to be guided (for example, through use of a manual or other structured guide)?

- Not all decisions need to be guided, but thinking about which are and which are not is helpful.

- It is important to guide decisions that are likely to influence the outcome(s) in a clinically significant way.
Design Considerations

Recall the 5 elements of Adaptive Interventions:

- ✔ Decision Points
- 2. Tailoring Variable
- 3. Decision Rule
- ✔ Intervention Options
- ✔ Proximal + Distal Outcomes

We can maximize the strength and replicability of an AI by carefully designing each element.
Design Considerations:
Selection of Tailoring Variables

Which tailoring variables will be useful for making intervention decisions?

Useful how?
Design Considerations:
Selection of Tailoring Variables

**Approach 1:** Based on Clinical, Practical or Ethical Considerations

Useful in identifying a sub-group for whom specific options should not be considered for clear practical, ethical, or clinical reasons

- Examples:
  - We may not want to offer an intervention that requires parent support to a child who lacks strong parental involvement.
    > *Strong parent involvement is a tailoring variable*
  - It may not be reasonable to offer a mobile-based intervention to people who do not have a mobile device.
    > *Owning a mobile device is a tailoring variable*
Design Considerations: 
Selection of Tailoring Variables

**Approach 2:** Based on Predictors Data Analysis

Useful in identifying a sub-group who needs an intervention or a change from the current intervention

- Example:
  - In the Autism example, exploratory analyses suggest that children who have not made progress in social communication between weeks 6 and 12 are likely to fail in the long-term (i.e., will not be socially communicative at weeks 24-36)

  > **Social communication progress is a tailoring variable**
Design Considerations:
Selection of Tailoring Variables

Approach 3: Based on a Moderators Data Analysis

Useful in identifying a sub-group of people who benefit more from one type of intervention option over another

- This is a sub-group:
  - from whom there is insufficient evidence to decide; or
  - who would clearly benefit from a different intervention option.
Hypothetical Moderation Study

\[ E[Y|R, I] = \beta_0 + \beta_1(R) + \beta_2(I) + \beta_3(R \times I) \]

There are 3 types of moderator tailoring variables.
Design Considerations: Selection of Tailoring Variables

**Type 3a:** Evidence suggests that subgroup 1 benefits from one intervention over another, but the evidence is unclear for subgroup 2.

Response status is a Type 3a tailoring variable because it is useful for making an intervention decision for non-responders.

There *is evidence* for the use of response status as a tailoring variable:
- A for non-responders.
- B or A for responders.
AI for Tailoring Variable 3a

Initial Intervention

Did the participant respond?

yes

Intervention A or B

no

Intervention A

Intervention A (I = 1)

Intervention B (I = 0)

R = 1 R = 0
Design Considerations: Selection of Tailoring Variables

**Type 3b:** Evidence suggests that subgroup 1 benefits from one intervention over another, while subgroup 2 benefit from the alternate intervention.

Response status is a Type 3b tailoring variable because responders and non-responders benefit from different intervention approaches.

There *is evidence* for the use of response status as a tailoring variable:  
A for non-responders.  
B for responders.
AI for Tailoring Variable 3b

Did the participant respond?

Initial Intervention

Intervention B (I = 0)

Intervention A (I = 1)

R = 1  R = 0

yes

no

Intervention B

Intervention A
**Design Considerations:**

**Selection of Tailoring Variables**

*Type 3c:* Evidence suggests that one intervention is better for both subgroups, but the magnitude of the effect differs by subgroup.

Response status as a tailoring variable because both responders and non-responders do better under Intervention A.

There *is NO evidence* for the use of response status as a tailoring variable: A for non-responders and responders.
AI for Tailoring Variable 3c

Did the participant respond?

- **Initial Intervention**
  - **Intervention A** ($I = 1$)
  - **Intervention B** ($I = 0$)
  - $R = 1$ or $R = 0$

- **Intervention A**

- **Initial Intervention**

- **Intervention A**
Design Considerations: Selection of Tailoring Variables

**Baseline variables:** gender, age, symptom severity

**Proximal outcomes:**

- Short term representations of the distal outcome
  - Example: Change in communicative utterances during therapy since last visit

- Performance-based mechanisms
  - Example: Child is using toys during and playing during treatment

- Engagement/adherence-based mechanisms
  - Example: Weekly attendance to clinic treatment
Design Considerations: Selection of Tailoring Variables

• **Reliability**: The degree to which an assessment tool produces stable and consistent results with repeated trials (under the same conditions).

• Tailoring variables that are not measured with high reliability may be capturing random variability (noise) rather than actual differences in social communication.

**Impact**: assignment to intervention may be unsystematic.
Design Considerations:
Selection of Tailoring Variables

• **Validity**: how well the measurement assesses the characteristic it is intended to measure as judged by external criteria.

• A measure with low validity may result in a clinician who consistently scores lower than the “true” value.

**Impact**: intervention effect is weakened when participants are systematically assigned to the wrong intervention.
Design Considerations: Measurement of Tailoring Variables

**Timing:** Tailoring variables should be assessed at sufficiently frequent intervals so that non-response is detected in a timely manner.

- **Too infrequent**
  - condition may deteriorate so much that you might not be able to rescue with available options.

- **Too frequent**
  - disengagement or non-adherence

**Example:**
Should I measure change in communicative utterances weekly or every 2 weeks?
Design Considerations

Recall the 5 elements of Adaptive Interventions:

- ✓ Decision Points
- ✓ Tailoring Variable
- ✓ 3. Decision Rule
- ✓ Intervention Options
- ✓ Proximal + Distal Outcomes

We can maximize the strength and replicability of an AI by carefully designing each element.
Design Considerations: Decision Rule

How do we derive decision rules?

*Design a theoretical model that:*

- Articulates how treatment effects on key outcomes are expected to differ across values of the tailoring variable.

- States expected outcome associated with each intervention option for every value of the tailoring variable.

*How?*

- Use prior clinical experience
- Use prior experimental and observational studies
- Discuss with research team / clinical staff: “What intervention option would be best for people with this value on the tailoring variable?”
Design Considerations: 
Decision Rule

*Strong decision rules:*

- are objective and clearly operationalized
- are comprehensive, clear and specific
- cover situations that can occur in real-life and practice

-For instance, what will you do if the tailoring variable is missing or unavailable?
Design Considerations: Decision Rule

**Poor**
Children who make poor progress in social communication should be offered SGD.

**Better**
Children who do not show improvement in clinician-rated SCU during therapy should be offered SGD.

**Awesome**
Children who, at week 12 following JASPER, improve by more than 25% (since baseline) on clinician-rated SCU should remain on JASPER; otherwise, the child should be offered JASPER with SGD starting at the next clinic visit.

If the child does not attend assessment at week 12, use change in SCU up to previous visit.
Outline

• What are adaptive interventions?
• Why use adaptive interventions?
• Adaptive intervention design goals
• Summary & discussion
Summary

The objective of an AI is to guide clinical or educational practice, or public health policy (which are adaptive in nature).

Individualization is achieved through the use of decision rules at each decision point.

Scientists develop adaptive interventions, and clinicians use them to guide clinical practice.
Summary

There are a number of experimental designs that can be used to develop and evaluate Adaptive Interventions.

Pilot Studies can be used to determine the acceptability and feasibility of implementing an Adaptive Intervention in practice.

Enhanced Non-Responder Trials or Sequential Multiple Assignment Randomized Trials can be used to optimize an Adaptive Intervention (e.g., to identify the best decision rules in an Adaptive Intervention).

Randomized Clinical Trials can be used to evaluate an already developed AI relative to a suitable control condition.
Goal: Develop one simple example adaptive intervention in your research/clinical area

1. Rationale for the adaptive intervention
2. Distal and proximal
3. First- and second-stage intervention options
4. Tailoring variables
5. Decision rules