Introduction & Rationale

- The field has been challenged by the need to produce rigorous empirical research documenting the outcomes of services & supports.
- Support for the creation & continuation of behavioral services has been historically anchored in both a theoretical & legislative rationale.
  - Consistent documentation within intervention studies affording precise replication & implementation of the independent variable (IV) remain elusive (Gresham, 1989; Gresham, Gansle, & Noell, 1993; Letaurin & Wolery, 1992; Wolery, 1994; Yeaton & Sechrest, 1981).

Baer, Wolf, & Risley (1987)

- “Fidelity to original procedures is recommended because those procedures have been studied & are known to be effective; their variations & alternatives usually have not been studied, so nothing can be said about their effectiveness...
- What is the range of variation of a program’s procedures that still allows sufficient effectiveness? If it is large enough, flexible application can be encouraged, & the program’s survival in diverse settings may well be enhanced. If it is narrow, fidelity will be required, or what survives will not be effective (p. 321).”

Benefits to the Field

1. Link assessment to intervention
2. Promote generalization across settings
3. Strive to achieve meaningful lifestyle changes & individual/family quality of life
4. Enhance rigor of scientific research driving law & policy for federal entitlement programs (e.g., IDEA)

Reason #1: Linking Assessment to Intervention

- The ability to accurately document the implementation of the IV is a fundamental aspect of accountability.
- This makes it possible to link assessment to intervention (Carta, 2002; Costello-Ingham & Riley, 1998; Gable, Hendrickson, & Van Acker, 2001).
Reason #2: Promoting Generalization Across Settings

- Measurement of IV implementation in one setting facilitates generalization in others (Halle, 1998).
- Critically important!
- The ultimate utility of an intervention is largely dependent upon an individual's ability to generalize a skill flexibly to new contexts & stimulus exemplars.

Reason #3: Meaningful Lifestyle Changes/Quality of Life

- There is a growing interest in achieving meaningful lifestyle changes & social outcomes impacting both individual & family quality of life (Turnbull & Turnbull, 2000).
- Experts have argued that both meaningful social outcomes & scientific rigor can be achieved through measurement of acceptability, utility, integrity, & effectiveness (Peterson & McConnell, 1993).
- The field would appear to directly benefit from a thorough analysis of its ability to incorporate, assess, & document replicable evidence of change in the IV.

Reason #4: Enhance Rigor of Scientific Research

- By its own nature, the system of care includes services & supports provided by multiple agencies, each with its own unique laws & policies (e.g., education, health, & public health).
- Scientific research is used to affect & shape existing law & policy, thereby relying on a high degree of rigor & precision.
- Such standards demand that research studies demonstrate a clear & functional relationship between the implementation of the IV & changes in dependent variables.

Barriers Impacting Utility

- The field presently lacks consistent practices of labeling, defining, measuring, & reporting the extent to which the IV is implemented as intended.
- Lack of consensus agreement on terminology & definition.
  - Ex. "Procedural fidelity" vs. "treatment integrity"
  - Concerns with not only terminology, but with multiple definitions for the same concept

Terms Reported in EI/ECSE Research Synthesis (Duda, 2004)

- Fidelity
- Fidelity of Treatment
- Independent Variable Measurement
- Procedural Fidelity
- Procedural Integrity
- Procedural Reliability
- Treatment Fidelity
- Treatment Integrity
- Accuracy of Treatment Implementation
- Adherence
- Implementation Integrity
- Intervention Integrity
- Parent's Use of Strategies
- Procedural Adherence
- Trainer Implementation
- Treatment Adherence
- Verification of the Independent Variable

Barriers Impacting Utility

- The field lacks both a consistent means of measuring IV implementation & has historically failed to report it within published intervention studies.
  - Found only 25 of 158 (16%) experimental studies reported integrity of IV implementation (p. 260).
Summary

- There is a strong rationale for more precise & accurate measurement & implementation of the IV.
  1. Ensures proper documentation & accountability: linking assessment to intervention
  2. Facilitates generalization to other settings
  3. Enhances meaningful differences in social outcomes impacting both individual & family quality of life
  4. Strengthens both a study’s practical application, as well as its ability to directly or indirectly influence education- or health-related law & policy
- Without consideration of IV implementation-related factors, researchers may interpret differences for PBS program consumers of research to misinterpret findings.
  - Ex.: Conclude that a particular intervention is effective, when in reality, there is not enough information to properly arrive at such a conclusion.
  - In order to verify such a hypothesis, researchers need to accurately report the degree to which an intervention was implemented as it was intended.

Advantages of collecting fidelity data in single subject case studies

- Measuring fidelity of intervention provides:
  - information about consistency & accuracy of intervention implementation
  - level of intervention implementation
  - opportunity to compare measures of fidelity with other empirical data collected (i.e., child behavior)
  - Review support plan if intervention fidelity is low

Case Study 1 Example: PBS intervention with 24-month old (Greg)

Greg’s Problem Behaviors: Aggression, physical resistance, temper tantrums throughout daily activities, excessive screaming & crying.

Medical Concerns:
- Multiple ear infections/Tubes inserted

Diagnosis:
- Receptive/Expressive Language Delay

Intervention Agent: Mother

Selected Routines:
- 1. Diaper change
- 2. Bathtime
- 3. Transition from play

Research

Measuring Fidelity in Single-Subject Case Studies: Illustrations of measures, analyses & outcomes in PBS research

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Methodology

Single-subject design
Concurrent multiple baseline across routines

Dependent Variables:
- Challenging Behavior: Aggression, resistance, property destruction, elopement, screaming, crying

Engagement: Following directions, participating in activity appropriately for majority of interval

Independent Variable: PBS process
Supplemental Data

Intervention Fidelity: Checklist of intervention components

Duration of diaper change routine: Length of time
Child Communication Lexicon: Frequency/Different words spoken
Adult Interactions: Positive & negative interactions
Social Validation: Parents ratings of procedures & outcomes

Intervention Fidelity Measure developed from Greg’s support plan for each routine
1. Identified & defined each intervention component utilized
2. Each component step broken down to allow data collector to determine and score if component was accurately implemented by mom
3. Fidelity collected & displayed as percentage of steps completed per session
4. Fidelity data reviewed prior to next intervention session to assess consistency, accuracy & level
5. If fidelity was low, or certain steps were not being implemented, discussed with intervention agent

Intervention Fidelity Checklist for Bath Routine

<table>
<thead>
<tr>
<th>BATH ROUTINE</th>
<th>Intervention Step</th>
<th>Was step/procedure implemented?</th>
<th>Circle: Yes or No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

Intervention Fidelity Checklist for Diaper Change

<table>
<thead>
<tr>
<th>DIAPER ROUTINE</th>
<th>Intervention Step</th>
<th>Was step/procedure implemented?</th>
<th>Circle: Yes or No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

Parent Responses
- Clear instructions
- Redirect & ignore
- Praise
- Provide choice
- Materials ready

Prevention Strategies
- Visual cues/schedule
- Choice chart
- Preferred items
- Modified materials
- Remove distractions

Skill Building
- Active participation
- Walk independently
- Choice
- Teach gesture for hug
Intervention Fidelity Checklist for Play Transition

Fidelity Checklist

PLAY TRANSITION ROUTINE
Intervention Steps

Circle "yes" or "no"
1. Provide a clear instruction that it is time to transition from outside play:
   (e.g., "Greg, it's time to go in the house.")
2. Provide Greg with verbal reminder of what he can obtain once he goes inside
   (e.g., "Let's go inside so we can get some juice.").
   Do you want to play with bubbles at bath?
   and/or option of next activity.
3. Provide a picture and/or preferred toy following instruction for transition.
4. Walk into house independently.
   Do not mark "yes" if Greg is carried or
   physical guidance is used (picked up).
5. Praise and/or physical affection directed to
   Greg for appropriate behavior or for completed
   routine.

How did we calculate

- Each behavior support plan was task analyzed into simple observable steps
- A research team member would code for fidelity via video tape & score "yes" "no" or "N/A" for each session
- "N/A" would be used only if a step was not observable (i.e. camera angle)
- Once session was completed then number of steps completed/total number of steps in that session was computed & expressed as a percentage

Conclusions from Intervention Fidelity Measures in Study 1

Some intervention component steps were already occurring in baseline

- Mother implemented intervention components with high levels of fidelity following baseline
- Mother spontaneously generalized support components to second routine (transition from outdoor play) prior to directed intervention phase
- Bath routine was complex, & required modifying support plan components throughout intervention phase
- Fidelity measures were lower during monthly follow-up due to change in child maturation level

Mindy
Case Study 2 Example: PBS intervention with 12 year-old girl in school setting (Mindy)

Mindy’s Challenges/Medical Concerns:
- Hypothyroidism, dysmorphic syndrome, asthma, visual impairment, hypotonia
- Problem Behaviors: Self-injurious behavior, noncompliance, physical resistance, aggression
- Diagnosis: Autism Spectrum Disorder
- Intervention Agents: Typical peers
- Selected Routine: Daily Physical Education Routine

Methodology

Single-subject design: A-B-A-B Withdrawal Design

Dependent Variables:
- Challenging Behavior: Self-injurious behavior, noncompliance, falling to floor, aggression, screaming, elopement, masturbation
- Engagement: Following directions, participating in activity appropriately for majority of interval
- Positive Affect: Percentage of intervals with happy behavior

Independent Variable: PBS Process

<table>
<thead>
<tr>
<th>PE Intervention Steps</th>
<th>Circle Yes/no if implemented?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Minimize distractions</td>
<td></td>
</tr>
<tr>
<td>2. Preferred peer to assist</td>
<td></td>
</tr>
<tr>
<td>3. Provide picture schedule</td>
<td></td>
</tr>
<tr>
<td>4. Preferred &quot; Winnie&quot; socks</td>
<td></td>
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<tr>
<td>5. Clear instruction “It’s time to walk”</td>
<td></td>
</tr>
<tr>
<td>6. Preferred activity (tape player)</td>
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<tr>
<td>7. Preferred item (e.g., plastic lid)</td>
<td></td>
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<tr>
<td>8. Rotate materials</td>
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<tr>
<td>9. Grab bag accessible</td>
<td></td>
</tr>
<tr>
<td>10. Grouping - clear redirection, turn off music, etc.</td>
<td></td>
</tr>
<tr>
<td>11. Provide music, praise &amp; attention, when M starts walking</td>
<td></td>
</tr>
<tr>
<td>12. Provide praise &amp; attention</td>
<td></td>
</tr>
<tr>
<td>13. Instruction to go to locker room</td>
<td></td>
</tr>
<tr>
<td>14. Preferred activity (i.e., water play)</td>
<td></td>
</tr>
<tr>
<td>15. Transition out, music pref. traveling</td>
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</tr>
<tr>
<td>16. Praise M during walk back to class</td>
<td></td>
</tr>
</tbody>
</table>

Intervention fidelity measure developed from Mindy’s support plan for PE routine

1. Identify & define each intervention component utilized
2. Each component step broken down to allow data collector to determine and score if component was implemented by PE buddies
3. Fidelity collected & displayed as percentage of steps completed per session
4. Fidelity data reviewed prior to next intervention session to assess consistency, accuracy & level
5. If fidelity is low, or certain steps are not being implemented discuss with intervention agents

Hypotheses Statements:
Mindy engaged in challenging behavior in an attempt to:
1. To escape from activity that was difficult due to poor motor skills & medical issues
2. To escape from activity that was not predictable
3. To escape from activity that was nonpreferred

Routine Expectations & Intervention Components

PE Routine
1. Transition from computer
2. Put on socks & shoes
3. Stand up & walk to outside track area
4. Walk track
5. Walk into locker room, play for 10 minutes
6. Walk back to class

Intervention Components
Prevention Strategies
Preferred items
Choice of activities
Add breaks
Visual cues/schedule

Peer Responses
Modified pacing
Physical affection
Rotation of materials
Praise

Replacement Skills
Initiate breaks
Express choice
How did we calculate

- Each behavior support plan was task analyzed into simple observable steps.
- A research team member would code for fidelity via video tape on score “yes” “no” or "N/A" for each session.
- "N/A" would be used only if a step was not observable (i.e. camera angle).
- Once session was completed then number of steps completed/total number of steps in that session was computed & expressed as a percentage.

Conclusions from Intervention Fidelity Measures in Study 2

- Some intervention component steps were already occurring in baseline.
- Peer buddies implemented intervention components with high levels of fidelity following baseline.
- Peer buddy dyads.
- Documented withdrawal of intervention components during reversal condition.
- Fidelity measures compared intervention sessions with generalization probe during different activity.

Project Goal

Goal was to increase the use of evidence-based strategies by special education teachers by using a collaborative approach; & to develop an economical fidelity measure.

The Role of Fidelity & Dosage in the Implementation of Evidence-Based Strategies in a Special Education Setting

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Effective Strategies Guides

http://cfs.fmhi.usf.edu/Policy/RMRT

Effective Strategies Guides

Participants

- 87 Students Participated in Outcome Investigation
  - 57 SLD (65.5%)
  - 13 ED (15.0%)
  - 17 EMH (19.5%)
  - 64.4% Male, 66.7% White, 14.6 Average Age
- 14 Teachers Participated in Implementing Guides
  - 9 Middle School - 5 High School

Research Results

Five outcome areas captured over 1½ school years for 87 students

1) Attendance
2) Discipline Referrals (office referrals, in-school & out of school referrals)
3) Academic Achievement – Reading
4) Academic Achievement – Math
5) Time in general education – level of inclusion

Research Results

1) Reading Achievement – Increased scores over time for all students
2) Time in Special Ed – Decreased time spent in special education settings for all students
3) Out-of-School Suspensions – Decreased number over time for all students
Office Referrals – No change over time
4) Math Achievement – No change over time
5) Absences – No change over time

Fidelity Measure

Developed an observational checklist to measure level of implementation (fidelity) of the four guides.
- Determined behaviors that were critical in each manual
- Conducted validity & reliability studies
- Resulting fidelity checklist for each area could range in score from 0 (no strategies used), to 10 (all strategies used)

Fidelity Instrument

<table>
<thead>
<tr>
<th>Code</th>
<th>Question</th>
<th>Score</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>How did student participate in the classroom? How much student involvement did you observe?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>How did student participate in the classroom? How much student involvement did you observe?</td>
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<td></td>
</tr>
<tr>
<td>3</td>
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</tr>
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<td>How did student participate in the classroom? How much student involvement did you observe?</td>
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<tr>
<td>8</td>
<td>How did student participate in the classroom? How much student involvement did you observe?</td>
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</tr>
<tr>
<td>9</td>
<td>How did student participate in the classroom? How much student involvement did you observe?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>How did student participate in the classroom? How much student involvement did you observe?</td>
<td></td>
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</tr>
</tbody>
</table>
Dosage

For each participating student, we calculated:

Amount of contact with each teacher × Fidelity Score of each teacher using manuals

(% of day with Teacher A) × (Teacher A’s Total Fidelity Score)

Can range from 0 to 40

Dosage Formula

For each student:

(% of day with Teacher A) × (Teacher A TFS) + (% of day with Teacher B) × (Teacher B TFS) + (% of day with Teacher C) × (Teacher C TFS) = Dosage Score

Exposure Example

Students spent between 0% & 75% of their day with the teachers in the study (M=42%)

Teacher B 5%
Teacher C 9%
Teacher D 0%
Teacher A 28%

This student spends 42% of his day with teachers in the study

Dosage

Individual teachers ranged from 13.0 to 33.0 on their Total Fidelity Score (possible 40; M=24.4)

Dosage Correlations

Higher dosage scores related to:

- Improved math scores for students in the EMH & ED categories (EMH, r= .455; ED, r=.394)
- Fewer absences for students in the EMH category (r=.439)
- Fewer absences for all students at the high school (r= .349)
- Fewer discipline referrals for all students at the high school (r= .237)

Conclusions

✓ Fidelity & Dosage – Critical for understanding the results of the intervention
✓ Measuring dosage is challenging but is an important effort
Final things to Consider

- By measuring treatment integrity, the researcher has.....
- The ability to talk about effectiveness of intervention
- Multiple ways to collect data in innovative ways that is not burdensome to the researcher/practitioner or to the consumer

Questions/Discussion

Thank You!

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References


References


References

- Smith, B. J., & Fox, L. (2003). Systems of service delivery: A synthesis of evidence relevant to young children at risk of or who have challenging behavior. Tampa, FL: Center for Evidence-based Practice: Young children with challenging behavior.