Influences of Contrasting Types of Training on Practitioners’ and Parents’ Use of Assistive Technology and Adaptations with Infants, Toddlers and Preschoolers with Disabilities

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Abstract

The effectiveness of different types of practices for promoting practitioner and parent adoption of different kinds of assistive technology and adaptations with young children birth to 105 months of age was the focus of a meta-analysis. Six operationally defined adult learning method characteristics and between 2 and 5 practices for each characteristic were used to code and analyze the results for both adult (practitioner and parent) and child outcomes. The synthesis included 35 studies with 839 adult participants and 1100 child participants. The assistive technology that were the focus of training included speech generative devices (e.g., CheapTalk), computers (e.g., adapted keyboards), and switch activated devices and toys. Results showed that certain practices for each adult learning method characteristic proved most effect in terms of changes and improvements in both adult and child outcomes. These included trainer description and explanation of the assistive technology for introducing the devices to the trainees, learner-informed experiences and trainer demonstration of the devices for illustrating how to use the devices, trainee use of the assistive technology and trainer-guided trainee practice using the devices, trainer feedback on the trainee use of the assistive technology, and trainee standards-based self-assessment of their knowledge and skills and the provision of opportunities to generalize the use of the assistive technology for assessing mastery. Results also showed that when more of the most effective practices were used as part of the training, the greater the adult and child outcomes; and the greater positive benefits when the children who were to use the assistive technology were present during the trainings. Implications for promoting practitioner and parent adoption and use of assistive technology and adaptations are described.

Introduction

The manner in which different types of training influenced practitioners’ and parents’ adoption and use of assistive technology and adaptations, which in turn influenced the behavior of young children with developmental disabilities, was the focus of this research synthesis. Assistive technology include “devices ranging from simple (e.g., adapted spoons and switches) to [those that are more] complex (e.g., computers, augmentative communication systems, environmental control devices, electric wheelchairs)” (Wilcox, Guimond, Campbell, & Moore, 2006, p. 33). Adaptations include modifications to the environment, activities, materials, and instructional practices that make it easier for young children with disabilities to participate in natural settings and everyday learning opportunities (Campbell, Milbourne, & Wilcox, 2008).

Assistive technology and adaptations have been found effective in terms of influencing child participation in everyday activities which then provides the children participatory learning opportunities for behavior and skill development (Mistrett et al., 2001; Ostensjo, Carlberg, & Vollestad, 2003; Trivette, Dunst, Hamby, & O’Herin, 2010); yet assistive technology and adaptations have been routinely found to be underutilized with young children with disabilities and especially infants and toddlers (see Campbell et al., 2008). Campbell, Wilcox, and their colleagues have extensively investigated the reasons why this is the case. They have found, among other things, that the training opportunities afforded practitioners and parents are related to their beliefs about and attitudes toward assistive technology and adaptations (Dugan, Campbell, & Wilcox, 2006; Sawyer, Milbourne, Dugan, & Campbell, 2005; Weintrob Moore & Wilcox, 2006). Close inspection of the types of training provided practitioners and parents suggests that the training afforded them may not have been optimally effective inasmuch as the training did not include practices that are likely to promote sustained use of assistive technology and adaptations. The extent to which dif-
different types of training, as well as specific training practices, were associated with the use of assistive technology and adaptations as well as child benefits was the focus of analyses reported in this paper.

The research synthesis was guided by a characteristics-consequences framework that focused on how and in what manner different types of training and practice characteristics influenced adoption and use of assistive technology and adaptations (Dunst & Trivette, 2009b). The research synthesis differed from meta-analyses of the efficacy and effectiveness of an intervention by going one step further and unpacking and disentangling the training afforded practitioners and parents to isolate the practice characteristics that matter most in terms of both adult and child benefits (Dunst & Trivette, in press; Dunst, Trivette, & Cutspec, 2007; Lipsey, 1993). The result was expected to be a better understanding of the conditions under which training was most effective.

**Background**

Findings from a meta-analysis of the effectiveness of adult learning methods and practices were used to code and analyze the studies in the research synthesis (Dunst, Trivette, & Hamby, in press; Trivette, Dunst, Hamby, & O’Herin, 2009). The meta-analysis included an examination of the relationships between six adult learning method characteristics, and different types of practices for each characteristic, and changes in learner skills, knowledge, attitudes, and self-efficacy beliefs. The six characteristics are shown in Table 1. There were three main features: Planning, application, and deep understanding. Each feature included two characteristics. Planning included the methods and procedures for both: (1) introducing new knowledge, material or practices to learners and (2) illustrating and demonstrating the use of the knowledge, material or practices by instructors. Application included the methods and procedures for both: (1) Learner applied use of knowledge, material or practices and (2) learner evaluation of the outcome or consequence of application. Deep understanding included the methods and procedures for (1) Engaging the learner in reflection on his or her learning experience and (2) learner self-assessment of knowledge and application mastery as a foundation for identifying new learning opportunities.

Each study in the synthesis described in this report was coded in terms of the use or inclusion of each characteristic as part of the training provided the participants. In addition, we coded the kinds of practices for each characteristic to determine if different practices had differential effects. Table 2 lists the practices used in the studies to promote practitioner and parent adoption of assistive technology and adaptations. A variety of different practices were used to (1) introduce and (2) illustrate the assistive technology and adaptations for the participants and to have the participants (3) use the assistive technology and adaptations and (4) evaluate their experiences. We also coded the practices used to have participants (5) reflect on their knowledge and skills using the assistive technology and adaptations and to (6) assess mastery. The practices included a mix of trainer, trainee, and trainer-trainee activities that were used to promote participant adoption and use of assistive technology and adaptations. Many of the practices were the same or very similar to those found by Dunst et al. (in press) and Trivette et al. (2009) to be related to learner outcomes and benefits (e.g., instructor presentation, trainee-informed illustration, real-life application, standards-based self-assessment). Other practices were unique to the studies in the synthesis (e.g., trainee needs assessment, trainer-guided trainee practice, trainee feedback, tests for generalization).

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Characteristics of the Adult Learning Methods Used to Code the Training Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Planning</strong></td>
<td></td>
</tr>
<tr>
<td>Introduce</td>
<td>Engage the learner in a preview of the material, knowledge or practice that is the focus of instruction or training</td>
</tr>
<tr>
<td>Illustrate</td>
<td>Demonstrate or illustrate the use or applicability of the material, knowledge or practice for the learner</td>
</tr>
<tr>
<td><strong>Application</strong></td>
<td></td>
</tr>
<tr>
<td>Practice</td>
<td>Engage the learner in the use of the material, knowledge or practice</td>
</tr>
<tr>
<td>Evaluate</td>
<td>Engage the learner in a process of evaluating the consequence or outcome of the application of the material, knowledge or practice</td>
</tr>
<tr>
<td><strong>Deep Understanding</strong></td>
<td></td>
</tr>
<tr>
<td>Reflection</td>
<td>Engage the learner in self-assessment of his or her acquisition of knowledge and skills as a basis for identifying “next steps” in the learning process</td>
</tr>
<tr>
<td>Mastery</td>
<td>Engage the learner in a process of assessing his or her experience in the context of some conceptual or practical model or framework, or some external set of standards or criteria</td>
</tr>
</tbody>
</table>
Search Strategy

Search Terms

Relevant studies were located by the search terms “assist* and technolog*” OR assist* technolog* OR assist* and device” OR “adapt* and modification” OR adapt* OR modification AND disabilit* OR disabled OR handicap AND infant* OR toddler OR preschool, AND study, OR research OR research stud* OR research report. Both controlled vocabulary and natural language searches were conducted (Lucas & Cutspec, 2007).

Sources

ERIC (Educational Resources Information Center), Psychological Abstracts (PsychInfo), MEDLINE, Academic Search Elite, Academic Search Premier, Dissertation Abstracts International, and REHABDATA were searched. These were supplemented by searches of Ingenta, Google Scholar, Google, the Cochrane Databases, and an extensive EndNote library maintained by the Puckett Institute.

Hand searches of the reference sections of all retrieved articles, book chapters, books, dissertations, and other reports were examined to identify additional studies. We also examined papers included in previous literature reviews and research syntheses of assistive technology and adaptations (e.g., Alper & Raharinirina, 2006; Campbell, Milbourne, Dugan, & Wilcox, 2006; Mistrett et al., 2001; Mistrett & Lane, 1995; Trivette et al., 2010).

Inclusion Criterion

Studies were included if either practitioners or parents received some type of training on using assistive technology or adaptations with young children with disabilities or developmental delays and sufficient information was included in the research reports to code the training methods according to the characteristics and practices listed in Tables 1 and 2 and either or both adult and child outcomes were measured.

Search Results

Thirty five studies were located. The studies included 839 adult participants and 1100 child participants. In those studies that included children both younger and older than eight years of age, we examined the results only for children birth to eight years of age. Appendix B shows the background characteristics of the adults and Appendix C shows the background characteristics of the child participants.

The adults who received training included early childhood practitioners (N = 472), parents (N = 206), and college students (N = 161). In those studies that reported the adults’ age and education, their average age was 30.00 years (SD = 5.95) and their average years of formal education was 15.33 (SD = 1.50). The child participants ranged in age from 5 to 105 months (Mean = 49.87, SD = 15.49). The largest majority of the children had identified disabilities. Some of the children had developmental delays or were at-risk for delays. Their

Table 2
Types of Practices Used to Promote Adoption and Use of Assistive Technology and Adaptations (AT/A)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduction</strong></td>
<td>Participant needs-assessment of their knowledge of the AT/A (Participant needs)³</td>
</tr>
<tr>
<td></td>
<td>Trainer description/presentation/lecture on the AT/A (Trainer description)</td>
</tr>
<tr>
<td></td>
<td>Trainer/participant identified goals for learning the AT/A (Goal setting)</td>
</tr>
<tr>
<td><strong>Illustration</strong></td>
<td>Real life demonstration/real life demonstration and role playing using the AT/A (Real-life/real-life + role playing)</td>
</tr>
<tr>
<td></td>
<td>Role playing/simulation using the AT/A (Role playing)</td>
</tr>
<tr>
<td></td>
<td>Participant input/experience used to explain or describe the AT/A (Learner-informed input)</td>
</tr>
<tr>
<td></td>
<td>Trainer instruction on how to use the AT/A (Trainer instruction)</td>
</tr>
<tr>
<td></td>
<td>Multi-media presentation/video illustrating the use of the AT/A (Multimedia/video demonstration)</td>
</tr>
<tr>
<td><strong>Practicing</strong></td>
<td>Real life-use of and/or role playing with the AT/A (Real life/real-life + role playing)</td>
</tr>
<tr>
<td></td>
<td>Trainer-guided participant practice using the AT/A (Trainer-guided practice)</td>
</tr>
<tr>
<td></td>
<td>Participant developed activity/implemented use of the AT/A (Trainee-implemented activity)</td>
</tr>
<tr>
<td></td>
<td>Participant elicited trainer explanation/discussion of the AT/A (Trainer-requested feedback)</td>
</tr>
<tr>
<td></td>
<td>Participant group discussion of the AT/A (Group discussion)</td>
</tr>
<tr>
<td><strong>Evaluation</strong></td>
<td>Joint trainer-participant evaluation of using the AT/A (Joint evaluation)</td>
</tr>
<tr>
<td></td>
<td>Participant assessment of their strengths and weaknesses using the AT/A (Assess strengths/weaknesses)</td>
</tr>
<tr>
<td></td>
<td>Trainer feedback to participants in response to using the AT/A (Trainer feedback)</td>
</tr>
<tr>
<td></td>
<td>Participant group discussion of the understanding and abilities using the AT/A (Group discussion)</td>
</tr>
<tr>
<td><strong>Reflection</strong></td>
<td>Participant journaling about their experiences with the AT/A (Journaling)</td>
</tr>
<tr>
<td></td>
<td>Participant standards-based self assessment of their knowledge and skills (Standards-based assessment)</td>
</tr>
<tr>
<td><strong>Mastery</strong></td>
<td>Participant self-assessment of knowledge or practice (Self assessment)</td>
</tr>
<tr>
<td></td>
<td>Participant ability to generalize their use of the AT/A (Generalization test)</td>
</tr>
</tbody>
</table>

³Abbreviated descriptions for describing the practices.
estimated severity of delay (based on information in the research reports) ranged from profound/severe to typically developing.

The types of research designs, the length of training, and the settings where the training occurred are shown in Appendix C. Fifteen studies were single participant design investigations, eight were comparative group investigations, and 12 were pretest-post test investigations. The settings where the training took place included preschool classrooms, the children’s homes, university clinics, and various combinations of these settings. In those studies where the number of sessions and hours of training were reported, both were quite varied. The number of training sessions varied from one to 26 (Mean = 5.70, SD = 5.60) and hours of training varied from less than one to 60 (Mean = 14.60, SD = 18.59).

Appendix D includes a description of the types of assistive technology or adaptations that the adults were trained to use. The largest majority were some type of speech-generative devices or computer applications. A combination of assistive technology and some type of adaptations were used in five studies.

The type of training afforded the adult participants and both the coded characteristics and practices are shown in Appendix E. All of the studies included instructor/trainer introduction of the assistive technology or adaptations and all but one study included instructor/trainer illustration or demonstration. Thirty studies included some type of practice to have the adults learn to use the assistive technology or adaptations and 24 studies involved practitioner or parent evaluation of those experiences. Six studies included practices that involved adult reflection on their knowledge, understanding, and skills; and seven studies had the adults assess their mastery of the assistive technology or adaptations.

The adult learner outcomes that were the focus of investigation included their skills/abilities using the assistive technology or adaptations (N = 11 studies), knowledge of the assistive technology or adaptations (N = 4 studies), and their beliefs and attitudes toward using assistive technology or adaptations (N = 4 studies). The child outcomes included communication skills (N = 16 studies), play and social behavior (N = 4 studies), literacy skills (N = 5 studies), computer use (N = 4 studies), time engaged in interactions with materials or with others (N = 2 studies), use of switch devices (N = 2 studies), and child development (N = 2).

Synthesis Findings

Cohen’s d effect sizes were used to determine the influence of the training afforded the practitioners and parents on both the adult and child outcomes (Dunst, Hamby, & Trivette, 2007). Appendix F shows the comparisons that were made to evaluate the training afforded the study participants, the outcome measures, and effect sizes for the practitioner and parent outcomes. Appendix G shows the same for the child outcomes. In those cases where there were more than two effect sizes for the same outcome in the same study, they were averaged to be sure those studies did not disproportionately contribute to combined effect sizes. The average effect sizes and 95% confidence intervals were computed for all studies combined and separately for the group design studies and single participant design studies.

An effect size for the comparative group design studies was the differences between the post-test means for the two groups of participants divided by the pooled standard deviation. An effect size for the one group pretest-post test design studies was the post test mean minus the pretest mean divided by the pooled standard deviation. An effect size for the single participant design studies was the mean score for the intervention phase of the study minus the mean score for the baseline phase divided by pooled baseline-intervention phases standard deviation. There was one exception to how Cohen’s d was calculated for a number of single participant design studies where the formula just described produced exceedingly inflated sizes of effect (> 8). In those cases where the baseline data were all zero or near zero and the intervention phase data were all at the maximum or near the maximum, the standard deviation for the combined baseline-intervention phases was used as the denominator for computing an effect size.

The average effect sizes and 95% confidence intervals for the averages were used for substantive interpretation. A 95% confidence interval not including zero for the lower bounds of a confidence interval indicates that the average effect size is statistically at the p < .05 level (Shadish & Haddock, 1994). We examined the effect sizes for the relationships between each of the six adult learning method characteristics, the individual practices for each characteristic and different combinations of practices separately, for both the adult and child outcomes.

Practitioner and Parent Outcomes

The relationships between the six adult learning method characteristics and the practitioner and parent outcomes are shown in Figure 1. Each of the characteristics was significantly related to the adult outcomes. The average effect sizes for the relationship between the adult learning characteristics

Figure 1. The average Cohen’s d effect sizes and 95% confidence intervals for the relationships between the six adult learning method characteristics and the practitioner and parent outcomes.
Average Cohen's d Effect Sizes and 95% Confidence Intervals (CI) for the Relationships Between the Adult Learning Methods and Practices and the Practitioner and Parent Outcomes

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### Characteristics/Practices

<table>
<thead>
<tr>
<th>Characteristics/Practices</th>
<th>All Studies Combined</th>
<th>Group Studies</th>
<th>Single Participant Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Mean</td>
<td>95% CI</td>
</tr>
<tr>
<td>Introduction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trainer description</td>
<td>44</td>
<td>1.56</td>
<td>1.14 – 1.99</td>
</tr>
<tr>
<td>Needs assessment</td>
<td>7</td>
<td>1.48</td>
<td>0.48 – 2.48</td>
</tr>
<tr>
<td>Goal setting</td>
<td>14</td>
<td>1.04</td>
<td>0.53 – 1.55</td>
</tr>
<tr>
<td>Illustration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learner-informed input</td>
<td>13</td>
<td>2.42</td>
<td>1.55 – 3.28</td>
</tr>
<tr>
<td>Role playing</td>
<td>12</td>
<td>2.08</td>
<td>1.11 – 3.05</td>
</tr>
<tr>
<td>Real life/real life + role playing</td>
<td>6</td>
<td>1.69</td>
<td>0.63 – 2.75</td>
</tr>
<tr>
<td>Multimedia/video demonstration</td>
<td>14</td>
<td>1.32</td>
<td>0.34 – 2.30</td>
</tr>
<tr>
<td>Trainer instruction</td>
<td>9</td>
<td>0.51</td>
<td>0.31 – 0.71</td>
</tr>
<tr>
<td>Practicing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Real life/real life + role playing</td>
<td>36</td>
<td>1.75</td>
<td>1.26 – 2.24</td>
</tr>
<tr>
<td>Trainer guided practice</td>
<td>27</td>
<td>1.49</td>
<td>0.98 – 2.00</td>
</tr>
<tr>
<td>Trainer engagement</td>
<td>7</td>
<td>1.37</td>
<td>0.29 – 2.45</td>
</tr>
<tr>
<td>Group discussion</td>
<td>17</td>
<td>0.94</td>
<td>0.64 – 1.24</td>
</tr>
<tr>
<td>Trainer-implemented activity</td>
<td>13</td>
<td>0.78</td>
<td>0.47 – 1.09</td>
</tr>
<tr>
<td>Evaluation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trainer feedback</td>
<td>23</td>
<td>1.50</td>
<td>0.89 – 2.10</td>
</tr>
<tr>
<td>Trainee-requested feedback</td>
<td>11</td>
<td>0.83</td>
<td>0.45 – 1.20</td>
</tr>
<tr>
<td>Joint evaluation</td>
<td>14</td>
<td>0.82</td>
<td>0.50 – 1.14</td>
</tr>
<tr>
<td>Assess strengths/weaknesses</td>
<td>9</td>
<td>0.51</td>
<td>0.31 – 0.71</td>
</tr>
<tr>
<td>Reflection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Journaling</td>
<td>2</td>
<td>0.63</td>
<td>–</td>
</tr>
<tr>
<td>Group discussion</td>
<td>10</td>
<td>0.54</td>
<td>0.38 – 0.70</td>
</tr>
<tr>
<td>Mastery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generalization test</td>
<td>8</td>
<td>2.49</td>
<td>1.07 – 3.91</td>
</tr>
<tr>
<td>Standards-based assessment</td>
<td>7</td>
<td>1.89</td>
<td>1.82 – 1.96</td>
</tr>
<tr>
<td>Self-assessment</td>
<td>8</td>
<td>0.55</td>
<td>0.34 – 0.76</td>
</tr>
</tbody>
</table>
trainees, and to a lesser extent, trainee-requested feedback and trainer-trainee discussions of the participants’ experiences.

The provision of opportunities to have the practitioners and parents generalize their use of the assistive technology and adaptations and the participants’ use of a standards-based assessment to judge their understanding and their abilities to use the devices and adaptations were most effective for assessing their mastery. Some type of group discussion of the practitioner and parents understanding of the devices and adaptations was associated with the practitioner and adult outcomes although not as strongly as the other practices for the reasons described above.

The manner in which a combination of practices contributed to practitioner and parent adoption and use of the assistive technology and adaptations is shown graphically in Figure 3. The practices include a mixture of activities in the planning (introduce and illustrate), application (practice and evaluate), and deep understanding (reflection and mastery) components of the adult learning model guiding the conduct of the coding and analysis of practices constituting the focus of analysis.

**Child Outcomes**

Figure 4 shows the relationships between the six adult learning method characteristics and the child outcomes. All six characteristics were significantly related to the child outcomes. The average effect sizes ranged between 1.30 (reflection) and 2.23 (mastery). These results indicate that the training provided the study participants resulted in positive effects for the children who were afforded the assistive technology and adaptations.

The results from the analyses of the relationships between the adult learning method characteristic practices and child outcomes are shown in Table 4. For all the studies combined and for both the group and single participant design studies, the effect sizes for the relationships between the adult learning method practices were all significantly related to the child outcomes. There were, however, certain practices for each of the characteristics that proved more important in terms of their relationships with the child outcomes. The same practices that were related to the practitioner and parent outcomes were also the outcomes that were more strongly related to the child outcome with only a few exceptions. The practices that proved most effective were a mixture of trainer guided activities, trainee participatory activities, and trainer-trainee interactive activities.

**Cumulative Influences of the Practices**

The extent to which there was a cumulative effect for the use of the most effective practices for each of the six adult
learning method characteristics was assessed by determining how many studies included the practices with the largest effect sizes as part of the training afforded the practitioners and parents. The practices that were the focus of analysis were the two with the largest effect sizes for each adult learning method characteristic (Tables 3 and 4). The number of practices therefore could range between 1 and 12. The average number of those practices with the largest effect sizes used in any one study was 4.06 (SD = 2.11, Range = 1 to 8). We regressed the use of 1 to 8 practices on the effect sizes for both the adult and child outcomes to determine if there were cumulative influences of the use of multiple practices on the study outcomes.

Figure 5 shows the results for both sets of analyses. The effect sizes for the use of only one practice was 0.99 for the adult outcomes and 0.90 for the child outcomes. Had the maximum number of practices been used by the investigators (N = 8), the effect sizes would have been 3.00 for the adult outcomes and 6.01 for the child outcomes. The consequence of using 8 of the effective practices would have been a three-fold increase in the effectiveness of the trainings on the adult outcomes and nearly a four-fold increase on the child outcomes. The effect size for the linear increases for the adult outcomes was 0.63 and the effect size for the linear increase for the child outcomes was 0.98. These results indicate that optimal training effects would have been realized if more of the effective practices had been used to promote adoption and use of the assistive technology and adaptations.

**Figure 5. Linear increases and their effect sizes for the relationships between the number of adult learning method practices and the adult (practitioner and parent) and child outcomes.**

**Intervention-Related Variable Effects**

In addition to differences in the practices used in the studies to influence practitioner and parent adoption and use of the assistive technology and adaptations, the investigations differed in terms of a number of other intervention-related variables. These included the relationship between the adult and child outcomes and the use of one or more effective practices.
variables. This included number of training sessions, length of training, instructional setting, type of assistive technology, the use of adaptations, and whether the child(ren) for which the devices and adaptations were to be used were present during the training. The relationships between these variables and both the adult and child outcomes were examined. The results are shown in Table 5. All of the average effect sizes for all the intervention-related variables except two were significantly related to the child and adult outcomes. This indicates that the effects of the adult learning method practices on both the adult and child outcomes were almost all positive regardless of the intervention-related variable. There were, however, differences in the strength of the relationships between the measures for a few within intervention-related variable groups.

The average effect sizes were larger for both the child and adult outcomes when the children using the assistive technology and adaptations were present during the trainings. Presumably, the opportunity to observe or to use the assistive technology and adaptations with the children facilitated practitioner and parent adoption of the devices which in turn affected the children’s behavior. The average effect sizes for both the adult and child outcomes were larger for speech generative devices compared to other types of technology. The reason(s) for this is not readily apparent. The fewer the number of sessions of training, the more effective were the trainings in terms of both the adult and child outcomes. The studies that had fewer training sessions tended to be ones that used more effective adult learning method practices. The trainings were less effective when a combination of different types of training (individual and group) were used as evidenced by the confidence intervals including zero for both the adult and child outcomes. These results indicate that using the assistive technology and adaptations in settings that provide both contextual and functional opportunities for both the adults and children are more likely to have positive effects.

**Moderator Effects**

The extent to which the influences of the training afforded the practitioners and parents were moderated by participant study variables were assessed by constituting different groups of participants and comparing the average effect sizes for those groups. The adult variables included participant age and education, type of participant (professionals or parents), number of trainees, type of outcome measure (behavioral observations or self-report), and the type of dependent measure

<table>
<thead>
<tr>
<th>Table 5</th>
<th>Average Cohen’s d Effect Sizes and 95% Confidence Intervals (CI) for the Intervention-Related Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intervention Variables</strong></td>
<td><strong>Number</strong></td>
</tr>
<tr>
<td><strong>Number of Sessions</strong></td>
<td></td>
</tr>
<tr>
<td>1-4</td>
<td>14</td>
</tr>
<tr>
<td>5-9</td>
<td>17</td>
</tr>
<tr>
<td>10-26</td>
<td>8</td>
</tr>
<tr>
<td><strong>Length of Training (Months)</strong></td>
<td></td>
</tr>
<tr>
<td>1 or less</td>
<td>12</td>
</tr>
<tr>
<td>2-9</td>
<td>10</td>
</tr>
<tr>
<td>10-60</td>
<td>21</td>
</tr>
<tr>
<td><strong>Instructional Setting</strong></td>
<td></td>
</tr>
<tr>
<td>Child’s Home/Home + Other</td>
<td>3</td>
</tr>
<tr>
<td>Classroom/School</td>
<td>21</td>
</tr>
<tr>
<td>Other</td>
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<tr>
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</tr>
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<td>Group</td>
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<td>Combination</td>
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<td>Computers</td>
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<td>Other Assistive Technology</td>
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<tr>
<td><strong>Adaptations</strong></td>
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<td>No</td>
<td>29</td>
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<td>20</td>
</tr>
<tr>
<td>No</td>
<td>24</td>
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(behavioral skills or knowledge/beliefs). The child variables included number of children who used the assistive technology and adaptations, child age, child condition (children with a disability or children without a disability) severity of child delay, type of outcome measure (behavioral observation or some standardized scale or rating instrument), and the domain of the child outcome measures.

Table 6 shows the results for the relationships between the adult study variables and the practitioner and parent outcomes. Several findings “stand out” as particularly important. The fewer the number of adult participants, the more effective were the trainings. The optimal number of trainee was 15 or fewer. Behavioral observations of the effectiveness of the trainings proved a better outcome measure than did participants’ self-reports. This indicates that the observations of the practitioners and parents learning to use the assistive technology and adaptations were more sensitive for detecting changes or improvements in the adults’ competencies. Especially important is the fact that the trainings were more effective in terms of influencing the skills of the participants compared to their knowledge and beliefs. On the one hand these results indicate that the practitioners and parents demonstrated the ability to use the assistive technology and adaptations, but on the other hand there were not as much concomitant changes in their self-reported knowledge of the devices nor their self-efficacy beliefs and attitudes about their capabilities.

The relationships between the moderator variables and the child outcomes are shown in Table 7. The trainings tended to be more effective when the assistive technology and adaptations were used with a smaller number of children. The trainings were similarly effective for all children regardless of age except for children birth to 36 months of age. The trainings were more effective for children with developmental disabilities or delays. The trainings had a more positive influence on changes in the children’s behavior associated with the use of the assistive technology and adaptations compared to changes on standardized scales or rating scales. The effects of the trainings on changes or improvements in the child outcomes were relatively similar regardless of the child

<table>
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<th>Number of Children</th>
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<th>Mean</th>
<th>95% CI</th>
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<tr>
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<td>27</td>
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<td>1.82 – 3.04</td>
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<td>4-9</td>
<td>43</td>
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<td>1.17 – 2.16</td>
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<td>3</td>
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<td>0.33 – 2.64</td>
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<tr>
<td>26-40</td>
<td>12</td>
<td>1.16</td>
<td>0.40 – 1.91</td>
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<td>41-59</td>
<td>12</td>
<td>0.96</td>
<td>0.67 – 1.24</td>
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<tr>
<td>60+</td>
<td>6</td>
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<thead>
<tr>
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<td>0-36</td>
<td>11</td>
<td>0.75</td>
<td>-0.60 – 2.10</td>
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<td>1.24 – 2.06</td>
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<td>61-72</td>
<td>13</td>
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<td>1.06 – 3.00</td>
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<td>85</td>
<td>1.69</td>
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<td>Behavioral</td>
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<td>Observation</td>
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<td>0.24 – 1.18</td>
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<td>Developmental/Rating Scale</td>
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<td>1.43 – 2.45</td>
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<td>0.82 – 1.67</td>
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<tr>
<td>Behavioral Skills</td>
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<td>1.29</td>
<td>1.02 – 1.55</td>
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<tr>
<td>Engagement</td>
<td>16</td>
<td>1.92</td>
<td>1.17 – 2.67</td>
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Table 7
Average Cohen’s d Effect Sizes and 95% Confidence Intervals for the Adult Participant and Study Variables and the Practitioner and Parent Outcomes

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*Few studies included participant ages and therefore the results should be interpreted with caution.*
outcomes measure or domain.

The results from the moderator analyses, taken together, indicated that the influences of the trainings afforded the practitioners and parents were more similar than different for both the adult and child outcomes, and where there were differences, most were not unexpected based on findings reported elsewhere (Dunst et al., in press; Trivette et al., 2009). These included number of trainees (the fewer the better), the number of child participants (the fewer the better), and changes or improvements both in the adult and child outcomes (skill development). The only two unexpected results were those related to child age where the trainings were less effective for the youngest children in the studies and those related to the trainings being more effective for children with developmental disabilities.

Discussion

Findings showed that the methods that were most effective in terms of promoting practitioner and parent adoption and use of the assistive technology and adaptations included specific kinds of practices for affecting changes and improvements in both the adult and child outcomes. The practice most effective for introducing the devices to the participants was trainer description and explanation of the assistive technology. The practices that proved most effective for illustrating the use of the assistive technology were incorporating the trainee’s experiences and knowledge into the trainings, trainer demonstration, and role playing. The practices that were most effective for promoting the participants abilities to use the assistive technology included real-life application, role playing, and trainer-guided practice. The practices that were most effective for having the trainees evaluate their knowledge and skills were standards-based self-assessment and the opportunity to generalize the use of the assistive technology. Results also showed that the more these practices were incorporated into the trainings, the more positive were both the adult and child outcomes.

Closer inspection of the training methods and results from the meta-analysis permit some insights into the nature of the practices used to promote adoption and use of the assistive technology and adaptations. The practices that had the largest effect sizes for both the adult and child outcomes were ones that had the participants assess their mastery (knowledge and skills) of the assistive technology and adaptations but these was used in only 7 of the 35 studies. Only six studies included some type of practice for engaging the trainees in reflection on their understanding and abilities to use the assistive technology, and the practices that were used are ones that are not particularly effective (see Dunst et al., in press; Trivette et al., 2009). Although the training afforded the practitioners and parents was effective in terms of improving the trainees skills using the assistive technology, there were much smaller changes in their self-efficacy beliefs and attitudes toward using the devices. Inasmuch as self-efficacy beliefs and attitudes are determinants of sustained behavior change (Bandura, 1997; Skinner, 1995), the reasons why assistive technology and other types of interventions are underutilized with young children (Campbell & Halbert, 2002; Campbell, McGregor, & Nasik, 1994) may be the lack of change in these types of attributions. The findings, taken together, lead to the conclusion that many of the investigations and the training methods and practices that were used may not have been optimally effective. This is the case because the most effective practices tended to be the least used practices.

In those studies where the training was effective, there were certain practices and intervention-related factors that contributed to more positive consequences. First, a mixture of trainee, trainer, and trainee-trainer activities that actively involved the practitioners and parents in learning to use the assistive technology and adaptations were more likely to affect both adult and child outcomes. Second, the fewer the number of practitioners and parents who participated in the trainings, and the fewer the number of children who subsequently were taught to use the assistive technology, the better the outcomes. Third, when more of the most effective practices were used to train the practitioners and parents, and the more targeted the training, the less time it required to promote adoption and use of the assistive technology.

Implications for Practice

The implications of the results reported in this paper for training practitioners and parents to understand and use assistive technology and adaptations are straightforward. The findings highlight the particular practices (Tables 3 and 4; Figures 2 and 4) and the conditions under which (Tables 6 and 7) attempts to promote adoption and sustained use of assistive technology and adaptations are likely to be most effective. This includes, but is not limited to, active trainee involvement in all phases of the learning process (planning, application, deep understanding), the use of practices that are most effective and appropriate for particular contexts and situations (e.g., learner-informed input, real-life application, trainer-guided practice and feedback, standards-based self-assessment of mastery), training a small number of practitioners or parents in a more concentrated way, and involving a small number of children in using the assistive technology at least during the initial phases of the learning process. The more the training involves trainer and trainee opportunities to interact, reflect on, and discuss and assess progress towards mastery, the more likely the training will be effective.

To help trainees use effective methods and practices to promote either or both practitioner and parent adoption and use of assistive technology or adaptations, the findings from this synthesis together with findings reported by Trivette et al. (2009) were used to develop the checklist in Appendix H for guiding the development and implementation of a training program. The checklist includes, for each of the six adult learning method characteristics, two of the practices that af-
fected changes and improvements in both adult and child outcomes. Each of the characteristics includes a trainer-focused practice, a trainee-focused experience, and several practices that include elements that involve trainer-trainee joint engagement in activities to promote trainee increased understanding and mastery of the assistive technology or adaptations. The interested reader is referred to Dunst and Trivette (2009a) for a list of other trainer practices and trainee experiences and opportunities that are the evidence-based for the type of training just described in addition to those described by Dunst et al. (in press) and Trivette et al. (2009) as well as the results in this paper.

In addition to the evidence-based practices on the checklist, several other considerations should be incorporated into a training. The training should be done with fewer than 15 trainees and the number of children who provide the trainees opportunities to use the assistive technology or adaptations should also be small (<10) at least during the time where the trainees are learning to use the devices or adaptations. To the extent possible, the training should be done in vivo with the children who will use the assistive technology or adaptations. These additional considerations are likely to have value added effects.

References


Macomb, IL: Western Illinois University, Center for Best Practices in Early Childhood Education. (ERIC Document Reproduction Service No. ED469844).


Thatcher, A. (2009). Teaching a school-based AAC team to support the communication skills of a student who requires AAC. Unpublished master's thesis, University of New Mexico, Albuquerque, NM.


Authors

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## Appendix A

### Characteristics of the Adult Study Participants

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample Size</th>
<th>Mean Age (Years)</th>
<th>Mean Years of Education</th>
<th>Trainee</th>
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<td>Binger et al. (2009)</td>
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<td>Professionals</td>
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<td>Professionals</td>
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<td>NR</td>
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<td>Parent</td>
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<td>NR</td>
<td>Professionals</td>
</tr>
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<td>NR</td>
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</tr>
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<td>NR</td>
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*Not reported.
## Appendix B

### Characteristics of Child Study Participants

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<th>Range</th>
<th>Participants</th>
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<th>Type</th>
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<td></td>
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<td>Cleft palate</td>
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<tr>
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<td>Disability</td>
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<td>16-60</td>
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<td>Speech/language delays, physical impairments, and/or cognitive disability</td>
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<td>Disability</td>
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<td>36</td>
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Appendix B, continued

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<th>Sample Size</th>
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<th>Child Conditions</th>
<th>Severity of Delay</th>
<th>Type</th>
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<td>80-82</td>
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*a Estimated based on information included in the research reports.*

*b Severe to profound disabilities.*

*c Mild to moderate disabilities.*

*d Developmental delay.*

*e Typically developing.*

*f Not Reported.*
## Appendix C

**Selected Characteristics of Training Studies**

<table>
<thead>
<tr>
<th>Study</th>
<th>Research Design</th>
<th>Length of Training</th>
<th>Instructional Setting</th>
<th>Training was done with a target child</th>
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<td>Design</td>
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<td>26</td>
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<td>Ferrier et al. (1996)</td>
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<td>Within group comparison</td>
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<td>Pretest/post test</td>
<td>36</td>
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<td>Olive et al. (2008)</td>
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## Appendix C, continued

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<td>Thatcher (2009)</td>
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* *Not reported.*
### Appendix D

**Types of Adaptations, Technologies, Adaptive Technologies, and Instruction**

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<th>Type of Adult Instruction</th>
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<td>Binger et al. (2008) (Study 2)</td>
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<td>Speech-generating devices (MiniMo, Springboard)</td>
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<td>Speech-generating device (Introtalker)</td>
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<td>Ferrier et al. (1996)</td>
<td>Baby-babble-blanket switch interface</td>
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<td>Computer with Omnibox, Switchmaster, and multiple switches and devices</td>
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<td>Computers/Software/Technology</td>
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<td>Computers/Software/Technology</td>
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<td>Interactive technology literacy curriculum (ITLC)—Focused on computers w/ switches, touch tablets, adaptive keyboards, AAC devices, alternative input devices, amplified sound, visual reinforcement</td>
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<tr>
<td>Hutinger et al. (2000); Hutinger &amp; Johanson (2000)</td>
<td>ECCTS project—Focused on computers with touch screens, switches, switch holders and mounts, adaptive keyboards, and other assistive device + interactive software</td>
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<td>Hutinger et al. (2002a)</td>
<td>LitTECH Interactive Outreach project—Focused on teaching how to use technology to promote early literacy</td>
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<td>Group</td>
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<td>ELiTeC model—Focused on teaching how technologies can provide access to literacy activities</td>
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<tr>
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<td>Speech generating devices (DynaVox, Techspeak, DynaMyte)</td>
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<td>Light tech ACC systems (PCS, single-message BigMack, multi-message Four In-Line Cheap Talk, variety of stands)</td>
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<td>Assistive technology and/or adaptations</td>
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<sup>a</sup> Not reported.
## Appendix E

*Adult Learning Method Practices Used to Promote Use of the Assistive Technology and Adaptations*

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Appendix E, continued

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* Not reported.
## Appendix F

### Adult Participant Outcome Measures and Cohen’s d Effect Sizes

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<th>Outcome Construct</th>
<th>Outcome Measure</th>
<th>Outcome Type</th>
<th>Participants</th>
<th>Effect Size</th>
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<td>Skill</td>
<td>Percentage of interaction strategy steps correctly implemented by parents within 10-minute sessions using intervention books</td>
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<td>P1 P3</td>
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<td>Observation</td>
<td>Skill</td>
<td>Percentage of steps correctly implemented</td>
<td>Percentage</td>
<td>P1 P2 P3</td>
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<td>Outcome Construct</td>
<td>Outcome Measure</td>
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<td>Intervention vs. comparison</td>
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<td>Panyan et al. (1991)</td>
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| Rosa-Lugo & Kent-Walsh (2008) | Intervention vs. baseline | Observation | Skill | Percentage accurate implementation of targeted strategy | Percentage | P1 1.82  
 | | | | | | | P2 1.83  |
| Schepis et al. (1996); Schepis et al. (1998) | Intervention vs. baseline | Observation | Skill | Communicative interactions per minute during child’s snack time | Rate | P1 4.39  
 | | | | | | | P2 4.85  
 | | | | | | | P3 2.18  
 | | | | | | | P4 3.58 |
| | Intervention vs. baseline | Observation | Skill | Communicative interactions per minute during child’s leisure time | Rate | P1 2.63  
 | | | | | | | P2 3.31 |
Appendix F, continued

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### Appendix G

**Child Participant Outcome Measures and Cohen’s d Effect Sizes**

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<td>Communication skill</td>
<td>Number of multi-symbol messages produced by children within 10 min sessions with intervention books</td>
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<td>Number of multi-symbol message productions per 10-minute session</td>
<td>Frequency</td>
<td>P1 P2 P3</td>
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<td>Durand (1999) (Studies 2 &amp; 3)</td>
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<td>Non-challenging behavior</td>
<td>Percentage intervals of non-challenging behavior in the classroom</td>
<td>Percentage</td>
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<td>Percentage of intervals of unprompted communication in the classroom</td>
<td>Percentage</td>
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<td>Percentage of intervals during which child was engaged</td>
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<td>Solitary play (reversed) Parallel play (reversed) Attentative play Reciprocal play Verbal communication Nonverbal communication Engagement Positive affect Negative affect (reversed)</td>
<td>Frequency</td>
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<td>Study</td>
<td>Comparative Conditions</td>
<td>Measurement Method</td>
<td>Outcome Construct</td>
<td>Outcome Measure</td>
<td>Outcome Type</td>
<td>Participants</td>
<td>Effect Size</td>
</tr>
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<td>-----------------------------</td>
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<tr>
<td>Olive et al. (2008)</td>
<td>Intervention vs. baseline</td>
<td>Observation</td>
<td>Non-challenging behavior</td>
<td>Frequency of non-challenging behavior</td>
<td>Frequency</td>
<td>P1</td>
<td>1.98</td>
</tr>
<tr>
<td></td>
<td>Intervention vs. baseline</td>
<td>Observation</td>
<td>Communication skill</td>
<td>Frequency of attention requesting</td>
<td>Frequency</td>
<td>P1</td>
<td>.44</td>
</tr>
<tr>
<td>Regtvoort &amp; Leij (2007)</td>
<td>Experimental vs. control post-test</td>
<td>Individually administered test</td>
<td>Literacy skill</td>
<td>Phonemic awareness</td>
<td>Total scale score</td>
<td>.59</td>
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<tr>
<td>(Groups 1&amp;2)</td>
<td>Experimental vs. control post-test</td>
<td>Individually administered test</td>
<td>Literacy skill</td>
<td>Letter knowledge</td>
<td>Total scale score</td>
<td>1.03</td>
<td></td>
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<td></td>
<td>Experimental vs. control post-test</td>
<td>Individually administered test</td>
<td>Literacy skill</td>
<td>Naming speed</td>
<td>Completion time</td>
<td>.26</td>
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<tr>
<td>Romski et al. (2010)</td>
<td>Pretest vs. post test</td>
<td>Observation</td>
<td>Communication skill</td>
<td>Number of augmented words used per 30 minutes</td>
<td>Frequency</td>
<td></td>
<td>1.92</td>
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<td>Romski et al. (1994);</td>
<td>Pretest vs. post test</td>
<td>Observation</td>
<td>Communication skill</td>
<td>Mean length of utterance</td>
<td>Frequency</td>
<td>- .75</td>
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<tr>
<td>Romski &amp; Sevcik (1996);</td>
<td>Pretest vs. post test</td>
<td>Observation</td>
<td>Communication skill</td>
<td>Mean number of lexigrams used per 30 minutes</td>
<td>Frequency</td>
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<td>Sevcik &amp; Romski (1995)</td>
<td>Pretest vs. post test</td>
<td>Observation</td>
<td>Communication skill</td>
<td>Mean of communicative turns expressed</td>
<td>Frequency</td>
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<tr>
<td></td>
<td>Pretest vs. post test</td>
<td>Observation</td>
<td>Communication skill</td>
<td>Mean of semantic concepts expressed</td>
<td>Frequency</td>
<td>1.69</td>
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<tr>
<td>Schepis et al. (1996);</td>
<td>Intervention vs. baseline</td>
<td>Observation</td>
<td>Communication skill</td>
<td>Rate per minute of communicative interactions during child snack time</td>
<td>Frequency</td>
<td>4.03, 3.12, 3.61, 3.25</td>
<td></td>
</tr>
<tr>
<td>Schepis et al. (1998)</td>
<td>Intervention vs. baseline</td>
<td>Observation</td>
<td>Communication skill</td>
<td>Mean rate per minute of communicative interactions during child leisure time</td>
<td>Frequency</td>
<td>P1, P2, P3, P4</td>
<td>6.28, 4.74</td>
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<tr>
<td>Sevcik et al. (2004)</td>
<td>Pretest vs. post test</td>
<td>Observation</td>
<td>Engagement</td>
<td>Percent of the time child is directly engaged in activities or communicating in an activity in therapy and at home</td>
<td>Percentage</td>
<td></td>
<td>.41</td>
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<tr>
<td>Sullivan &amp; Lewis (1990)</td>
<td>Intervention vs. baseline</td>
<td>Switch activation</td>
<td>Switch activation</td>
<td>Non-contingent vs. contingent motor responses per minute</td>
<td>Frequency</td>
<td>P1</td>
<td>1.64</td>
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<td>Thunberg et al. (2007)</td>
<td>Pretest vs. post test</td>
<td>Observation</td>
<td>Communication skill</td>
<td>Percentage of effective child responses with device to communicative partner</td>
<td>Percentage</td>
<td></td>
<td>1.14</td>
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<tr>
<td>Williams et al. (2002)</td>
<td>Pretest vs. post test</td>
<td>Observation</td>
<td>Communication skill</td>
<td>Number of words read correctly—computer group (15 minutes)</td>
<td>Frequency</td>
<td></td>
<td>.21</td>
</tr>
<tr>
<td></td>
<td>Pretest vs. post test</td>
<td>Observation</td>
<td>Communication skill</td>
<td>Words recorded during two 30-minute direct observations—computer group</td>
<td>Frequency</td>
<td></td>
<td>.13</td>
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</table>
### Appendix H

**Checklist for Promoting the Use of Assistive Technology or Adaptations**

<table>
<thead>
<tr>
<th>Trainer __________________________</th>
<th>Type of Device/Adaptation __________________________</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The training to promote adoption and use of the assistive technology or adaptations (AT/A) included each of the following practices:

<table>
<thead>
<tr>
<th>Introduction</th>
<th>1. Solicit trainee identification or description of what they expect to learn from the training</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Provide a detailed description or explanation of the AT/A</td>
</tr>
<tr>
<td>Illustration</td>
<td>3. Use trainee knowledge or experience with the AT/A or similar devices to provide example(s) of application</td>
</tr>
<tr>
<td></td>
<td>4. Demonstrate the use of the AT/A either <em>in vivo</em> or through role playing</td>
</tr>
<tr>
<td>Practicing</td>
<td>5. Engage the trainee is the use of the AT/A either <em>in vivo</em> or through role playing</td>
</tr>
<tr>
<td></td>
<td>6. Provide the trainee trainer-guided practice using the AT/A</td>
</tr>
<tr>
<td>Evaluation</td>
<td>7. Engage the trainee in evaluation of the experience using the AT/A</td>
</tr>
<tr>
<td></td>
<td>8. Provide the trainee feedback based on trainer observation of trainee application</td>
</tr>
<tr>
<td>Reflection</td>
<td>9. Engage the trainee in self-assessment of the understanding of both the use and consequences of the AT/A</td>
</tr>
<tr>
<td></td>
<td>10. Together with the trainee, assess trainee performance and identify next steps in the learning process</td>
</tr>
<tr>
<td>Mastery</td>
<td>11. Have the trainee use a checklist or set of performance standards to assess overall mastery of the AT/A</td>
</tr>
<tr>
<td></td>
<td>12. Provide the trainee opportunities to use the AT/A in different settings or with different children</td>
</tr>
</tbody>
</table>