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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 trainees 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 child(ren) 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; Weintraub 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-

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ferent 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 at 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 1
Characteristics of the Adult Learning Methods Used to Code the Training Methods

Features/Characteristics	Definition
Planning	
Introduce	Engage the learner in a preview of the material, knowledge or practice that is the focus of instruction or training
Illustrate	Demonstrate or illustrate the use or applicability of the material, knowledge or practice for the learner
Application	
Practice	Engage the learner in the use of the material, knowledge or practice
Evaluate	Engage the learner in a process of evaluating the consequence or outcome of the application of the material, knowledge or practice
Deep Understanding	
Reflection	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
Mastery	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

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 A shows the background characteristics of the adults and Appendix B 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)

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

[a] Abbreviated 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 disproportionally 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

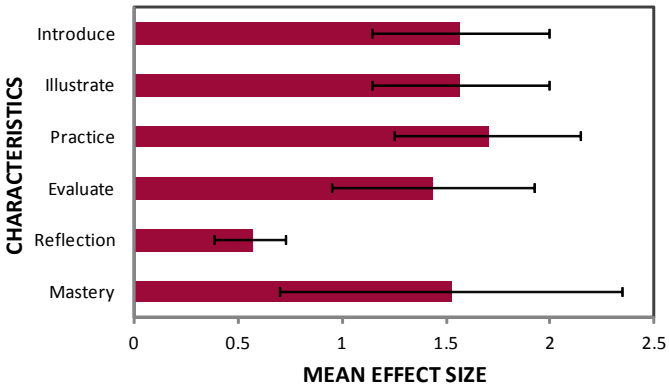

Figure 1. **The average Cohen's d effect sizes and 95% confidence intervals for the relationships between the six adult learning method characteristics and the practitioner and parent outcomes.**

(except for evaluation and reflection) were all 1.50 or larger. The fact that reflection was not as strongly related to the adult outcomes compared to the other characteristics was not unexpected. Only six studies included some type of reflective practices, and those practices are ones that were are not found particularly effective in terms of engaging learners in the assessment of their knowledge and skills in the meta-analysis used to guide the conduct of this research synthesis (Dunst et al., in press; Trivette et al., 2009). In fact, the average effect sizes for the practices in the studies in this synthesis (see below) were almost identical to those in the Dunst et al. (in press) and Trivette et al. (2009) research synthesis for the same practices.

Table 3 shows the results for the relationships between the adult learning method characteristic practices and the practitioner and parent outcomes. For all studies combined, all of the practices for each of the six characteristics were significantly related to the practitioner and parent outcomes. The patterns of relationships between the different practices for each characteristic were very much alike for the group and single participant design studies. The fact that the single participant design studies tended to have average effect sizes larger than the group design studies was not unexpected since this has generally been the case in research syntheses of the type reported in this paper (e.g., Raab & Dunst, 2007).

Despite the fact that almost all of the practices were significantly related to the study outcomes, there were certain practices for the different adult learning method characteristics that were more strongly related to the adult outcome measures (Figure 2). These particular practices, taken together, were the ones that were most effective in promoting the practitioners and parents adoption and use of the assistive technology and adaptations.

Trainer descriptions/presentations and identifying the participants' needs prior to the trainings proved to be most effective for introducing the assistive technology and adaptations to the practitioners and parents. Learner-informed input, real life demonstrations, and role playing were most effective for illustrating the devices or adaptations to the participants. The use of video and multimedia demonstrations of the devices and the adaptations were also effective for illustrating the devices and adaptations to the participants.

The practices that were most effective for having the practitioners and parents learn to use the assistive technology and adaptations were real life application, role playing, and trainer-guided practice. The practices that were most effective for having the participants evaluate their experiences using the devices and adaptations were trainer feedback to the

Table 3

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

	All Studies Combined			Group Studies			Single Participant Studies		
Characteristics/Practices	Number	Mean	95% CI	Number	Mean	95% CI	Number	Mean	95% CI
Introduction									
Trainer description	44	1.56	1.14 – 1.99	27	1.07	0.53 – 1.61	17	2.35	1.80 – 2.91
Needs assessment	7	1.48	0.48 – 2.48	7	1.48	0.48 – 2.48	0	–	–
Goal setting	14	1.04	0.53 – 1.55	14	1.04	0.53 – 1.55	0	–	–
Illustration									
Learner-informed input	13	2.42	1.55 – 3.28	7	1.50	0.52 – 2.48	6	3.49	2.42 – 4.56
Role playing	12	2.08	1.11 – 3.05	5	2.35	-0.75 – 5.46	7	1.89	1.82 – 1.96
Real life/real life + role playing	6	1.69	0.63 – 2.75	6	1.69	0.63 – 2.75	0	–	–
Multimedia/video demonstration	14	1.32	0.34 – 2.30	8	1.13	-0.76 – 3.01	6	1.58	1.10 – 2.06
Trainer instruction	9	0.51	0.31 – 0.71	9	0.51	0.31 – 0.71	0	–	–
Practicing									
Real life/real life + role playing	36	1.75	1.26 – 2.24	19	1.21	0.46 – 1.95	17	2.35	1.80 – 2.91
Trainer guided practice	27	1.49	0.98 – 2.00	20	1.35	0.66 – 2.05	7	1.89	1.82 – 1.96
Trainer engagement	7	1.37	0.29 – 2.45	7	1.37	0.29 – 2.45	0	–	–
Group discussion	17	0.94	0.64 – 1.24	13	0.78	0.47 – 1.09	4	1.46	0.60 – 2.32
Trainee-implemented activity	13	0.78	0.47 – 1.09	13	0.78	0.47 – 1.09	0	-	-
Evaluation									
Trainer feedback	23	1.50	0.89 – 2.10	16	1.33	0.44 – 2.21	7	1.89	1.82 – 1.96
Trainee-requested feedback	11	0.83	0.45 – 1.20	9	0.61	0.38 – 0.83	2	1.83	–
Joint evaluation	14	0.82	0.50 – 1.14	10	0.57	0.35 – 0.78	4	1.46	0.60 – 2.32
Assess strengths/weaknesses	9	0.51	0.31 – 0.71	9	0.51	0.31 – 0.71	0	–	–
Reflection									
Journaling	2	0.63	–	2	0.63	–	0	–	–
Group discussion	10	0.54	0.38 – 0.70	10	0.54	0.38 – 0.70	0	–	–
Mastery									
Generalization test	8	2.49	1.07 – 3.91	1	6.70	–	7	1.89	1.82 – 1.96
Standards-based assessment	7	1.89	1.82 – 1.96	0	–	–	7	1.89	1.82 – 1.96
Self-assessment	8	0.55	0.34 – 0.76	8	0.55	0.34 – 0.76	0	–	–

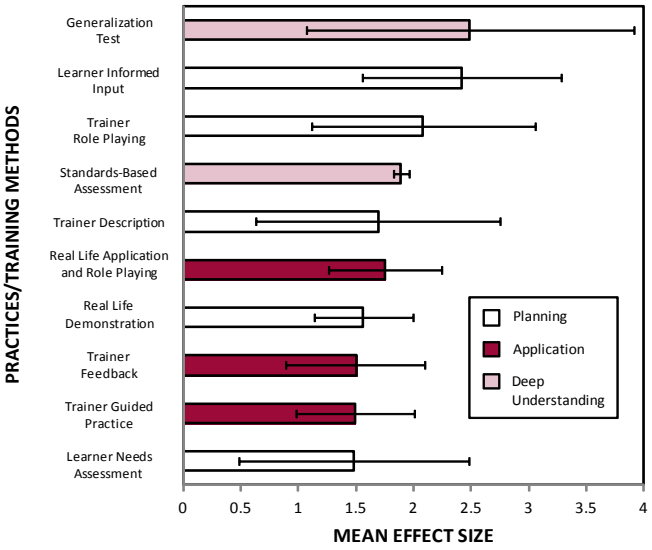

Figure 2. **The average Cohen's d effect sizes and 95% confidence intervals for the relationships between the training method practices and the practitioners' and parents' adoption and use of the assistive technology and adaptations.**

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

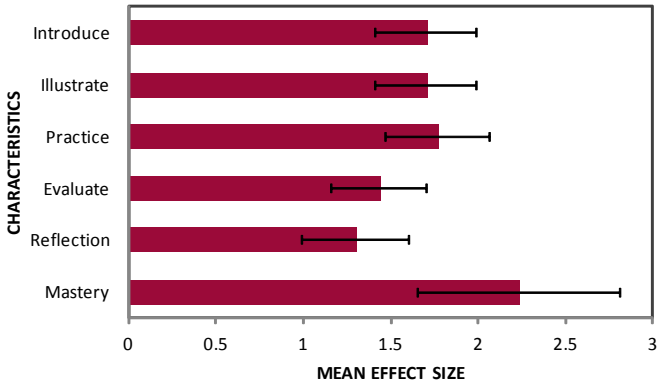

Figure 3. **The average Cohen's d effect sizes and 95% confidence intervals for the relationships between the six adult learning method characteristics and the child outcomes.**

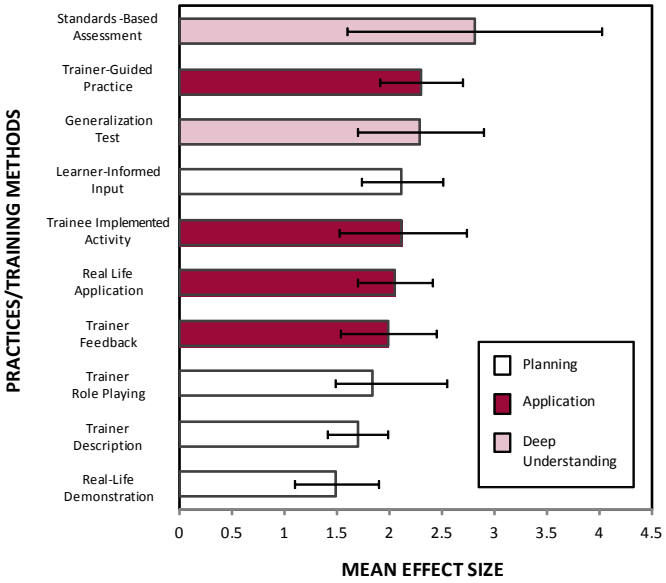

Figure 4. **The average Cohen's d effect sizes and 95% confidence intervals for the relationships between the training method practices and the child outcomes.**

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

Table 4

Average Cohen's d Effect Sizes and 95% Confidence Intervals (CI) for the Relationships Between the Adult Learning Characteristics and Practices and the Child Outcomes

	All Studies Combined			Group Studies			Single Participant Studies		
Characteristics/Practices	Number	Mean	95% CI	Number	Mean	95% CI	Number	Mean	95% CI
Introduction									
Trainer description	103	1.70	1.41 – 1.98	53	1.11	0.73 – 1.50	50	2.31	1.96 – 2.66
Participant needs assessment	28	1.43	1.18 – 1.67	28	1.43	1.18 – 1.67	0	–	–
Participant goal setting	19	0.80	-.02 – 1.60	18	0.72	-0.12 – 1.57	1	1.96	–
Illustration									
Learner-informed input	48	2.12	1.73 – 2.51	19	1.48	1.10 – 1.86	29	2.54	1.99 – 3.10
Role playing/simulations	39	1.84	1.48 – 2.19	5	2.25	-0.95 – 5.45	34	1.77	1.51 – 2.03
Real life/real life + role playing	15	1.49	1.09 – 1.90	15	1.49	1.09 – 1.90	0	–	–
Trainer instruction	55	1.45	1.07 – 1.83	34	0.99	0.52 – 1.45	21	2.20	1.65 – 2.76
Multimedia/video presentation	11	1.19	0.62 – 1.77	7	0.87	-0.01 – 1.74	4	1.77	1.68 – 1.86
Practicing									
Trainer guided practice	40	2.30	1.91 – 2.69	10	2.20	1.04 – 3.36	30	2.34	1.93 – 2.74
Trainee implemented activity	21	2.12	1.52 – 2.73	12	1.33	0.84 – 1.82	9	3.18	2.26 – 4.10
Real life/real life + role playing	54	2.05	1.69 – 2.41	14	1.78	0.83 – 2.72	40	2.14	1.77 – 2.52
Trainee engagement	52	1.23	0.91 – 1.55	40	1.10	0.69 – 1.50	12	1.67	1.42 – 1.92
Group discussion	4	1.00	-0.07 – 2.06	4	1.00	-0.07 – 2.06	0	–	–
Evaluation									
Trainer feedback	30	1.99	1.53 – 2.45	10	1.89	0.51 – 3.26	20	2.04	1.68 – 2.39
Trainee-requested trainer feedback	17	1.34	0.94 – 1.74	9	1.07	0.37 – 1.77	8	1.64	1.22 – 2.05
Assess strengths/weaknesses	17	1.27	0.98 – 1.57	17	1.27	0.98 – 1.57	0	–	–
Trainee-trainer interactions	40	0.96	0.56 – 1.37	40	0.96	0.56 – 1.37	0	–	–
Reflection									
Journaling	14	1.23	0.89 – 1.57	14	1.23	0.89 – 1.57	0	–	–
Group discussion	2	1.78	–	2	1.78	–	0	–	–
Mastery									
Standards-based assessment	10	2.81	1.60 – 4.02	1	6.71	–	9	2.38	1.58 – 3.18
Generalization test	20	2.29	1.69 – 2.89	1	6.71	–	19	2.06	1.69 – 2.42
Self assessment	1	1.10	–	1	1.10	–	0	–	–

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.

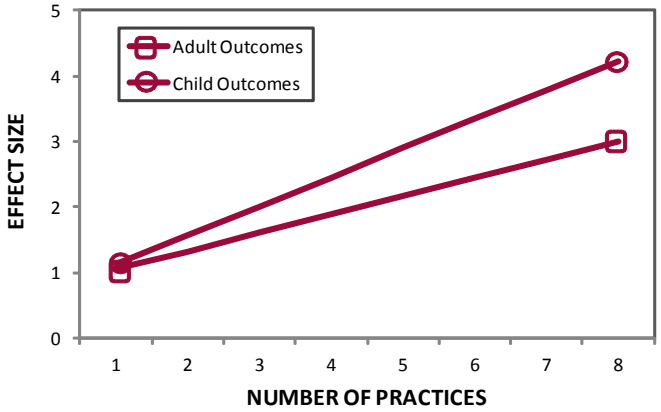

***Figure 5.* Linear increases and their effect sizes for the relationships between the number of adult learning method practices and the adult (practitioner and parent) and child outcomes.**

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. 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 5
Average Cohen's d Effect Sizes and 95% Confidence Intervals(CI) for the Intervention-Related Variables

	Adult Outcomes			Child Outcomes		
Intervention Variables	Number	Mean	95% CI	Number	Mean	95% CI
Number of Sessions						
1-4	14	1.68	0.68 – 2.69	52	1.78	1.30 – 2.26
5-9	17	1.84	1.10 – 2.58	29	1.53	1.31 – 1.75
10-26	8	0.55	0.34 – 0.76	7	1.15	0.51 – 1.80
Length of Training (Months)						
1 or less	12	1.88	0.72 – 3.03	20	2.31	1.63 – 2.99
2-9	10	2.10	0.87 – 3.33	34	1.51	0.88 – 2.13
10-60	21	1.16	0.79 – 1.52	36	1.84	1.46 – 2.21
Instructional Setting						
Child's Home/Home + Other	3	1.57	0.49 – 2.66	23	1.51	1.29 – 1.74
Classroom/School	21	1.85	1.03 – 2.67	35	1.43	0.80 – 2.07
Other	15	1.04	0.51 – 1.58	26	1.50	1.26 – 1.74
Type of Training						
Individual	18	1.64	1.29 – 1.99	49	1.72	1.42 – 2.02
Group	22	1.42	0.77 – 2.07	33	2.38	1.86 – 2.40
Combination	4	2.01	-2.97 – 2.66	20	0.49	-0.24 – 1.23
Type of Assistive Technology						
Speech Generative Devices	25	2.26	1.65 – 2.87	49	2.38	1.95 – 2.80
Computers	11	0.51	0.35 – 0.67	53	1.08	0.76 – 1.39
Other Assistive Technology	8	0.85	0.27 – 1.43	1	1.22	–
Adaptations						
Yes	15	1.32	0.81 – 1.82	9	2.02	1.14 – 2.91
No	29	1.69	1.09 – 2.30	94	1.66	1.36 – 1.97
Child Present at Training						
Yes	20	2.55	1.87 – 3.23	37	2.29	1.80 – 2.78
No	24	0.74	0.50 – 0.99	45	1.45	0.99 – 1.91

(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 trainees 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.

Table 6
Average Cohen's d Effect Sizes and 95% Confidence Intervals for the Adult Participant and Study Variables and the Practitioner and Parent Outcomes

Adult Variables	Number	Mean	95% CI
Participant Age (Years)[a]			
24-29	6	0.27	0.14 – 0.39
30-39	4	1.88	1.75 – 2.00
Participant Education (Years)			
13-15	17	2.07	1.35 – 2.78
16-18	12	1.32	0.20 – 2.45
Type of Participant			
Professional/Student	34	1.51	0.97 – 2.04
Parent	10	1.77	1.22 – 2.31
Number of Trainees			
1-4	17	2.35	1.80 – 2.91
5-15	6	2.63	0.31 – 4.95
16-25	5	1.08	0.17 – 1.98
26-50	5	0.37	0.17 – 0.58
> 50	11	0.53	0.31 – 0.74
Type of Outcome Measure			
Behavioral Observation	25	2.26	1.65 – 2.86
Self-Report	19	0.65	0.41 – 0.89
Outcome Measure			
Behavioral Skills	32	1.93	1.40 – 2.45
Knowledge and Beliefs	12	0.60	0.26 – 0.94

[a] Few studies included participant ages and therefore the results should be interpreted with caution.

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 7
Average Cohen's d Effect Sizes and 95% Confidence Intervals for the Child Participant and Study Variables and the Child Outcomes

Child Variables	Number	Mean	95% CI
Number of Children			
1-3	27	2.43	1.82 – 3.04
4-9	43	1.66	1.17 – 2.16
10-25	3	1.48	0.33 – 2.64
26-40	12	1.16	0.40 – 1.91
41-59	12	0.96	0.67 – 1.24
60 +	6	1.30	0.81 – 1.79
Child Age (Months)			
0-36	11	0.75	-0.60 – 2.10
37-48	47	1.65	1.24 – 2.06
49-60	12	2.52	1.51 – 3.53
61-72	13	2.03	1.06 – 3.00
73+	17	1.59	1.27 – 1.91
Child Disability			
Yes	85	1.69	1.38 – 2.00
No/Mixed	16	1.38	0.91 – 1.85
Severity of Delay			
Severe/Profound	48	2.07	1.73 – 2.41
Mild/Moderate	33	1.25	0.65 – 1.84
Delayed	12	1.63	1.08 – 2.19
At-Risk/No Delay	4	0.61	0.11 – 1.12
Type of Outcome Measure			
Behavioral Observation	97	1.76	1.46 – 2.05
Developmental/ Rating Scale	6	0.71	0.24 – 1.18
Outcome Measures			
Communication Abilities	50	1.94	1.43 – 2.45
Literacy Skills	15	1.25	0.82 – 1.67
Behavioral Engagement	22	1.29	1.02 – 1.55
Behavioral/ Developmental	16	1.92	1.17 – 2.67

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 the consequences of their experiences using the assistive technology were trainer feedback and trainee-requested feedback. Group discussion was the only practice found effective for having the trainees reflect on their knowledge and skills but only for the child outcomes. The practices that were effective for having the trainees assess 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 practitioner 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.

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Appendix A

Characteristics of the Adult Study Participants

Study	Sample Size	Mean Age (Years)	Mean Years of Education	Trainee
Binger et al. (2008) (Study 2)	2	30	14	Parents
Binger et al. (2009)	3	NR[a]	15	Professionals
Chen & Chang (2006)	175	NR	16	Professionals
Durand (1999) (Studies 2 & 3)	NR	NR	NR	Professionals/Parents
Ferrier et al. (1996)	1	NR	NR	Parent
Horn et al. (1992)	2	26	14	Professional/Parent
Howard et al. (1996) (Group 1, Toddler)	3	NR	NR	Professionals
Howard et al. (1996) (Group 2, Preschooler)	24	NR	NR	Professionals
Hutinger et al. (1998)	77	NR	NR	Professionals
Hutinger et al. (2000); Hutinger & Johanson (2000)	43	NR	NR	Professionals
Hutinger et al. (2002a)	27	NR	NR	Professionals
Hutinger et al. (2002b)	18	NR	NR	Professionals
Hutinger et al. (2005); Hutinger et al. (2006)	18	NR	NR	Professionals
Kent-Walsh & Light (2002)	2	NR	NR	Professionals
Kent-Walsh et al. (2010)	5	34	16	Parents
Koppenhaver et al. (2001a); Koppenhaver et al. (2001b); Skotko et al. (2004)	6	NR	NR	Parents
Langone et al. (1998); Langone et al. (1999); Malone & Langone (2005) (Group 1, Special education)	37	25	15	College students
Langone et al. (1998); Langone et al. (1999); Malone & Langone (2005) (Group 2, General education)	100	25	15	College students
Mar & Sall (1993)	1	NR	NR	Professional
Mathisen et al. (2009)	2	NR	NR	Professional/Parent
Mistrett (2000)	84	NR	NR	Parents
Olive et al. (2008)	1	NR	NR	Parent
Panyan et al. (1991)	46	NR	NR	Professionals
Puckett & Brozo (2004)	19	NR	18	Professionals
Regtvoort & Leij (2007)	57	NR	NR	Parents
Romski et al. (2010)	41	37	17	Parents
Romski et al. (1994); Romski & Sevcik (1996); Sevcik & Romski (1995)	8	NR	NR	Professionals/Parents
Rosa-Lugo & Kent-Walsh (2008)	2	39	13	Parents
Schepis et al. (1996); Schepis et al. (1998)	4	NR	14	Professionals
Sevcik et al. (2004)	NR	NR	NR	Professionals/Parents
Simpson et al. (1997)	24	24	NR	College students
Sullivan & Lewis (1990)	1	NR	NR	Parent
Thatcher (2009)	6	NR	17	Professionals
Thunberg et al. (2007)	NR	NR	NR	Parents
Williams et al. (2002)	NR	NR	NR	Professionals

[a]Not reported.

Appendix B

Characteristics of Child Study Participants

Study	Sample Size	Mean	Range	Participants	Child Conditions	Severity of Delay[a]	Type
Binger et al. (2008) (Study 2)	2	42	35-49	P1 P3	Phonological process disorder Cleft palate	S/P[b] M/M[c]	Disability
Binger et al. (2009)	3	66	54-76	P1 P2 P3	Developmental delay Developmental delay Dysarthria, cerebral palsy	DD[d] DD S/P	Disability
Durand (1999) (Studies 2 & 3)	2	54	42-65	P1 P2	Cerebral palsy, cognitive disability Cerebral palsy, cognitive disability	M/M S/P	Disability
Ferrier et al. (1996)	1	5	–		Motor disabilities	M/M	Disability
Horn et al. (1992)	6	40	16-60		Cerebral palsy with multiple disabilities	S/P	Disability
Howard et al. (1996) (Group 1, Toddler)	8	27	18-36		Speech/language delays, physical impairments, and/or cognitive disability	M/M	Disability
Howard et al. (1996) (Group 2, Preschooler)	29	48	36-60		Speech/language delays, physical impairments, and/or cognitive disability	M/M	Disability
Hutinger et al. (1998)	151	NR[b]	36-72		Mild to moderate disabilities	M/M	Disability
Hutinger et al. (2000); Hutinger & Johanson (2000)	15	48	36-60		Multiple systems disorder (MSD), pervasive developmental disorder, learning disabled, speech impaired, visually impaired, cognitive disability	M/M S/P	Disability
Hutinger et al. (2002a) (Year 2, Early Childhood/ Special Education)	33	36	NR[f]		Mild to moderate disabilities	M/M	Disability
Hutinger et al. (2002a) (Year 2, Pre-Kindergarten)	72	48	NR		Mild to moderate disabilities	M/M	Disability
Hutinger et al. (2002a) (Year 2, Inclusive)	28	48	NR		Mild to moderate disabilities	M/M	Disability
Hutinger et al. (2002a) (Year 2, Pre-Kindergarten/ Kindergarten)	16	60	NR		Mild to moderate disabilities	M/M	Disability
Hutinger et al. (2002a) (Year 2, Kindergarten/1st Grade)	12	66	NR		Mild to moderate disabilities, typically developing	M/M TD[e]	Mixed
Hutinger et al. (2002a) (Year 3, Early Childhood/ Special Education)	42	36	NR		Mild to moderate disabilities	M/M	Disability
Hutinger et al. (2002a) (Year 3, Pre-Kindergarten)	41	48	NR		Mild to moderate disabilities	M/M	Disability
Hutinger et al. (2002 b) (Year 2)	36	48	36-60		Developmental delay, speech and language impairment	DD	Disability
Hutinger et al. (2002 b) (Year 3)	36	48	36-60		Developmental delay, speech and language impairment	DD	Disability
Hutinger et al. (2002 b) (Year 4)	58	48	36-60		Developmental delay, speech and language impairment	DD	Disability
Hutinger et al. (2002 b) (Year 5)	68	48	36-60		Developmental delay, speech and language impairment	DD	Disability

Appendix B, continued

Study	Sample Size	Mean	Range	Participants	Child Conditions	Severity of Delay	Type
Hutinger et al. (2005); Hutinger et al. (2006) (Year 1, At-risk)	38	42	36-48		At-risk (Non-specified)	TD	At-risk
Hutinger et al. (2005); Hutinger et al. (2006) (Year 1, Disabled)	41	42	36-48		Developmental delay, speech and language delay, autism, cerebral palsy, Down syndrome, learning disabilities, social emotional conditions	DD	Disability
Hutinger et al. (2005); Hutinger et al. (2006) (Year 2, At-risk)	38	42	36-48		At-risk (Non-specified)	TD	At-risk
Hutinger et al. (2005); Hutinger et al. (2006) (Year 2, Disabled)	55	42	36-48		Developmental delay, speech and language delay, autism, cerebral palsy, Down syndrome, learning disabilities, social emotional conditions	DD	Disability
Hutinger et al. (2005); Hutinger et al. (2006) (Year 3, At-risk)	73	42	36-48		At-risk (Non-specified)	TD	At-risk
Hutinger et al. (2005); Hutinger et al. (2006) (Year 3, Disabled)	60	42	36-48		Developmental delay, speech and language delay, autism, cerebral palsy, Down syndrome, learning disabilities, social emotional conditions	DD	Disability
Kent-Walsh & Light (2002)	2	60	60[g]		Cerebral palsy	S/P	Disability
Kent-Walsh et al. (2010)	5	78	60-99	P1 P2 P3 P4 P6	Cerebral palsy Down syndrome Cerebral palsy Cerebral palsy Down syndrome	S/P S/P S/P S/P S/P	Disability
Koppenhaver et al. (2001a); Koppenhaver et al. (2001b); Skotko et al. (2004)	4	63	43-84		Rett syndrome	S/P	Disability
Mar & Sall (1993)	1	40	–		Cerebral palsy, cortical visual impairment, bilateral hearing impairment	S/P	Disability
Mathisen et al. (2009)	1	46	–		Cerebral palsy, congential heart disease, microcephaly	S/P	Disability
Mistrett (2000)	NR	NR	NR		Motor disabilities, cognitive disabilities	S/P	Disability
Olive et al. (2008)	1	48	–		Autism Spectrum Disorder	S/P	Disability
Regtvoort & Leij (2007)	57	70	NR		At-risk for reading impairment	TD	At-risk
Romski et al. (2010)	41	30	21-40		Down syndrome, seizure disorder, cerebral palsy	M/M	Disability
Romski et al. (1994); (Romski & Sevcik (1996); Sevcik & Romski (1995)	4	87	74-105	P2 P6 P9 P12	Unknown Reye syndrome Unknown Autism	M/M S/P S/P M/M	Disability

Appendix B, continued

Study	Sample Size	Mean	Range	Participants	Child Conditions	Severity of Delay	Type
Rosa-Lugo & Kent-Walsh (2008)	2	81	80-82	P1 P2	Congenital speech impairments Developmental delay, congenital speech impairments	S/P DD	Disability
Schepis et al. (1996); Schepis et al. (1998)	4	48	36-60		Autism	S/P	Disability
Sevcik et al. (2004)	1	48	–		Severe developmental delay, seizure disorder	S/P	Disability
Sullivan & Lewis (1990)	1	NR	–		Down syndrome	M/M	Disability
Thunberg et al. (2007)	4	75	66-90	P1 P2 P3 P4	Autism, mild cognitive disability Autism, moderate cognitive disability Pervasive developmental disorder Pervasive developmental disorder	M/M M/M S/P S/P	Disability
Williams et al. (2002)	8	55	37-69		Autism	M/M	Disability

[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

Study	Research Design		Length of Training		Instructional Setting	Training was done with a target child
	Type	Design	Hours	Number of Sessions		
Binger et al. (2008) (Study 2)	Single participant	Multiple baseline	2	NR[a]	NR	Yes
Binger et al. (2009)	Single participant	Multiple baseline	2-3	NR	NR	Yes
Chen & Chang (2006)	Between group	Post test comparison	52	26	School	No
Durand (1999) (Studies 2 & 3)	Single participant	Multiple baseline	18	3	NR	No
Ferrier et al. (1996)	Single participant	A-B design	NR	NR	Home	NR
Horn et al. (1992)	Single participant	Multi-treatment design	1	2	School	NR
Howard et al. (1996) (Group 1, Toddler)	Within group	Within group comparison	4	2	School	No
Howard et al. (1996) (Group 2, Preschooler)	Between group	Post test comparison	4	2	School	No
Hutinger et al. (1998)	Between group	Post test comparison	<1	NR	School, university	No
Hutinger et al. (2000); Hutinger & Johanson (2000)	Within group	Pretest/post test	60	10	School	No
Hutinger et al. (2002a)	Within group	Pretest/post test	36	5	University, school	No
Hutinger et al. (2002b)	Within group	Pretest/post test	40	5	University	No
Hutinger et al. (2005); Hutinger et al. (2006)	Within group	Pretest/post test	36	10	School	No
Kent-Walsh & Light (2002)	Single participant	A-B design	30	6	School	No
Kent-Walsh et al. (2010)	Single participant	Multiple baseline	2	3	Home	Yes
Koppenhaver et al. (2001a); Koppenhaver et al. (2001b); Skotko et al. (2004)	Single participant	Multiple baseline	10	5	Hospital	Yes
Langone et al. (1998); Langone et al. (1999); Malone & Langone (2005) (Group 1, Special education)	Between group	Post test comparison	1	1	University	No
Langone et al. (1998); Langone et al. (1999); Malone & Langone (2005) (Group 2, General education)	Between group	Post test comparison	1	1	University	No
Mar & Sall (1993)	Single participant	A-B design	NR	NR	Classroom	No
Mathisen et al. (2009)	Single participant	Pretest/post test	NR	NR	School, home	Yes
Mistrett (2000)	Between group	Post test comparison	NR	6	Environment chosen by family	Yes
Olive et al. (2008)	Single participant	Multiple baseline	NR	10	Home	NR
Panyan et al. (1991)	Within group	Pretest/post test	7	3	Schools	No
Puckett & Brozo (2004)	Within group	Pretest/post test	46	8	University	No

Appendix C, continued

Study	Research Design		Length of Training		Instructional Setting	Training was done with a target child
	Type	Design	Hours	Number of Sessions		
Regtvoort & Leij (2007)	Between group	Post test comparison	NR	2	NR	NR
Romski et al. (2010)	Within group	Pretest/post test	8	16	Home, university	Yes
Romski et al. (1994); Romski & Sevcik (1996); Sevcik & Romski (1995)	Within group	Pretest/post test	3	3	NR	NR
Rosa-Lugo & Kent-Walsh (2008)	Single participant	Multiple baseline	5	5	Home	Yes
Schepis et al. (1996); Schepis et al. (1998)	Single participant	Multiple baseline	<1	1	School	Yes
Sevcik et al. (2004)	Single participant	A-B design	NR	NR	School, home	NR
Simpson et al. (1997)	Between group	Post test comparison	1	1	University	No
Sullivan & Lewis (1990)	Single participant	A-B design	NR	12	Home	Yes
Thatcher (2009)	Within group	Pretest/post test	5	5	School	Yes
Thunberg et al. (2007)	Within group	Pretest/post test	4	1	Home	No
Williams et al. (2002)	Within group crossover design	Computer vs. no computer Book vs. computer	NR	NR	School	Yes

[a] Not reported.

Appendix D

Types of Adaptations, Technologies, Adaptive Technologies, and Instruction

Study	Device/Adaptation	Type	Type of Adult Instruction
Binger et al. (2008) (Study 2)	AAC intervention to support shift from single to multiple symbol stage of language development	Speech-generating devices + other adaptations/ Assistive technologies	Individual
Binger et al. (2009)	Speech-generating devices (MiniMo, Springboard)	Speech-generating devices	Individual
Chen & Chang (2006)	Computers/ software	Computers/ Software/ Technology	Group
Durand (1999) (Studies 2 & 3)	Speech-generating device (Introtalker)	Speech-generating devices	Group
Ferrier et al. (1996)	Baby-babble-blanket switch interface	Switches	Individual
Horn et al. (1992)	Computer with Omnibox, Switchmaster, and multiple switches and devices	Computers/Assistive technologies	Individual
Howard et al. (1996) (Group 1, Toddler)	Computer	Computers/Software/ Technology	Group, individual
Howard et al. (1996) (Group 2, Preschooler)	Computer	Computers/Software/ Technology	Group, individual
Hutinger et al. (1998)	Interactive technology literacy curriculum (ITLC)—Focused on computers w/ switches, touch tablets, adaptive keyboards, AAC devices, alternative input devices, amplified sound, visual reinforcement	Computers/Assistive technologies	Group, individual
Hutinger et al. (2000); Hutinger & Johanson (2000)	ECCTS project—Focused on computers with touch screens, switches, switch holders and mounts, adaptive keyboards, and other assistive device + interactive software	Computers/Assistive technologies	Group, individual
Hutinger et al. (2002a)	LitTECH Interactive Outreach project—Focused on teaching how to use technology to promote early literacy	Computers/Assistive technologies	Group
Hutinger et al. (2002b)	Interactive Technology Literacy Curriculum (ITLC)—Focused on computers w/ switches, touch tablets, adaptive keyboards, AAC devices, alternative input devices, amplified sound, visual reinforcement	Computers/Assistive technologies	Group
Hutinger et al. (2005); Hutinger et al. (2006)	ELiTeC model –Focused on teaching how technologies can provide access to literacy activities	Computers/Assistive technologies	Group, individual
Kent-Walsh & Light (2002)	Speech-generating devices (Tech/Speak systems)	Speech-generating devices	Individual
Kent-Walsh et al. (2010)	Speech generating devices (DynaVox, Techspeak, DynaMyte)	Speech-generating devices	Individual
Koppenhaver et al. (2001a); Koppenhaver et al. (2001b); Skotko et al. (2004)	Light tech ACC systems (PCS, single-message Big-Mack, multi-message Four In-Line Cheap Talk, variety of stands)	Speech-generating devices + other adaptations/ assistive technologies	Individual
Langone et al. (1998); Langone et al. (1999); Malone & Langone (2005) (Group 1, Special education)	General assistive technology	Assistive technology and/ or adaptations	Group

Appendix D, continued

Study	Device/Adaptation	Type	Type of Adult Instruction
Langone et al. (1998); Langone et al. (1999); Malone & Langone (2005) (Group 2, General Education)	General assistive technology	Assistive technology and/ or adaptations	Group
Mar & Sall (1993)	Computer, switches, adaptive keyboards, software	Computers/Assistive technologies	NR[a]
Mathisen et al. (2009)	Speech-generating device (Vanguard II with Unity 84 powered by MINSPEAK)	Speech-generating devices	Individual
Mistrett (2000)	Adaptive devices to encourage play	Assistive technology and/ or adaptations	Individual
Olive et al. (2008)	Voice Output Communication Aid (VOCA) (Four Button Touch Talk Direct)	Speech-generating devices	Individual
Panyan et al. (1991)	Computer-assisted instruction (Technology Integration Enhancement (TIE) model)	Computers/ Software/ Technology	Group, individual
Puckett & Brozo (2004)	Instructional software (Assistive technology) to teach literacy strategies	Assistive technology and/ or adaptations	Group
Regtvoort & Leij (2007)	Phonemic awareness training with computer	Computers/ Software/ Technology	Group, individual
Romski et al. (2010)	Speech-generating devices (CheapTalk, Communication Builder, GoTalk, TechSpeak, TechTalk)	Speech-generating devices	Individual
Romski et al. (1994); Romski & Sevcik (1996); Sevcik & Romski (1995)	Microcomputer-based speech-output communication device (Words + Portable Voice II)	Speech-generating devices	Group, individual
Rosa-Lugo & Kent-Walsh (2008)	Computer-based voice-output communication system (Dynnamyte 3100)	Speech-generating devices	Individual
Schepis et al. (1996); Schepis et al. (1998)	Naturalistic training of Voice Output Communication Aid (Cheap Talk)	Speech-generating devices	Group
Sevcik et al. (2004)	WOLF speech output communication device	Speech-generating devices	Individual
Simpson et al. (1997) (Group 1, face-to-face)	Speech-generating device (Touch Talker)	Speech-generating devices	Group, individual
(Group 2, video)	Speech-generating device (Touch Talker)	Speech-generating devices	Individual
Sullivan & Lewis (1990)	Computer with contingency interface, software, adaptive toys, switches, and a mounting panel	Computers/Assistive technologies	Individual
Thatcher (2009)	Speech-generating device (Vantage)	Speech-generating devices	Group, individual
Thunberg et al. (2007)	Speech-generating devices with symbols (Portable touch-screen computer, Clicker 3, TechTalk)	Speech-generating device + other adaptations/ Assistive technologies	Individual
Williams et al. (2002)	Computer-based instruction	Computers/ Software/ Technology	Individual

[a] Not reported.

Appendix E

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

	Planning		Application		Understanding	
Study	Introduce	Illustrate	Practice	Evaluate	Reflection	Mastery
Binger et al. (2008) (Study 2)	Trainer description	Role-playing/ simulation	Real-life application/ role playing Trainer-guided practice	Trainer feedback	NR[a]	Standards-based assessment Generalization
Binger et al. (2009)	Trainer description	Role playing/ simulation Written material/ material availability	Real-life application/ role playing Trainer-guided practice	Trainer feedback	NR	Standards-based assessment Generalization
Chen & Chang (2006)	Participant goal-setting Trainer description	Trainer instruction Written material/ material availability	Real-life application/ role playing Trainer-guided practice Trainee-implemented activity Group discussion	Trainee-requested feedback Trainee-trainer interactions Assess strengths/ weaknesses Trainer feedback	Group reflection	Self-assessment
Durand (1999) (Studies 2 & 3)	Trainer description	Learner input Trainer instruction	Trainer-guided practice Trainee-implemented activity	NR	NR	NR
Ferrier et al. (1996)	Trainer description	Role playing/ simulation Written material/ material availability	NR	NR	NR	NR
Horn et al. (1992)	Trainer description	Role playing/ simulation Learner input Trainer instruction Written material/ materials available	Real-life application/ role playing	NR	NR	NR
Howard et al. (1996) (Group 1, Toddler)	Participant goal setting Project description	Trainer instruction	Trainee engagement	Trainee-trainer interactions	NR	NR
Howard et al. (1996) (Group 2, Preschooler)	Participant goal setting Trainer description	Trainer instruction	Trainee engagement	Trainee-trainer interactions	NR	NR

Appendix E, continued

	Planning		Application		Understanding	
Study	Introduce	Illustrate	Practice	Evaluate	Reflection	Mastery
Hutinger et al. (1998)	Participant needs assessment Trainer description	Role playing/ simulation Learner input Trainer instruction	Real-life application/ role playing Trainer-guided practice Trainee-implemented activity Trainee engagement	Trainee-requested feedback Trainee-trainer interactions Assess strengths/ weaknesses	Group reflection	NR
Hutinger et al. (2000); Hutinger & Johanson (2000)	Trainer description	Learner input Trainer instruction Instructional video Written material/ materials available	Group discussion	Trainee-requested feedback Trainee-trainer interactions	NR	Self-assessment
Hutinger et al. (2002a)	Participant needs assessment Trainer description	Trainer instruction	Trainee engagement	Trainee interactions Assess strengths/ weakness	Journaling	NR
Hutinger et al. (2002b)	Participant needs assessment Trainer description	Real life/ real life + role-playing Learner input Trainer instruction	Trainee-implemented activity Trainee engagement	Trainee-trainer interactions	NR	NR
Hutinger et al. (2005); Hutinger et al. (2006)	Participant needs assessment Trainer description	Role playing/ simulation Trainer instruction	Real-life application/ role playing Group discussion	Trainee-trainer interactions	Journaling	NR
Kent-Walsh & Light (2002)	Trainer description	Instructional video	Real-life application/ role playing Group discussion	Trainee-trainer interactions	NR	NR
Kent-Walsh et al. (2010)	Trainer description	Role playing/ simulation	Real-life application/ role playing Trainer-guided practice Trainee engagement	Trainer feedback	NR	Generalization

Appendix E, continued

Study	Planning		Application		Understanding	
	Introduce	Illustrate	Practice	Evaluate	Reflection	Mastery
Koppenhaver et al. (2001a); Koppenhaver et al. (2001b); Skotko et al. (2004)	Trainer description Participant needs assessment Predetermined participant goals	Real life/ real life + role-playing Learner input Written material/ materials availability	Real-life application/ role playing Trainer-guided practice Trainee engagement	Trainer feedback	NR	NR
Langone et al. (1998); Langone et al. (1999); Malone & Langone (2005) (Group 1, Special education)	Trainer description	Instructional video Multimedia training	NR	NR	NR	NR
Langone et al. (1998); Langone et al. (1999); Malone & Langone (2005) (Group 2, General education)	Trainer description	Instructional video Multimedia training	NR	NR	NR	NR
Mar & Sall (1993)	Participant goal setting Trainer description	Learner input Trainer instruction	Trainer-guided practice Trainee-implemented activity	Trainee-requested feedback	NR	NR
Mathisen et al. (2009)	Participant goal setting Trainer description	Real life/ real life + role playing Written materials/ material availability	NR	NR	NR	NR
Mistrett (2000)	Participant goal-setting Participant needs assessment Trainer description Child-assessment profile	Real life/ real life + role playing Learner input	Real-life application/ role playing Trainer-guided practice	Trainee-requested feedback Trainer interactions	Journaling	NR
Olive et al. (2008)	Trainer description	Role playing/ simulation Learner input Written material/ materials available	Real-life application/ role playing Trainer-guided practice Trainee engagement	Trainee-requested feedback	NR	NR

Appendix E, continued

Study	Planning		Application		Understanding	
	Introduce	Illustrate	Practice	Evaluate	Reflection	Mastery
Panyan et al. (1991)	Trainer description	Multimedia training Written material/ materials available	Real-life application + role playing Trainer-guided practice Trainee-implemented activity Group discussion	Trainer feedback	Group reflection	NR
Puckett & Brozo (2004)	Trainer description	Role playing/ simulation Written materials/ Material availability	Trainer-guided practice Trainee-implemented activity Group discussion	NR	NR	NR
Regtvoort & Leij (2007)	Trainer description	Multimedia training	Trainee-implemented activity Trainee engagement	Trainee-requested feedback Trainee/trainer interactions Assess strengths/ weaknesses	NR	NR
Romski et al. (2010)	Predetermined participant goals Trainer description	Real life/ Real life + role playing Learner input Written material/ materials available	Real-life application/ role playing Trainer-guided practice Trainee engagement	Trainee-requested feedback Trainer feedback	NR	NR
Romski et al. (1994); Romski & Sevcik (1996); Sevcik & Romski (1995)	Trainer description	Learner input Instructional video	Real-life application/ role playing	Trainee experience-focused feedback Trainee-trainer interactions Trainer feedback	NR	NR
Rosa-Lugo & Kent-Walsh (2008)	Trainer description	Role playing/ simulation Instructional video	Real-life application/ role playing Trainer-guided practice	Trainee-requested feedback Trainer feedback	NR	Standards-based assessment Generalization
Schepis et al. (1996); Schepis et al. (1998)	Trainer description	Learner input Written material/ materials available	Real-life application/ role playing	NR	NR	NR
Sevcik et al. (2004)	Trainer description	Written materials/ material availability	NR	Trainer feedback	NR	NR
Simpson et al. (1997) (Group 1, face-to-face)	Trainer description	Role playing/ simulation Learner input	Real-life application/ role playing Trainee engagement	NR	NR	NR

Appendix E, continued

	Planning		Application		Understanding	
Study	Introduce	Illustrate	Practice	Evaluate	Reflection	Mastery
(Group 2, Video)	Trainer description	Instructional video	Real-life application/ role playing	NR	NR	NR
Sullivan & Lewis (1990)	Trainer description	NR	Real-life application/ role playing	Trainee-requested feedback Trainer feedback	NR	NR
Thatcher (2009)	Trainer description	Role playing/ simulation Instructional video	Real-life application/ role playing Trainer-guided practice	Trainer feedback	NR	Generalization
Thunberg et al. (2007)	Trainer description	Learner input	Trainer-guided practice	NR	NR	NR
Williams et al. (2002)	Trainer description	Written material/ materials available	NR	NR	NR	NR

[a] Not reported.

Appendix F

Adult Participant Outcome Measures and Cohen's d Effect Sizes

Study	Comparative Conditions	Measurement Method	Outcome Construct	Outcome Measure	Outcome Type	Participants	Effect Size
Binger et al. (2008) (Study 2)	Intervention vs. baseline	Observation	Skill	Percentage of interaction strategy steps correctly implemented by parents within 10-minute sessions using intervention books	Percentage	P1 P3	1.86 1.99
Binger et al. (2009)	Intervention vs. baseline	Observation	Skill	Percentage of steps correctly implemented	Percentage	P1 P2 P3	1.82 1.99 1.93
Chen & Chang (2006)	Intervention vs. non-intervention	Self-report	Belief	Teacher confidence in computer usage Expectation of computer usage	Rating		.21 .56
	Intervention vs. non-intervention	Self-report	Skill	Basic computer skills Ability to master new technology independently	Rating		.48 .95
	Intervention vs. non-intervention	Self-report	Skill	Use of instructional methods with children Use of instructional materials with children	Rating		.38 .32
	Intervention vs. non-intervention	Self-report	Skill	Effectiveness of training on skill improvement Effectiveness of training on integrating computer usage in teaching	Rating		.78 .71
Hutinger et al. (2002a)	Pretest vs. post test	Self-report	Skill	Selected percentage of use of constructs form the model fidelity profile	Percentage		.19
Kent-Walsh & Light (2002)	Intervention vs. baseline	Observation	Skill	Percent correct implementation of prompting hierarchy	Percentage	P1	1.77
	Intervention vs. baseline	Observation	Skill	Percent correct implementation of prompting hierarchy strategy	Percentage	P2	1.53
	Intervention vs. baseline	Observation	Skill	Percent correct implementation of responsivity strategy	Percentage	P1	1.86
	Intervention vs. baseline	Observation	Skill	Percent correct implementation of responsivity strategy	Percentage	P2	.68
Koppenhaver et al. (2001a); Koppenhaver et al. (2001b); Skotko et al. (2004)	Pretest vs. post test	Observation	Skill	Percentage of successful pointing to symbols	Percentage		1.90
	Pretest vs. post test	Observation	Skill	Percentage of successful pointing to book	Percentage		-.02
	Pretest vs. post test	Observation	Skill	Frequency of communication acts per minute (Directing)	Frequency		2.36
	Pretest vs. post test	Observation	Skill	Frequency of communication acts per minute (Predicting/ inferring)	Frequency		2.76
	Pretest vs. post test	Observation	Skill	Frequency of confirmations or requests for clarification per minute	Frequency		2.09

Appendix F, continued

Study	Comparative Conditions	Measurement Method	Outcome Construct	Outcome Measure	Outcome Type	Participants	Effect Size
Langone et al. (1998); Langone et al. (1999); Malone & Langone (2005) (Group 1, Special education)	Intervention vs. comparison	Self-report	Knowledge	Special education teachers' multiple choice test scores on test about using assistive technology with children with disabilities	Total scale score		.44
	Intervention vs. comparison	Self report	Knowledge	Special education teachers' essay test scores on test about using assistive technology with children with disabilities	Total scale score		.22
Langone et al. (1998); Langone et al. (1999); Malone & Langone (2005) (Group 2, General education)	Intervention vs. comparison	Self report	Knowledge	General education teachers' multiple choice test scores on test about using assistive technology with children with disabilities	Total scale score		.24
	Intervention vs. comparison	Self report	Knowledge	General education teachers' essay test scores on test about using assistive technology with children with disabilities	Total scale score		.08
Mistrett (2000)	Low intensity vs. high intensity	Self-report	Belief	Satisfaction survey	Rating		1.07
Panyan et al. (1991)	Pretest vs. post test	Self-report	Belief	Percentage of teachers at the "refocusing" Stage of Concern	Percentage		.59
	Pretest vs. post test	Self-report	Skill	Percentage of teachers at the "refinement" and above Levels of Use	Percentage		.43
Puckett & Brozo (2004)	Pretest vs. post test	Self-report	Knowledge	Knowledge of assistive technology	Percentage		1.88
	Pretest vs. post test	Self-report	Skill	Use of technology with special education students	Percentage		1.60
	Pretest vs. post test	Self-report	Belief	Confidence in ability to help special education students to achieve reading standards using technology	Percentage		1.28
Rosa-Lugo & Kent-Walsh (2008)	Intervention vs. baseline	Observation	Skill	Percentage accurate implementation of targeted strategy	Percentage	P1 P2	1.82 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 P2 P3 P4	4.39 4.85 2.18 3.58
	Intervention vs. baseline	Observation	Skill	Communicative interactions per minute during child's leisure time	Rate	P1 P2	2.63 3.31

Appendix F, continued

Study	Comparative Conditions	Measurement Method	Outcome Construct	Outcome Measure	Outcome Type	Participants	Effect Size
Simpson et al. (1997)	Experimental (face-to-face) vs. control (written)	Observation	Knowledge	Acquisition of programming knowledge correctly answered	Total scale score		.31
	Experimental (face-to-face) vs. control (written)	Observation	Knowledge	Acquisition of programming knowledge correctly answered	Total scale score		.32
Thatcher (2009)	Pretest vs. post test	Observation	Skill	Percentage of accurate implementation of the targeted strategies	Percentage		6.70

Appendix G

Child Participant Outcome Measures and Cohen's d Effect Sizes

Study	Comparative Conditions	Measurement Method	Outcome Construct	Outcome Measure	Outcome Type	Participants	Effect Size
Binger et al. (2008) (Study 2)	Intervention vs. baseline	Observation	Communication skill	Number of multi-symbol messages produced by children within 10 min sessions with intervention books	Frequency	P1 P3	4.85 2.35
Binger et al. (2009)	Pretest vs. post test	Observation	Communication skill	Mean percentage of different multi-symbol messages per 10-minute session	Percentage		6.71
	Intervention vs. baseline	Observation	Communication skill	Number of multi-symbol message productions per 10-minute session	Frequency	P1 P2 P3	1.81 3.22 2.10
Durand (1999) (Studies 2 & 3)	Intervention vs. baseline	Observation	Non-challenging behavior	Percentage intervals of non-challenging behavior in the classroom	Percentage	P1 P3	3.13 2.97
	Intervention vs. baseline	Observation	Communication skill	Percentage of intervals of unprompted communication in the classroom	Percentage	P1 P3	3.17 2.91
	Intervention vs. baseline	Observation	Non-challenging behavior	Percentage of intervals of non-challenging behavior in the community	Percentage	P1 P3	6.17 3.04
	Intervention vs. baseline	Observation	Communication skill	Percentage of intervals of unprompted communication in the community	Percentage	P1 P3	2.25 3.02
Ferrier et al. (1996)	Intervention vs. baseline	Switch activation	Switch activations	Switch activations per minute	Frequency	P1	1.22
Horn et al. (1992)	Intervention vs. baseline	Observation	Engagement	Percentage of intervals during which child was engaged	Percentage	P1 P2 P3 P4 P5 P6	1.36 1.67 2.61 1.49 1.27 .85
	Intervention vs. baseline	Observation	Motor behavior	Percentage of intervals during which child was performing target motor behavior	Percentage	P1 P2 P3 P4 P5 P6	1.77 1.83 1.64 .86 .65 1.64
Howard et al. (1996) (Group 1, Toddler)	Experimental vs. control	Observation	Social play	Solitary play (reversed)	Frequency		1.42
				Parallel play (reversed)			1.67
				Attentative play			.81
				Reciprocal play			2.56
			Communication skill	Verbal communication			-4.80
				Nonverbal communication			-.58
				Engagement			2.60
			Affect	Positive affect			1.91
				Negative affect (reversed)			.00

Appendix G, continued

Study	Comparative Conditions	Measurement Method	Outcome Construct	Outcome Measure	Outcome Type	Participants	Effect Size
Howard et al. (1996) (Group 2, Preschooler)	Experimental vs. control	Observation	Social play	Solitary play (reversed)	Frequency		.60
				Parallel play (reversed)			.94
				Attentive play			-3.54
				Reciprocal play			3.89
			Communication skill	Verbal communication			.08
				Nonverbal communication			-1.37
				Engagement			1.27
			Affect	Positive affect			1.23
				Negative affect (reversed)			.63
Hutinger et al. (1998)	Experimental vs. control post test	Observation	Computer behavior	Behavior Interaction Tool scores	Total scale score		1.76
	Experimental vs. control post test	Observation	Literacy skill	Informal Literacy Assessment scores	Factor score		1.79
Hutinger et al. (2000); Hutinger & Johanson (2000)	Pretest vs. post test	Standardized measure	General development	Brigance Diagnostic Inventory of Early Development	Developmental quotient		1.10
Hutinger et al. (2002a) (Year 2)	Pretest vs. post test	Observation	Literacy skill	Informal Literacy Assessment—modified Early Childhood/Special Education	Factor score		1.90
	Pretest vs. post test	Observation	Literacy skill	Informal Literacy Assessment—modified Pre-Kindergarten	Factor score		.82
	Pretest vs. post test	Observation	Literacy skill	Informal Literacy Assessment—modified Inclusive	Factor score		1.31
	Pretest vs. post test	Observation	Literacy skill	Informal Literacy Assessment—modified Pre-Kindergarten/ Kindergarten	Factor score		1.35
	Pretest vs. post test	Observation	Computer behavior	Behavior Interaction Tool—modified Early Childhood/Special Education	Total scale score		1.16
	Pretest vs. post test	Observation	Computer behavior	Behavior Interaction Tool—modified Pre-Kindergarten	Total scale score		.80
	Pretest vs. post test	Observation	Computer behavior	Behavior Interaction Tool—modified Inclusive	Total scale score		2.58
	Pretest vs. post test	Observation	Computer behavior	Behavior Interaction Tool—modified Kindergarten/1st	Total scale score		2.00

Appendix G, continued

Study	Comparative Conditions	Measurement Method	Outcome Construct	Outcome Measure	Outcome Type	Participants	Effect Size
Hutinger et al. (2002a) (Year 3)	Pretest vs. post test	Observation	Literacy skill	Informal Literacy Assessment—modified Early Childhood/Special Education	Factor score		1.17
	Pretest vs. post test	Observation	Literacy skill	Informal Literacy Assessment—modified Pre-Kindergarten	Factor score		.97
	Pretest vs. post test	Observation	Computer behavior	Behavior Interaction Tool—modified Early Childhood/Special Education	Total scale score		1.10
	Pretest vs. post test	Observation	Computer behavior	Behavior Interaction Tool—modified Pre-Kindergarten	Total scale score		1.06
Hutinger et al. (2002b) (Year 2)	Pretest vs. post test	Observation	Computer behavior	Behavior Interaction Tool	Total scale score		.99
Hutinger et al. (2002b) (Year 3)	Pretest vs. post test	Observation	Computer behavior	Behavior Interaction Tool	Total scale score		1.20
	Pretest vs. post test	Observation	Literacy skill	Informal Literacy Assessment	Factor score		3.35
Hutinger et al. (2002b) (Year 4)	Pretest vs. post test	Observation	Computer behavior	Behavior Interaction Tool	Total scale score		1.06
	Pretest vs. post test	Observation	Literacy skill	Informal Literacy Assessment	Factor score		1.32
Hutinger et al. (2002b) (Year 5)	Pretest vs. post test	Observation	Computer behavior	Behavior Interaction Tool	Total scale score		1.05
	Pretest vs. post test	Observation	Literacy skill	Informal Literacy Assessment	Factor score		1.58
Hutinger et al. (2005); Hutinger et al. (2006) (Year 1, At-risk)	Pretest vs. post test	Observation	Computer behavior	Behavior Interaction Tool	Total scale score		.47
Hutinger et al. (2005); Hutinger et al. (2006) (Year 1, Disabilities)	Pretest vs. post test	Observation	Computer behavior	Behavior Interaction Tool	Total scale score		.31
Hutinger et al. (2005); Hutinger et al. (2006) (Year 2, At-risk)	Pretest vs. post test	Observation	Computer behavior	Behavior Interaction Tool	Total scale score		.76
Hutinger et al. (2005); Hutinger et al. (2006) (Year 2, Disabilities)	Pretest vs. post test	Observation	Computer behavior	Behavior Interaction Tool	Total scale score		.34

Appendix G, continued

Study	Comparative Conditions	Measurement Method	Outcome Construct	Outcome Measure	Outcome Type	Participants	Effect Size
Hutinger et al. (2005); Hutinger et al. (2006) (Year 3, At-risk)	Pretest vs. post test	Observation	Computer behavior	Behavior Interaction Tool	Total scale score		.49
Hutinger et al. (2005); Hutinger et al. (2006) (Year 3, Disabilities)	Pretest vs. post test	Observation	Computer behavior	Behavior Interaction Tool	Total scale score		.62
Kent-Walsh & Light (2002)	Pretest vs. post test	Observation	Communication skill	Frequency of communicative turns	Frequency		1.90
Kent-Walsh et al. (2010)	Intervention vs. baseline	Observation	Communication skill	Number of communicative turns	Frequency	P1 P2 P3 P4 P6	1.81 1.82 1.80 1.77 1.69
	Intervention vs. baseline	Observation	Communication skill	Number of different semantic concepts	Frequency	P1 P2 P3 P4 P6	1.73 1.78 1.78 1.72 1.76
Koppenhaver et al. (2001a); Koppenhaver et al. (2001b); Skotko et al. (2004)	Pretest vs. post test	Observation	Communication skill	Frequencies of children's successful symbolic communication acts per phase with familiar storybooks	Frequency		2.29
	Pretest vs. post test	Observation	Communication skill	Frequencies of children's successful symbolic communication acts per phase with unfamiliar storybooks	Frequency		1.91
	Pretest vs. post test	Observation	Communication skill	Frequencies of children's labels and comments per phase with familiar storybooks	Frequency		1.57
	Pretest vs. post test	Observation	Communication skill	Frequencies of children's labels and comments per phase with unfamiliar storybooks	Frequency		1.13
	Pretest vs. post test	Observation	Communication skill	Percentage of VOCA during communication exchange use	Percentage		1.75
Mar & Sall (1993)	Intervention vs. baseline	Observation	Communication skill	Ratings of level of achievement of communication goals	Rating	P1	1.96
Mathisen et al. (2009)	Pretest vs. post test	Standardized measure	Literacy skill	The Preschool and Primary Inventory of Phonological Awareness (PIPA)	Standard score		.13
	Pretest vs. post test	Individually administered test	Literacy skill	The Sheffield Early Literacy Development Profile	Total scale score		1.16

Appendix G, continued

Study	Comparative Conditions	Measurement Method	Outcome Construct	Outcome Measure	Outcome Type	Participants	Effect Size
Olive et al. (2008)	Intervention vs. baseline	Observation	Non-challenging behavior	Frequency of non-challenging behavior	Frequency	P1	1.98
	Intervention vs. baseline	Observation	Communication skill	Frequency of attention requesting	Frequency	P1	.44
Regtvoort & Leij (2007) (Groups 1&2)	Experimental vs. control post-test	Individually administered test	Literacy skill	Phonemic awareness	Total scale score		.59
	Experimental vs. control post-test	Individually administered test	Literacy skill	Letter knowledge	Total scale score		1.03
	Experimental vs. control post-test	Individually administered test	Literacy skill	Naming speed	Completion time		.26
Romski et al. (2010)	Pretest vs. post test	Observation	Communication skill	Number of augmented words used per 30 minutes	Frequency		1.92
Romski et al. (1994); Romski & Sevcik (1996); Sevcik & Romski (1995)	Pretest vs. post test	Observation	Communication skill	Mean length of utterance	Frequency		-.75
	Pretest vs. post test	Observation	Communication skill	Mean number of lexigrams used per 30 minutes	Frequency		1.94
Rosa-Lugo & Kent-Walsh (2008)	Intervention vs. baseline	Observation	Communication skill	Frequency of communicative turns expressed	Frequency	P1 P2	1.76 1.82
	Intervention vs. baseline	Observation	Communication skill	Frequency of semantic concepts expressed	Frequency	P1 P2	1.69 1.80
Schepis et al. (1996); Schepis et al. (1998)	Intervention vs. baseline	Observation	Communication skill	Rate per minute of communicative interactions during child snack time	Frequency	P1 P2 P3 P4	4.03 3.12 3.61 3.25
	Intervention vs. baseline	Observation	Communication skill	Mean rate per minute of communicative interactions during child leisure time	Frequency	P1 P2	6.28 4.74
Sevcik et al. (2004)	Pretest vs. post test	Observation	Engagement	Percent of the time child is directly engaged in activities or communicating in an activity in therapy and at home	Percentage		.41
Sullivan & Lewis (1990)	Intervention vs. baseline	Switch activation	Switch activation	Non-contingent vs. contingent motor responses per minute	Frequency	P1	1.64
Thunberg et al. (2007)	Pretest vs. post test	Observation	Communication skill	Percentage of effective child responses with device to communicative partner	Percentage		1.14
Williams et al. (2002)	Pretest vs. post test	Observation	Communication skill	Number of words read correctly—computer group (15 minutes)	Frequency		.21
	Pretest vs. post test	Observation	Communication skill	Words recorded during two 30-minute direct observations—computer group	Frequency		.13

Appendix H

Checklist for Promoting the Use of Assistive Technology or Adaptations

Trainer _____ Type of Device/Adaptation _____

	The training to promote adoption and use of the assistive technology or adaptations (AT/A) included each of the following practices:	Yes	No
Introduction	1. Solicit trainee identification or description of what they expect to learn from the training		
	2. Provide a detailed description or explanation of the AT/A		
Illustration	3. Use trainee knowledge or experience with the AT/A or similar devices to provide example(s) of application		
	4. Demonstrate the use of the AT/A either *in vivo* or through role playing		
Practicing	5. Engage the trainee is the use of the AT/A either *in vivo* or through role playing		
	6. Provide the trainee trainer-guided practice using the AT/A		
Evaluation	7. Engage the trainee in evaluation of the experience using the AT/A		
	8. Provide the trainee feedback based on trainer observation of trainee application		
Reflection	9. Engage the trainee in self-assessment of the understanding of both the use and consequences of the AT/A		
	10. Together with the trainee, assess trainee performance and identify next steps in the learning process		
Mastery	11. Have the trainee use a checklist or set of performance standards to assess overall mastery of the AT/A		
	12. Provide the trainee opportunities to use the AT/A in different settings or with different children		