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Extending the Reach of Early Intervention Training for Practitioners: A Preliminary Investigation of an Online Curriculum for Teaching Behavioral Intervention Knowledge in Autism to Families and Service Providers

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Abstract

Early behavioral intervention, based on the methods of applied behavior analysis, has the strongest and most consistent scientific support as a means of teaching skills to young children with Autism Spectrum Disorder and reducing their restricted and maladaptive behavior. Though individual ABA-based treatment plans are usually developed, designed and supervised by a senior-level clinician, they are most often implemented by a practitioner, such as a parent, direct service provider, aide, or an early childhood professional from a related discipline. Unfortunately, few practitioner-orientated training programs are available to geographically disparate persons. Online distance-learning education offers a potential solution to this problem. Fifty-one individuals participated in an initial study of a short, three-module online course. The results showed a highly statistically significant difference between the mean pre-test and post-test score. The outcomes suggest the feasibility and user satisfaction of teaching BI knowledge acquisition online, and thus bolster confidence that future, larger-scale curricula aimed at teaching BI in a distance-learning format is warranted.

Keywords

Early Intervention (Education); Autism; Health Education; Behavior Modification; Developmental Disabilities; Developmental Disorders; Child; Children; Children; Disabled; Intellectual Disability

The diagnosis of a developmental disability in a newborn, infant or very young child presents many challenges for most families, who may find themselves struggling to understand the nature of their child's difficulties and to secure the necessary services and support to help the child develop to his or her best potential. The stress that some families

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face in trying to meet the needs of a child with a developmental disability has been well documented (Donenberg & Baker, 1993; Minnes, 1988) and is recognized as a significant contributor to child outcomes. Indeed, a central factor in facilitating positive outcomes for a child with a disability is the extent to which the family members can acquire the help and support they need to nurture and support the child's growth and development (Bouma & Schweitzer, 1990; Dunn, et al., 2001; Holroyd & McArthur, 1976; Montes & Halterman, 2007). Families must not only find qualified service providers for treatment both inside and outside the home, they themselves must become knowledgeable about the treatments that their young children are receiving and in which they will likely take part.

Among the many developmental disabilities that can affect young children, Autism Spectrum Disorders (ASDs) may be particularly challenging for some parents. ASDs are a group of complex neurological disorders that typically appear before the age of three and immediately and profoundly affects a young child's ability to communicate, develop language, form social relationships and respond appropriately to environmental cues (Centers for Disease Control and Prevention, 2008; National Institute of Mental Health, 2009). Up to 50% of children with autism have associated intellectual disabilities (Volkmar, Lord, Bailey, Schultz, & Klin, 2004), and unless treated early, most will require lifetime care.

As researchers search for the causes and pathways to prevention of ASDs, there is consensus that families must find appropriate intervention services for their young child as soon as possible, to effect the best possible outcomes. Among various approaches, early behavioral intervention (BI) has the strongest and most consistent scientific support as a means of teaching skills to young children with ASDs and reducing their restricted and maladaptive behavior (Aman, 2005; National Research Council, 2001; Sallows & Graupner, 2005; Simpson, 2005). To be maximally effective, BI treatments for young children should be applied early and intensively, and they should employ several select methods and procedures that are primarily behavioral in nature.

Derived from the field of psychology known as *Behavior Analysis*, BI consists of a family of strategies that utilize specific arrangements of component treatment and instructional procedures to effect change in behavior. While there are a number of different approaches to behavioral intervention, such as Discrete Trial Training (Anderson, Taras, & Cannon, 1996), Incidental Teaching (McGee, Morrier, & Daly, 1999), Pivotal Response Training (Koegel, Koegel, Shoshan, & McNerney, 1999; Koegel, Koegel, & McNerney, 2001; Schreibman & Koegel, 1996), all of these program models share common procedural methods, such as: 1) prompts (verbal, gestures, modeling or physical cues) as needed to evoke desired child behavior, 2) prompt "fading" to promote increasing child independence, 3) differential reinforcement – praise or tangible items when the child performs the desired behavior correctly, 4) error correction strategies, if a mistake or no response occurs, and 5) careful evaluation and documentation of child performance, as a means of determining the effectiveness of or course correction to given behavioral procedures. Perhaps most importantly, these methods are all highly individualized for specific children. When implemented correctly, frequently and begun very early in a young child's life (e.g., two-years old) in conjunction with other support services, large gains in intellectual, social and behavioral development can occur.

One of the hallmarks of behavioral intervention is that those who implement it directly with a child need not possess a doctoral or other advanced degree to do so. Though individual treatment plans are usually developed and designed by a senior-level clinician (e.g., a licensed psychologist, Board Certified Behavior Analyst, Behavior Analysis Certification Board, 2004, or other qualified professional), they are most often implemented by *a*

practitioner. In an early childhood setting, the practitioner can be a direct service provider, a teacher's aide or a professional from a related discipline. Importantly, BI treatment plans should be extended to the child's home and community setting, as well. At home, the practitioner is a parent or guardian, with the guidance of a senior-level clinician. In practice, BI treatment plans should be carried out by a combination of practitioners from all settings.

For either family-member or support-staff practitioners, education and training is critical to implementing BI procedures properly. For support-staff practitioners, they must possess foundational knowledge and skills in "core" BI procedures that are applicable to a variety of individual clinical situations in children with ASD (Scheuermann, Webber, Boutot, & Goodwin, 2003). For example, the practitioner must understand and be able to apply procedures such as differential reinforcement, shaping, and prompt fading. In addition, effective practitioners requires proficiency in BI teaching skills such as the differential reinforcement of correct responses and in implementing procedures to reduce maladaptive and stereotypical behaviors. Practitioners also require competence in BI support skills such as observing, recording, graphing, and data analysis. Understanding BI is equally important to the families of young children with an ASD: The more a family member understands and is skilled with the above, the greater success they will have in selecting qualified support personnel, advocating for BI services and working directly with their young child. Given that a university degree is not needed for a family or support-staff practitioner to become an effective implementer of BI procedures, the problem becomes one of finding efficient ways to deliver education and training in BI.

Ideally, best practice suggests that the senior-level behavioral clinician provide training followed by direct supervision to the practitioner, as might be done in either the home or a school or service agency. High quality training will reduce the need for extended supervision, but the individualized nature of working with children with autism will always require adaptations and the support of professional/supervisory staff. Unfortunately, few practitioner-orientated training programs are available or accessible to geographically disparate persons or to individuals unable to access training through more conventional means. Though a small number of university-based programs exist, they are only available in select geographic areas that are difficult or inconvenient for many busy parents, family members, and support staff to access. To maximize the potential for all who need to become practitioners, and to expand training beyond what is currently available, BI training in a *distance-learning* medium presents an attractive option to the practitioner.

Distance learning refers to activities in which computer and communication technology is used to mediate instruction (Moore & Kearsley, 2005). This instructional medium is rapidly becoming a functional alternative to more traditional forms of education and training. Some estimates suggest penetration rates for university-sponsored distance learning education and training to approaching 100% by the year 2010 (Boettcher, 2004). There are several ways in which distance learning can be provided. For example, instructors and learners (who are usually geographically distant from each other), "interact" through a variety of means including e-mail, "threaded discussion," video conferencing and on-line "white board" dialogues. Distance learning can also be provided asynchronously. Asynchronous distance learning (also referred to as "anytime, anywhere" learning) allows the user to access course material at his/her own pace and without the need for an instructor. These methods leverage the efficacy and scalability of computer and Internet-based technologies and have been used successfully for educational purposes in a number of different settings, particularly in colleges and universities (Sugrue & Rivera, 2005). Research has shown that distance-learning performance outcomes compare favorably to traditional face-to-face instruction (Bernard et al., 2004; Sitzmann, Kraiger, Stewart, & Wisher, 2006; Tallent-Runnels et al., 2006) and in some cases, distance learning can result in better performance and user

satisfaction measures when compared to traditional classroom-based courses (Christianson, Tiene, & Luft, 2002; Howard, Schenk, & Discenza, 2003; Kulik, 1986; Lepper & Gurtner, 1989; Roblyer, 1988; Wise & Olson, 1998).

The present study reports an initial investigation of the use of a distance-learning medium to train practitioners in skills related to some key concepts within behavioral intervention. Using internet-based "asynchronous" distance learning, users completed a small-scale three-module online course. In this initial study, the primary goal was to determine whether such a course could be feasibly presented in a distance-learning medium. More specifically, it was asked whether a distance-learning BI course resulted in knowledge acquisition as evaluated by a pre-/post-test design. To measure reaction to the course and its medium, user satisfaction was also measured. A smaller-scale study such as this one is viewed as a critical first step, prior to implementing larger-scale curricula in the area of practitioner education and training in behavioral intervention.

Method

Participants

An initial group of 84 participants were enrolled in the study. Fifty-one (51) completed participation (i.e., the course). Participants were educators, professionals, paraprofessionals, teacher aides, parents, and family members of children diagnosed with ASD. They were recruited through a flyer sent to public schools, agencies that serve the ASD population and their families, parents of children with ASD, on-line list-serves, and state social service agencies (e.g., early intervention, department of developmental disabilities, child and family services, etc.). The content was described as a three-module course for parents, family members, paraprofessionals, teacher aids, teachers, professionals, and providers who work with children with autism or related developmental disabilities and have little to no training in behavioral interventions. The topics were further described as presented entirely online, and included short online lectures, practical exercises, video demonstrations of procedures, study questions and frequent short online quizzes. Participants were told they needed to invest approximately 4–8 hours to complete all three modules at their own pace during a three-week window of time. They were also offered a stipend of $50 for completing all content and evaluation aspects relating to each of the three modules.

Course/Module Description

The online BI course, entitled *Behavioral Intervention in Autism - Practitioner Skills*, consisted of three modules: (1) *Positive Reinforcement: Selection and Use of Reinforcement*; (2) *Relationship Building: Pairing and Teaching Cooperation*; and (3) *Prompting and Prompt Fading*. Table 1 summarizes the specific content covered in each module. Each module consisted of targeted online" lectures" and video footage that depicted providers, including parents and children with ASD, demonstrating core BI procedures in both home-and school-based settings. Further, selected links were provided to sites that expanded upon the use of the BI procedures presented in the modules. Other features of the course included graphically illustrated lecture pages, each covering a logical and digestible "chunk" of information, frequent video demonstrations embedded strategically in lecture pages, that is, where the text called for "showing" as an immediately available support to "telling," and application exercises in which participants could self-check their knowledge by identifying the appropriate procedures based on what they had just learned. All of the key content information was summarized at the end of each module section.

Technology

The modules were designed and delivered as a "stand-alone" product that did not require the use of instructors. The software (learning management) platform employed was *Blackboard Vista 4*, an eLearning software product widely used by U.S. universities. Blackboard supports several critical instructional features to enable stand-alone product development, including HTML-based graphic design capabilities (banner, color background, embedded photos, etc.), online survey and assessment functions, and seamless linking to online video downloads, among other features. Figure 1 shows a screen capture of the opening page of the first module to illustrate the look and feel of simple text and graphic presentation in *Blackboard Vista 4*. Note that the left side of the screen offers a navigation bar containing an outline of the module. Selection of an outline element brings the user to specified module material. The video download function allowed instructional video segments to be embedded and viewed in the appropriate instructional context.

Procedure

Each enrolled participant received an email providing log-in credentials to the medical school's learning management system. Once an individual logged in, verification of status was provided. A participant's orientation guide to *Blackboard* was provided as well as instructions for obtaining support. Help was available 24 hours a day, 7 days a week.

Prior to starting the course, each participant completed a 13-item online survey that asked about their gender, ethnicity, education level, professional discipline, length of time working in BI field, and characteristics of their computer use.

Pre-/post-test—To measure knowledge acquisition participants also completed a 25-item online pretest comprised of multiple-choice and multiple-select items, prior to starting the course; following course completion, an identical posttest was administered. The knowledge acquisition measure was developed to fit the specific learning objectives of the course, based on a target-audience needs analysis. Test items were initially reviewed by several Board Certified Behavior Analysts, who were asked to read and respond to the pre-and post-test items to ensure that they accurately reflected the most critical practical concepts and procedures for conducting behavioral intervention with young children with ASDs. Revisions based on their feedback resulted in the final 25-item group of test questions. No test question was identical to any of the self-check questions that were presented during application exercises within course. Upon completion of the pre-test, participants were presented with their total score, but they received *no feedback on their performance on individual test items*. Therefore while they had a general sense of how they did, post-test contamination was controlled. Participants then took the course.

Results

Participant Demographic Analysis

Tables 2, 3, and 4 present demographic information on the 51 participants. For purposes of the pre-/post-test data analysis (see next section), participants were categorized into three groups: professionals (N=25), parents and family members of individuals diagnosed with ASD (N=15), and paraprofessionals (N=11), as shown in Table 2. Almost half of the participants were professionals (49%), and most were white (91%) and female (92%). The full group was heterogeneous with respect to their levels of education, goals for taking the course, and means of accessing the course (either from home and/or from work; see Tables 2 and 3). In addition, the majority of participants across all three groups reported working 1:1 with children with ASD (61%). Data on computer and Internet use showed heavy frequent daily Internet use (78%). In terms of *type* of computer and Internet use (see Table 4), all

participants reported using technology for emailing (100%) and Internet browsing for information on ASD (94%). Several had taken courses online (67%) or watched online video (76%), but only 45% had participated in discussion or chat groups.

Knowledge Acquisition

Figures 2, 3, and 4 display pre-/post-test score comparisons for each of the three participant groups comprising the 51 participants. The results were divided as such to explore differences between parents or family members and those who work in professional or paraprofessional roles. Figure 2 presents data for professionals; Figure 3 for parents and family members of children diagnosed with ASD; and Figure 4 for paraprofessionals. The mean pre- and post-test scores and standard deviations for each group are presented in Table 5.

As depicted in Figures 2, 3 and 4, all but three participants demonstrated post-test gains. Although recruitment targeted participants who reported being beginners in the field of BI, it appears that some came into the course with previous knowledge. Thus, differences in pre-test and post-test scores may not have been as dramatic as they might have been with a group of participants who were truly naïve to BI.

Statistical analyses were conducted to determine the magnitude of knowledge acquisition of all participants, and to assess any differences in pre-test scores, post-test scores and degree of change associated with educational level and profession. When sub-sample size was insufficient and/or normality assumptions were not met, nonparametric methods were used to confirm any differences detected parametrically.

A highly statistically significant difference (paired t-test, $p<.0001$) between the mean pre-test score (64.2%) and post-test score (82.2%) was found for all participants combined (N=51). The effect size of this pre- to post-test difference was 1.92, which is considered extremely large (Cohen, 1988).

Though ANOVA indicated there were no overall differences in pre-test, post-test, or change scores associated with educational level, least square means contrasts indicated specific sub-group differences, which were statistically significant ($p <.05$) or borderline significant ($p<.10$). Participants having attained only a High School (HS) level of education had a mean pre-test score of 60.7%, while those with a Master of Arts/Science/Education (MA/S/E) scored on average 70.7% ($p=.08$). Similarly, those with an Associate of Arts/Science (AA/S) and a Bachelor of Arts/Science (BA/S) degree had mean pre-test scores of 60.8% and 62.8% respectively, which were also statistically different from the MA/S/E group at the $p=.04$ and $p=06$ level. Though the AA/S and BA/S groups began with lower pre-test scores, they achieved post-test scores on par with participants in the MA/S/E group. In terms of magnitude of change from pre-test to post-test, participants in the AA/S and BA/S groups differed statistically from the MA/S/E group at the $p=08$ and $=.09$ level. The AA/S and BA/S groups experienced mean gains of 21.2% and 19.6% respectively, while the MA/S/E group mean gain was 12.0%, again confirming the earlier finding that all participants achieved improved scores, with those with lower baseline values benefiting the most in terms of gain.

Satisfaction Assessment

Upon completing the various module readings (lectures, article summaries, links, book reviews), video viewing, and post-test, participants completed a 22-item satisfaction survey. In general, participants rated the modules very highly with ratings of greater than 90% for the majority of items. For example, 94% found the modules relatively easy to navigate, and 91% found the design appealing. All 51 participants found it helpful to go through the

modules at their own pace. In addition, 87% found the language and presentation easy to understand and 98% found the on-line readings useful. All but three participants found the links to additional information helpful. Ninety-one percent (91%) found the mastery assessments presented at the end of each module helpful and all 51 participants liked the automated grading feature of the on-line assessments. Eighty-six percent (86%) found the content of the modules to be just right in terms of helping a beginning practitioner learn about behavioral intervention, and 71% found that the materials presented could be used in their work. In rating the level of satisfaction of the modules, participants reported being mostly or extremely satisfied; 86% found the overall quality to be either good or excellent. Participants also responded to the total number of hours spent to complete the entire three-module course. Twenty-four (24) participants reported that it took 1–4 hours to complete each module and 24 participants reported that it took 5–8 hours to complete each module. Finally, participants responded to queries on multiple aspects associated with: (a) module activities and assignments, (b) overall quality, and (c) how to improve the course. Course satisfaction data are summarized in Table 6.

Discussion

In this preliminary study we demonstrated that an Internet-based training curriculum could be effective in training practitioners about methods and procedures that form the primary basis of clinical intervention common to many early BI programs, including parents and family members of children with ASDs, paraprofessionals and professionals, such as early childhood education specialists. Knowledge acquisition gains from pre- to post-test were significant; participants who participated also rated the course highly both in terms of usability as well relevance to their work. The outcomes from this study clearly suggest the feasibility and user satisfaction of teaching BI knowledge acquisition online, and thus bolster confidence that future, larger-scale curricula aimed at teaching BI in a distance-learning format is warranted.

The instructional materials used in this study were presented as a package consisting of text written as “lectures” and short video clips. Lectures were meant to provide written descriptions of information relevant to the subject matter; video was used to illustrate actual practice. In the present study, users appeared to have welcomed the use of video, especially when presented in the context of skills-based teaching. For example, while the concept of “reinforcement” can be written about and discussed, there are details and nuance to the actual delivery of reinforcement that can be more clearly understood after observing a model of someone correctly using it. In the present study, no effort was made to tease out contributions made by any single instructional component. Hence, the extent to which, for example, online printed lectures versus video contributed to changes in learning performance remains unknown, though the need for instructional component analyses in future studies of this type is certainly recognized. Nevertheless, while it is known that written content of various types (lectures, case studies) can produce significant improvements in trainee knowledge, it is strongly suspected that the use of video was an important component that contributed to the findings, especially given the growing body of relevant research demonstrating that that video can produce training outcomes on par with live training (e.g., Crockett, Fleming, Doepke, & Stevens, 2007; Iwata et al., 2000; Moore & Kearsley, 2005; Neef, Trachtenberg, Loeb, & Sterner, 1991). Moreover, the very nature of the distance-learning format would seem to require video in lieu of live demonstration.

The many advantages to distance learning methods are particularly attractive to those hoping to train BI practitioners. For example, the virtual nature of the delivery platform facilitates constant revision and addition as improved practices develop. The broad nature of the audience will inform the content continually, so that new developments based on research

can be included quickly. As new clinical methods are developed, course work can quickly change in response. This helps to keep material up-to-date, and it also helps with research-to-practice initiatives where the scientific community is trying quickly transfer emerging practices into the hands of practitioners. Distance learning also has cost advantages. While upfront development and testing costs can be expensive, once a training product has been designed, developed, and testing completed, it can be used over and over again with just occasional updating as is appropriate. Distance learning courses are also both cost effective and scalable. Dozens or even hundreds of practitioners can be trained with the only requirement for increased use being additional server and technical support to accommodate larger numbers of trainees, and they allow for scarce training resources to be delivered to anyone with Internet access.

Importantly, the outcome of this study should be viewed in the context of a larger programmatic effort to training practitioners, an effort that ranges from knowledge-acquisition to actual skill development. Consider a parent who wishes to become a relatively skilled user of applied behavior analytic approaches to the treatment of autism. To accomplish this in the most effective way, we see summarize a continuum of activities that proceeds from (a) *knowledge acquisition* by parents regarding behavioral interventions, to (b) supervised *skill acquisition* by parents in selecting and performing behavioral interventions correctly; to (c) *skill implementation* by parents, resulting in positive and adaptive *behavior change* in their children. Of course, there will always be interaction amongst these three, but there are clear distinctions among them. This initial study was designed to address principally knowledge acquisition. Thus, training in the core procedures used in BI does not take the place of supervised training; rather, it is viewed as a path towards it. Future studies should examine the remainder of the path: skill acquisition and skill implementation. For example, how can online training be developed such that actual practice (as opposed to knowledge) is improved or modified? Is asynchronous presentation of material sufficient? How much and what type (e.g., linear vs. interactive) video is needed to effect changes in practice? Answers to these and related questions will be valuable in moving online early behavioral intervention forward.

The results of this initial investigation as well as future study of online BI training could have important implications for many early childhood intervention/education service providers who work with young children in home, community and early childhood settings. For example, most professionals who provide EI services do so within the context of their own professional discipline. However, EI approaches increasingly recognize the importance of implementing a family-centered, broad-based approach that transcends the training and expertise of any one specific professional discipline (Bruder, 1997). While it is generally expected that EI providers function as clinical experts, increasingly providers are required to implement interventions designed to improve parenting practices and coping skills (Brooks-Gunn, Berlin, Aber, & Fuligno, 2000). Online BI training for EI providers may supplement their knowledge and skill base for working with families who have a young child with an ASD. Moreover, given the widespread use of BI as a means of treating ASDs, an early childhood educator, teacher, therapist, or other provider who has obtained training in BI is in a much better position to provide indirect support to families, if not direct treatment.

There are other possible training scenarios that a fully developed early-BI course could address. To name a few, such an online course could be “prescribed” by senior-level clinicians to parents of newly diagnosed young children as preparation for the parents’ role in supervised practice in the home. This might be particularly useful for parents in rural areas whose visits from a senior-level clinician are less frequent than for those living in more populated areas. For support staff, a school or agency could assign the course to paraprofessionals just beginning to work under the guidance of clinicians. Though such a

course would be primarily geared toward non-academic (parent and paraprofessional) applications, instructors of BI in university settings might find such a course useful as, for example, a supplement to live courses. Moreover, as technology and design advancements are made in distance learning, variations of such a course might prove valuable as an evaluation tool, not unlike simulations used in industry.

The overarching goal of early BI is to alter the developmental trajectory for a child such that skills are learned that allow him/her to become more independent and function more appropriately. With mounting evidence that correctly applied BI allows children to make large developmental gains, training staff to correctly implement the methods and procedures of BI is essential. Technology clearly has an important role to play in such training, and distance learning is an obvious choice. As technology develops further, far more interactive methods such as video transfer, virtual displays, and interactive video will become more widespread and less expensive. This will also allow the distance learning pedagogical toolbox to expand to teach a larger range of knowledge and skills, from advanced concepts to complex problem solving to psychomotor skills (Ludlow, 2005; Ludlow, Collins, & Menlove, 2006). While there will always be a need for at-home or on-site support, supervision and follow-up by trained professional staff, distance learning is likely to grow into a training medium that will be used to help train practitioners.

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References

Aman MG. Treatment planning for patients with autism spectrum disorders. Journal of Clinical Psychiatry. 2005; 66(Suppl 10):38–45. [PubMed: 16401149]

Anderson, SR.; Taras, M.; Cannon, BOM. Teaching new skills to young children with autism. In: Maurice, C.; Green, G.; Luce, SC., editors. Behavioral intervention for young children with autism: A manual for parents and professionals. Austin, TX: Pro-Ed; 1996. p. 181-194.

Bernard RM, Abrami PC, Lou Y, Borokhovsk E, Wade A, Wozney L, et al. How Does Distance Education Compare with Classroom Instruction? A Meta-Analysis of the Empirical Literature. Review of Educational Research. 2004; 74(3):379–439.

Boettcher JV. Distance Education: Are we there yet? Campus Technology. 2004; 18(3):22–26.

Bouma R, Schweitzer R. The impact of chronic childhood illness on family stress: a comparison between autism and cystic fibrosis. J Clin Psychol. 1990; 46(6):722–30. [PubMed: 2286663]

Bruder MB. Child care initiatives across the country – Connecticut: Multiple strategies link services to support inclusion. Child Care Bulletin. 1997; 15(6)

Centers for Disease Control and Prevention. Autism Information Center. 2008. Retrieved April 14, 2009, from http://www.cdc.gov/ncbddd/autism

Christianson L, Tiene D, Luft P. Web-based Teaching in Undergraduate Nursing Programs. Nurse Educator. 2002; 27(6):276–282. [PubMed: 12464769]

Cohen, J. Statistical Power Analysis for the Behavioral Sciences. 2. Mahwah, NJ: Lawrence Erlbaum; 1988.

Crockett JL, Fleming RK, Doepke KJ, Stevens JS. Parent training: acquisition and generalization of discrete trials teaching skills with parents of children with autism. Research in Developmental Disabilities. 2007; 28(1):23–36. [PubMed: 16338118]

Donenberg G, Baker BL. The impact of young children with externalizing behaviors on their families. Journal of Abnormal Child Psychology. 1993; 21(2):179–98. [PubMed: 8491931]

Dunn ME, Burbine T, Bowers CA, Tantleff-Dunn S. Moderators of stress in parents of children with autism. Community Mental Health Journal. 2001; 37(1):39–52. [PubMed: 11300666]

Holroyd J, McArthur D. Mental retardation and stress on the parents: a contrast between Down syndrome and childhood autism. American Journal of Mental Deficiency. 1976; 80(4):431–436. [PubMed: 129006]

Howard, C.; Schenk, C.; Discenza, R. Distance-learning and university effectiveness: Changing educational paradigms for online learning. Hershey, PA: The Idea Group Inc; 2003.

Iwata BA, Wallace MD, Kahng S, Lindberg JS, Roscoe EM, Conners J, et al. Skill acquisition in the implementation of functional analysis methodology. Journal of Applied Behavior Analysis. 2000; 33(2):181–194. [PubMed: 10885526]

Koegel LK, Koegel RL, Shoshan Y, McNerney E. Pivotal response intervention II: Preliminary long-term outcomes data. Journal of the Association for Persons with Severe Handicaps. 1999; 24(3): 186–198.

Koegel RL, Koegel LK, McNerney EK. Pivotal areas in intervention for autism. Journal of Clinical Child Psychology. 2001; 30(1):19–32. [PubMed: 11294074]

Kulik CLC. The Effectiveness of Computer-Based Adult Education: A Meta-Analysis. Journal of Educational Computing Research. 1986; 2(2):235–252.

Lepper MR, Gurtner JL. Children and Computers: Approaching the Twenty-First Century. American Psychologist. 1989; 44(2):170–178. [PubMed: 2653128]

Ludlow, BL. Technology-mediated distance education: Current practices and future trends. In: Edyburn, LD.; Higgins, K.; Boone, R., editors. The handbook of special education technology research and practice. Whitefish Bay, WI: Knowledge by Design; 2005. p. 795-819.

Ludlow, BL.; Collins, BC.; Menlove, R., editors. Online instruction for to prepare special education personnel for and in rural areas. Logan, UT: American Council on Rural Special Education; 2006.

McGee GG, Morrier MJ, Daly T. An incidental teaching approach to early intervention for toddlers with autism. Journal of the Association for Persons with Severe Handicaps. 1999; 24(3):133–146.

Minnes PM. Family resources and stress associated with having a mentally retarded child. American Journal of Mental Retardation. 1988; 93(2):184–92. [PubMed: 2971381]

Montes G, Halterman JS. Psychological functioning and coping among mothers of children with autism: a population-based study. Pediatrics. 2007; 119(5):e1040–6. [PubMed: 17473077]

Moore, M.; Kearsley, G. Distance education: A systems view. Belmont, CA: Wadsworth; 2005.

National Institute of Mental Health. Autism Spectrum Disorders (Pervasive Developmental Disorders). 2009. Retrieved April 14, 2009, from http://www.nimh.nih.gov/health/publications/autism/complete-index.shtml

National Research Council. Educating Children with Autism. In: Lord, C.; McGee, JP., editors. Committee on Educational Interventions for Children with Autism. Division of Behavioral and Social Sciences and Education; Washington, D.C: National Academy Press; 2001.

Neef NA, Trachtenberg S, Loeb J, Sterner K. Video-based training of respite care providers: An interactional analysis of presentation format. Journal of Applied Behavior Analysis. 1991; 24(3): 473–486. [PubMed: 1836458]

Roblyer MD. Assessing the Impact of Computer-Based Instruction: A Review of Recent Research. Computers in the Schools. 1988; 5(3–4)

Sallows GO, Graupner TD. Intensive behavioral treatment for children with autism: four-year outcome and predictors. American Journal on Mental Retardation. 2005; 110(6):417–438. [PubMed: 16212446]

Scheuermann B, Webber J, Boutot EA, Goodwin M. Problems with Personnel Preparation in Autism Spectrum Disorders. Focus on Autism and Other Developmental Disabilities. 2003; 18(3):197–206.

Schreibman, L.; Koegel, RL. Fostering self-management: Parent-delivered pivotal response training for children with autistic disorder. In: Hibbs, ED.; Jensen, PS., editors. Psychosocial treatments for child and adolescent disorders: Empirically based strategies for clinical practice. Washington, DC: American Psychological Association; 1996. p. 525-552.

Simpson RL. Evidence-Based Practices and Students With Autism Spectrum Disorders. Focus on Autism and Other Developmental Disabilities. 2005; 20(3):140–149.

Sitzmann T, Kraiger K, Stewart D, Wisher R. The comparative effectiveness of web-based and classroom instruction: A meta-analysis. Personnel Psychology. 2006; 59(3):623–664.

Sugrue, B.; Rivera, RJ. ASTD 2005 State of the Industry Report. Alexandria: American Society for Training & Development; 2005.

Tallent-Runnels MK, Thomas JA, Lan WY, Cooper S, Ahern TC, Shaw SM, et al. Teaching courses online: A review of the research. Review of Educational Research. 2006; 76(1):93–135.

Volkmar FR, Lord C, Bailey A, Schultz RT, Klin A. Autism and pervasive developmental disorders. Journal of Child Psychology and Psychiatry. 2004; 45(1):135–170. [PubMed: 14959806]

Wise, BW.; Olson, RK. Studies of computer-aided remediation for reading disabilities. In: Hulme, C.; Joshi, RM., editors. Reading and spelling: Development and disorder. Mahwah, NJ: Lawrence Erlbaum Associates; 1998. p. 473-488.

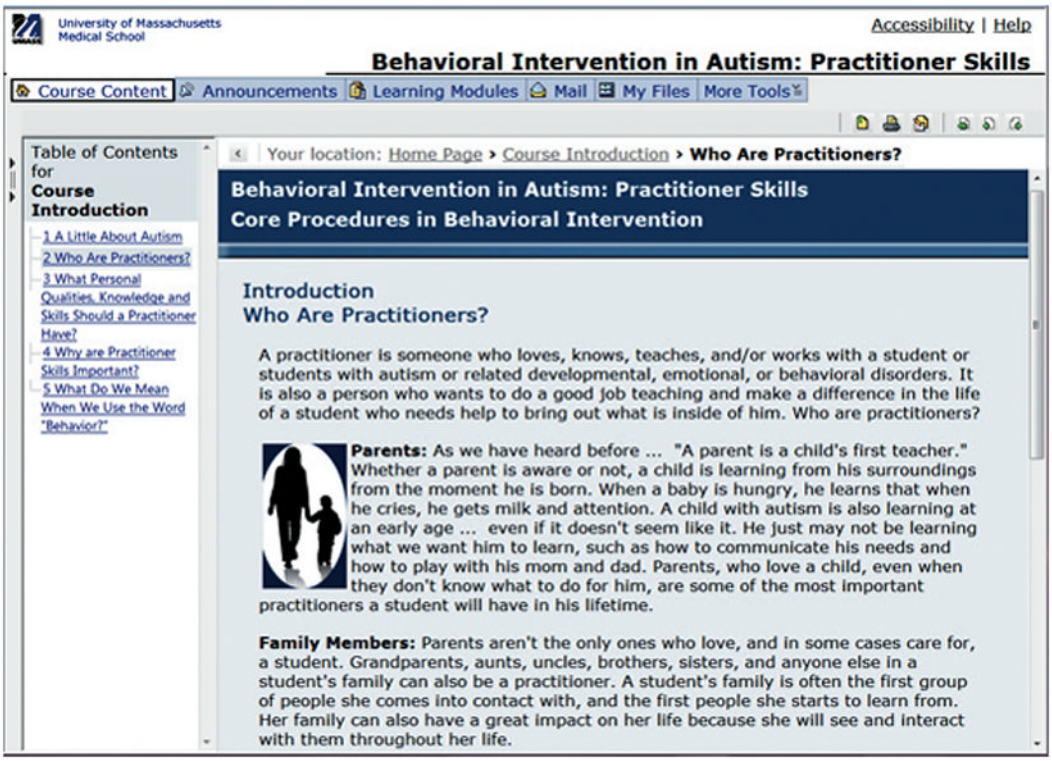

Figure 1.
Screenshot of *BIA-Practitioner Skills* opening webpage.

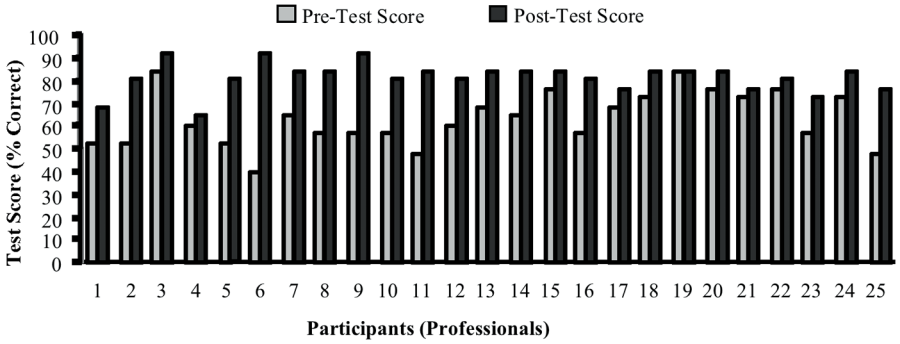

Figure 2.
Comparison of pre- and post-test knowledge acquisition by role: *Professionals*.

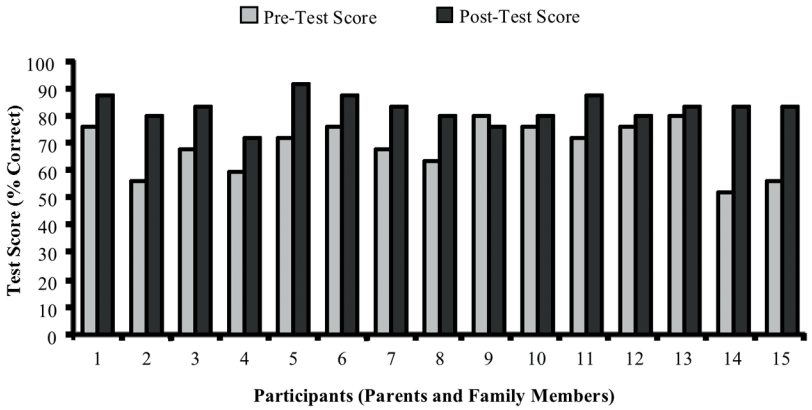

Figure 3.
Comparison of pre- and post-test knowledge acquisition by role: *Parents and family members.*

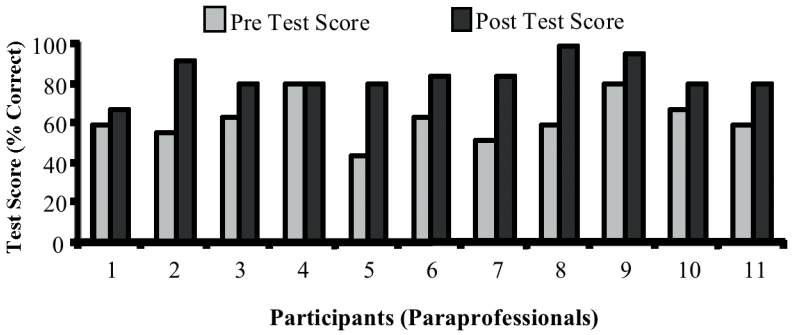

Figure 4.
Comparison of pre- and post-test knowledge acquisition by role: *Paraprofessionals*.

Table 1

Information Covered in Each Module

Module 1: Positive Reinforcement: Selection and Use of Reinforcement
What is Positive Reinforcement?
What is a Positive Reinforcer?
Selecting Reinforcers for Teaching
How to Use Reinforcers for Teaching Effectively
Ways in Which Reinforcement Can Backfire
Ethical Considerations When Using Positive Reinforcement
Module 2: Relationship Building: Pairing and Teaching Cooperation
Why are Most students with Autism “Unwilling” Learners?
Ways to Help Students with Autism Love Learning
What is Pairing?
Teaching a Student to Have Fun Learning
Ethical Considerations When Pairing and Teaching Cooperation
Module 3: Prompting and Prompt Fading
What are Prompts and Why Use Them?
How to Teach Using Prompts: *Errorless Learning*
How to Get Rid of Prompts: *Prompt Fading*
Ethical Considerations When Prompting and Fading Prompts

Table 2

Participant Demographic Information, N = 51

Gender (n)	Ethnicity (n)	Education (n)	Professional Discipline (n)	Length of Time Working in BI Field
Male (4)	White (42)	High School (6)	Early Childhood Education (6)	Mean: 5.2 years
Female (47)	Hispanic (5)	AA/AS (10)	Early Childhood Special Education (8)	Range: 1–20 years
	Native American (1)	BA/BS (20)	Occupational Therapist (1)	
	More than one race (3)	MA/MS/MEd (12)	Psychology (1)	
		Other (3)	Social Work (3)	
			Speech and Language Pathologist (6)	
			Parent of Child with ASD (14)	
			Family Member of Child with ASD (1)	
			Other (11)	

Table 3

Participants' Goals and Job Responsibilities

Goals for Taking Course (Select all that apply)	Number (% Reporting)	Current Job Responsibilities (can be multiple responses)	Number (% Reporting)
Gain complete understanding of practitioner skills	16 (31%)	Working 1:1 teaching a child with ASD	31 (61%)
Learn more about practitioner skills in general	24 (47%)	Assisting teachers in the classroom	2 (4%)
Learn how to become more effective in your work	34 (67%)	Early intervention play	4 (8%)
Learn more about selecting and using positive reinforcement	27 (53%)	Writing behavior plans and interventions	6 (18%)
Learn more about building positive relationships through pairing with students	16 (31%)	Parenting and grand-parenting	8 (16%)
Learn more about how to teach students to be more cooperative	21 (41%)		
Learn more about using and fading prompts	20 (39%)		
Meet my professional development goals or CEU requirements	6 (18%)		
Other	6 (18%)		

Table 4

Participants' Computer and Internet Usage

Frequency of Computer and Internet Use	Number and % Reporting	Type of Computer and Internet Use	Number (% Reporting)
Use computer frequently every day	40 (78%)	Emailing	51 (100%)
Use computer about once per day	10 (20%)	Browsing internet for information on ASD	48 (94%)
Use computer about once per week	1 (2%)	Taking online courses	34 (67%)
		Participating in online discussion or chat groups	23 (45%)
		Watching online video clips	39 (76%)

Infants Young Child. Author manuscript; available in PMC 2013 March 14.

Table 5

Participant Means (M) and Standard Deviations (SD) for Pre- and Post-Test Scores by Group

Group	Pre-Test Score	Post-Test Score Mean
Professionals	M (62.7)	M (81.1)
	SD (13.4)	SD (6.6)
Parents and family Members	M (68.8)	M (82.9)
	SD (15.6)	SD (4.9)
Paraprofessionals	M (63.8)	M (82.0)
	SD (14.3)	SD (8.7)

Table 6

Summary of Open-Ended Feedback from Participants

Comment and Feedback Types	Number (% Reporting)
Comments on module activities and assignments:	
Activities and assignments were just right for beginners	27 (53%)
Experienced technical problems (e.g., videos too slow to load, screenshot too small, kicked out of session)	9 (18%)
Change wording on assessment questions	5 (10%)
Include more and/or longer video examples	3 (6%)
Comments on overall quality:	
Overall quality was just right for beginners	34 (67%)
Expand on content in both written and video forms	4 (8%)
Change wording on exam questions	4 (8%)
Experienced technical problems with video downloads	2 (4%)
Feedback on how to improve the course:	
Clear up technological issues (e.g., videos too slow to load, screenshot too small, kicked out)	6 (12%)
Include additional content related to adolescent students	3 (6%)
Provide clearer instructions on how to complete assignments	1 (2%)
Favorite feature was print-out option (on content)	1 (2%)
Target the general public to take the course and not just practitioners	1 (2%)
Include action steps at the end of each module	1 (2%)
Do not place a time limit on completing assessments	1 (2%)