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## Randomized trial of an eLearning program for training family members of children with autism in the principles and procedures of applied behavior analysis

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### ABSTRACT

Effective training of caregivers is an integral part of top-quality treatment programs for individuals with autism spectrum disorders (ASD). However, traditional caregiver training can be time consuming and costly. The development of Web-based electronic training programs (e.g., “eLearning”) may extend training to rural areas, thereby increasing accessibility and improving efficiency. The eLearning approach has been shown to be effective and efficient in various disciplines and industries, but studies evaluating eLearning programs for training parents of children with ASD are limited. The purpose of this study was to evaluate the effectiveness of an eLearning program for training family members of children with ASD in the principles and procedures of applied behavior analysis treatment. A total of 28 family members participated in this randomized, waitlist-controlled, between-groups study. Differences in change scores between groups were significant, with the trained group substantially outperforming the waitlist control group at post-test. The control group then received training and also demonstrated significant gains post training.

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### 1. Introduction

Effective training of caregivers is an essential part of top-quality treatment programs in applied behavior analysis (ABA). Numerous studies have shown that parents are able to learn to implement behavioral procedures and techniques successfully, leading to beneficial outcomes for their children, including increases in skill acquisition and decreases in challenging behavior (Gillet & LeBlanc, 2007; Ingersoll & Gergans, 2006; Reagon & Higbee, 2009; Vismara, Colombi, & Rogers, 2009). Thus, it has become the consensus that all treatment for children with autism spectrum disorders (ASD) should include substantial parent and family training (Brookman-Frazee, Stahmer, Baker-Ericzen, & Tsai, 2006; Matson, Mahan, & Maton, 2009; McConachie & Diggle, 2007).

Parents of children with ASD have the potential to impact their children's outcomes to a high degree because they have more contact with their children than educators or clinicians, even when children are enrolled in early intensive behavioral intervention programs. Given the important role that caregivers play in ASD treatment, caregiver training is a high priority. Most traditional caregiver training is offered in a one-person or group setting with an expert-level trainer physically present to provide direct feedback. However, traditional parent training programs are often time consuming and costly to operate (Webster-Stratton, 1984). Particularly, families in rural areas often travel long distances to see qualified clinicians. Also, a

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lack of funding and services in many regions result in parent training often being unavailable, and families' needs are, therefore, not accommodated (Gordon, 2000).

Alternative parent training methods may be needed in order to increase the efficiency of training and to extend the accessibility of training to remote areas. The development of electronic training programs (eLearning) may be one way to disseminate training opportunities and provide an alternative or supplement to traditional in-person training. The term, "eLearning," is defined as "the use of computer network technology, primarily over an intranet or through the Internet, to deliver information and instruction to individuals" (Welsh, Wanberg, Brown, & Simmering, 2003). A potential advantage of eLearning is its inherent accessibility; it can reach users in remote and rural areas where service providers are limited or absent altogether. Caregivers can access eLearning training from the comfort of their homes, thus reducing travel time for both caregivers and clinicians. Also, caregivers can access training any time of the day at their convenience since a qualified clinician does not need to be physically present during the training.

These eLearning approaches have been evaluated to be effective and efficient methods by which to educate people in a variety of disciplines and industries (Welsh et al., 2003). Despite their effectiveness, studies evaluating autism-related education using eLearning approaches are limited. A recent study by Granpeesheh and colleagues is one of the few studies to evaluate the effectiveness of an eLearning program for training newly-hired behavioral therapists in the principles and procedures of ABA treatment for children with ASD (Granpeesheh et al., 2010). Hamad, Serna, Morrison, and Fleming (2010) have also demonstrated that Internet-based training is effective in training practitioners, including educators, professionals, paraprofessionals, teacher aides, parents, and family members of children with autism spectrum disorders, about foundational behavioral intervention knowledge. The authors of both studies asserted that the foundational and academic knowledge training in ABA should not replace practical, hands-on training, yet they emphasized that it provides an important part of the overall training process in ABA. Granpeesheh et al. addressed the fact that academic training is particularly relevant in ABA because procedures of ABA are directly related to "basic principles of learning and motivation," and Hamad et al. (2010) further suggested that it should be considered a path toward "supervised skill acquisition" and "skill implementation" (Hamad et al., 2010).

Training parents and other family members of children with ASD in the principles and procedures of ABA treatment may help them understand their children's ABA programs better and assist them in their efforts to become proficient agents of their children's intervention. An environment in which caregivers work on generalization of their child's newly-learned skills, as well as teaching their children new skills in their natural environment, will likely result in more effective treatment than if the child learns only when his/her ABA therapists are present. Given the potential contributions of eLearning approaches to parent training, the current study evaluated the effectiveness of an eLearning program for training family members of children with ASD in the principles and procedures of ABA treatment.

## 2. Method

### 2.1. Participants and setting

A total of 28 family members of children diagnosed with Autistic Disorder, Asperger's Disorder, or PDD-NOS participated in the study. Participants included 24 mothers, two grandmothers, and two fathers. Four of the participants reported having a high school diploma, three had an associate's degree, 15 had a bachelor's degree, and six had a master's degree. Participants resided in Arizona, California, New Hampshire, New York, and Texas. All participants were English speaking and had access to computers with a high-speed Internet connection.

The children of 25 out of 28 participants were receiving ABA-based services from a variety of providers, and these service programs varied in intensity and duration. The mean age of participants' children was 6.6 years, ranging from 3.1 to 11.5 years old. Among the children, there were eight females and 21 males.

### 2.2. Experimental design and group assignment

A randomized, waitlist-controlled, between-groups design was used. A waitlist-control design was selected so that participants in the control group would not have to be deprived of training but would, instead, simply have to wait to be trained. Participants were randomly assigned either to immediate training (eLearning) or delayed training (control). Fourteen participants were randomly assigned to the eLearning group, and 14 were assigned to the control group. Participants in the eLearning group took the online pre-test immediately after group assignment. Upon completion of the pre-test, they were given immediate access to the eLearning program. They took the post-test after completing the training. Participants in the control group took the pre-test immediately after group assignment, waited one week, and took the post-test. After taking the post-test, the control group had access to the eLearning program. They then repeated the post-test after completing the eLearning program.

### 2.3. Dependent measure

The dependent measure was a 20-question multiple-choice exam that was administered pre and post training. At each administration, questions were randomly chosen from a pool of 109 questions.

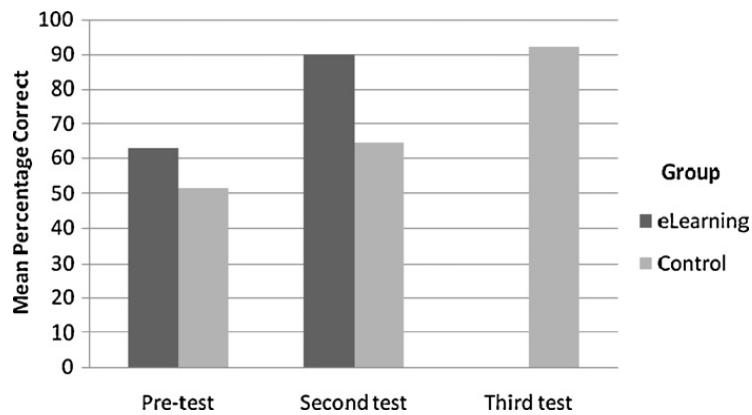


Fig. 1. Mean percentage correct on exams for the eLearning and control groups. The eLearning group received training between the pre and second tests and the control group received training between the second and third tests.

#### 2.4. eLearning program

Participants had access to the eLearning program any time of the day or night through computers at their home and work. The eLearning program used in this study was the same as the one used for staff training in the Granpeesheh et al. (2010) study. The program is a self-paced, interactive, Web-based training system that requires 30–40 h to complete. It provides an overview of all major components of ABA intervention for children with autism across the following topics: (1) Introduction to Autism, (2) Introduction to ABA, (3) Introduction to Discrete Trial Training, (4) The Antecedent, (5) The Response, (6) The Consequence, (7) The Intertrial Interval, (8) Prompting and Fading, (9) Shaping, (10) Chaining, (11) Discrimination Training, (12) Defining Behavior, (13) Functions of Behavior, (14) Antecedent-Based Interventions, and (15) Consequence-Based Interventions (Granpeesheh et al., 2010). The eLearning program consists of visual notes, vocal instruction, and video clips demonstrating implementation of procedures. Each module concludes with a multiple-choice quiz. Participants can take each module as many times as they wish, and they are also able to type notes during the training and save them to review and print for later use. After all nine modules are taken, a final test is given. Participants cannot proceed to the final test until they pass all module quizzes with a minimum of 85% correct. A passing score of 85% is required on the final exam for training to be complete. Both the quizzes and the final exam are dynamically created through random selection of test-bank items. The first author followed up with all participants, addressing any concerns or problems via emails and phone calls.

### 3. Results

An independent samples *t*-test was used to evaluate differences in change scores between the treatment and control groups. A significant difference was found with  $t(26) = 3.138, p = .004$ . On average, participants in the eLearning group scored 63% on the pre-test and 90% on the post-test, demonstrating a 27% increase in accuracy. On average, participants in the control group scored 51% on the pre-test and 64% on the post-test, which they took after a minimum of a one-week delay without receiving the eLearning training. After completing the eLearning training, the control group scored 92% on the post-test (see Fig. 1). Four out of 14 participants in the eLearning group took the final exam multiple times to meet the program training criteria, and two out of 14 participants in the control group took the final exam multiple times to pass the training criteria. Because the program was self-paced, the total hours required to complete the training varied.

As a secondary analysis, exam performance was analyzed irrespective of group membership. To evaluate if scores significantly changed between the pretest and the final test, a dependent samples *t*-test was conducted and found to be significant  $t(27) = 12.86, p < 0.001$ . To evaluate participant opinion regarding the content of the training, feedback was solicited from all participants. A total of 17 of the 28 participants responded. All 17 participants gave positive feedback about the eLearning program. A small number of participants gave negative feedback, mostly related to technology infrastructure, such as personal Internet connection and computer compatibility. Two participants complained that the program was too lengthy.

### 4. Discussion

The results of the current study suggest that eLearning is an effective and efficient method for training caregivers in knowledge of ABA principles and procedures. On average, participants in both treatment groups scored 34% higher on the post-test after completing the eLearning program, suggesting a substantial increase in their knowledge of ABA. To our knowledge, this is the first randomized controlled study to evaluate an eLearning program for training family members of children with ASD in knowledge of the principles and procedures of ABA. All participants who provided feedback were

generally satisfied with the program and reported that the training was a helpful tool which provided an overview of all major components of ABA. Many also reported that they had a better understanding and appreciation of their child's ABA treatment programs after participating in the eLearning. To quote one participant, "...I understand the premise that what we reinforce will be maintained and that consistency is paramount. I appreciate how the material was systematically presented with video examples. I'm using the skills I've acquired with all my boys, and I'm already seeing a difference in their behavior."

One advantage of an eLearning program is that it allows training opportunities to be disseminated to areas where such opportunities are limited. For those who live in rural areas, locating a qualified clinician who provides ABA therapy and other relevant training can be challenging (Gething, 1997a, 1997b; Loschen, 1986). One of the participants reported that she lived in an area where no ABA providers were available and that she had to travel over 3 h to meet her child's ABA provider. Moreover, many countries have few certified behavior analysts (Behavior Analyst Certification Board, 2011), and some have no behavior analysts. An eLearning approach may be a viable training option for families in these regions.

An eLearning program not only expands training opportunities, but it is also convenient for families to complete at their own pace. Active caregiver involvement is a crucial part of the child's treatment because parents can help the child use and generalize the skills learned during his/her therapy sessions. However, traditional in-person caregiver training can be difficult for many parents to attend. Particularly during difficult economic times, parents may often work more than one job and may not be able to attend in-person trainings at clinics. eLearning may provide a solution for this problem because caregivers can access the training from their own homes any time of the day without having to travel or schedule a meeting with a clinician. Furthermore, for parents who cannot commit to adhering to particular schedules or to attending training for longer periods (e.g., up to three or more hours) on a particular day, the ability to space-out eLearning across many shorter durations (e.g., 30–60 min), may help increase access to training.

Another advantage of an eLearning program is its cost effectiveness. As discussed, eLearning will decrease travel time for both clinicians and caregivers and, therefore, save travel cost, especially for those families that have to travel long distance to see clinicians. The eLearning program used in this study is intensive and requires approximately 30–40 training hours. If this training were to be presented in a traditional way with a qualified clinician physically present, the costs would be dramatically higher, thereby possibly making the training cost prohibitive for families with lower socioeconomic status or for whom third-party funding is unavailable. While there are inherent costs in an eLearning system (e.g., Internet, computer, program development), these costs are likely much lower than in-person, expert-level training.

One potential limitation of eLearning training formats is that no immediate answers can be provided to unanticipated questions during training. In live training formats, an expert is available to answer caregivers' questions, but eLearning approaches do not yet have the technology to offer that option. Also, it is important to note that this study did not train or assess practical implementation of ABA procedures. The purpose of this study was to conduct an evaluation of an eLearning tool for training parents and other family members in academic knowledge of ABA treatment. The eLearning training is not intended to replace hands-on training by an expert; it is intended to replace some or all of traditional didactic classroom training. Therefore, caregivers who complete the eLearning program are not necessarily qualified to perform ABA procedures. As Granpeesheh et al. (2010) discussed, the rationale for training in academic knowledge is to lay the foundation for hands-on training in implementation.

Despite some limitations, the results of this study suggest that eLearning may be an effective alternative or supplement to traditional, in-person didactic training. Dissemination of eLearning will better accommodate families' needs by providing convenient and cost-effective training opportunities. As technology develops, eLearning will have more advanced interactive systems in which users' questions can be addressed through live video interactions. Future studies should examine whether family members' ability to implement clinical intervention with their children is impacted when they acquire academic knowledge of ABA. Further, treatment outcomes of children whose family members had academic training in ABA should be evaluated to observe if caregiver training was an important factor in children's treatment outcomes.

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