Research in Autism Spectrum Disorders 5 (2011) 640–647

Contents lists available at ScienceDirect

Research in Autism Spectrum Disorders

Journal homepage: http://ees.elsevier.com/RASD/default.asp

Effects of computer-assisted instruction on correct responding and procedural integrity during early intensive behavioral intervention

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ARTICLE INFO

Article history:
Received 13 July 2010
Accepted 28 July 2010

Keywords:
Computer-assisted instruction
Early intensive behavioral intervention
Generalization training
Procedural integrity
Staff training
Therapist training

ABSTRACT

Computer-assisted instruction (CAI) is used to teach a variety of skills to children with developmental disabilities. However, it remains unclear whether CAI or direct instruction from a therapist produces better learning outcomes. In addition, no studies have evaluated the ease of training therapists to implement CAI versus direct instruction. In the first experiment, the current study compared acquisition of mastered and unmastered targets during generalization training with CAI or one-on-one instruction with a child diagnosed with autism. Although correct responding was similar across CAI and one-on-one instruction, independent responding was higher during CAI. In the second experiment, we compared procedural integrity during teaching trials conducted either via CAI or one-on-one instruction by three inexperienced therapists. The therapists read a protocol and asked questions prior to implementation of the instructional trials. Results indicated that each therapist implemented CAI with 90–100% accuracy by the second session, whereas procedural integrity levels were 60% or lower during one-on-one instruction. The advantages of using CAI to promote independent responding during generalization training and procedural integrity for inexperience therapists are discussed.

Computer-assisted instruction (CAI) has been used to teach children with developmental disabilities a variety of academic skills (Bosseler & Massaro, 2003; Moore & Calvert, 2000). For example, Bosseler and Massaro taught children with autism spoken word-to-picture discriminations and grammar skills using computer-based instructional procedures. Children acquired a significant number of vocabulary words with CAI and maintained more than 90% of these newly acquired skills for 30 days following training.

Previous research has compared CAI to other methods of instruction (e.g., one-on-one instruction) to evaluate whether CAI produces superior levels of acquisition (Chen & Bernard-Opitz, 1993; Moore & Calvert, 2000; Williams, Wright, Callaghan, & Coughlan, 2002). In these preliminary studies, CAI was associated with decreased levels of problem behavior, but differences in the rate of acquisition favoring CAI were observed in some studies but not others. As such, additional comparisons of CAI and one-on-one instruction are warranted.

Computer-assisted instruction has also been applied to staff training (Ingvarsson & Hanley, 2006). Ingvarsson and Hanley evaluated whether CAI would promote preschool teachers use of parents' names during morning and afternoon greetings. Staff members received training on parent and child picture naming via CAI. Teachers rapidly acquired parents' names, although an additional treatment package was necessary for some of the teachers in the preschool classroom following

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doi:10.1016/j.rasd.2010.07.011

training to maintain the use of names during greetings. The authors discussed several advantages of using CAI for staff training including flexibility in the time spent training, the omission of a specialist needed to conduct training, and computerized analysis of training data.

CAI may also have other added benefits. Using CAI to provide academic instruction allows for control over the presentation of stimuli and can ensure correct implementation of various prompting procedures. Thus, CAI may eliminate some of the procedural integrity errors that often occur when inexperienced paraprofessionals conduct one-on-one instruction. Although preliminary studies indicate CAI may result in greater acquisition of target skills and have benefits over direct instruction with a therapist, it remains unclear to what extent CAI will increase procedural integrity and decrease the amount of time required to train therapists to implement individualized instruction.

Previous investigations of CAI have primarily focused on speed of acquisition and problem behavior (Chen & Bernard-Opitz, 1993; Moore & Calvert, 2000). Although CAI is commonly used to teach children novel skills, CAI has not yet been applied to generalization training despite a number of potential advantages. Parents may be able to use CAI to implement early intensive behavioral intervention (EIBI) trials in home settings with minimal training. In addition, it may be less time consuming for caregivers to implement CAI because the child can participate in learning opportunities while caregivers complete other activities. Third, video clips or graphics can be incorporated into academic programming to increase a child's motivation to attend and respond during CAI (e.g., Headsprout® Early Reading). Finally, generalization training trials can be programmed in CAI in a manner that ensures the child is presented with multiple exemplars of previously mastered stimuli during each instructional session.

Training for generalization is a critical, although sometimes overlooked, component of EIBI (Smith, 1999). Generalization training may involve presenting new exemplars of mastered stimuli or practicing mastered skills with novel therapists or in novel settings. Generalization training is important in any EIBI program to ensure that the skills that are mastered in one setting are displayed in a number of other settings (e.g., school, home, in the community). Stokes and Baer (1977) described ways to train for generalization including training sufficient exemplars. Despite the importance of training sufficient exemplars, only a small number of studies have investigated procedures for conducting this type of training (Allen, 1973; Garcia, 1974; Stokes, Baer, & Jackson, 1974). Stokes et al. taught individuals living in an institution to greet staff members. Initially, participants were trained to wave to one staff member, and generalization probes across novel staff members indicated that participants did not display greetings with novel staff. However, following training with two different staff members, greetings generalized to novel staff for three of the participants. More research is needed to examine efficient techniques of training sufficient exemplars so that generalization of recently acquired skills is achieved.

Training novel exemplars of mastered stimuli in CAI is one potentially efficient methodology for training sufficient exemplars. A computer program can be used in multiple settings with a variety of teachers, caregivers, and therapists to allow the child to practice newly acquired skills in every relevant setting. In addition, programming stimuli into CAI eliminates the need for producing sets of stimuli to give to teachers or caregivers so that the child can practice skills across settings. However, there may be several limitations of using CAI with children with autism. One-on-one instruction provides opportunities for therapists to provide social interactions during instruction and deliver praise paired with highly preferred items during reinforcement intervals. In addition, a computer would need to be available in a number of settings for the child to practice previously mastered skills. Finally, the child may not respond to the computer in the absence of a therapist to prompt the child to engage in target behavior. In light of the potential advantages and limitations of CAI, additional evaluations are needed to identify the benefits of CAI in comparison to one-on-one instruction.

The purpose of the present investigation was to compare (a) correct prompted and unprompted responding during CAI and one-on-one instruction during generalization training trials and (b) procedural integrity during CAI and one-on-one instruction with inexperienced therapists that had not received direct instruction in implementation of early intensive behavioral intervention (EIBI) procedures.

1. Experiment 1

1.1. Participants, setting, and materials

Lisa was a 7-year-old female diagnosed with autism by a multidisciplinary team who specializes in the assessment of autism spectrum disorders. She received EIBI services at a university-based early intervention program. Lisa attended second grade at a public school, followed two-to-three-step instructions, and requested and labeled items in the environment using short sentences (e.g., "Can I have an animal cookie?" or "It's a blue circle"). We conducted all sessions in a private therapy room containing a table, chair, laptop computer, data collectors, and academic materials necessary for instruction. The computer program utilized in the evaluation was developed by an employee at the university-based clinic using Visual Basic®. The computer displayed the target picture for each trial in the center of the screen. The picture was approximately 14 cm × 13 cm.

The therapist selected potential targets for inclusion in one-on-one instruction and CAI based on responding during prior EIBI training. During daily EIBI (prior to the investigation), the therapist presented learning trials until target stimuli were mastered (e.g., correct unprompted responding for 2 consecutive sessions at or above 90%). Training involved presenting the