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ORIGINAL PAPER

Use of Audio Cuing to Expand Employment Opportunities for Adolescents with Autism Spectrum Disorders and Intellectual Disabilities

Keith D. Allen · Raymond V. Burke · Monica R. Howard · Dustin P. Wallace · Scott L. Bowen

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Abstract We evaluated audio cuing to facilitate community employment of individuals with autism and intellectual disability. The job required promoting products in retail stores by wearing an air-inflated WalkAround® costume of a popular commercial character. Three adolescents, ages 16–18, were initially trained with video modeling. Audio cuing was then used by an attendant who delivered prompts regarding when to perform job skills. The two interventions were evaluated in an interrupted time series withdrawal design during training and then again in an actual job setting. Results show video modeling was not effective. However, the audio cuing produced job performances well above the designated criteria during training and when on the job. These changes were replicated with each participant, demonstrating clear experimental control. The changes proved statistically significant as well. Participants and parents reported high job satisfaction. The challenges of competitive employment for individuals with autism and intellectual disabilities are discussed.

Keywords Autism · Intellectual disability · Employment · Job skills · Audio cuing

K. D. Allen (✉) · M. R. Howard
Munroe Meyer Institute for Genetics and Rehabilitation, 985450 University of Nebraska Medical Center, Omaha, NE 68198, USA
e-mail: kdallen@unmc.edu

R. V. Burke (✉) · S. L. Bowen
The Prevention Group, LLC, 2320 Paul Street, Omaha, NE, USA
e-mail: ray@thepreventiongroup.org

R. V. Burke
University of Nebraska-Lincoln, Lincoln, NE, USA

D. P. Wallace
University of Missouri-Kansas City, Kansas City, MO, USA

S. L. Bowen
Signs & Shapes International, Inc., Omaha, NE, USA

Introduction

Despite a host of benefits to hiring individuals with disabilities (Hartnett et al. 2011) and widespread agreement that employment can have mental health benefits (e.g., Szymanski et al. 1996; Paul and Moser 2009), rates of employment for individuals with disabilities remain low (Brown et al. 2006). Employment is especially difficult to obtain for individuals with Autism Spectrum Disorders (ASD), where the vast majority is unemployed (e.g., Barnard et al. 2001; Billstedt et al. 2005; Hendricks 2010). Even among those on the autism spectrum who are considered to be the highest functioning, less than 5 % are competitively employed (e.g., Engstrom et al. 2003). Furthermore, without employment, long-term outcomes have been found to be quite poor, affecting those individuals, their families, and society (Beadle-Brown et al. 2005).

One of the particular challenges with finding meaningful employment for individuals on the spectrum is that due to social and communication deficits associated with autism, they typically require high levels of support in the workplace. Indeed, individuals with autism have been found to be among the most costly individuals to serve with vocational supports (Cimera and Cowan 2009). Although vocational rehabilitation (VR) programs can have a beneficial impact on the performance of individuals with autism (e.g., García-Villamisar and Hughes 2007), the system is overloaded at a time when increasing numbers of adults

with ASD are entering the VR system (Cimera and Cowan 2009).

One approach to expanding the network of employment options is the melding of behavioral and electronic technology. Recent research suggests that technology has the potential to enable individuals with disabilities to achieve more positive employment and rehabilitation outcomes (Wehmeyer et al. 2006). For example, video modeling, which has been used successfully to teach a variety of skills to individuals with ASD (Darden-Brunson et al. 2008), has recently been applied to vocational training. In a collaborative project between a University Center for Excellence in Developmental Disabilities and a private business, Allen and colleagues (Allen et al. 2010a, b) assessed the viability of videotaped modeling to teach individuals with ASD to perform skills critical to a job involving in-store marketing of retail products. The specific job involved wearing an air-inflated costume of a popular commercial character (i.e., Chester Cheetah from Frito Lay®) to help promote products in large discount retail stores. The air-inflated costumes, called WalkArounds®, are a unique employment opportunity for some individuals with ASD, in part because Signs & Shapes International, the company that manufactures WalkAround costumes uses video modeling as part of its on-line training program. In addition, performance in the WalkAround does not require the person wearing the costume to read and respond to complex social cues or use verbal communication. Allen et al. demonstrated that videotaped modeling could effectively teach high functioning individuals with autism (age 16–26 years) to perform well in this competitive, well paying (US$15.00-US$20.00/h) part-time job.

In a subsequent study, these same investigators evaluated the use of electronic technology to deliver written textual cues via an iPod to teach more complex job skills to individuals with autism performing in WalkArounds (Burke et al. 2010). While written textual cues have been found effective in improving the social communication of individuals with autism (e.g., Thiemann and Goldstein 2001), they have not been specifically used to improve vocational training outcomes. In this particular application, Burke et al. demonstrated that written textual cues delivered via an electronic personal digital assistant (PDA) device enabled individuals with autism to perform extended and complex sequences of actions while in a WalkAround. The complex sequences were part of an educational fire safety program. Study participants wore a "Fire Pal" WalkAround and functioned as an assistant to a fire safety program facilitator (an actual firefighter). Participants performed during real fire safety programs delivered to elementary school students and were paid competitive wages.

To date, these applications of technology to improve vocational opportunities for individuals with autism have centered on finding competitive jobs for relatively high functioning individuals with autism. Yet, many with ASD also have an intellectual disability (ID) and meeting their vocational needs could prove even more challenging. Indeed, a 2004 report from the President's Committee for People with Intellectual Disabilities (PCPID) indicated that almost 90 % of employment-age individuals with intellectual disability are unemployed. Of those who are employed, the vast majority remains underemployed in sheltered workshops (PCPID 2004), while those with moderate or severe intellectual disabilities typically have no employment at all (Kirby 1997). Furthermore, the effectiveness of technologies involving modeling or written textual cues may be quite limited for those who do not imitate or read (Darden-Brunson et al. 2008). Thus, for those with both an ASD and a comorbid ID, additional technological supports are needed.

Audio cuing represents one promising alternative. Numerous investigators have found that prerecorded audio prompts can assist individuals with intellectual disabilities to perform vocational tasks in supported employment or prevocational settings (e.g., Alberto et al. 1986; Davis et al. 1992; Steed and Lutzker 1999). More recently, the technological delivery of audio cues has advanced from prerecorded cassette tapes to wireless radio technology, with cues being delivered via a "bug-in-the-ear." Bennett et al. (2010), found that job coaches could significantly increase the job performance of individuals with ID working in supported employment settings using audio cuing and performance feedback. Yet, all of these applications of audio cuing have been conducted primarily with individuals without ASD in supported employment settings with job coaches, limiting our knowledge of the generalizability of audio cuing to help individuals with both ASD and ID in competitive job environments.

The purpose of this investigation was to evaluate the effectiveness of covert audio cuing to assist individuals with ASD and ID performing in WalkArounds. WalkArounds represent a particularly attractive employment opportunity to test with audio cuing because the presence of a fulltime mascot "attendant" is always recommended or required for WalkAround appearances. In a retail setting, attendants facilitate interaction with customers, hand out free product samples, and assist the mascot with any needs, so the attendants could provide audio cues for desired performance. In addition, the job has already been found, in previous studies, to offer a real-world competitive employment opportunity for some individuals with ASD and may also provide opportunities for those with ASD and ID. Finally, the company that manufactures the WalkArounds, through collaborative business arrangements

between large discount retailers and food product manufacturers, can offer part-time employment opportunities doing in-store product marketing throughout the country.

Method

Participants

Individuals between the ages of 16–20 with both an ASD and an ID were eligible for participation in the study and were recruited from participants in a developmental/behavioral clinic at University Center for Excellent in Developmental Disabilities. Four adolescents with both ASD and also ID agreed to participate. Although previous research on transitional employment has often targeted young adults, we targeted adolescents because there is evidence that one of the best predictors of whether students with intellectual and developmental disabilities will successfully adjust to employment following graduation is whether they have had a paid job before they leave school (e.g., Benz et al. 2000; Blackorby and Wagner 1996; Phelps and Hanley-Maxwell 1997).

Ned was an 18-year-old Caucasian male who had been diagnosed with Autism using a structured interview format following the Diagnostic and Statistical Manual, Fourth Edition (DSM_IV; American Psychiatric Association 1994) criteria by a developmental pediatrician and diagnosed by a psychologist with mild Mental Retardation using the Wechsler Intelligence Scale for Children, Fourth Edition (WISC_IV; Full Scale = 50). He had received behavioral services in the past for noncompliance, enuresis, and mild aggression. Trace was a 17-year-old Caucasian male who had been diagnosed with Autism using a structured interview format (following DSM-IV criteria) by a developmental pediatrician, diagnosed by a neurologist with a seizure disorder, and diagnosed by a psychologist with moderate Mental Retardation (Full Scale WISC-IV = 41). He was, at the time of the study, receiving outpatient behavioral services to address occasional problems with aggression and noncompliance. Emma was a 16-year-old Caucasian female who had been diagnosed with Autism using a structured interview format (following DSM-IV criteria) by a developmental pediatrician and diagnosed by a pediatric psychologist with moderate Mental Retardation (Full Scale WISC-IV = 44). She had a history of severe behavior problems and had been treated previously in an inpatient program for individuals with severe aggression or self-injury. A fourth individual, Matthew (age 17), diagnosed with Autism and Attention Deficit Hyperactivity Disorder as well as moderate Mental Retardation was identified as a potential participant, but he was unwilling to wear the costume. After a brief (15 min) unsuccessful program of graduated exposure to wearing the costume, he was excluded from participation.

None of the participants had experience with supported employment but each had begun prevocational training through transitional employment or the young adult programs associated with their public schools. All of the participants' scores pertaining to intellectual disability were obtained from their case files (i.e., public school and developmental clinic records). All had been enrolled in special education services throughout their lives. Individuals who met the eligibility criteria were selected regardless of race, gender, or socioeconomic status. Participation was voluntary, and written consent was obtained from the participant's primary caregivers and/or legal guardians. The study was approved by the Institutional Review Board at the University of Nebraska Medical Center.

Job Materials

WalkAround® Costumes

There were two different WalkAround costumes used in this particular project, one labeled "Rocky the Raccoon," and the other labeled "Chester Cheetah." Each stood about 9 feet tall and could accommodate individuals ranging in height from about 5 feet to about 6 ½ feet. Rocky was used in initial training because the company already had training videos using Rocky as the model. Chester Cheetah was used during generalization probes since the specific job targeted in this research required wearing the Chester Cheetah WalkAround. To wear either of the WalkAround costumes, the participants strapped a battery pack and mechanical blower around their waist and then stepped inside the deflated costume. Once the blower was engaged and the costume zipped, the costume inflated to full size in about 20 s. When inside the inflated costume, an opaque panel in the front of the costume allowed participants to see out without allowing the public to see in.

Job Training Setting

The initial training and observations of the participants were conducted at the factory and warehouse where the WalkArounds are manufactured. This was arranged for the safety and the confidentiality of the participants and to allow for extra time for graduated exposure to wearing the WalkAround if needed in order to get the participant to put it on. One portion of the warehouse was arranged into an analogue of a typical aisle at a major discount retailer (e.g., wide aisles, shelves with items for sale on both sides of the aisle, customers walking by), where the participants could be trained. To help simulate a discount retail store setting, 3–5 volunteers of varying ages were recruited to

periodically walk up and down the aisles and past the participant in the WalkAround on a variable interval 15 s schedule. Volunteers were also scheduled to engage in common shopper behaviors that rotated randomly between (1) ignore the WalkAround, (2) ask a question, (3) respond to any initiations by the WalkAround, (4) walk past the WalkAround while talking on a cell phone, (5) look at items on the shelves, and (6) ask for a hug.

Dependent Measures

Job Skills

Job skills targeted for acquisition were grouped into three categories but were coded separately; (1) head actions, including nodding or shaking the head, moving the ears, and wagging the tongue; (2) arm/hand actions, including waving, shaking hands, giving high-fives, and clapping the arms against the side (as if excited); and (3) leg/torso actions, including posing for pictures, shaking the tail, shaking the body, and jumping up and down. The occurrence or nonoccurrence of each of these targeted vocational skills was measured using a 15 s partial interval recording system. The primary dependent measure was the occurrence of multiple target skills within a single interval, i.e., the participant had to perform a skill from two or more of the head, arm/hand, or leg/torso action categories within each interval. The percent occurrence of multiple target skill use was calculated during ongoing 2 min work samples. To perform the job successfully, participants were expected to use multiple target skills a minimum of 30 % of the time; a criterion that was deemed by the employer to be necessary for the WalkAround to appear to customers to be "life-like" and engaging (Allen et al. 2010b).

Inter-observer Agreement

A clinical psychologist and doctoral student conducted all observations in this study. The observers were not blind to the treatment conditions. In each setting, the observers stood apart from each other and out of direct view of the mascot but in a location that allowed them to clearly see the participant in the costume, e.g., behind a clothing rack in the retail store. Data were collected using paper and pencil. Reliability was calculated by having an independent observer code the targeted skills on 30 % of the observations. Overall, interobserver agreement for target behavior was calculated by dividing the agreements on occurrence of multiple targeted behaviors divided by agreements plus disagreements multiplied by 100. The overall agreement was 93 % (range = 87–100 %).

Treatment Satisfaction

The participant's parents also completed an 8-item measure of their satisfaction with their son or daughter wearing and performing in the costume in the job setting. The participant's parents/caregivers rated on a 6 point Likert-type scale (1 = strongly disagree, 6 = strongly agree), their agreement with statements about whether they found employment for their son or daughter in a costume was comfortable, acceptable, and enjoyable, whether they would willing to allow their son or daughter to work this type of job on a regular basis, and whether they would recommend this sort of job to others with a son or daughter with ASD and ID.

Procedure

Baseline

During baseline, each participant was asked to put on the Rocky costume and to stand in the aisle of the analogue retail store. They were told that their job was to entertain customers, to interact with customers, and to try to get customers to interact with the WalkAround. An attendant (2nd author) stood near the participant in the costume as would be expected in the store. The participants were told that they would be evaluated with respect to their interactions with customers. Baseline duration was determined by the stability of data. Baseline data were collected during one simulated appearance in the analogue setting. Audio cues did not occur during baseline or reversal conditions.

Modeling

During video modeling, the participants removed the costume and sat with a laptop computer to watch the standard training videos used by the employer. These same training videos had been used previously (Allen et al. 2010a, b) and were found to be effective in training moderate and high functioning individuals with ASD to perform multiple WalkAround skills to criterion. The videos showed Rocky the Raccoon's actions in both scripted and naturalistic settings. In the scripted version, the skills were modeled in isolation and participants were specifically shown how to use their hands or move their arms inside the costume to cause Rocky to perform the target skills. The naturalistic version showed Rocky in a large retail store on a busy weekend day using each of the targeted skills in various combinations and in a variety of situations with customers. The naturalistic version also showed Rocky posing for pictures with customers. In addition, in the naturalistic

version, each time Rocky modeled a sequence of various skills together, a narrator stated an embedded rule, "In this situation, you should do the same." The scripted version lasted about 1 min, 30 s while the naturalistic version lasted about 4 min, 30 s.

The participants listened to the videos through headphones to block distracting noise. One of the observers sat to one side of participants while they watched the video to assess the extent to which they remained engaged with the training video, i.e., eyes were facing the video. The total minutes that eyes were on the video was divided by the total length of the video. Trace was visually engaged 89 % of the time, Ned was visually engaged 74 % of the time and Emma was engaged 100 % of the time. Consistent with practices that had produced positive outcomes with high functioning individuals with ASD (Allen et al. 2010b), participants watched both the scripted and naturalistic versions of the Rocky the Raccoon mascot immediately prior to the probes. Then, participants got into the Rocky costume, were returned to the main aisle while in the costume, were reminded of the performance objectives, and again instructed to "Do your best."

Audio Cuing

For the Audio Cuing condition, the participants wore a Radio Shack TRC-508 s FM transceiver with microphone and earphones that allowed hands-free operation. The participants wore one transceiver on their belt or waist inside the costume along with an earphone while the attendant wore the other transceiver and earphone. During the training in the analogue setting the earpiece would occasionally fall out when the participant would jump or bend over, so during actual job performances, the audio cuing device was switched to universal "over-the ear" headphones (Plantronics M175RT35 Headset) paired with cell phones.

During this Audio Cuing condition, the participants were told to "Listen to the attendant, who will give you ideas of things you can do to entertain and interact with customers." The attendant was asked to provide a prompt for action about every 10 s (about 6/min), to help the participant reach criterion. The attendant worded the prompts to fit the context and seem natural, as if he were talking to the character, saying things like "Rocky, give those nice folks a big wave," or "Rocky, jump up and down and show them how excited you are," or "Rocky, give that little girl a big hug." The attendant also praised the participants when they responded to or initiated interactions with the shoppers. The duration of the audio cuing condition was determined by the stability of the data.

Job (Generalization) Probes

After initial training and observations in the warehouse, the three participants were invited to work an actual job at a local discount retail store on a Saturday afternoon to perform in retail product promotion. The job required the maintenance of skills over time and also the generalization of those skills to a novel, untrained costume (Chester Cheetah) in an untrained setting (actual large discount department store). Here the attendant changed prompts to fit the context and seem natural, saying things like "Chester, look! That girl wants a hug. Give her a big hug," or "Chester, jump up and down and show them how excited you are," or "Chester, give that boy a high five." The participants were asked to each work for 1 h, without a break, on two separate weekend days at a pay of US$20.00/h.

Observations of on-the-job performance during generalization probes were conducted midday on a typical weekend. Observers collected 10 min work samples from each generalization job, with the probes timed to occur after about 10 min on the job and then again after about 30 min on the job. Job 1 was conducted 1 month post training. Job 2 was conducted 3 months post training and the generalization probes were collected in the same way as Job 1. However, during the initial 10 min of work on Job 2, an additional work sample probe was collected during which the audio cuing was purposely turned off, constituting a withdrawal of the intervention. At the conclusion of this brief treatment withdrawal, the audio cuing was reinstated. The same attendant was present during baseline, intervention, and generalization performances.

Experimental Design

The effects of the covert audio cuing were evaluated in a small *n* ABCAC withdrawal design in the training condition and CAC withdrawal design in the generalization and maintenance follow-up probes during actual jobs worked at 1 and 3 months. In this type of interrupted time-series design, experimental control is demonstrated when, in the presence of stable baseline responding, marked and immediate changes in level or trend are observed when the intervention is introduced and when subsequent replication of baseline and intervention phases produce performances that approximate the original baseline and intervention phases.

Treatment Integrity

Observers conducted integrity checks by taking 5 min samples of the rate (simple frequency count) at which the attendant delivered prompts during each cuing condition

during training and also during the job probes. Integrity checks showed that the attendant delivered prompts during training conditions slightly more often than requested (6/min), at 9.1/min with Trace, 8.6/min with Ned, and 7.5/min with Emma. Prompting during the Job conditions was found to be at a slightly lower rate, but still matched closely with what was requested; 5.8/min with Trace, 6.9 with Ned and 6.2 with Emma.

Results

The percent occurrence of multiple target behaviors during ongoing work samples for each participant is presented in Fig. 1. During baseline, each of the participants showed relatively stable, low rates of using multiple target behaviors. Trace showed a decreasing trend in multiple skill use, Ned showed no evidence of multiple skill use, and Emma showed some evidence of multiple skill use, but below criterion. Following exposure to the standard video modeling program, Trace showed no evidence of multiple skill use. Ned showed an initial but unsustained increase following the video modeling training and he was not consistently above criterion. Emma also showed a modest increase in multiple skill use after video modeling, but also was not consistently at or above criterion.

With the introduction of the audio cuing, the rates of multiple skills use changed immediately and substantially for each participant. Trace showed an immediate increase in multiple skill use that was more than double the targeted criterion. His rate of multiple skill use returned to initial levels during the second baseline condition. When audio cuing was reintroduced, Trace's use of multiple skills reached 100 %.

Emma's multiple skill use increased over 80 % with the introduction of audio cuing. She averaged using multiple skills nearly 90 % of the time. These gains immediately decreased to zero levels in the return to baseline. Then, with the reintroduction of the audio cuing, performance again increased to levels similar to those achieved during the first AC phase.

Finally, Ned also showed a large improvement with the introduction of audio cuing. He consistently used multiple skills 80 % of the time. Then, in the return-to-baseline, Ned showed an immediate but more gradual decrease in multiple skill use that eventually fell below criterion. When audio cuing was reintroduced, Ned's use of multiple skills immediately reached 100 %.

Figure 1 also shows the results from 10 min probes taken when the participants went to an actual retail store to work a paid job as Chester Cheetah. Participants stood in the aisles in the inflated Chester Cheetah costume and were asked to perform as they had previously, entertaining, greeting, and interacting with customers. An attendant stayed nearby as usual to prompt the participants who worked for an hour long "performance." Each of the participants was able to perform above criterion in both an untrained costume and an untrained environment. In addition, they were able to do so on two different occasions for at least 1 h each performance. When audio cues were removed in a return to baseline withdrawal, rates of multiple skill use decreased to baseline levels or lower.

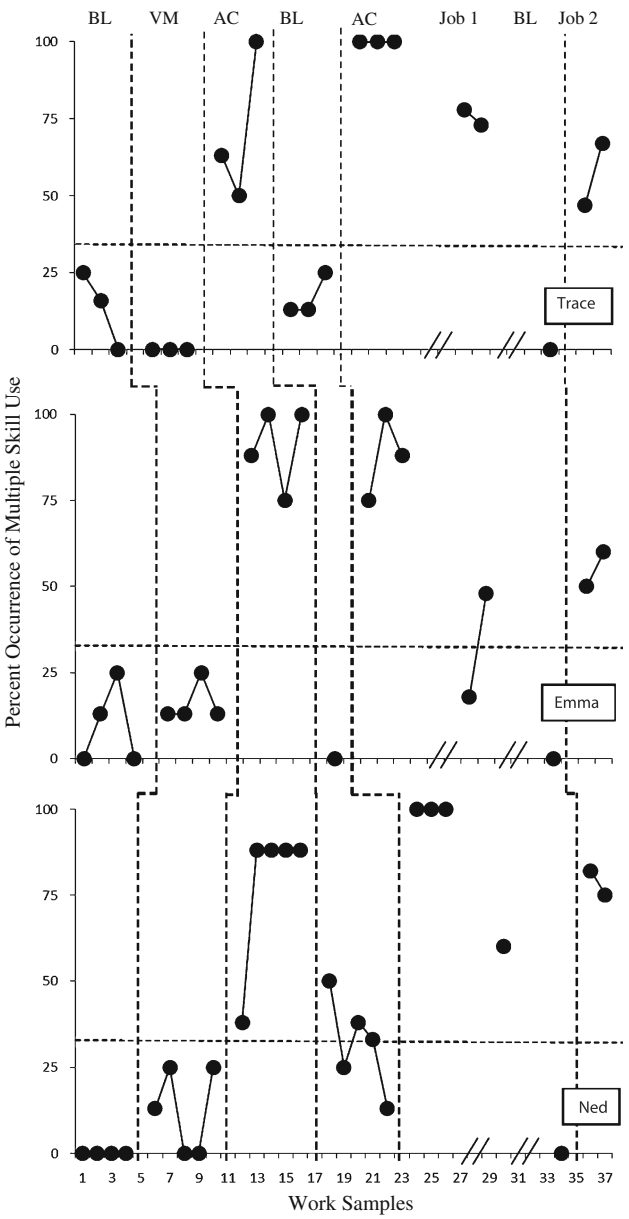

Fig. 1 Percent occurrence of multiple skills during 2 min work samples across baseline (BL), video modeling (VM), audio cuing (AC), and 10 min work samples across job site (Job) performance conditions. Job 1 was 1 month post training and Job 2 was 3 months post training. The *horizontal dashed line* represents the minimum 30 % target performance criterion

In an effort to supplement the previous visual analysis, the data were subjected to statistical evaluation. Statistical analyses of small *n* designs present a variety of challenges because many statistical procedures assume independence of observations, an assumption that is violated by the repeated observations inherent to any small *n* design. Repeated observations can present autocorrelations; the tendency of repeated observations within a subject to be more similar than would be expected if the observations came from different subjects. Pragmatically, this can artificially increase or decrease the error variances used in parametric tests, potentially leading a researcher to a faulty conclusion about the presence or absence of a real effect. Thus, statisticians have developed a variety of strategies in an attempt to control for autocorrelation (e.g., Campbell and Herzinger 2010).

For the purposes of the present analysis, data for all three subjects were analyzed simultaneously using Poisson loglinear regression within a generalized estimating equations (GEE) framework using PASW Statistics version 18. GEE allows a researcher to account for autocorrelation within the data by specifying an appropriate correlation matrix, and Poisson regression allows for accurate analysis of rate or count data as a dependent variable. Thus, using the Poisson loglinear regression (controlling for autocorrelation via generalized estimating equations), results indicated that the audio cuing (ACS) conditions (Wald $X^2 = 161.2$) and the Job performance (Job 1 and 2) conditions (Wald $X^2 = 220.4$) were statistically significantly superior to baseline condition (both p's $< .0001$).

Finally, the participant's parents and caregivers rated the experience as highly acceptable, strongly agreeing that the participants were comfortable and enjoyed performing in the costume and also strongly agreeing that they would be willing to have their son or daughter perform regularly in this type of job and would recommend this type of job to others (Table 1). Anecdotally, the parents and caregivers reported particular pleasure with their son or daughter doing meaningful work. Trace's parents wrote "Trace loves this job and looks forward to it each time" while Ned's mother wrote, "Ned enjoys interacting with the crowd. I enjoy watching others interact with him without the autism being a barrier." Trace's and Ned's parents reported that their boys now ask frequently about when they might be able to work again.

Table 1 Participants' parent and caregiver mean ratings of employment experience

Item	Mean	SD	Range
My son/daughter liked wearing the costume	6.00	0.00	
The costume made my son/daughter feel more comfortable in a crowd	4.33	2.08	2–6
Customers liked the performance of my son/daughter	6.00	0.00	
My son/daughter liked entertaining customers	6.00	0.00	
The costume seemed physically comfortable for my son/daughter	5.67	0.58	5–6
I would allow my son/daughter to wear costume again in a job	6.00	0.00	
I would allow my son/daughter to work this job	5.67	0.58	5–6
I would recommend this job to others with ASD	6.00	0.00	

Parents responded using a Likert Scale ranging from 1 (strongly disagree) to 6 (strongly agree)

Discussion

Overall, the results indicate that the audio cuing procedure produced immediate and sustained improvements in performance in an analogue setting. All of the participants were able to perform the skills in combination more than 30 % of the time, which was considered important for the WalkAround mascots to appear life-like and engaging. In addition, these changes appear to be a result of the audio cuing, as removal of the cuing produced equally immediate decrements in performance that were below criterion for each participant. Experimental control and confidence in the conclusions were further strengthened when reinstating the cuing produced immediate recovery of performance well above criterion levels. In addition, appropriate statistical analyses, controlling for potential autocorrelations, found that the differences between baseline and audio cuing conditions were significantly different. Finally, and most importantly, the effectiveness of the audio cuing extended to a new WalkAround costume and new performance setting. This is noteworthy because the mascots were stationed at the front entrance to a very busy retail store with considerable noise and activity from customers, registers, and store operations. Participants encountered customers of all ages and levels of enthusiasm for interacting with the 9' tall WalkAround mascots. Yet repeated probes during two separate live, paid job performances showed that each of the participants was able to exhibit multiple skill use above criterion.

It should not surprise that the overall effectiveness of the audio cuing was closely related to the frequency with which the attendant delivered prompts. That is, the attendant offered prompts at a higher rate during the training conditions than during the job conditions and, as a result, performance was stronger in the training than in the job conditions. The lower rate of prompting in the job conditions, although consistent with the rate that was requested, was most likely related to the fact that in the job setting, there were more distractions for the attendant than in the

analogue training conditions. Anecdotally, observers noted that customers occasionally initiated interactions with the attendant as well as the mascot, providing one source of distraction. In addition, the attendant was asked, as a part of the attendant job, to keep the participant safe from obstacles in the aisles as well as from children who were too rough and these demands proved to introduce additional occasional distractions. Nevertheless, the attendant delivered prompts at least as frequently as requested (i.e., with good treatment integrity) across all conditions. In addition, the performances by the participants on the job were well above criterion levels; enough to typically satisfy employers and customers.

The effectiveness of the audio cuing was particularly important to the success of these three individuals because the video modeling training approach proved insufficient. In contrast to previous research which had demonstrated that video modeling training, by itself, was an effective training tool for higher functioning individuals with autism (Allen et al. 2010a, b), here it produced unsatisfactory results. Two participants improved after video modeling but not to criterion levels. It may be that video modeling is not a sufficiently potent training approach, by itself, for those with comorbid ASD and ID. Future studies will benefit from assessing whether audio cuing, by itself, produces results as dramatic as video modeling followed by audio cuing.

Limitations

The fact that the participants did not perform well independent of the attendant's audio cues could be considered a limitation of the cuing and is consistent with previous research showing that individuals with ASD are often prompt dependent (e.g., Cannella-Malone et al. 2006; Sigafoos et al. 2007). However, there are unique aspects to this job that make the prompt dependency less of a limitation or liability. With jobs that involve WalkAround mascot appearances, there is almost always an attendant present for each performance, providing the opportunity for prompting that can occur naturally and without additional costs associated with supportive personnel. In the current study, the prompting helped make these participants employable; whereas baseline data show that without prompting, they were not.

It might also be considered a limitation that these participants were only provided one viewing of the basic and naturalistic video models. While this was consistent with previous research where these same videos were found to be effective in an employment setting, those studies were with higher functioning individuals (see Allen et al. 2010a, b). It may be that individuals with both ASD and ID simply require more viewings in order to achieve criterion levels of performance. In addition, repeated viewings of video modeling may lead to individuals who are less dependent on cuing. This would be an important direction for future research since many jobs would not support or permit an attendant who can provides cues or prompts.

Finally, there were several other methodological limitations. Each of the phases was relatively short, sometimes resulting in a phase ending with performance trending downward, as with Emma (second AC phase) and Ned (Job 2). However, some of this concern is attenuated by the fact that the effect of the cuing was replicated both within and across individuals. Thus, we can see repeatedly that brief downward trends (e.g., first AC phase for both Trace and Emma) were followed by increases. In addition, the fact that the observers were not blind to the conditions is unfortunately. However, the high degree of agreement between the independent observers provides some measure of reassurance in the reliability of the observed changes in behavior.

Future Directions

Although each of the participants was paid a competitive salary for part-time work, this would not represent a full-time employment opportunity. Future research will need to investigate the extent to which cuing could be a part of a full time employment opportunity. Still, this particular job could provide a realistic part-time opportunity for some individuals. Retail companies currently hire part-time workers to wear a WalkAround mascot for 4-h promotional activities (with 5–10 min breaks every hour) and pay up to US$20.00/h. This pay rate is consistent with the current average hourly wage (US$19.52) for non-supervisory, private sector employees in competitive employment throughout the U. S. (Bureau of Labor Statistics 2011). In addition, these opportunities to perform in WalkAround mascots are increasing in frequency around the country due to collaborative agreements between the makers of the WalkArounds, a major retailer, and a major consumer product manufacturer. For example, in a recent 2 week period, 76 different young adults with ASD (including all three participants of this research), ranging in age from 16 to 30, and living in various communities across Nebraska and Kansas were employed at US$20.00/h as Chester Cheetah for 4-h showings in a local retail store in their area. These individuals were informally recruited from vocational rehabilitation counselors, transition specialists in educational units, parent support groups, community developmental disability organizations, and regional Autism-focused non-profit organizations throughout the area. Over 96 % of the participants, including several with

comorbid diagnoses of ASD and ID successfully completed the work. Parents, teachers, job coaches, neuro-typical classmates, and siblings served as attendants (also paid US$20.00/h) and anecdotally reported considerable satisfaction with the young adults' successful employment and performance.

Additionally, the costs associated with the audio cuing training and materials were quite low. The headphones used in this study are available on-line for US$28.00 to US$38.00. The headphones worked with the first and second authors' cell phones to provide the audio cues without additional costs or services. The training of attendants and individuals diagnosed with ASD and ID for the in-store appearances took approximately 1 h. Using store performance pay rates for an hourly training rate, the entire cost for personnel time in training and materials comes to approximately US$68.00 to US$78.00.

The results of this current investigation are of additional importance because they demonstrate that individuals with ASD and ID can perform in a job, typically performed by neuro-typical individuals, in a hectic, socially demanding work environment if provided with appropriate supports. However, the job skills were relatively simple and the unique nature of the job made it particularly amenable to audio cuing. Future research will need to investigate whether cuing could be used or would even be practical to prompt more complex job skills in more challenging environments, although audio cuing might offer benefits in any job setting where a job coach is already involved.

Finally, although this particular job represents a fairly unique and limited part-time employment opportunity, future research must continue to find ways to increase vocational opportunities for individuals with ASD. Employment has been demonstrated to improve the quality of life in individuals with ASD (Garcia-Villamisar et al. 2000, 2002) and it is thought to promote personal dignity by allowing access to the same opportunities enjoyed by the rest of society (Hendricks 2010). Employment also has a significant cost impact on the economy, resulting in less reliance on government funds and greater contribution of taxes (Jarbrink et al. 2007). Finally, there is good evidence to support the potential benefits to employers and companies when they hire individuals with ASD who are often more reliable and dependable than more typical part-time employees (Howlin et al. 2005; Hillier et al. 2007). Thus, addressing the challenges of competitive employment for young adults with an ASD and ID is important work.

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