Article

Hammill Institute on Disabilities

Focus on Autism and Other Developmental Disabilities
2023, Vol. 38(3) 188–198

DOI: 10.1177/10883576221127971
focus.sagepub.com
SAGE

Effects of Behavioral Skills Training With Video Modeling and In Situ Training on Workplace Conversational Skills of Students With Autism

Holly N. Whittenburg, PhD[1], Yaoying Xu, PhD[2], Colleen A. Thoma, PhD[2], Carol Schall, PhD[3], and Whitney Ham, MS[3]

Abstract

This study investigated the effects of behavioral skills training (BST) with video modeling and in situ training on workplace conversational skills of four transition-age students with autism enrolled in a U.S. community-based internship program. Intervention sessions began with BST, which included direct instruction, video modeling, conversational practice, and feedback on practice performance, and concluded with in situ training, during which participants conversed with coworkers in their internship settings. Data were collected on participants' accuracy in conversing with coworkers through mock conversations and in situ trials in internship settings. Findings demonstrated a functional relation between the implementation of the intervention package and increases in skill accuracy on in situ trials for all participants. Substantive improvements in participants' mock conversation scores within training settings were also noted. Findings highlight the importance of in situ training and how video modeling can be incorporated within a BST instructional sequence.

Keywords

autism, transition, employment, behavioral skills training, in situ training, social communication skills

Transition-age students with autism often need support in developing workplace social communication skills; however, traditional transition planning and activities may not provide these students with the skills and knowledge needed to meet workplace expectations. Wehman et al. (2012) found that students with autism required direct instruction and sustained support to learn and adhere to workplace social expectations and norms, communicate effectively with coworkers and customers, and accept feedback from supervisors. This conclusion aligns with other research stressing the importance of providing social skills instruction within the authentic contexts in which the skills will be used (Bellini et al., 2007; Ledford et al., 2018). Yet very few studies to date have investigated the use of work-related social skill interventions for transition-age students with autism within competitive, integrated workplace settings (Whittenburg et al., 2020b). Research is needed that teaches transition-age students with autism workplace social skills that align with student needs and employer expectations and is taught within the integrated, competitive settings where the skills will be used.

Instructional Strategies for Social Skills

Previous research describes how behavioral skills training (BST), in situ training, and video modeling have been used to support people with autism in developing social skills. BST is an instructional strategy that teaches specific skills through direct instruction and practice. It consists of four sequential steps—instruction, modeling, rehearsal, and feedback (Miltenberger, 2014) and is sometimes used in combination with in situ training. During in situ training, participants practice targeted skills in the authentic settings in which skills are used, and feedback on performance is delivered immediately to correct errors and reinforce accurate trials (Miltenberger, 2014). When used with BST, in situ training promotes skill generalization to different people and settings (Gunby & Rapp, 2014; Miltenberger et al., 2013).

Within the past decade, researchers have investigated the use of BST or BST with in-situ training to teach greetings, non-scripted conversational skills, and a variety of work-related social communication skills in (e.g., making

[1]Washington State University, Pullman, USA
[2]Virginia Commonwealth University, Richmond, USA
[3]Virginia Commonwealth University Rehabilitation Research and Training Center, Richmond, USA

Corresponding Author:
Holly N. Whittenburg, Department of Teaching & Learning, Washington State University, 1155 College Avenue, 333 Cleveland Hall, Pullman, WA 99164-2114, USA.
Email: holly.whittenburg@wsu.edu

confirming statements when given direction, asking for a task model, apologizing, asking for feedback, asking for help with materials) within university-based clinics (Grob et al., 2019; Hood et al., 2017), and peer-focused conversational skills in a comprehensive rehabilitation facility (Nuernberger et al., 2013). These studies also incorporated prompting (Grob et al., 2019; Hood et al., 2017) and/or reinforcement (Hood et al., 2017; Nuernberger et al., 2013) into the intervention package to facilitate participants' skill acquisition. Although they support the effectiveness of BST within situ training in teaching conversational skills to people with autism, they also highlight gaps in current knowledge. Specifically, research has yet to examine the use of BST within situ training to teach workplace conversational skills to transition-age students with autism within competitive, integrated employment settings.

Video modeling, in which learners view videos of themselves or others successfully completing the steps of a given task, has demonstrated efficacy in the acquisition of a variety of skills for adolescents and adults with autism (Roth et al., 2014). Moreover, skills acquired through video modeling tend to generalize well to other settings (Hume et al., 2009). Walsh et al. (2017) used video modeling within a comprehensive social skills curriculum and documented substantive gains in a variety of work-related social skills for young adults with autism. In other studies, video modeling interventions resulted in improvements in problem-solving during functional and vocational tasks (Yakubova & Zeleke, 2016). Video modeling shows promise in teaching work-related social skills because it provides an antecedent-based, visually focused strategy for instruction prior to encountering similar situations in authentic workplace settings.

Purpose of the Study

Very few studies have investigated interventions to improve the work-related skills of people with autism, and even fewer studies have focused on the work-related social skills of transition-age youth with autism within competitive, integrated workplace settings (Whittenburg et al., 2020b). Studies targeting improvements in workplace conversational skills are needed, given the importance of these skills in developing positive interpersonal relationships with coworkers and ultimately, in promoting successful employment outcomes. Although BST with in situ training has been successfully used to teach transition-age youth and adults with autism social communication skills, no studies to date have investigated the effects of BST with video modeling and in situ training to teach workplace conversational skills to transition-age students with autism within competitive, integrated settings.

The current study seeks to address this gap within the existing literature by investigating the effectiveness of an intervention package including BST, embedded video modeling, and in situ training to teach workplace conversational skills to transition-age students with autism within community-based internship settings. The following research question guided the study:

> Research Question 1 (RQ1): What are the effects of BST with video modeling and in situ training on the workplace conversational skills of transition-age students with autism within community-based internships?

Method

Participants

The four participants were recruited from a larger research study investigating the effects of the U.S. community-based Project SEARCH + ASD Supports (PS+ASD) internship model, which provided autism-specific supports and strategies to youth with autism who were working toward special education certificates of completion from high school and who required intensive instruction to learn new skills (Wehman et al., 2013; Wehman et al.,, 2020; Whittenburg et al., 2020a). To be included in the current study, participants had to have a medical diagnosis or educational determination of autism, be between the ages of 18 and 22 years old, have received no previous instruction within internship settings on workplace conversational skills, and demonstrate deficits in workplace conversational skills. Participants' workplace conversational skills proficiency was measured through three structured workplace observations and semi-structured interviews with the participants' special educator or job coach, using two subscales of the Virginia Commonwealth University and Autism Speaks Community Based Functional Skills Assessment for Transition Aged Youth with Autism Spectrum Disorder (CBFSA; Schall et al., 2014), the Work Observation: Peer Relationships, Socialization, Social Communication–Level 3 Life Seeker subscale and the Peer Relationships, Socialization, Social Communication Interview. Internship employers also completed a researcher-developed questionnaire about the relevance of different work-related social skills described within the CBFSA to their specific workplace environments. Consent for the present study was obtained through the Virginia Commonwealth University Institutional Review Board and was approved by the Virginia Department for Aging and Rehabilitative Services and the participating school district. All participants gave their informed consent or assent before study procedures began.

Rodney. Rodney was a 21-year-old White student who received special education services under the category of autism. He was able to read materials written at a fourth-grade level and used multi-word phrases and sentences to

communicate. Pre-intervention observations and an interview with Rodney's job coach provided additional information about Rodney's work-related social skill performance. Rodney consistently followed verbal and written directions given by his supervisor and job coach, and he demonstrated the use of workplace etiquette when appropriate (i.e., saying "Thank you," and "You're welcome."). With verbal prompting from his job coach, he asked questions to gain clarification or assistance on his internship. Rodney's job coach reported that making eye contact with others was difficult for him. During pre-intervention observations, Rodney rarely initiated conversations with his coworkers or customers. He typically responded to coworker conversational exchanges with one-word replies.

Thomas. Thomas was a 21-year-old White student who received special education services under the category of autism. He was able to read simple sentences, familiar sight words, and safety signs. Thomas used short (one to three word) verbal phrases to respond to questions and comments from others, but rarely initiated communication. Thomas' special educator reported that he accepted correction well, typically responding by saying "I'm sorry," and trying to fix the error. The special educator also stated that Thomas had difficulty with verbal communication and struggled to find the words to ask for help or problem solve on his internship. During pre-intervention observations conducted at his internship site, Thomas did not greet or engage in conversations with coworkers or customers, although he was presented with multiple opportunities to do so.

Terrence. Terrence was a 21-year-old Black student who received special education services under the category of autism. Terrence's reading skills were at a fifth-grade level, and he used a variety of statements and questions to make comments, describe his thoughts and feelings, and gain clarification. Terrence's job coach reported that he possessed strong verbal communication skills and was able to remember and apply work-related information presented to him verbally. The job coach also stated that Terrence sought clarification when he did not understand something and accepted changes in routines well, and that he required intermittent verbal prompts to use a quiet voice volume in his internship setting. During pre-intervention observations, Terrence responded to customer greetings and directions from his internship supervisor with verbal prompts. He did not initiate greetings or engage in conversations with his coworkers within the observation timeframes.

Chris. Chris was a 21-year-old Black student who received special education services under the category of autism. He was able to accurately read short texts written at a second-grade level but struggled with reading comprehension. Chris used simple sentences and questions to verbally communicate his wants and needs and to seek clarification or support from familiar individuals. The special educator indicated that Chris followed verbal multi-step directions at work, accepted correction by apologizing and trying to fix the mistake, and used work-appropriate etiquette (i.e., saying, "Thank you" and "You're welcome"). The special educator also stated that Chris' conversations tended to focus on his personal interests, specifically cell phones, or concerns/worries he was experiencing. In the internship setting, Chris was observed to occasionally initiate greetings with customers and coworkers and to regularly respond to greetings from coworkers. However, he did not initiate conversations with coworkers, and he typically replied to coworker conversational questions with one-word responses.

Setting and Materials

The setting for the study was a mid-sized military installation in the southeastern United States, which was the location of the PS+ASD program and the larger research study. Researchers conducted the intervention at each participant's internship site on the military installation. Rodney interned at the military museum, Thomas and Chris interned in the supply room and housekeeping departments, respectively, at the installation's hotel, and Terrence interned at a small medical office in the outpatient medical center. BST with video modeling was conducted in private locations at each of the internship sites, and in situ training occurred in the internship locations where participants interacted with coworkers (the museum gift shop and office reception area for Rodney; the employee break room, the linen room, the supply room, and hotel hallways for Thomas and Chris; the receptionist area and in office hallways for Terrence). All mock conversations, BST with video modeling portions of intervention sessions, and in situ trials were video recorded.

Instructional materials (see Note 1) were developed for the BST portion of intervention sessions. Researchers created a type-written chart on a piece of plain white paper that described the basic components of conversing with coworkers (i.e., who are coworkers, what you can say to them in conversations, when you can have conversations, why it is important to talk with coworkers). On a separate piece of white paper, the specific steps to conversing with a coworker were typewritten. Researchers also created individualized videos of each participant performing the steps to conversing with a coworker within their respective internship settings on a seventh-generation iPad with the iMovie application. Researchers recorded video segments of participants as they performed each step in the conversing with a coworker skill sequence. Performance errors were edited out of videos using iMovie, and video segments were combined to create seamless, error-free videos of each participant performing all steps to conversing with coworkers. Participants viewed the videos of themselves during the modeling part of BST sessions.

Table 1. Task Analysis of Conversing With Coworkers Skill.

Step	Description
1. When coworker is within hearing distance (3–7 feet away from participant), gain their attention.	Call the person's name, wave at them, gesture to them, stand near them, or make eye contact.
2. Initiate greeting or respond to greeting from coworker.	Say "Hi"/"Hello" or respond to greeting from coworker by saying "Hi"/"Hello" back if greeted first.
3. Ask coworker question/make comment to coworker about a workplace-appropriate topic or respond back to coworker's comment or question.	Topics include the coworker's well-being; the weather; work routines, procedures, and events; plans; special events; coworkers' interests.
4. Wait for coworker's response.	Remain in the area and stay silent during reply.
5. Ask coworker a different question/make a different comment to coworker about a workplace-appropriate topic or respond back to coworker's comment or question.	Ask a different question or make a different comment about the same or a new workplace-appropriate topic; reply to the comment or question with an on-topic statement.
6. Wait for coworker's response.	Remain in the area and stay silent during reply.
7. Ask coworker a different question/make a different comment to coworker about a workplace-appropriate topic or respond back to coworker's comment or question.	Ask a different question or make a different comment about the same or a new workplace-appropriate topic; reply to the comment or question with an on-topic statement.
8. Wait for coworker's response.	Remain in the area and stay silent during reply.
9. End the conversation by saying farewell or stating why you need to finish the conversation.	Say goodbye or say, "I have to go back to work," or "I have to go now."
10. Return to performing tasks or leave area.	Begin to perform work tasks or leave the area.

Dependent Variable and Measurement

The dependent variable was participants' accurate and independent performance of the steps to conversing with a coworker in training and in situ settings, measured through task analysis. The task analysis was based on a review of previous task analyses on conversational skills within the research literature (Hood et al., 2017; Nuernberger et al., 2013) and through observations of competent models within participants' internship settings. The target skill, conversing with a coworker, was behaviorally defined as gaining the coworker's attention, initiating or responding to a greeting to start the conversation, participating in at least three conversational exchanges with the coworker, and then ending the conversation by saying goodbye and leaving the area or returning to work tasks. A conversational exchange occurred when each conversational partner took a turn by speaking in the conversation (i.e., the participant spoke and then the coworker responded, or the coworker spoke and then the participant responded). Conversational exchanges had to include workplace-appropriate conversational topics, such as talking about the weather, asking coworkers how they were doing, commenting on a work routine or work-related event, and talking about coworkers' interests. Table 1 shows the steps to the task analysis used in the study.

Task analysis data on mock conversations were collected in the private training area at the beginning of each study session. During mock conversations, participants were asked to demonstrate how they would have a conversation with their coworkers. Mock conversations were conducted with the first author, who was familiar to participants as research co-coordinator for the larger PS+ASD study. Task analysis data on in situ trials were collected during 10-min observational periods in the participants' internship setting immediately afterward. Researchers watched to see if participants engaged in a workplace conversation with a coworker on the first naturally occurring opportunity. If a naturally occurring opportunity did not arise during the observational period, then the researchers arranged a contrived opportunity (i.e., asked a coworker to stand within the participant's immediate proximity or greet the participant). Coworkers were told that participants were learning about and practicing conversational skills, but no other instructions were provided.

All mock conversations and in situ trials were video recorded; the recordings were subsequently reviewed and coded using the task analysis form. Steps completed accurately and independently were coded as correct responses; steps completed inaccurately, prompted, or skipped were coded as incorrect responses. If participants did not initiate a conversation during baseline and maintenance phases, then the mock conversation or in situ trial was scored as 0% accuracy. During the intervention phase, indirect verbal prompts (e.g., "Who can you talk to?") were provided to participants if needed to initiate a conversation and were scored as incorrect responses on the task analysis. The target number of exchanges for each conversation was set at three, based on previous research (Nuernberger et al., 2013) and observations conducted during the development of the task analysis. If a participant engaged in more than three conversational exchanges, then only the first three exchanges were coded. The number of steps performed

correctly was added, divided by the total number of steps in the task analysis, multiplied by 100, and rounded to the nearest 10th place, to calculate the accuracy percentage for each mock conversation and in situ trial.

Study Design

The study utilized a multiple baseline across participants' single-case research design (Kazdin, 1982). All participants began the baseline phase concurrently. The implementation of intervention was staggered across participants and continued for each participant until the criterion for skill mastery was met, defined as three consecutive in situ trials with at least 80% accuracy. Subsequent participants began the intervention after the previous participant completed five intervention sessions or achieved skill mastery, whichever came first. Maintenance data were collected on mock conversations and in situ trials 2 weeks after the intervention phase ended.

Procedures

Baseline phase. Each baseline session began with a mock conversation in the private training area at the participants' internship sites. During the baseline phase, task analysis data were collected on mock conversations, but participants did not receive any instruction, prompting, or feedback on the conversing with a coworker skill. The second half of each baseline session consisted of an in situ trial. Researchers observed participants in their workplace settings to determine if participants engaged in workplace conversations with coworkers on the first occurring opportunity (i.e., the in situ trial). No instruction, feedback, or prompting was provided to participants during baseline in situ trials.

Video self-model creation session. After the baseline phase was concluded but before the intervention phase began, participants worked with researchers to create video self-models of the steps to conversing with a coworker within their respective internship settings, which were subsequently used in the BST portion of the intervention. Immediately following the video self-model creation session, a mock conversation was conducted to gauge the effect of creating a video self-model on participants' demonstration of workplace conversational skills.

Intervention phase. Each intervention session started with BST with video modeling and ended with in situ training, following procedures used by Nuernberger et al. (2013). Mock conversations were conducted at the start of every intervention session, followed by BST with video modeling in the private training area. During BST with video modeling, the first author described the steps to conversing with coworkers using the training materials, participants watched the video model of themselves conversing with a coworker, participants practiced the steps to conversing with a coworker on multiple BST trials with the first author, and participants received explicit feedback on their performance. Practice trials were conducted during each intervention session, and once participants achieved three consecutive BST trials with 100% accuracy during each intervention session, they returned to their internship sites. The mean number of practice BST trials per intervention session for Rodney was 3.33 ($SD = .58$), 4.11 ($SD = 2.42$) for Thomas, 3.67 ($SD = .58$) for Terrence, and 3.92 ($SD = 1.71$) for Chris.

The in situ training portion of the intervention session occurred at the internship site, immediately following BST. Researchers watched participants for 10-min observational periods to assess their use of workplace conversational skills when conversing with coworkers (i.e., the in situ trial). If participants made errors during the in situ trial (i.e., did not greet a coworker in their immediate vicinity, did not continue a conversational exchange, did not return to work after the conversation ended), then researchers intervened immediately and provided participants with a targeted indirect verbal prompt (i.e., "Who can you talk to?" "What could you say next?" "Where do you go now?"). Following in situ trials with errors, omissions, or prompted responses, researchers immediately provided an additional round of BST with video modeling to the participant in the private training setting. The intervention phase for each participant was discontinued once the criterion for skill mastery was met.

Maintenance. One maintenance session was conducted 2 weeks after the intervention phase ended for each participant. Maintenance session procedures mirrored those during the baseline phase. Researchers collected maintenance data on the mock conversation in the private training area and on the in situ trial in the internship setting.

Interobserver Agreement

Interobserver agreement (IOA) was calculated for a random sample of 25% of the mock conversation and in situ trial video recorded sessions in each phase. A secondary coder was trained on and practiced coding mock conversations and in situ trials with the first author using the task analysis form until they reached 100% IOA on three consecutive recordings. The secondary coder viewed a random sample of 25% of the mock conversations and in situ trials within each phase and used the task analysis form to record whether the participant performed each step to conversing with coworkers accurately. The secondary coder's scores for each step were then compared with the original scores for each step to determine agreement. IOA was calculated using the total agreement method, by dividing the number of agreements into the number of possible responses and

multiplying by 100 (Kazdin, 1982). IOA scores ranged from 50% to 100%, with a mean score of 90%. For the four double-coded sessions that fell beneath 80% IOA, the secondary coder was provided additional training on specific coding procedures related to the disagreements. The sessions were then recoded by both coders, and 100% IOA was obtained for each of the sessions that fell beneath 80% IOA.

Fidelity of Implementation

Fidelity of implementation was evaluated using a researcher-developed checklist. A random sample of 25% of intervention sessions was selected for fidelity checks and was scored by the secondary coder using intervention session video recordings. Each step of the intervention package was evaluated using a 0- to 2-point scale, where 0 = step was not implemented at all, 1 = step was partially implemented, 2 = step was fully implemented, and N/O = there was no opportunity to perform the step. Evaluated steps included whether the researcher described the steps to conversing with a coworker, showed the participant the video model, completed at least three mock conversation trials with the participant, provided specific verbal performance feedback after each trial, observed the participant having a workplace conversation in their internship, and completed an additional round of BST (e.g., instruction, video modeling, practice, and feedback) if errors occurred during the in situ trial. A fidelity percentage was calculated for each observed session by dividing the total number of points awarded for the session by the total number of possible points and multiplying that number by 100. The overall mean fidelity percentage was 96.8%, with scores ranging from 88.9% to 100%.

Social Validity

The researchers used several measures to assess the social validity of the intervention package. First, participants completed an eight-item, researcher-developed questionnaire entitled the Social Validity Measure for Participants that asked them to rate their agreement with various statements about the intervention and its effects on their social skill performance at work. Second, the participants' special educator and job coach completed a modified version of the Treatment Acceptability Rating Form–Revised post-intervention (TARF-R; Reimers et al., 1991). The modified version of the TARF-R used in this study consisted of 19 items and utilized a 5-point Likert-type scale, in which positive perceptions were scored more highly (Langthorne & McGill, 2011). Finally, the CBFSA was used to conduct follow-up interviews with the special educator and job coach and to observe participants in three post-intervention observations.

Results

Mock Conversations

All participants' mean baseline mock conversation accuracy percentage scores were low (Rodney M = 50%, Thomas M = 8%, Terrence M = 66%, Chris M = 31%). Although visual analysis indicated that Thomas and Chris' baseline mock conversation data were stable, Rodney and Terrence's baseline data showed more variability. Rodney's baseline trend line was affected by the first mock conversation data point, as his first mock conversation score was substantially lower than subsequent baseline probe scores. Therefore, a fourth baseline data point was added to promote baseline stability. Terrence's baseline mock conversation scores, although relatively high, displayed a descending trend.

Graphed results for Rodney, Terrence, and Chris showed improvements in mock conversation accuracy after the video creation session. Mock conversation scores increased by 30 percentage points for Rodney and Terrence and by 20 percentage points for Chris. Furthermore, increases in mock conversation scores occurred between the video creation session and the first intervention phase session for Thomas, Terrence, and Chris. The positive change was 80 percentage points for Thomas and 20 percentage points for Terrence and Chris.

With the introduction of the BST with video modeling and in situ training intervention package, all four participants' skills increased. Mock conversation data for three participants (Rodney, Terrence, and Thomas) showed an immediate response to the intervention, with high levels of accuracy (80%–100%) documented within the first two intervention sessions. Chris required three sessions to achieve higher levels of accuracy (90%–100%) but maintained mock conversation performance at those levels after that point. Intervention phase mock conversations for Rodney and Terrence were discontinued after two sessions, as they had met study mastery criteria (three consecutive in situ trials with 80% or higher accuracy) at those same points in time.

One maintenance session was conducted for each participant in the training setting 2 weeks after the intervention phase ended for the participant. All four participants achieved mock conversation scores of 100% accuracy in these follow-up sessions. Figure 1 displays graphs of mock conversation score accuracy across participants for each phase of the study.

In Situ Trials

During in situ trials, participants were observed in their internship settings to assess their skills in conversing with coworkers on the first opportunity. Less variability in data was seen in situ trial baseline scores. Baseline in situ trial accuracy percentage score range was 33 for Rodney

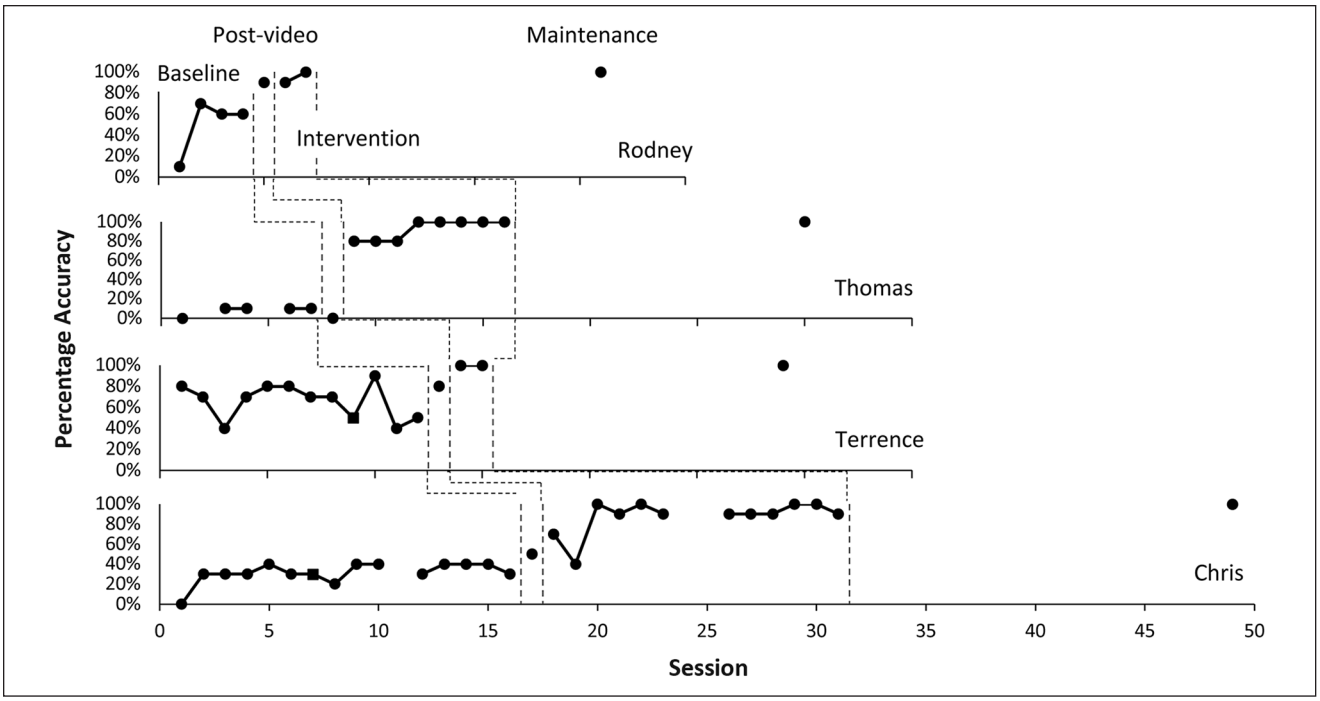

Figure 1. Mock conversation accuracy across participants.
Note. These are scores on mock conversations conducted in the training setting. The post-video condition occurred after video model creation but before intervention start. Square data points indicate where observer agreement fell <80%.

($M = 10\%$), 0 for Thomas ($M = 0\%$), 20 for Terrence ($M = 3\%$), and 30 for Chris ($M = 5\%$).

A functional relation was demonstrated between the introduction of the intervention package and increases in skill accuracy in conversing with coworkers during in situ trials across the four participants. Ascending data trends were noted for all participants after the intervention package was implemented. Researchers documented increases in level between baseline and intervention phases for all four participants, and there was no data overlap for any participant between baseline and intervention phase in situ trials. Two participants, Rodney and Terrence, achieved skill mastery criteria in three intervention sessions. Thomas achieved skill mastery in nine sessions, and Chris achieved skill mastery in 13 sessions. In initial intervention phase in situ trials, both Thomas and Chris required indirect verbal prompts to initiate and maintain conversations with coworkers in their immediate vicinity. Furthermore, all participants' frequency of unprompted conversational initiations increased after the implementation of the intervention package, as shown in Table 2.

Three out of four participants (Rodney, Terrence, and Chris) maintained skills at the follow-up in situ trial session conducted approximately 2 weeks post-intervention. Although Thomas demonstrated the skill of conversing with a coworker at a higher level of accuracy (56%) than at baseline (0%), he did not meet skill mastery criteria at follow-up. Figure 2 displays graphs of in situ trial accuracy across participants for each phase of the study.

Social Validity Results

Results from the questionnaire administered to participants show overall positive perceptions of the intervention package. All participants agreed that their workplace social skills improved from being in the study and that being in the study helped them do their jobs better. All participants agreed that telling them about the social skill and practicing the skill helped them learn it. However, Terrence responded that he was unsure if showing him the skill helped him learn it and if communicating better with others at work was important to him, and he did not feel that receiving feedback on his performance of the skill was helpful. Rodney indicated that he was not sure if understanding social rules at work was important to him. The modified TARF-R results indicate the special educator and job coach had favorable perceptions of the intervention package. They reported that they understood the intervention, liked the intervention procedures and thought it would be effective in improving their students' social skills. They also indicated that the intervention package was inexpensive, would take little time to implement, and would cause very little disruption to the internship program. In addition, all four participants demonstrated overall gains in social skill scores on

Table 2. Frequency of Unprompted Conversation Initiations Compared With Opportunities to Initiate.

	Baseline		Intervention		Maintenance	
Participant	Mock conversation	In situ trial	Mock conversation	In situ trial	Mock conversation	In situ trial
Rodney	3 (4)	0 (4)	2 (2)	3 (3)	1 (1)	1 (1)
Thomas	0 (5)	0 (5)	8 (8)	6 (9)	1 (1)	1 (1)
Terrence	2 (12)	2 (12)	2 (2)	2 (3)	1 (1)	1 (1)
Chris	0 (15)	3 (15)	11 (12)	6 (13)	1 (1)	1 (1)

Note. The first number in each cell indicates the total number of unprompted workplace conversations initiated by the participant in each phase of the study. Numbers in parentheses represent the total number of opportunities to initiate conversations within each phase.

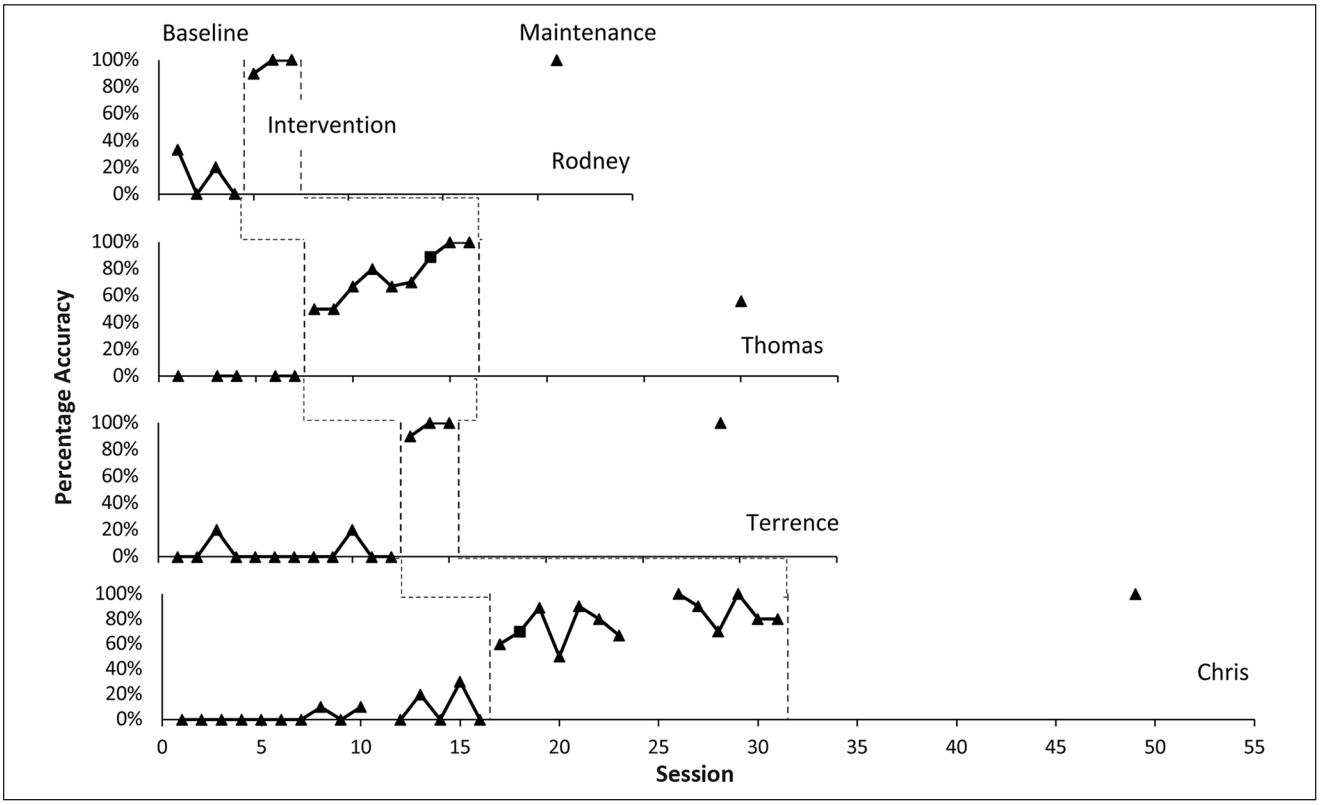

Figure 2. In situ trial accuracy across participants.
Note. These are scores in the internship setting. Square data points indicate where observer agreement fell <80%.

post-intervention observations using the CBFSA. Rodney's scores improved from 73.2% to 94.8%; Thomas' scores increased from 73.6% to 82.5%; Terrence's scores increased from 69.8% to 92.3%, and Chris' scores improved from 56.5% to 93.8%. Finally, CBFSA post-intervention interview scores with the special educator or job coach increased for three out of four participants. Rodney's scores improved from 64.0% to 77.1%, Thomas' scores increased from 70.7% to 72.0%, and Terrence's scores increased from 65.3% to 68.6%. Chris' CBFSA interview score decreased from 78.7% to 62.7%. The special educator reported that Chris experienced issues with medication management during the study period, which negatively affected her ratings of his social communication skills. However, the skills rated lower by Chris' special educator, such as his ability to participate in group activities and his ability to apologize and correct behavior, were not skills specifically targeted by the intervention package.

Discussion

This study examined the effectiveness of BST with video modeling and in situ training on the workplace conversational skills of four transition-age students with autism participating in the PS+ASD internship program. A functional relation was demonstrated between the intervention and

improvements in workplace conversational skills across all four participants within the in situ setting. Increases in conversational skill accuracy during mock conversations were also noted with the four participants. All four participants maintained skills at mastery level within the training setting at 2 weeks post-intervention; three out of four participants maintained skills at mastery level in the in situ setting 2 weeks post-intervention.

Importance of in Situ Training

Findings from this study point to the importance of in situ training in improving the workplace conversational skills of transition-age students with autism. Across all participants, mean baseline mock conversation scores were higher than baseline in situ trials. Skills also increased more slowly within in situ settings than BST settings during the intervention phase for two of the four study participants. These differences highlight how the two portions of the intervention package targeted different aspects of the conversing with coworkers skill set. The BST with video modeling portion of the intervention taught participants what to say and do during workplace conversations, but participants learned how to apply and respond to novel conversational situations (e.g., interruptions, unscripted conversational exchanges, different conversational partners) within real-life workplace settings through in situ training. Results suggest that the in situ training portion of the intervention package promoted skill generalization through the multiple stimuli conditions described above and by exploiting functional contingencies, specifically the social reinforcement provided by coworkers, which occurred as result of workplace conversations (Stokes & Osnes, 1989).

Findings of the current study also align with previous studies, which found that in situ training facilitates skill acquisition for learners with autism in real-life contexts (Gunby & Rapp, 2014; Kornacki et al., 2013; Nuernberger et al., 2013). The current study adds to the growing body of evidence that supports teaching social skills in the contexts in which skills are used and including real-life communication partners in social skill interventions (Bellini et al., 2007; Gilson & Carter, 2016; Ledford et al., 2018). Teaching social skills in workplace contexts with authentic communication partners gives learners with autism multiple opportunities to practice relevant skills in the contexts in which the skills are used, thus supporting skill generalization outside of training settings.

Use of Video Modeling Within the Intervention Package

After baseline but prior to the introduction of the intervention package, all participants worked with researchers to develop video self-models of the steps to conversing with coworkers. Data collected after the video creation session showed that scores increased for three participants (except Thomas) on mock conversations following the singular video creation session. Mock conversation scores increased further with the introduction of the full intervention package across all participants. Due to the multi-component nature of the intervention package, researchers were unable to discern which component(s) of the intervention were responsible for behavior change. However, these data offer supporting evidence that creating and watching a video of themselves conversing with coworkers helped most participants learn the skill. This finding is in keeping with participant self-reports. Three out of four participants agreed with the statement that showing them the skill helped them learn it. This finding also aligns with previous research, documenting the effectiveness of video modeling with learners with autism across a range of skills (Roth et al., 2014; Yakubova & Zeleke, 2016). Future research utilizing multi-element designs could be useful in determining the specific impact of video modeling within the larger intervention package.

Implications for Practice

This study offers several implications for practice. First, these findings indicate the importance of teaching work-related social skills in the settings in which they are used. Differences in baseline workplace conversational skill usage on mock conversations and in situ trials and differences in skill increase post-intervention across these same settings suggest that learners need to practice conversational skills in real-life workplace settings to use them effectively. Second, this study highlights a process for identifying contextually relevant skills by using the CBFSA and obtaining employer input on which social skills are deemed important within specific workplace settings. Engaging in careful assessment of learner needs and workplace values will help ensure that taught skills are relevant and meaningful within different work environments. Third, this study demonstrates how video modeling can be situated within BST to help transition-age students with autism more readily acquire workplace conversation skills. BST provides a method for incorporating video self-modeling in an existing instructional sequence, and findings from this study suggest that creating and watching videos of themselves perform a work-related social skill may help learners with autism improve their skill usage.

Limitations and Future Directions

One of the major limitations of the current study is that only two intervention phase mock conversation data points were collected for Rodney and Terrence. During the intervention phase, in situ trials occurred at the end of each intervention session, and mock conversation data were taken at the

beginning of the next intervention session. Because Terrence and Rodney achieved the criterion for skill mastery after three in situ sessions, the intervention was discontinued, and data were only collected for two intervention phase mock conversations. Future studies examining this intervention package should increase the criterion for skill mastery to four in situ sessions at 80% accuracy or more to allow for at least three mock conversation data points during the intervention phase.

Second, Rodney and Terrence's baseline mock conversation scores showed variability and several higher accuracy data points. To address potential validity concerns, researchers extended the baseline with additional data points for Rodney and documented an overall downward trend in baseline data for Terrence before moving to the intervention phase. It could be that the higher levels of behavioral accuracy demonstrated by Rodney and Terrence during baseline mock conversations reflected more developed expressive communication skills. However, neither participant demonstrated the ability to accurately use workplace conversational skills in real-life settings during baseline in situ trials. Future studies may want to systematically evaluate the efficacy of this intervention for participants with different expressive language abilities.

Third, this study taught participants to engage in three exchanges per conversation. Sometimes coworkers and participants extended conversations past three exchanges, particularly during in situ trials. However, only the first three exchanges were coded, to maintain consistency of results across mock conversations and in situ trials. Although a review of the BST and in situ session video recordings did not indicate major differences in skill performance in conversational exchanges occurring after the third one, future researchers may want to consider coding all exchanges in each conversation.

Finally, this study only targeted one specific work-related social skill, conversing with coworkers, for intervention. Moving forward, it will be important to determine the effectiveness of this intervention package in teaching other social skills that have been identified by employers as important to workplace success for transition-age youth with autism. Similarly, coworker conversational skills, including how those skills supported or hindered communicative efforts of transition-age students with autism, were not investigated in the current study. Research is needed that examines how coworker and student interactions affect each other's social communication skill development, which could lead to the development of training interventions that increase the skills of all conversational partners within business settings.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The contents of the article were developed under a grant from the Congressionally Directed Medical Research Programs (CDMRP) Autism Research Program grant no. W81XWH16-1-0707. The contents of this journal article do not necessarily represent the policy of CDMRP, and you should not assume endorsement by the U.S. federal government.

ORCID iD

Holly N. Whittenburg https://orcid.org/0000-0002-8893-657X

Note

1. Instructional materials are available upon request by contacting the first author at holly.whittenburg@wsu.edu.

References

Bellini, S., Peters, J. K., Benner, L., & Hopf, A. (2007). A meta-analysis of school-based social skills interventions for children with autism spectrum disorders. *Remedial & Special Education*, *28*(3), 153–162. https://doi.org/10.1177/07419325070280030401

Gilson, C. B., & Carter, E. W. (2016). Promoting social interactions and job independence for college students with autism or intellectual disability: A pilot study. *Journal of Autism and Developmental Disorders*, *46*(11), 3583–3596. https://doi.org/10.1007/s10803-016-2894-2

Grob, C. M., Lerman, D. C., Langlinais, C. A., & Villante, N. K. (2019). Assessing and teaching job-related social skills to adults with autism spectrum disorder. *Journal of Applied Behavior Analysis*, *52*(1), 150–172. https://doi.org/10.1002/jaba.503

Gunby, K. V., & Rapp, J. T. (2014). The use of behavioral skills training and in situ feedback to protect children with autism from abduction lures. *Journal of Applied Behavior Analysis*, *47*(4), 856–860. https://doi.org/10.1002/jaba.173

Hood, S. A., Luczynski, K. C., & Mitteer, D. R. (2017). Toward meaningful outcomes in teaching conversation and greeting skills with individuals with autism spectrum disorder. *Journal of Applied Behavior Analysis*, *50*(3), 459–486. https://doi.org/10.1002/jaba.388

Hume, K., Loftin, R., & Lantz, J. (2009). Increasing independence in autism spectrum disorders: A review of three focused interventions. *Journal of Autism and Developmental Disorders*, *39*(9), 1329–1338. https://doi.org/10.1007/s10803-009-0751-2

Kazdin, A. E. (1982). *Single-case research designs: Methods for clinical and applied settings*. Oxford University Press.

Kornacki, L. T., Ringdahl, J. E., Sjostrom, A., & Nuernberger, J. E. (2013). A component analysis of a behavioral skills training package used to teach conversational skills to young adults with autism spectrum and other developmental disorders. *Research in Autism Spectrum Disorders*, *7*(11), 1370–1376. https://doi.org/10.1016/j.rasd.2013.07.012

Langthorne, P., & McGill, P. (2011). Assessing the social acceptability of the functional analysis of problem behavior. *Journal of Applied Behavior Analysis*, *44*(2), 403–407. https://doi.org/10.1901/jaba.2011.44-403

Ledford, J. R., King, S., Harbin, E. R., & Zimmerman, K. N. (2018). Antecedent social skills interventions for individuals with ASD: What works, for whom, and under what conditions? *Focus on Autism and Other Developmental Disabilities*, *33*(1), 3–13. https://doi.org/10.1177/1088357616634024

Miltenberger, R. G. (2014). *Behavior modification: Principles and procedures* (6th ed.). Cengage Learning.

Miltenberger, R. G., Fogel, V. A., Beck, K. V., Koehler, S., Shayne, R., Noah, J., McFee, K., Perdomo, A., Chan, P., Simmons, D., & Godish, D. (2013). Efficacy of the stranger abduction-prevention program and parent-conducted in situ training. *Journal of Applied Behavior Analysis*, *46*(4), 817–820. https://doi.org/10.1002/jaba.80

Nuernberger, J. E., Ringdahl, J. E., Vargo, K. K., Crumpecker, A. C., & Gunnarsson, K. F. (2013). Using a behavioral skills training package to teach conversation skills to young adults with autism spectrum disorders. *Research in Autism Spectrum Disorders*, *7*(2), 411–417. https://doi.org/10.1016/j.rasd.2012.09.004

Reimers, T. M., Wacker, D. P., & Cooper, L. J. (1991). Evaluation of the acceptability of treatments for children's behavioral difficulties. *Child & Family Behavior Therapy*, *13*(2), 53–71. https://doi.org/10.1300/J019v13n02_04

Roth, M. E., Gillis, J. M., & DiGennaro-Reed, F. D. (2014). A meta-analysis of behavioral interventions for adolescents and adults with autism spectrum disorders. *Journal of Behavioral Education*, *23*(2), 258–286. https://doi.org/10.1007/s10864-013-9189-x

Schall, C., Brooke, V., Wehman, P., Palko, S., Brooke, A., Ham, W., Carr, S., & Gerhardt, P. (2014, July). *Community based functional skills assessment for transition aged youth with autism spectrum disorder* [Scholarly project]. Virginia Commonwealth University Autism Center for Excellence. http://www.vcuautismcenter.org/documents/FinalCommunityAssessment711141.pdf

Stokes, T. F., & Osnes, P. G. (1989). An operant pursuit of generalization. *Behavior Therapy*, *20*(3), 337–355. https://doi.org/10.1016/S0005-7894(89)80054-1

Walsh, E., Holloway, J., & Lydon, H. (2017). An evaluation of a social skills intervention for adults with autism spectrum disorder and intellectual disabilities preparing for employment in Ireland: A pilot study. *Journal of Autism and Developmental Disorders*, *48*(5), 1727–1741. https://doi.org/10.1007/s10803-017-3441-5

Wehman, P. H., Schall, C. M., McDonough, J., Kregel, J., Brooke, V., Molinelli, A., Ham, W., Graham, C. W., Riehle, J. E., Collins, H. T., & Thiss, W. (2013). Competitive employment for youth with autism spectrum disorders: Early results from a randomized clinical trial. *Journal of Autism and Developmental Disorders*, *44*, 487–50. https://doi.org/10.1007/s10803-013-1892-x

Wehman, P., Schall, C., McDonough, J., Molinelli, A., Riehle, E., Ham, W., & Thiss, W. R. (2012). Project SEARCH for youth with autism spectrum disorders: Increasing competitive employment on transition from high school. *Journal of Positive Behavior Interventions*, *15*(3), 144–155. https://doi.org/10.1177/1098300712459760

Wehman, P., Schall, C., McDonough, J., Sima, A., Brooke, A., Ham, W., Whittenburg, H., Brooke, V., Avellone, L., & Riehle, E. (2020). Competitive employment for transition-aged youth with significant impact from autism: A multi-site randomized clinical trial. *Journal of Autism and Developmental Disorders*, *50*, 1882–1897. https://doi.org/10.1007/s10803-019-03940-2

Whittenburg, H. N., Schall, C., Wehman, P., McDonough, J., & DuBois, T. (2020a). Helping high-school aged military dependents with autism gain employment through Project SEARCH + ASD Supports. *Military Medicine*, *185*(1), 663–668. https://doi.org/10.1093/milmed/usz224

Whittenburg, H. N., Taylor, J. P., Thoma, C. A., Pickover, G. S., & Vitullo, V. (2020b). A systematic literature review of interventions to improve work-related social skills of individuals with autism spectrum disorder. *Inclusion*, *8*(4), 320–334. https://doi.org/10.1352/2326-6988-8.4.320

Yakubova, G., & Zeleke, W. A. (2016). A problem-solving intervention using iPads to improve transition-related task performance of students with autism spectrum disorder. *Journal of Special Education Technology*, *31*(2), 77–86. https://doi.org/10.1177/0162643416650023