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Teaching Adults with Neurodevelopmental Disabilities to Interact Successfully with Others in a Virtual Format

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Abstract

As a result of the COVID-19 pandemic, individuals with neurodevelopmental disabilities (NDD) are engaging more with others in virtual group formats for social, educational, and professional reasons. This study extends prior research by evaluating the efficacy of common behavioral interventions, including behavioral skills training, provided via group video conferencing to teach skills that are important when interacting with others in a virtual format. Four adults with NDD were taught to use their cameras and microphones appropriately and to make encouraging statements to one another while discussing current events and social skills-based lessons via Zoom™. Two of the three skills increased and maintained for all participants even after the experimenter faded the contingencies for appropriate responding. The third skill maintained after the experimenter arranged for the response to produce natural consequences. Tests for generalization across group leads and activities yielded promising results. Findings suggest that adults with NDD benefit from group-based telehealth services to improve skills needed to interact successfully with others in a virtual format.

Keywords : Autism spectrum disorder · Behavioral skills training · Group training, Neurodevelopmental disabilities · Social skills · Telehealth services · Virtual interaction

The need for social distancing to decrease the spread of the global coronavirus disease 2019 (COVID-19) transformed how people in the world connect with others. In particular, the pandemic resulted in the rapid and widespread use of videoconferencing to connect people for personal, educational, professional, and health-related purposes. For example, the demand for business-related communication apps exploded at the start of the pandemic, with the weekly download average up 90% from prepandemic numbers (Trueman, 2020). Many schools and colleges ceased in-person teaching and moved to online learning platforms (Dhawan, 2020). Health-care professionals offered telemedicine and telehealth services to record numbers of patients (Frye et al., 2021; Sharma et al., 2021; Shivkumar et al., 2021). People also reported an increase in video conferencing with family and friends as a result of changing their interactions from in-person to virtual modalities (Nguyen et al., 2020). By enabling social interactions through audio and video transmissions, videoconferencing reportedly helped reduce feelings of social isolation and loneliness (Luchetti et al., 2020).

The need for social distancing particularly affected the lives of individuals with neurodevelopmental disabilities (NDD). Throughout the pandemic, many children and adults who were receiving in-person therapeutic services made the transition to direct and indirect telehealth services to mitigate the spread of the disease while ensuring continued access to care (Bal et al., 2021; CASP, 2020; Pollard et al., 2021; Spain et al., 2021; Wagner et al., 2020). Like people across the globe, individuals with NDD began to participate in virtual interviews and meetings with employers and socialize with family and friends via virtual gatherings.

Despite the temporary nature of the COVID-19 pandemic, videoconferencing is likely to remain a popular modality for personal and professional interactions. Relative to in-person meetings, videoconferencing promotes connections among geographically distanced individuals and provides a more cost-effective and efficient way to receive educational and health-related services (Lindgren et al., 2016; McMaster et al., 2021). Some individuals also

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may feel more comfortable interacting with others remotely. Patients receiving telemedicine and telehealth services have reported high levels of satisfaction with this modality (Rodrigues et al., 2021). In one recent study, a noteworthy portion of respondents indicated a preference for receiving health-related services remotely (e.g., Adamou et al., 2021). Individuals with autism spectrum disorder (ASD) also have reported finding the internet useful for interacting with others and connecting to people with similar interests (Benford & Standen, 2009; Gillespie-Lynch et al., 2014; Jones & Meldal, 2001; Muller et al., 2008).

Although use of remote modalities of interaction likely will persist beyond the COVID-19 pandemic, it may present challenges for individuals with NDD. For example, in a recent study, adults with ASD described difficulties interacting with others during video calls (Oomen et al., 2021). Important prerequisites are needed for interacting successfully with others via videoconferencing platforms. For example, authors have provided guidelines for determining which clients may benefit from receiving applied behavior analysis services directly from therapists via remote modalities (Council of Autism Service Providers [CASP], 2020; Rodriguez, 2020). These guidelines include consideration of some potentially important skills, such basic motor imitation skills and attending to video screens.

Other types of prerequisite skills specific to interacting successfully with others in personal and professional videoconferencing sessions (e.g., job interviews, business meetings, social support groups) likely include keeping the head oriented and positioned appropriately in the camera, muting the audio feed when not speaking, and actively engaging in on-going discussion by responding positively to the contributions of others. Targeting these skills within the context of therapeutic programs may be beneficial for individuals with NDD. Skills that promote successful interactions with others may increase the likelihood that the individual's responding will contact natural contingencies associated with the particular remote context (e.g., receiving job offers following successful job interviews, making new friends during a social gathering, obtaining information during educational programs).

Group social skills training is one therapeutic context that might lend itself well to this type of instruction. Numerous studies have demonstrated the effectiveness of teaching social skills in a group format (for reviews, see Kaat & Lecavalier, 2014; Miller et al., 2014; Spain & Blainey, 2015). In most studies, the intervention contained elements of behavioral skills training (BST), which consists of instructions, modeling, and role play with feedback, combined with reinforcement for correct responding.

Dotson et al. (2010), for example, examined the effects of group BST on improving several conversation skills, which included maintaining eye contact, asking and answering questions, and providing positive feedback, for five adolescents with ASD. Each participant role played with a research assistant in front of other group members. Results showed that the intervention was effective for the majority of participants and skills, although improvements in the participants' performance did not consistently generalize to conversations with neurotypical peers. Leaf et al. (2010) used similar procedures to teach a variety of social skills to five young children with ASD, including giving compliments and expressing appreciation (e.g., saying "thank you"). Although the intervention was generally effective for all participants, they found that, in some cases, results did not generalize to a novel adult unless the participants received reminders and/or reinforcement for correct responding during the generalization probes.

Group training is not only more efficient than one-on-one formats, but it provides learners with opportunities to practice the targeted skills in a social context and with multiple practice partners. Group trainings also can be structured to resemble a variety of group interaction contexts, such as support groups, social gatherings, and professional meetings. The use of multiple practice partners and common stimuli will increase the likelihood of generalization (Stokes & Osnes, 1989). Ensuring that skills not only generalize to settings outside of the training context but maintain in the absence of programmed consequences is important for effective training. Thus, group trainings should include consideration of strategies that promote maintenance and generalization, including reinforcement schedule thinning and arranging contact with natural consequences.

In light of the growing popularity of videoconferencing for group-based interaction, further research is needed to better prepare individuals for success when engaging with others in a virtual format. An appropriate first step might be to target responses that are prerequisites to successful virtual interactions (e.g., appropriate use of camera and microphone), along with responses that likely would help promote effective engagement with others in this format (e.g., responding positively to others). The purpose of this study was to evaluate the effectiveness of commonly used behavioral procedures (i.e., BST, reinforcement) for targeting these responses within the context of a virtual group social skills training for adults with NDD. The evaluation included an assessment of generalization, maintenance, and social validity.

Method

Participants and Setting

Four adults ranging in age from 27 to 46 years old participated in the study. Participants were recruited from a

weekly social skills group consisting of nine adults diagnosed with autism spectrum disorder and other developmental disabilities. All nine adults participated in the social skills sessions in-person prior to the start of the COVID-19 pandemic and before beginning the study. Eligible participants had strong attendance records in the past and expressed an interest in attending virtual social skills sessions during the COVID-19 pandemic either to their parents or directly to the group instructor via email and/ or phone conversation. Study participants were also chosen based on regular access to necessary hardware (i.e., laptop, computer, phone/tablet), reliable internet, and low performance on the skills targeted in this study during an initial assessment. For the initial assessment, observers used 1-min partial interval recording to collect data on the targeted skills (described below) for all nine adults in the virtual social skills group.

After identifying eligible participants, the experimenter informed the potential participants that they would be learning new skills taught via video conferencing; that the therapist would be using behavior skills training, virtual tokens, and feedback to teach these skills; that participation in the study was entirely voluntary; and that they could refuse to participate or withdraw from the study at any time without any penalty or loss of benefits. The experimenter did not identify the specific target behaviors that would be included in the study as part of the consent process. After receiving an opportunity to ask questions, all four eligible individuals consented to participate by signing the consent form via a Qualtrics® survey. Participants also indicated their continuing consent by voluntarily joining the group meetings each week.

Brad was a 46-year-old man diagnosed ASD and borderline intellectual functioning. He was employed at a major chain grocery store and resided with his mother. Brad received a score of 74 on the Weschler Adult Intelligence Scale–4th ed. (WAIS-IV; Wechsler, 2008) and a score of 65 on the Global Assessment of Functioning Scale (GAF; 4th ed.; DSM-IV; American Psychological Association, 2000) 7 years prior the study. Brad was social and enjoyed interacting with others. At the time of the study, Brad had been participating in the social skills group for 2 years.

Kevin was a 39-year-old man diagnosed with ASD, attention-deficit hyperactivity disorder, obsessive-compulsive disorder, and borderline intellectual disability. He received a score of 74 on the WAIS-III (Wechsler, 1997) and a 55 on the GAF 11 years prior the study. He graduated from high school and previously worked at a fast-food restaurant but was terminated due to inappropriate social behaviors with customers. Kevin lived with his parents who reported that he seldomly interacted with other people. Kevin had been participating in the social skills group for 6 years at the time of the study.

Alex was a 35-year-old man diagnosed with mild ID. Alex received a score of 56 on the WAIS-IV and a score of 65 on the GAF 20 years prior to the study. He resided with his mother. Alex enjoyed socializing with others and had a history of engaging in inappropriate social behaviors with females. Alex had been participating in the social skills for 2 years prior to the start of the study.

Sam was a 27-year-old man diagnosed with ASD. Sam received a score of 116 on the GAF 1 year prior to the study. He was employed at a pizza company as a delivery driver and reported that he had difficulties getting along with his coworkers. Sam had limited interactions with others and reported not having any friends. Prior to the study, Sam had been participating in the social skills group for 4 years.

All sessions took place via Zoom™, an online video conferencing platform. The social skills group had shifted to a virtual modality 4 weeks prior to the start of the study due to the COVID-19 pandemic. The experimenters conducted sessions from their offices and the participants attended from their homes. A Board Certified Behavior Analyst (BCBA) led all sessions. The same BCBA, a male who was 33 years old, served as the experimenter and hosted all meetings except for the generalization probe meetings. The generalization probes were hosted by a BCBA who was a 62-year-old male, a BCBA-D who was a 32-year-old female, and a BCBA who was a 35-year-old male. Sessions were video recorded using the recording function of Zoom™.

Response Measurement, Reliability, and Procedural Integrity

Trained observers collected data on encouraging statements, acknowledgement of encouraging statements, appropriate camera usage, appropriate microphone usage, and appropriate responding. *Encouraging statements* were compliments or other positive vocal verbal remarks (e.g., "that's cool," "good job," "thank you," "you are welcome," "nice try," "good point") directed to peers in response to their statements. Encouraging statements directed towards the experimenter hosting the meeting were not scored. An *acknowledgement of an encouraging statement* was scored when a participant directed an on-topic positive comment towards a peer in response to the peer making an encouraging statement directed towards the participant. For example, if Sam said, "that's a great idea" to Kevin, and Kevin stated, "that was really nice of you to say," an encouraging statement was scored for Sam and an acknowledgement of an encouraging statement was scored for Kevin.

Appropriate camera usage was defined as the participant keeping their entire head, including the top of the head and neck, within the camera's view; orienting themselves towards the camera with both eyes visible; and remaining in a stationary location sitting upright with no more than

a 1–2-s lapse with no prompting. *Appropriate microphone usage* was defined as the participant muting their microphone when they were not speaking and unmuting their microphone when they were speaking with no more than a 10-s lapse and with no prompting. *Appropriate responding* was scored when a participant emitted an on-topic comment or question without interrupting another speaker and with no prompting. It was not considered prompting if the participant raised their hand and was called on by the experimenter before making an appropriate response. Appropriate responses were not scored if the statement met the definition of an encouraging statement or an acknowledgement of an encouraging statement or if the response included curse words. Appropriate responding was monitored throughout the study but was not directly targeted.

Observers used paper and pencil to collect data. The observers used 1-min partial-interval recording to collect data on encouraging statements, acknowledgement of encouraging statements, and appropriate responding; and 1-min whole-interval recording on appropriate camera usage and appropriate microphone usage. Discontinuous data were collected to ease data collection and, for encouraging statements, to match the reinforcement criteria and goal level of responding (see further description below). All data were converted to percentages by dividing the total number of intervals in which the behavior occurred by the total number of intervals in the session or by the total number of intervals with encouraging statements that the participant received (acknowledgements only). Intervals were excluded from calculations if the participant excused themselves prior to exiting the screen, such as to use the restroom, or if technology issues prevented clear audio or visual observation (e.g., disruption of visual feed). If the participant exited the screen without excusing himself, observers continued to score intervals. Sessions were excluded if the participant was off-screen for more than 50% of intervals due to technological issues. This rarely occurred during the study.

A second data collector independently scored at least 30% of each participant's sessions in each phase for the purpose of measuring interobserver agreement (IOA). Overall, IOA was calculated for a total of 43% (Brad), 42% (Kevin), 43% (Alex), and 43% (Sam) of the sessions. Observers' records were compared on an interval-by interval basis. Mean occurrence and nonoccurrence IOA was calculated for each behavior by dividing the total instances of agreement by the total instances of agreement and disagreement and multiplying by 100. Mean occurrence and nonoccurrence agreement, respectively, was 88% (range: 0%–100%) and 95% (range: 5%–100%) for encouraging statements; 97% (range: 50%–100%) and 91% (range: 0%–100%) for appropriate microphone usage; 94% (range: 50%–100%) and 96% (range: 0%–100%) for appropriate camera usage; 100% and 100% for acknowledgement of encouraging statements; and

92% (range: 0%–100%) and 93% (range: 31%–100%) for appropriate responding. With few exceptions, the low end of the ranges occurred during sessions with either few occurrences of the behavior (for occurrence agreement) or few nonoccurrences of the behavior (for nonoccurrence agreement). In these situations, just one or two intervals with disagreement resulted in extremely low IOA.

Procedural integrity data were collected on each behavior skills training (BST) session and refresher sessions. Data were collected on whether the experimenter followed a written script of instructions, stated the contingency for earning tokens, conducted live modeling, gave each participant an opportunity to practice the behavior, praised participants who responded correctly, gave corrective feedback and additional practice opportunities until successful demonstration of the behavior to participants who did not respond correctly, and repeated the instructions and contingencies for earning tokens during subsequent sessions. Each opportunity to emit these components was scored as correct or incorrect. For example, when the experimenter gave each participant an opportunity to practice the behavior, each practice opportunity was scored separately. Data were calculated by dividing the number of steps completed correctly by the total number of opportunities in each BST or refresher session and multiplying by 100 to obtain a percentage. Mean procedural integrity was 96% (range: 63%–100%) for BST sessions and 100% for refresher sessions. Procedural integrity data on the experimenter's behavior also were collected during each generalization meeting. The observer scored whether the experimenter followed the written script of instructions, which varied based on the context of the meeting (see contexts in Table 1). Each opportunity to emit a step of the instructions was scored as correct or incorrect. Data were calculated by dividing the number of steps completed correctly by the total number of opportunities in each generalization session and multiplying by 100 to obtain a percentage. Mean procedural integrity was 100% for the generalization probes.

Design and Procedures

A multiple baseline design across the three targeted behaviors was used to evaluate the effectiveness of the teaching procedures for each participant. A fourth behavior (appropriate responding) was not targeted as an additional measure of control. Throughout the course of the study, the group met for 2 hr once per week. Meetings began with a discussion of "current events" in which each participant took turns sharing updates on their activities from the previous week while the other participants asked questions and commented on the updates. After each participant shared their current events, the experimenter provided a brief lesson on topics related to social and vocational skills. These lessons did not include

Table 1 Description of the three generalization probes

	Host	Context	Session Participants
Gen Probe 1	Novel BCBA 1 (male, age 35)	Lesson on using slide animations in PowerPoint™	Alex, Sam, Brad
Gen Probe 2	Novel BCBA-D 2 (female, age 32)	Regular social skills meeting	Alex, Sam, Brad, Kevin, 5 nonresearch participants in the social skills group
Gen Probe 3	BCBA 3 (male, age 62)	Jeopardy™ game	Alex, Sam, Brad, Kevin, 5 nonresearch participants in the social skills group

the behaviors targeted in this study, and no lessons covered the targeted behaviors prior the study. The lessons consisted of a PowerPoint presentation and included active participation such as reading questions aloud, answering questions, and playing interactive games. Lessons varied in length but all were a minimum of 20 min. Following the lesson, participants were given opportunities to watch preferred YouTube videos or play additional interactive games such as tic-tac-toe until the meeting ended. To ensure equal opportunity to engage in the targeted skills across meetings, experimenters divided the first 60 min of each meeting into three 20-min sessions for the purposes of data collection. The first two sessions occurred during the current events portion of the meeting, and the third session occurred during the lesson.

The experimenter utilized an electronic token system throughout the study. The participants had a history of earning tokens during this social skills group and had asked the experimenter if they could continue to earn tokens during the study. Delivering tokens over the shared screen also permitted the experimenter to give visual feedback along with vocal feedback and to individualize the backup reinforcers based on the participant's preferences. Each participant's name was listed on a PowerPoint slide. At the end of each 20-min session, the PowerPoint slide was presented via the screen sharing feature so that all participants could view it simultaneously. If the participant earned a token, an image of a one-dollar or two-dollar bill was pasted into a square next to the participant's name. The therapist delivered one-dollar tokens until all participants had met the goal criteria for the first targeted skill (encouraging statements); the experimenter switched to $2 tokens when the criteria to receive reinforcement included multiple targeted skills. By doing so, participants had the opportunity to "purchase" more reinforcement per token. Tokens were awarded contingently or noncontingently depending on the condition. Each participant could receive a maximum of five tokens per meeting. One token was awarded for joining the meeting within 5 min of the scheduled start time, and a second token was awarded for listening to the instructions provided by the host at the start of the meeting. During intervention, a token

was also awarded for meeting the reinforcement criteria for the target behavior(s) for each 20-min session for a total of three tokens. To earn a token for each 20-min session, the participant's responding had to meet the goal criteria for each behavior targeted in that session. At the end of each weekly meeting, the experimenter provided an opportunity for participants to exchange their tokens or place them in their token bank to exchange after a future meeting. Tokens could be exchanged for a variety of backup reinforcers, including snacks, drinks, time to watch YouTube videos, or electronic gift cards for restaurants and activities such as Xbox and PlayStation. Backup reinforcers were selected based on a survey sent to participants prior to the beginning of the study. Because the study was conducted during the COVID-19 pandemic, backup reinforcers were delivered electronically when possible by sending gift cards to the participants' email addresses. If the participant selected a physical backup reinforcer, such as a snack or drink, the experimenter delivered the reinforcer by leaving the item on the doorstep of the participant's home within 24 hr of the end of the meeting.

Baseline (Noncontingent Reinforcement [NCR])

The experimenter did not provide any feedback or programmed responses for the target behaviors. Tokens were delivered contingent on attendance at each meeting. Participants earned one token for logging on to the meeting at the correct time and up to four additional tokens throughout the meeting for staying logged on until the end of the meeting. Participants were not required to actively participate to earn tokens and tokens were not delivered contingent on any specific behavior.

Behavioral Skills Training (BST)

Training was introduced sequentially across targets. The experimenter conducted all BST and refresher sessions at the beginning of a meeting and prior to the first data collection session. The experimenter began by providing vocal

instructions about the target behavior, including a definition and rationale for learning the skill. The experimenter also stated the contingency to earn reinforcement, such as "In order to earn dollar tokens going forward, I am going to need each of you to make four encouraging statements every 20 minutes." If the participant could engage in the target behavior in multiple ways (e.g., different ways to mute oneself on Zoom) or if the target behavior was topographically different across technological devices (i.e., muting oneself on the Zoom app on a cell phone versus on a desktop computer), the experimenter provided instructions for a variety of methods excluding keyboard shortcuts. The experimenter provided an opportunity for participants to ask questions.

Next, the experimenter modeled many topographical forms of the behavior. Models included correct and incorrect responses. For example, when teaching appropriate microphone usage, the experimenter modeled muting appropriately, muting inappropriately, failing to mute when needed, and failing to unmute when needed. Research assistants participated if multiple people were needed to model the behavior effectively. For example, to model inappropriate microphone usage, one research assistant unmuted their microphone and played a loud noise while a second research assistant attempted to answer the experimenter's question. After each model, the experimenter checked for understanding via the electronic polling feature of Zoom by asking participants if the model was correct. All participants responded by selecting "yes" or "no" to answer the poll. The experimenter reviewed the results of the poll and provided praise to participants who answered the poll correctly. Vocal feedback was provided for incorrect answers.

Lastly, participants practiced the behavior while the experimenter provided feedback. Each participant (including participants in the study and nonparticipants) was given an opportunity to engage in the target behavior while the others observed. The experimenter presented practice opportunities designed to include relevant situations for the target behavior. For example, when targeting encouraging statements, the experimenter stated, "I went on a walk today," and the participant would emit an encouraging statement. Each participant was given a unique practice opportunity. For example, when targeting encouraging statements, the experimenter said, "I watched a movie with my brother this weekend," to the first participant, and "I hate being stuck inside," to the second participant to evoke different responses from each participant. The experimenter provided praise for correct responses. If the participant made an error, the experimenter provided vocal feedback and additional practice opportunities until the participant engaged in a correct response. If the participant responded correctly to the first practice opportunity, the experimenter did not provide additional practice opportunities. BST concluded with the experimenter repeating the initial contingency and providing

an opportunity for participants to ask questions. Following BST, the experimenter transitioned to the current events portion of the weekly meeting.

Feedback and Reinforcement

Prior to each 20-min session, the experimenter stated the contingency for earning reinforcement for each session, including how many instances of the behavior must be observed. The required levels of responding for reinforcement were 20% of 1-min intervals for encouraging statements and acknowledgement of encouraging statements (four total intervals), 50% of intervals for appropriate microphone usage, and 80% of intervals for appropriate camera usage. For encouraging statements and acknowledgements of encouraging statements, the experimenter also told the participants that they must space out their responding across intervals to earn reinforcement. For example, if a participant emitted two encouraging statements in a 1-min interval, it was only scored as one interval of responding. This was done to prevent participants from making four encouraging statements within a short period of time and then not speaking for the remainder of the session. The criteria for encouraging statements and acknowledgement of encouraging statements were informed by collecting data on the experimenter's responding during a weekly meeting. The experimenter informally observed neurotypical individuals' use of their microphone and camera during virtual meetings to select the criteria for these responses.

During all sessions, the experimenter provided vocal feedback for target behaviors on a time-based schedule and faded this feedback as he introduced training for additional target behaviors. Following BST for the first target behavior (encouraging statements), the experimenter provided participant-specific vocal feedback every 4–5 min. This schedule varied to allow the experimenter to identify a natural break in conversation to deliver the feedback. In particular, the experimenter's feedback about encouraging statements directly reflected the number of intervals containing at least one encouraging statement along with confirmation on whether or not they had met the criteria established by the experimenter at the beginning of the session (e.g., "Brad, you already made four encouraging statements. Great job!" vs. "Sam, I only heard two encouraging statements so far, make sure that you make at least two more in order to earn the virtual dollar token."). The experimenter's feedback for microphone usage and camera usage was not as specific. If the participant had not met the criteria when it was time for feedback, the experimenter would say, "Remember to mute your microphone when you are not talking and unmute your microphone when you have something to say" or "Remember to keep your whole face in the camera so that you can earn the next dollar token." If the participant had met the

criteria, the experimenter would say, "Great job muting and unmuting your microphone" or "Great job using your camera correctly." Data collectors used the chat function in Zoom™ to report each participant's responding to the experimenter before he delivered the vocal feedback.

Following BST for the second target behavior (microphone usage), the experimenter provided vocal feedback every 10 min for the first target behavior and every 4–5 min for the second target behavior. Following BST for the third target behavior (camera usage), the experimenter provided vocal feedback every 10 min for the first and second target behaviors and every 4–5 min for the third target behavior. Next, the experimenter provided vocal feedback every 10 min for all three target behaviors, but the feedback was not participant-specific; instead, the experimenter directed general statements to all participants (e.g., "Everyone is doing an excellent job with remembering to mute themselves when they are not speaking and unmute themselves when they speak" or "I didn't hear enough encouraging statements, let's all make sure we're making encouraging statements"). Lastly, the experimenter provided participant-specific vocal feedback only at the time of token delivery (e.g., "Sam, you did a great job making four encouraging statements" or "Kevin, you only made two encouraging statements. Remember that you have to make four to earn a token"). It should be noted that BST for the fourth targeted behavior (acknowledgement of encouraging statements) was not introduced until the maintenance phase as described further below.

The experimenter delivered tokens at the end of each session contingent on participants' responding. As noted previously, responding had to meet the goal criteria for *each* behavior being targeted to earn a token for that session. If responding met or exceeded the reinforcement criteria, the therapist delivered a token and praise. If responding did not meet the reinforcement criteria, the experimenter did not deliver a token and gave vocal feedback (i.e., "I heard encouraging statements in three intervals but I needed to hear a few more in order to give you a token").

BST Refresher Sessions

The experimenter conducted additional BST refresher sessions as needed dependent on participants' responding during the practice portion of the training. Refresher sessions were identical in format to the original BST sessions but provided clarified instructions, different models, and additional practice opportunities. Across the study, the experimenter conducted two refresher sessions for encouraging statements (immediately prior to session 11 and session 14) and one refresher session for appropriate camera use (immediately prior to session 22).

Maintenance (NCR)

After the experimenter faded the vocal feedback for the first three targeted behaviors so that it only occurred at the time of token delivery, contingent token delivery was switched to noncontingent token delivery as in baseline. Participants earned tokens for logging onto the group meeting, listening to instructions, and staying until the end of the meeting. Participants received the same number of tokens available when tokens were delivered contingent on target behaviors. The experimenter told the participants, "We still want to see you using your microphones and cameras correctly, and making encouraging statements to your peers, but you will not be earning dollar tokens for those behaviors. Instead, you will be earning one token for joining the meeting on-time, one token for listening to the daily instructions at the beginning of the meeting, and three tokens before you log off for remaining in the social skills session until the end."

Reinforcement for Acknowledgements

The fourth behavior (acknowledging encouraging statements) was targeted during this condition after encouraging statements failed to maintain under noncontingent token delivery. We hypothesized that social consequences (e.g., acknowledgements) likely maintain encouraging statements in the natural environment. Suppose, for example, that Joe tells Sue that he got a haircut. Sue says, "It looks really nice" and Jose says, "Well, thank you!" Acknowledgements like Jose's response ("Well, thank you!) likely maintain Sue's encouraging statements ("It looks really nice.") To test this hypothesis, the experimenter introduced an additional reinforcement contingency for acknowledging encouraging statements to determine if this contingency would be associated with improved maintenance of encouraging statements.

Generalization Probes

The purpose of these probes was to assess generalization across novel group leads (i.e., hosts or instructors) and situations (e.g., skill-based presentations, group-based games). Procedures were identical to those in baseline. The experimenter (i.e., original host) did not attend the generalization meetings. A total of three generalization meetings were held on separate days, with three probes conducted during each meeting. The first generalization meeting was held on a different day of the week than the social skills group meeting, for a shorter duration (1 hr instead of 2 hr), and with only three research participants present. (Sam did not attend this meeting). Brad missed the first probe session during this meeting because he arrived late. A BCBA (male, age 35) who the participants had never met and who was unaware of the behaviors targeted in the study led the first generalization

meeting. During this meeting, the BCBA delivered a PowerPoint™ presentation on how to use slide animations in PowerPoint™. The participants were not provided an opportunity to share current events. The purpose of this probe was to assess generalization across hosts and situations.

The second generalization meeting was held on the original day and time as the social skills group meeting, for the same 2-hr duration, and with all group members present. A BCBA-D (female, age 32) who the participants had never met and who was unaware of the behaviors targeted in the study led a regular social skills group meeting, which included current events, a lesson on a vocational topic, and free time at the end to play a game. The purpose of this probe was to assess generalization across hosts only.

The third generalization meeting was held on a different day of the week, for the same 2-hr duration, and with all group members present. The participants had previously met the BCBA (male, age 62) who hosted this meeting. The BCBA also was aware of the behaviors targeted in the study. During this meeting, the host presented a Jeopardy™ game during which participants reviewed content from previous vocational and social lessons (unrelated to the skills taught in this study). The participants were not provided an opportunity to share current events. The purpose of this probe was to assess generalization across situations. Details about each generalization probe are summarized in Table 1.

Social Validity

Multiple social validity measures were collected to evaluate treatment acceptance and outcomes. First, the participants and their caregivers were asked to complete a survey via Qualtrics, an electronic survey platform upon completion of the study. The experimenter emailed survey links to the participants and their caregivers. Participants rated their level of agreement with statements about the study using a 5-point Likert scale (survey items are displayed in Table 2).

Caregivers completed a different survey. First, the caregivers were asked if the participant had engaged in any other virtual gatherings since beginning the study. If the caregiver indicated that the participant had engaged in other virtual gatherings, the caregiver then rated their participant's skills during other virtual gatherings (e.g., using their microphone appropriately, interrupting others, speaking loudly enough, positioning the camera appropriately, raising their hand to speak, needing help logging in or out, making encouraging statements to peers) using a 5-point Likert scale. Next, the caregivers indicated how often they observed the participant during the weekly group meeting. If the caregiver indicated they did observe the participant during some or all the meetings, the caregiver then rated the participant's skills during the weekly meeting (items are displayed in Table 3). If the caregiver did not observe the participant in other virtual gatherings and/or any of the weekly meetings, they did not complete the skill ratings.

Second, 16 independent observers rated videos of one baseline session (the 4th session) and one end-of-treatment session (the 89th session) to report their impressions of each participant's outcomes using a 7-point Likert scale. The independent observers were nursing students participating in a clinical rotation that included observations of service provision at the organization where the study occurred. Their ages ranged from 23 to 49 years, and none had experience working with individuals with ASD or IDD. Two observers reported having friends with children diagnosed with ASD. The observers did not attend any research sessions and were blind to the target behaviors. Four different observers independently rated each participant in baseline and treatment, and each observer only rated one participant. The experimenter randomly selected the one baseline and one treatment session for the ratings. Observations were counterbalanced so that half of the observers rated the participant's baseline session before their treatment session, while the other observers rated the participant's treatment session

Table 2 Number of participants endorsing each response option for each item on the social validity survey

Survey Item	Disagree	Some-what Disagree	Neither Disagree nor Agree	Some-what agree	Agree
I like having conversations with others in the group over Zoom™				1	3
The training helped me learn when to mute and unmute my microphone in Zoom™ meetings					4
The training helped me use the camera correctly during Zoom™ meetings					4
I enjoyed earning virtual dollar tokens during the Zoom™ meetings					4
I made more encouraging statements to my peers in the Zoom™ meetings after the training					4
I liked when my peers acknowledged the encouraging statements that I made to them			1		3
I liked receiving feedback about my performance	1				3
I would recommend this program to others					4

Table 3 Number of caregivers endorsing each response option for each item on the social validity survey

Survey Item	Definitely Not	Probably Not	Might or Might Not	Probably Yes	Definitely Yes
Use microphones appropriately during weekly group meeting			1	2	
Interrupt others during weekly group meeting		1	2		
Speak loud enough during weekly group meeting			1	1	1
Position camera appropriately during weekly group meeting			1	1	1
Raise their hand to speak during weekly group meeting			1	1	1
Need help logging in or out during weekly group meeting	2	1			
Make encouraging statements to their peers during weekly group meeting	1			1	1

Note. Caregivers responded to the following question, "If you did observe your son/daughter during some or all of the Zoom meetings, did they. . . ."

before their baseline session. The observer was provided the name and description of the participant who they were assigned to rate. The observer completed a survey in which they were asked to rate the participant's general social skills (e.g., "This person had good social interaction skills") as well as his performance on specific target behaviors (e.g., "This person positioned themselves in front of the camera appropriately") after viewing each video. The survey items are displayed in Table 4.

Results

Figures 1 and 2 display the participants' level of responding for each target behavior and untargeted appropriate responding across all phases of the study. During baseline, Brad (top left panel, Fig. 1) engaged in encouraging statements during a mean of 5% (range: 0%–30%) of intervals. Brad's encouraging statements increased to a mean of 30% (range: 0%–65%) of intervals when he received reinforcement and feedback. However, they decreased to a mean of 16% during the NCR (maintenance) condition and generalization probes (range: 0%–45% during NCR; 0%–40% during generalization probes). When the experimenter introduced reinforcement to peers for acknowledging others' encouraging statements, Brad's encouraging statements returned to a mean

of 30% (range: 15%–40%) of intervals. Peers acknowledged a mean of 75% (range: 50%–100%) of Brad's encouraging statements during this condition. Brad never used his microphone appropriately during baseline (second left panel, Fig. 1). Like the remaining participants, Brad tended to leave his microphone unmuted throughout the sessions; thus, his responding never met the definition for appropriate microphone use for an entire 1-min interval. Levels of appropriate microphone use increased to a mean of 85% (range: 5%–100%) of intervals when he received reinforcement and feedback. Although his responding became more variable when the experimenter transitioned to NCR, he continued to use his microphone appropriately at high levels ($M = 87\%$ of intervals; range: 50%–100%). During the first and third set of generalization probes, Brad's responding remained high ($M = 94\%$; range: 85%–100%); however, responding returned to baseline level during the second set of generalization probes. Brad's camera usage was highly variable in baseline (third left panel), initially occurring at high levels ($M = 82\%$ during first four sessions) and then decreasing to low levels across the condition ($M = 17\%$ during last four sessions). He frequently positioned himself such that the upper or lower part of his face was not in the camera's view. Brad's responding immediately increased ($M = 93\%$, range: 0%–78%, of intervals) when he received reinforcement and feedback, levels that maintained under both NCR and during

Table 4 Items on the social validity survey rated by independent observers

This person made encouraging statements to their peers.

This person had good social interaction skills.

This person appeared interested in speaking with other group members.

This person positioned themselves in the camera appropriately.

This person talked for an appropriate amount of time.

This person appeared engaged while other participants were speaking.
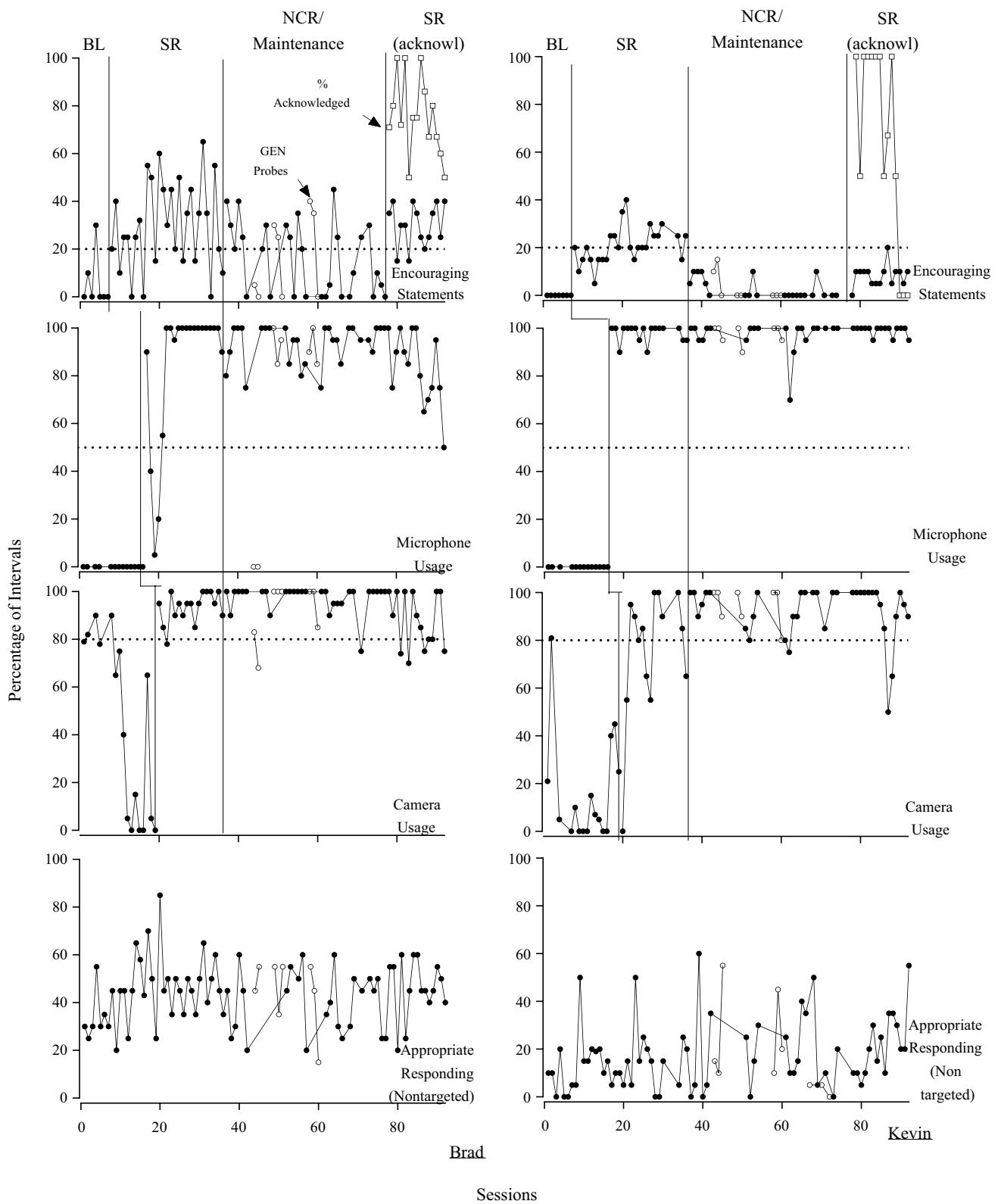
This person used their microphone appropriately.

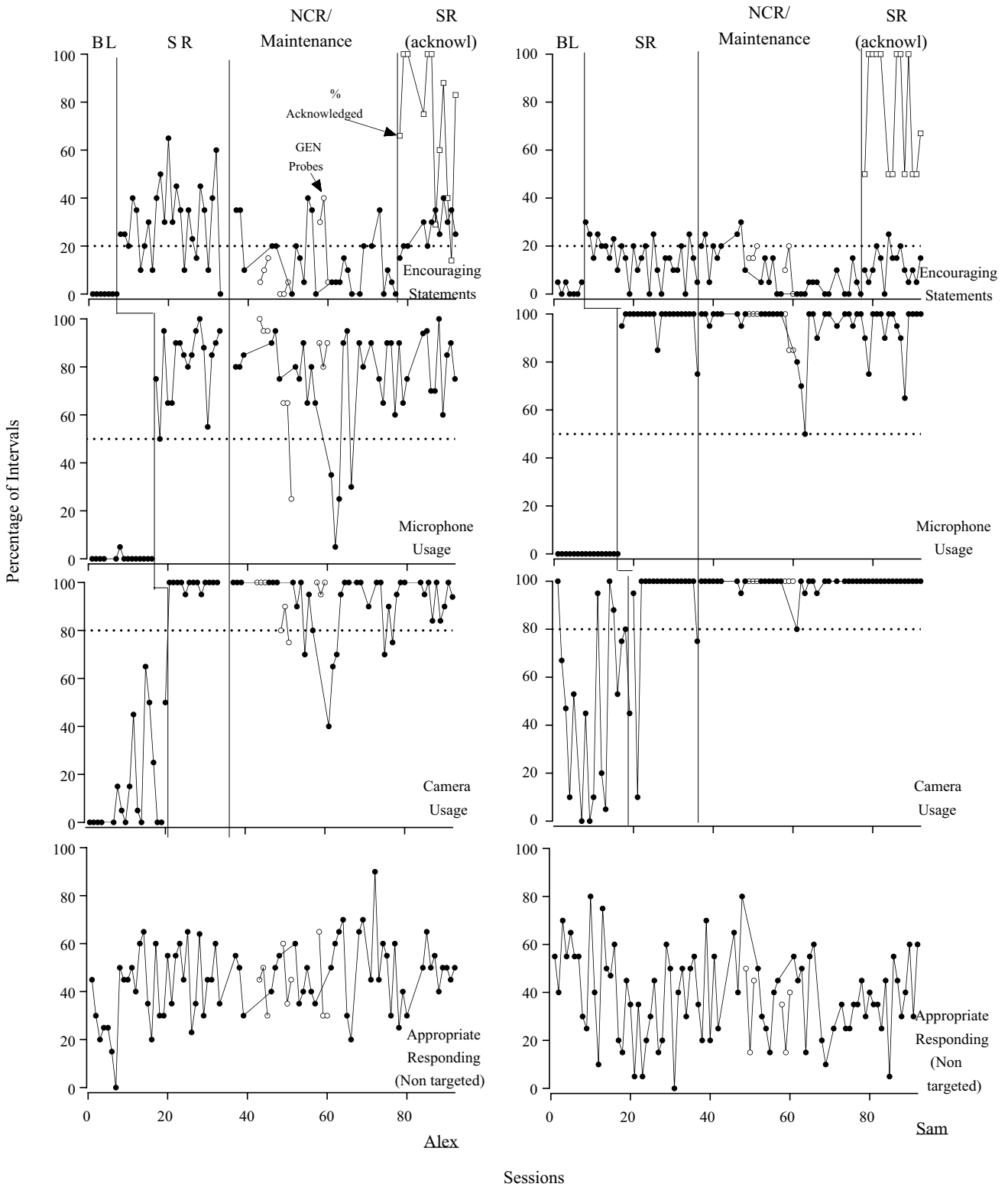**Fig. 1** Results for Brad and Kevin

Fig. 2 Results for Alex and Sam

the generalization probes. Finally, Brad engaged in moderate, variable levels of the untargeted response, appropriate responding (*M* = 45%, range: 20%–75%), that remained relatively stable throughout the study (bottom left panel)

Kevin did not emit any encouraging statements during baseline (top right panel, Fig. 1). Following BST, responding increased to a mean of 21% (range: 5%–40%) of intervals when he received reinforcement and feedback. However, encouraging statements decreased to low levels during both NCR (*M* = 3% of intervals) and the generalization probes (*M* = 1%). When the experimenter introduced reinforcement to peers for acknowledging others' encouraging statements, Kevin's encouraging statements increased somewhat to a mean of 8% (range: 0%–20%) of intervals. Peers acknowledged a mean of 65% (range: 0%–100%) of his encouraging statements during this condition. Kevin never used his microphone appropriately during baseline (right second panel of Fig. 1). Responding immediately increased following BST (*M* = 98% of intervals, range: 90%–100%) when he received reinforcement and feedback, levels that maintained under both NCR and the generalization probes. Kevin's appropriate camera use was highly variable during baseline, averaging just 16% (range: 0%–81%) of intervals (third right panel). He frequently laid down or positioned himself such that only half of his face was visible in the camera. Following BST, he used his camera appropriately for 76% (range: 0%–100%) of intervals while receiving reinforcement and feedback, and levels remained high under both NCR (*M* = 93% of intervals; range: 50%–100%) and the generalization probes (*M* = of 88% of intervals, range: 80%–100%). Finally, Kevin engaged in low but highly variable levels of untargeted appropriate responding throughout the study (*M* = 17% of intervals; range: 0%–50%).

Alex did not emit any encouraging statements in baseline (top left panel of Fig. 2). Responding increased to moderate, variable levels (*M* = 30% of intervals; range: 0%–65%) when he received reinforcement and feedback following BST. Similar to the other participants, encouraging statements decreased under both NCR (*M* = 13% of intervals; range: 0%–40%) and the generalization probes (*M* = 7%; of intervals; range: 0%–40%), but returned to levels observed under reinforcement and feedback when participants received reinforcement for acknowledging others' encouraging statements (*M* = 27% of intervals; range: 15%–40%). Peers acknowledged a mean of 71% (range: 14%–100%) of his encouraging statements during this condition. Like the other participants, Alex did not use his microphone appropriately in baseline (second left panel), and his performance increased to high levels when he received reinforcement and feedback following BST (*M* = 82%, range: 50%–100%). These levels remained high but were somewhat variable under NCR (*M* = 76% of intervals, range: 5%–100%) and during generalization probes (*M* = 52% of intervals; range: 25%–100%). The

level of Alex's appropriate camera use was highly variable during baseline (third left panel) because he often sat too close to the camera (*M* = 13% of intervals; range: 0%–65%). Following BST, his performance improved substantially, with appropriate camera usage occurring in a mean of 96% of intervals (range: 50%–100%). He maintained similar levels of responding during NCR and generalization probes (*M* = 92 of intervals in both conditions; range: 40%–100% under NCR and 75%–100% in the generalization probes). Finally, Alex engaged in relatively stable levels of untargeted appropriate responding across the study (bottom left panel; *M* = 45% of intervals; range: 0%–90%).

Sam engaged in few encouraging statements towards peers in baseline (top right panel of Fig. 2; *M* = 2% of intervals; range: 0%–5%). Following BST, statements increased to a mean of 15% of intervals (range: 0%–30%) when he received reinforcement and feedback, although his responding infrequently met the criterion to receive token reinforcement. His encouraging statements then decreased under NCR (*M* = 9% of intervals; range: 0%–30%) and during generalization probes (*M* = 4% of intervals; range: 0%–20%). Like the other participants, his encouraging statements increased to levels observed under contingent reinforcement when the experimenter provided reinforcement for acknowledgements (*M* = 12% of intervals; range: 0%–25%). Peers acknowledged a mean of 76% (range: 50%–100%) of Sam's encouraging statements during this condition. Sam did not use his microphone appropriately during baseline (second right panel). Following BST, responding immediately increased to high levels (*M* = 98% of intervals; range: 75%–100%) during reinforcement and feedback, levels that maintained under NCR (*M* = 95% of intervals; range: 50%–100%) and during generalization probes (*M* = 83% of intervals; range: 85%–100%). Sam used his camera appropriately during a mean of 50% of intervals (range: 0%–100%) during baseline (third right panel), often failing to illuminate his face sufficiently. Immediately following BST, Sam's appropriate camera use increased to high levels (*M* = 93% of intervals; range: 10%–100%) as he began to position a lamp next to his computer with the light directed towards his face. His performance maintained under NCR (*M* = 99% of intervals; range: 80%–100%) and during generalization probes (*M* = 100% of intervals). Finally, throughout the study, Sam engaged in moderate levels of untargeted appropriate responding (*M* = 38% of intervals; range: 5%–80%) that remained relatively stable across the evaluation (bottom right panel).

Results of the social validity ratings of independent observers are shown in Fig. 3. Across all participants and almost all items, the independent observers ranked the participants' skills higher in posttraining videos than in baseline videos. The only exception to this was for Brad, who was ranked at the same high level on both baseline and posttraining scores for demonstrating interest in speaking with
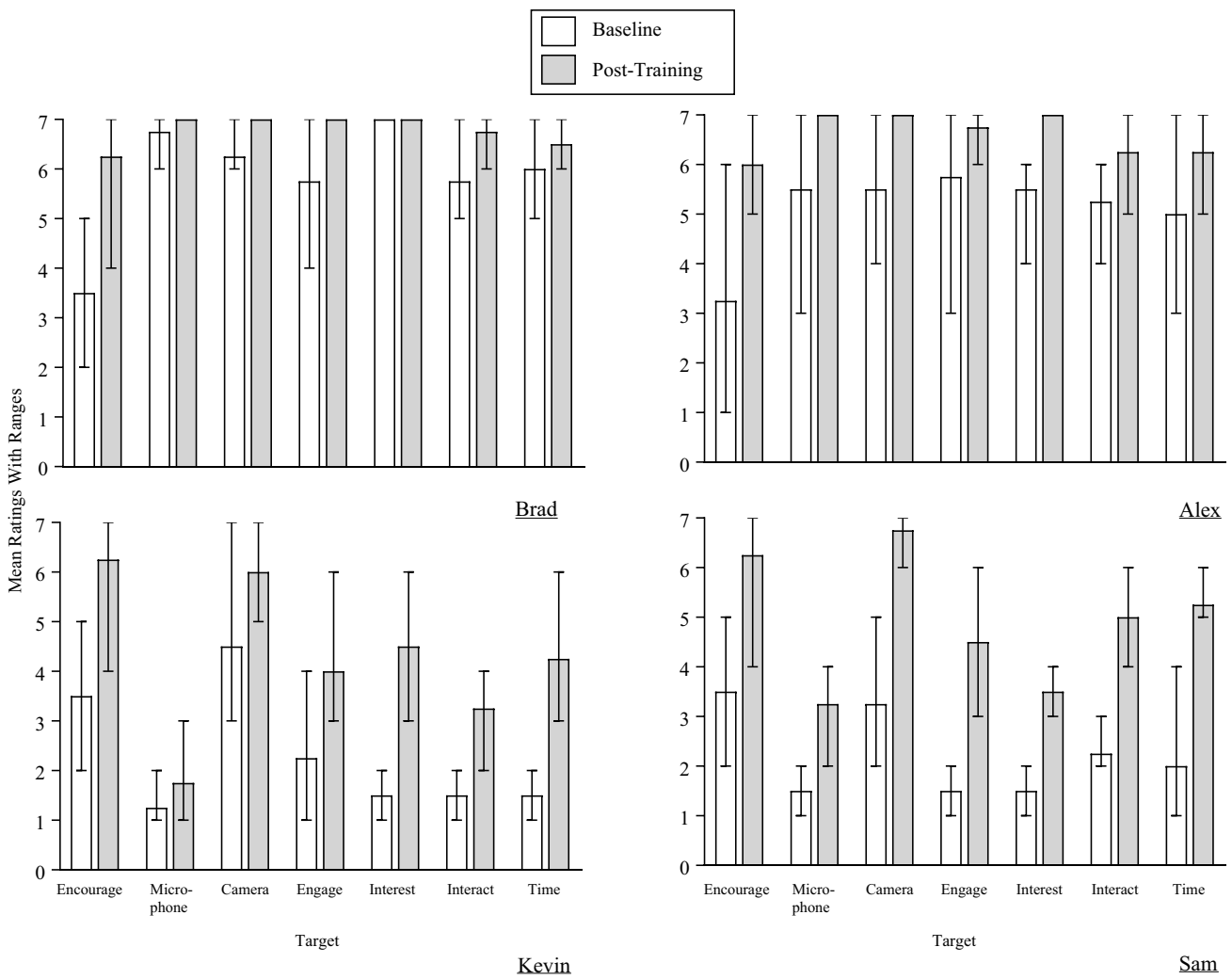
Fig. 3 Mean Social Validity Ratings (with Ranges) of Independent Observers

others. Ratings for Brad and Alex (top left and top right panels) showed a slightly less substantial improvement when compared to scores for Kevin and Sam (bottom left and bottom right panels), who had lower baseline scores as well. The independent observers also rated the participants higher on nontargeted skills in the post-training videos than in the baseline videos.

Participants and caregivers also completed social validity rankings. The number of participants endorsing each of the response options for each item on the survey is displayed in Table 2. All the participants "agreed" that the training helped them to use their microphone and camera correctly and that they provided more encouraging statements to their peers after the training. Three participants "agreed" and one participant "somewhat disagreed" that they liked receiving feedback on their performance. Three participants "agreed" and one participant "neither disagreed or agreed" that they liked when their peers acknowledged their encouraging

statements, whereas all participants "agreed" or "somewhat agreed" that they liked having conversations with their peers via Zoom™. Finally, all participants "agreed" that they would recommend this training to others.

Caregivers were asked if they had observed the participant in either the social skills group meetings or in other virtual meetings. If they indicated that they had done so, they were asked to rate the targets in the study in addition to other targets. Three of the four caregivers indicated that they had observed the participant during the social skills meetings "sometimes" or "half the time." The number of these caregivers who endorsed each of the response options for each item on this section of the survey is displayed in Table 2. All of them indicated that their participant "might or might not," "probably yes," or "definitely yes" have exhibited two of the targeted responses (using their microphones and cameras appropriately). On the other hand, two caregivers indicated that their participant "probably yes" or "definitely

yes" made encouraging statements to peers (the third targeted response), whereas one caregiver selected "definitely not" for this survey item. We purposely included additional, nontargeted responses on the caregiver's survey to obscure those that were the focus of the training. For those items, all caregivers indicated that their participant "might or might not," "probably yes," or "definitely yes" have spoken loudly enough and raised their hand to speak. All caregivers indicated that their participant did not need help logging in or out during the weekly group meeting. Lastly, when asked if their participant interrupted others during the weekly group meeting, one caregiver indicated "probably not" and two caregivers indicated "might or might not." The two caregivers who indicated that they had observed the participant in other virtual gatherings also indicated that the participant "probably" or "definitely" engaged in the three target responses during these gatherings.

Discussion

Results suggest that commonly used behavioral procedures, including BST and token reinforcement, provided in a group video conferencing format were highly effective for teaching a subset of skills needed for successful virtual interactions to adults with NDD. The findings appear promising on the basis of both the direct observation data and the social validity measures. The outcomes have important implications for assisting individuals with NDD so that they may successfully participate in videoconferences for educational, social, and professional purposes. The findings also are important because, to our knowledge, this is the first study providing evidence that adults with NDD may benefit from direct intervention via a group virtual format. The responses targeted in this study are just a subset of skills that may be needed to interact effectively with others on virtual platforms. As such, this study constitutes an initial demonstration of a therapeutic model to target these skills.

Results also revealed some of the limitations of this approach in terms of maintenance and generalization of skills. Encouraging statements, in particular, did not maintain when the experimenter transitioned from contingent to noncontingent token reinforcement delivery. Arranging reinforcement for peer acknowledgements of encouraging statements, intended to capture the putative natural contingencies of encouraging statements, was associated with the reemergence and short-term maintenance of encouraging statements. Levels were similar to those obtained under the contingent reinforcement condition. This outcome suggests that this target might, in fact, maintain in settings where others provide this type of natural consequence. It should be noted, however, that the participants' encouraging statements were on relatively dense schedules of reinforcement

(i.e., 50%–100% were acknowledged by peers), which may not be representative of typical naturalistic schedules. Thus, further research is needed to explore this approach to intervention. Brad's microphone use also was on a downward trend at the end of the maintenance period, suggesting that it may not have maintained over the long run.

Generalization to other hosts and situations also had variable success. For most participants and targets, levels of responding were similar to those in the training context. However, we also observed some exceptions, such as Brad's and Alex's responding during the second generalization probe meeting. Encouraging statements also appeared to decrease during the generalization probes, although analysis of this target is complicated by the decrement in responding during the ongoing maintenance (NCR) phase. We elected to further evaluate a potential approach for promoting maintenance of this skill, leaving the question of generalization unresolved. In an ideal situation, we should have continued to assess generalization of all three skills after encouraging statements reemerged under the final condition. We can conclude, however, that strategies such as teaching under more varied conditions (i.e., multiple exemplar training) likely will be needed to promote generalization of these skills beyond the training environment.

In fact, the experimenter introduced trainings with multiple exemplars towards the end of the evaluation; however, practical constraints prevented us from evaluating the efficacy of this training so we did not include it in the description of our procedures. During the trainings, the experimenter provided a rationale for the importance of emitting encouraging statements outside of the context of the social skills group and instructed the participants to role play scenarios involving a group meeting or discussion. The scenarios were designed to establish hypothetical situations during which the participants could emit encouraging statements. For example, participants were asked to pretend that they were local YMCA employees who were meeting to discuss how to increase participation in the summer sports programs using social media. After describing the scenario, the experimenter turned off his camera, and an alternative BCBA, who never hosted a meeting but was familiar to the participants, turned his camera on and served as the group lead to guide the discussion. The alternate host presented questions for discussion, such as "What types of social media can we use to get more people to sign up for our summer programs?" and "What activities can we offer to get more people interested in our sports program?" Further research is needed to evaluate the effectiveness of this approach.

We selected the desired levels of responding somewhat informally by observing neurotypical individuals' use of their microphone and camera during virtual meetings and by collecting data on the experimenter's frequency of encouragement statements during a weekly social skills

group meeting. As such, our goals for the participants may not reflect the typical performance of people attending virtual meetings. Indeed, it could be argued that many people who participate in virtual meetings do not mute and unmute the microphone, situate their camera so that their entire face can be seen, or deliver encouraging statements to their peers. However, each of these skills are important in some situations, such as during professional meetings, job interviews, and meetings with supervisors.

It also should be noted that the skills were chosen based on the experimenter's observations of the group prior to the study. During these initial observations, the experimenter could not see some of the participants adequately to determine if they were attending, had inappropriate views of the participants' setting (e.g., views of a participant's stomach or their bathroom), and heard inappropriate sounds (e.g., dogs barking, other family members talking loudly in the room), which made listening and speaking during the group meetings difficult. For these reasons, appropriate camera and microphone use were selected as target behaviors. The experimenter also observed few positive remarks and noted that two of the four participants interacted only with the experimenter rather than with the other participants. These observations were of concern given that the purpose of the group was to improve interactions in vocational and social settings. As such, encouraging statements toward peers was chosen as a target behavior because it addressed the need to increase participants' verbal support of and interactions with the other group members. Nonetheless, these skills may not be relevant for some contexts, such as informal family videoconferencing, social time with friends, or highly focused business meetings where the emphasis is on a shared screen or other factors. Teaching individuals to identify when these skills are important is a worthwhile topic of future research.

We supplemented these approaches for selecting socially valid goals with two measures for assessing the social validity of our outcomes. First, we asked the participants and their caregivers to complete surveys that solicited their opinions about the effectiveness of the training. Participants' responses demonstrate high levels of social validity; all participants indicated they had improved their performance in the targeted skills following intervention. The participants also agreed that they enjoyed the group conversations and that they would recommend the program to others. Although the participants were not explicitly asked to rate the meaningfulness of the skills to them, these results suggest that the participants felt that the skills were important. However, the significance of the skills to the participants should be evaluated in future research. Caregivers also ranked the intervention favorably, scoring the participants as having engaged in the target behaviors during the social skills meetings. In addition, two of the four caregivers reported they had likely observed their participant engaging in the target skills in other virtual settings, demonstrating possible generalization.

Second, we asked nursing students who were unaware of the purpose of the study to indicate how much they agreed with statements about the participants' responding prior to and following completion of the training. Across nearly all items, the nursing students provided higher ratings when viewing the posttraining videos compared to the baseline videos. Despite the subjective nature of the data, these findings suggested the goals selected for the participants produced noticeable improvements in the targeted responses. This would indicate that the targeted skills were socially significant because these improvements were observable by others. It is interesting that ratings for nearly all of the responses (both targeted and nontargeted) increased following the training. It is possible that changes in the three targets affected the professionals' perceptions of other participant responses included on the survey, such as how much they talked, whether they appeared engaged, and whether they had good social interaction skills. As an alternative, other social interaction skills that we did not measure may have improved over time as a result of ongoing involvement in the virtual group social skills meetings. It should be noted, however, that the one nontargeted response measured in this study (percentage of intervals with appropriate responses) remained relatively stable across the duration of the evaluation. Along with the participants' opinions about the appropriateness of the training procedures, our social validity measures provide strong support for the social validity of the goals, procedures, and outcomes. Future research would be beneficial on the best way to determine the most meaningful skills necessary for videoconferencing.

Other limitations should be noted. Levels of encouraging statements for two of four participants (Kevin and Sam) frequently remained below the selected goal (20% of intervals), even under contingent token reinforcement. Nonetheless, levels continued to remain above baseline although they infrequently met the reinforcement criterion. The use of a token economy and contrived reinforcers also limited the study in several respects. As noted previously, the participants had a history of earning tokens during this previously existing social skills group, and they had requested the opportunity to continue earning these tokens with the shift to the virtual format, because they found them very reinforcing. The experimenter also asked all group members periodically throughout the study if they approved of the token system and the rewards, and all of the participants gave positive responses. In addition, the participants unanimously reported on the social validity survey that they had enjoyed earning virtual tokens. However, immediate delivery of the backup reinforcers was somewhat challenging because training necessarily occurred in a virtual environment. The experimenter delivered some of the reinforcers

electronically (e.g., sent gift cards via email) but had to transport other selected reinforcers, such as food or drink, to the participants' homes to ensure that they received the reinforcers in a timely manner (i.e., within 24 hr of the token exchange). Such an arrangement likely would not be practical for clinicians. Thus, further research should evaluate the efficacy of using only backup reinforcers that can be delivered electronically or the efficacy of token economies that include a delay between the token exchange and receipt of a mailed backup reinforcer.

Another disadvantage of using contrived reinforcers is that they need to be faded and replaced with natural reinforcers. The experimenter partially faded both the vocal feedback and the tokens over time and, for encouraging statements, replaced the tokens with more natural reinforcement in the form of acknowledgement by peers. It is interesting to note that three out of four of the participants reported they liked when the peers acknowledged their encouraging statements, whereas all participants reported they enjoyed earning tokens. Nonetheless, researchers and clinicians should always evaluate the participants and setting when determining whether tokens are appropriate and consider participant preference as a primary factor in this decision.

Clinicians should prepare individuals with NDD to successfully engage with others in virtual formats because of the growing popularity of videoconferencing for group-based interaction, which has been accelerated by the COVID-19 pandemic. The current study represents a first step for identifying approaches that will assist those with NDD to successfully connect with their social, educational, and professional communities via virtual modalities. Further research is needed to identify and target the variety of skills needed to engage remotely with others and to ensure that those skills generalize and maintain over time.

Declarations

Conflicts of Interest The authors have no conflicts of interest to disclose.

Ethics Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional review board of the university and with the 1964 Helsinki declaration and its later amendments.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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