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A translational evaluation of listener interest on the presentation of conversation topics to individuals who exhibit restricted interests

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Listener behavior has been shown to influence speaker behavior. However, little is known about the extent to which listener behavior can influence countertherapeutic outcomes. This study evaluated the influence of listener interest on the topics presented by adult participants conversing with an experimenter acting as an individual who exhibited restricted interests. Each session consisted of a 5-min conversation, during which the participant was instructed to talk about 3 topics. We compared the duration of topic presentation across phases in which the experimenter behaved as an interested listener for 1 topic or for all 3 topics. Results showed that topic presentation was controlled by listener interest and all participants reported that the simulation was believable, acceptable, and useful. Although preliminary, these findings have implications for understanding possible undesirable interactions between individuals diagnosed with autism spectrum disorder who exhibit restricted interests and their peers or caregivers.

Key words: adherence, autism, child effects, conversation, restricted interests

Listener behavior plays a central role in the acquisition of verbal behavior (Petursdottir & Mellor, 2017; Schlinger, 2008; Skinner, 1957). The reactions of listeners have been shown to influence who speakers talk to, who they orient toward, and what they say (Borrero et al., 2007; Conger & Killeen, 1974; Salzinger & Pisoni, 1960). However, the extent to which listener interest can influence speaker behavior has yet to be evaluated. Restricted (or circumscribed) interests are a common characteristic of autism spectrum disorder (ASD) that can have a negative impact on socialization and relationships (American Psychiatric Association, 2013; Klin et al., 2007; Mercier et al., 2000; South et al., 2005; Turner-Brown et al., 2011). The listener behavior of those with restricted interests may impact who talks to them and what is said. Caregivers and peers have reported that they avoid social interactions with individuals who talk excessively about restricted interests and appear uninterested in other topics (Mercier et al., 2000).

Because making and maintaining relationships may require conversing about topics outside of their restricted interests (Black & Hazen, 1990; see also Rodriguez & Thompson, 2015; VanBergeijk et al., 2008), researchers have evaluated strategies for increasing conversation about nonrestricted topics (Fisher et al., 2013; Kuntz et al., 2020; Lepper et al., 2017; Noel & Rubow, 2018; Rehfeldt & Chambers, 2003; Roantree & Kennedy, 2012; Stocco et al., 2021). Although components of these strategies often vary (e.g., the form and schedule of reinforcement), the presentation of nonrestricted topics and differential reinforcement of related speech are quite standard. For example, Fisher et al. (2013) allowed participants to converse about their restricted topic following conversation about nonrestricted topics or a therapist-selected

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topic for a specific duration. Despite the positive outcomes associated with these interventions, little is known about the variables that influence countertherapeutic interactions (e.g., avoiding presentation of nonrestricted topics) between individuals who exhibit restricted interests and their caregivers or peers.

Child behavior can reinforce countertherapeutic responses, resulting in adverse interactions or caregiver nonadherence to recommended interventions (Allen & Warzak, 2000; Stocco & Thompson, 2015). For example, caregivers might avoid academic instruction (Carr et al., 1991), provide more reprimands (Miller et al., 2010; Sloman et al., 2005), and revert to reinforcing problem behavior following training on therapeutic interventions (Addison & Lerman, 2009) because these responses are reinforced by the temporary cessation of problem behavior. In the area of restricted interests, Stocco et al. (2011) found that children with restricted interests engaged in more problem behavior and appeared uninterested when caregivers presented leisure items that were outside of their limited interests. For example, one child (Wayne) displayed an intense interest in roller coasters. When a caregiver presented items that did not involve roller coasters (e.g., a book about bears), Wayne aggressed toward the caregiver, made negative vocalizations (e.g., screaming), or made avoidance responses (e.g., blocked the presentation of the item). In contrast, children without restricted interests tended to appear interested in all leisure items and did not engage in problem behavior. Caregivers tended to avoid the presentation of leisure items that were outside of a child's restricted interests and sometimes presented restricted interest items exclusively during the entire 10-min play periods. Caregiver behavior did not seem to be affected by the behavior of children without restricted interests as they presented all items more equitably to these children. In short, individuals who exhibit restricted interests might engage in responses that can impact the range of stimuli presented to them in social interactions.

Compared to their neurotypical peers, individuals with ASD are more likely to be unresponsive to, or appear uninterested in, general conversation topics introduced by a partner (Capps et al., 1998; Turkstra et al., 2003). If the restricted interests of an individual with ASD influence the topics presented to them, the therapeutic goal of increasing conversation about nonrestricted topics may not be achieved, which could have a negative impact on socialization and relationships. Over time, caregivers or peers might avoid the presentation of nonrestricted topics or predominantly present restricted topics. As a result, individuals with ASD could have fewer social interactions with individuals who do not share their interests. To date, no studies have evaluated the influence of listener interest on the presentation of conversation topics to individuals who exhibit restricted interests.

In a review of the literature, Stocco and Thompson (2015) reported that researchers have used apparatuses (e.g., tones; Mulhern & Passman, 1979), simulator dolls (Thompson et al., 2011), and experimenters (Miller et al., 2010) as proxies to analyze how caregiver responses are influenced by the behavior of those they care for. For example, in a follow-up to Addison and Lerman (2009), Miller et al. (2010) instructed participants to teach skills (e.g., matching colors) to an adult confederate acting as a student. Participants were college students enrolled in a teacher certification program. Results of this study showed that participant reprimands were sensitive to negative reinforcement such that they tended to give more reprimands when those responses resulted in a decrease in confederate–student problem behavior. Although adults commonly simulate learners during role-play components of staff and parent training procedures (Kaminski et al., 2008; Parsons et al., 2012; Shriver & Allen, 2008), Miller et al. is the only study where researchers used a confederate to experimentally evaluate the influence of consumer

behavior on caregiver responses. Using confederate consumers to evaluate the influence of their behavior on caregiver responses during social interactions could be useful for two reasons. First, researchers can increase the internal validity of their research by eliminating extraneous actions (e.g., facial expressions) that an individual with ASD might exhibit during naturalistic observations or by holding those actions constant across experimental conditions. Second, researchers can systematically manipulate confederate-learner responses to assess caregiver responding in a variety of scenarios. This research is important because understanding variables that influence social interactions between consumers and their caregivers could contribute to the success of social skills interventions for individuals with ASD.

The purpose of this study was to evaluate the influence of listener behavior on the presentation of restricted and nonrestricted topics to simulate conversations between individuals with ASD who exhibit restricted interests and their caregivers or peers. Participants in this study had conversations with an experimenter who played the role of an individual with ASD. The experimenter behaved as an interested listener for one (restricted interest) or all three (distributed interests) topics of conversation across phases in a reversal design. After a debriefing, participants completed a social validity questionnaire that asked about the believability and acceptability of participating in this type of simulation.

Method

Participants, Setting, and Experimenters

We recruited three 19-year-old female undergraduate students through fliers posted on course websites and a research participation website within the Psychology department. Participants reported no experience working with individuals diagnosed with ASD but expressed interest in doing so in their future careers. Two participants were psychology majors (Emily, Katie) and one was a biology major (Elena). Students received extra credit in one of their current courses for participating. Sessions were conducted in a university laboratory equipped with a one-way observation window and included items typically found in this space (e.g., chairs, a table).

Three experimenters were involved in recruiting participants or conducting sessions. Experimenter 1 recruited participants and delivered instructions to the participants at the beginning of the study and after prolonged breaks, Experimenter 2 collected data from behind the one-way observation window, and Experimenter 3 (first author) served as a confederate individual with ASD who had restricted interests. All three experimenters were Asian or White female graduate students in their mid-20's who were enrolled in a master's program in behavior analysis. To reduce the possibility of participants discovering that Experimenter 3 was a confederate who was not diagnosed with ASD, all fliers, emails, and consent forms included the name of Experimenter 1. We obtained approval from the institutional review board (IRB) at University of the Pacific.

Preassessment

We gave participants a questionnaire to identify the target topics of conversation for each session (Supporting Information 1). The possible topics on this questionnaire were derived from Stocco et al. (2021) in which caregivers of individuals diagnosed with disabilities were asked to identify meaningful conversation topics. Participants sorted topics into one of three categories: topics they enjoyed talking about or talked about daily (high preference), topics they avoided talking about or did not talk about daily (low preference), and neutral topics or those that they did not talk about daily (moderate preference). To minimize the potential influence of participant preference on

topic presentation, we used three topics identified by the participant as high preference topics during sessions. We did not use moderate preference topics because each participant identified at least three high preference topics and we thought that talking about high preference topics would increase the likelihood of voluntary participation. Out of the three high preference topics, one topic was selected as the restricted topic. We did not use low preference topics because doing so may have reduced the possibility of voluntary participation.

Measurement

Similar to Hughes et al. (1995), *presentations by topic* was defined as statements or questions related to the topics that were assigned to each session. For example, "What did you do at school today?" was scored as the presentation of school. Nonexamples included statements or questions unrelated to the assigned topics and vocalizations such as "mmhm" or "yeah." To inform decisions about switching phases, we measured the duration of presentations by topic from behind the one-way mirror during sessions using a data collection program (Instant Data PC). However, because conversations often involve dynamic shifts between topics, we reported data collected from video recordings of sessions. We collected data from recordings so observers could pause, fast-forward, and rewind videos if the content of speech (e.g., topic or actual speech) was initially unclear. To increase the accuracy of measurement, we used onset and offset criteria. The start of statements or questions related to a topic marked the onset of a topic; the offset of a topic included the start of a statement or question related to a different topic or discontinuing speech for 3 s. For example, if a participant said, "I like listening to music in the car, where do you like to listen to music," the observer scored "I like…" as the onset and 3 s after "…listen to music" as the offset. Presentation of the restricted and nonrestricted topics were not mutually exclusive and were scored simultaneously when the participant presented two or more topics at the same time. For example, if the restricted topic was music and the nonrestricted topic was family, a statement like, "My family likes to listen to the radio," counted toward the duration of presentation for music and family. Observers also calculated the participant's total duration of topics presented per session by adding the duration of presentation for the restricted and nonrestricted topics.

Interobserver Agreement and Training

Interobserver agreement data were collected for 66% of sessions. We calculated mean duration-per-interval agreement for duration of presentations by topic using the following formula (± 3 s short duration ÷ long duration x 100). An agreement was scored when the primary and secondary observer recorded the occurrence and same duration of the topic that was presented within a ± 3-s window. Mean interobserver agreement for presentation of the restricted topic was 96% (range, 84%–100%) for Emily, 95% (range, 87%–100%) for Katie, and 96% (range, 90%–100%) for Elena. Mean interobserver agreement for presentation of the Nonrestricted Topic 1 was 100% for Emily, 97% (range, 91%–100%) for Katie, and 96% (range, 90%–100%) for Elena. Mean interobserver agreement for presentation of Nonrestricted Topic 2 was 99% (range, 94%–100%) for Emily, 98% (range, 94%–100%) for Katie, and 88% (range, 80%–97%) for Elena.

The primary investigator provided secondary data collectors with written instructions and operational definitions that included examples of the dependent variable. Before scoring sessions, the secondary data collectors were trained on data collection using practice videos that were created by the experimenters that showed role-plays of sessions between Experimenters

1 and 3 until they obtained an agreement coefficient of 80% or higher with the primary investigator.

Procedure

Sessions were completed in 2-hr blocks, and all sessions per participant were completed in 1 day. Each session within a 2-hr block consisted of a 5-min conversation between the confederate and a participant. Prior to the first session, Experimenter 1 obtained informed consent from the participant. To conceal the true purpose of the study, the experimenter deceived the participant by telling them that the purpose of the study was to engage in conversations with an individual diagnosed with ASD who recently completed a social skills program that specifically aimed at increasing the range of topics she talked about. We deceived participants to arrange a context that most closely approximates engaging in conversations with someone who has ASD and restricted interests in everyday life. Participants were told that they could discontinue their participation at any time and would still receive some course credit. Before the first session, Experimenter 1 provided the participant with the following set of instructions:

> "You will be talking to an adult diagnosed with ASD who recently completed a social skills program administered by our team. Her family members reported that she tends to talk excessively about (insert restricted topic), and they asked us to address this issue in our program. So, we have been working on increasing the range of topics she talks about during conversation. We are asking you to talk with her to see how she does with other people who were not a part of our social skills program. You will be given a list of 3 topics, one of which is (insert restricted topic). Please try to present all of the topics but do whatever comes naturally to you. Please do not present topics that are not on the list. We will notify you when the session begins and ends."

The participant was able to present the topics in any order during the session and each session was assigned the same 3 topics. The experimenter provided the participant with an index card that listed the topics of conversation.

During each session, the confederate acted interested by orienting her body and head toward the participant, providing eye contact, smiling, making statements or asking questions that were in response to the participant's topic, and providing brief vocal feedback (e.g., "Nice" or "I like that too") or uninterested by orienting her body and head away from the participant, removing eye contact, leaning her head on her hand, sighing, and making brief statements (e.g., "I don't know" or "nothing"; Peters & Thompson, 2015). The following conditions were evaluated using a BAB reversal design.

Restricted Interest

The confederate began the session by acting uninterested and continued doing so if the participant presented the nonrestricted topics (e.g., family). The confederate acted interested contingent on the participant's presentation of the restricted topic (e.g., music). If the participant stopped presenting topics for 3 s, the confederate gradually stopped acting interested by removing eye contact and slowly turning her body away from the participant until she was no longer facing the participant. The confederate remained uninterested until the participant presented the restricted topic again. The confederate acted uninterested if the participant presented any topics that were not assigned to the sessions.

Distributed Interests

This was similar to the restricted interest condition except that the confederate acted interested contingent on the participant's presentation of any of the three topics.

Procedural Integrity

Observers collected data on procedural integrity for 33% of sessions using momentary time sampling with 5-s intervals. Integrity was scored when the confederate provided the appropriate consequence for the participant's presentation of topics across conditions. For example, integrity was scored if the confederate oriented her body toward the participant and engaged in at least one other interested response (e.g., nodded head) after the participant presented the restricted topic during the restricted interest condition. An error was scored if the confederate did not provide the appropriate consequence during each condition. For example, an error was scored if the confederate oriented her body toward the participant but sighed and leaned her head on her hand after the participant presented the restricted topic during the restricted interest condition. If the participant did not present a topic or presented topics that were not assigned to the session, then integrity was scored when the confederate turned her body away from the participant and engaged in at least one other uninterested response (e.g., sighed). The percentage of total intervals with integrity was calculated by dividing the number of intervals with integrity by the total number of intervals. Mean percentage of intervals with integrity was 99% (range, 98%–100%) for sessions with Elena, 99.5% (range, 98%–100%) for sessions with Emily, and 100% for sessions with Katie.

Debriefing and Social Validity

Experimenter 1 debriefed the participants on the purpose of the study, informed the participants that the confederate did not have a diagnosis of ASD, and showed the participants their data. For example, Experimenter 1 followed a script like the one below:

> The purpose of this study was to experimentally evaluate the influence of the interested or uninterested responses of an individual diagnosed with ASD on the topics presented by a conversation partner. The broader goal of our research is to understand factors that may influence the restricted interests of individuals diagnosed with ASD. In this study, you were asked to engage in several conversations with an individual diagnosed with ASD. However, this individual does not actually have a diagnosis of ASD. We withheld this information from you to observe your responses and reactions under the context of being told that you were talking to an individual diagnosed with ASD. We also want to show you a graph of the data we collected from your sessions. In the restricted-interests condition, the experimenter was instructed to act interested if you presented her restricted topic. If you presented a nonrestricted topic, then the experimenter was instructed to act uninterested. In the distributed-interests condition, the experimenter acted interested when you presented any of the topics. During these conversations, we looked at the topics you presented and how long you talked about each of them with the experimenter who acted as an individual diagnosed with ASD. We found that you presented the restricted topic for longer durations than the nonrestricted topic during the restricted-interests condition. During the distributed-interests condition, you presented all three topics for similar durations. When we repeated the restricted-interests condition, your responses were similar to the first time that we implemented this condition. This suggests that your behavior of presenting topics was sensitive to the experimenter's programmed reactions. Therefore, you presented topics that resulted in the experimenter acting interested for longer durations than topics that resulted in the experimenter acting uninterested.

Participants were asked to fill out a social validity questionnaire after their final session (Supporting Information 2). The questionnaire used a 7-point Likert-type scale to assess the acceptability of participating in this type of

Figure 1

The Total Duration of Topics Presented by Session (Top) and Second-By-Second Within-Session Data for Restricted (Middle) and Distributed (Bottom) Interest Phases for Elena

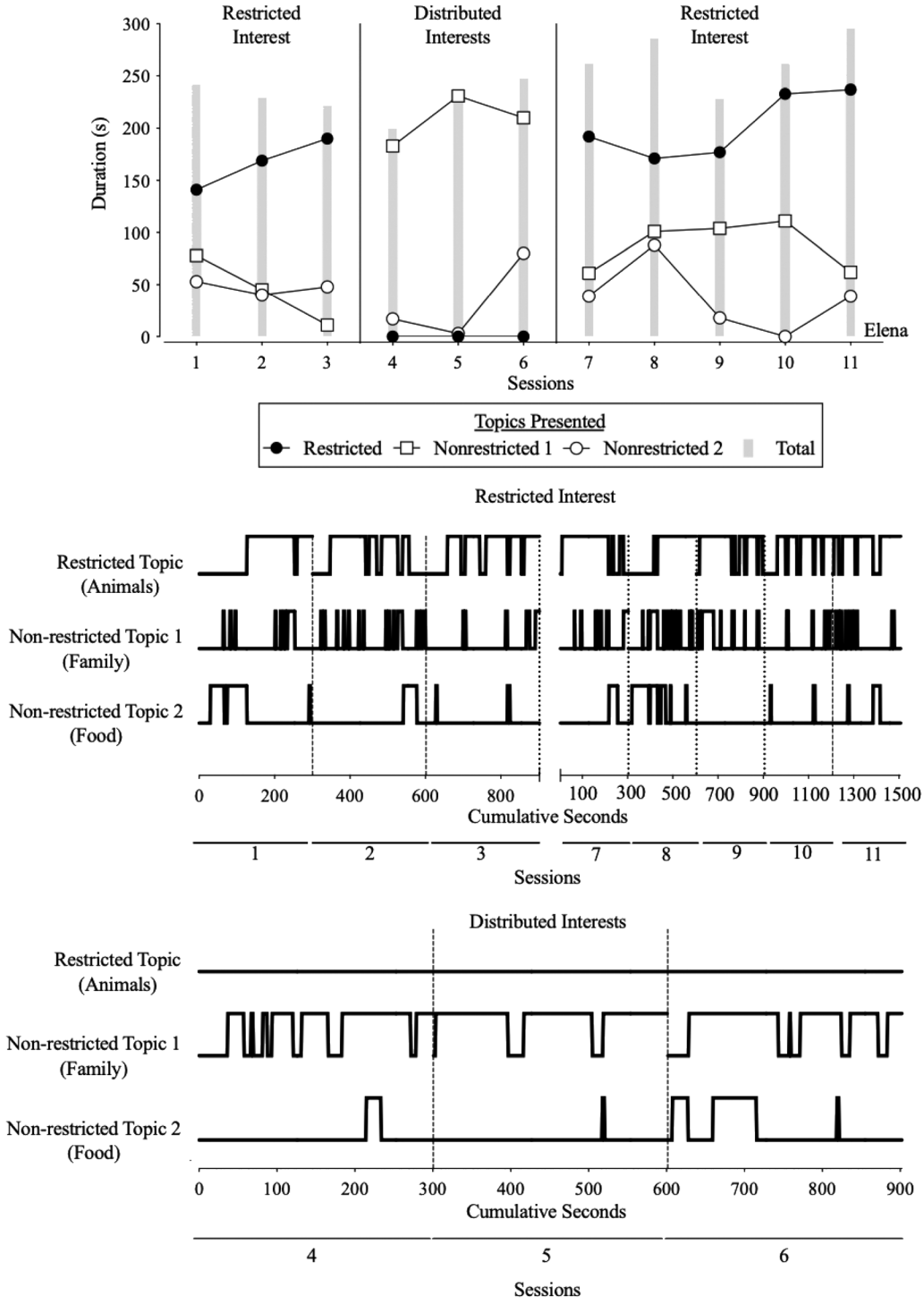


Figure 2

The Total Duration of Topics Presented by Session (Top) and Second-By-Second Within-Session Data for Restricted (Middle) and Distributed (Bottom) Interest Phases for Emily

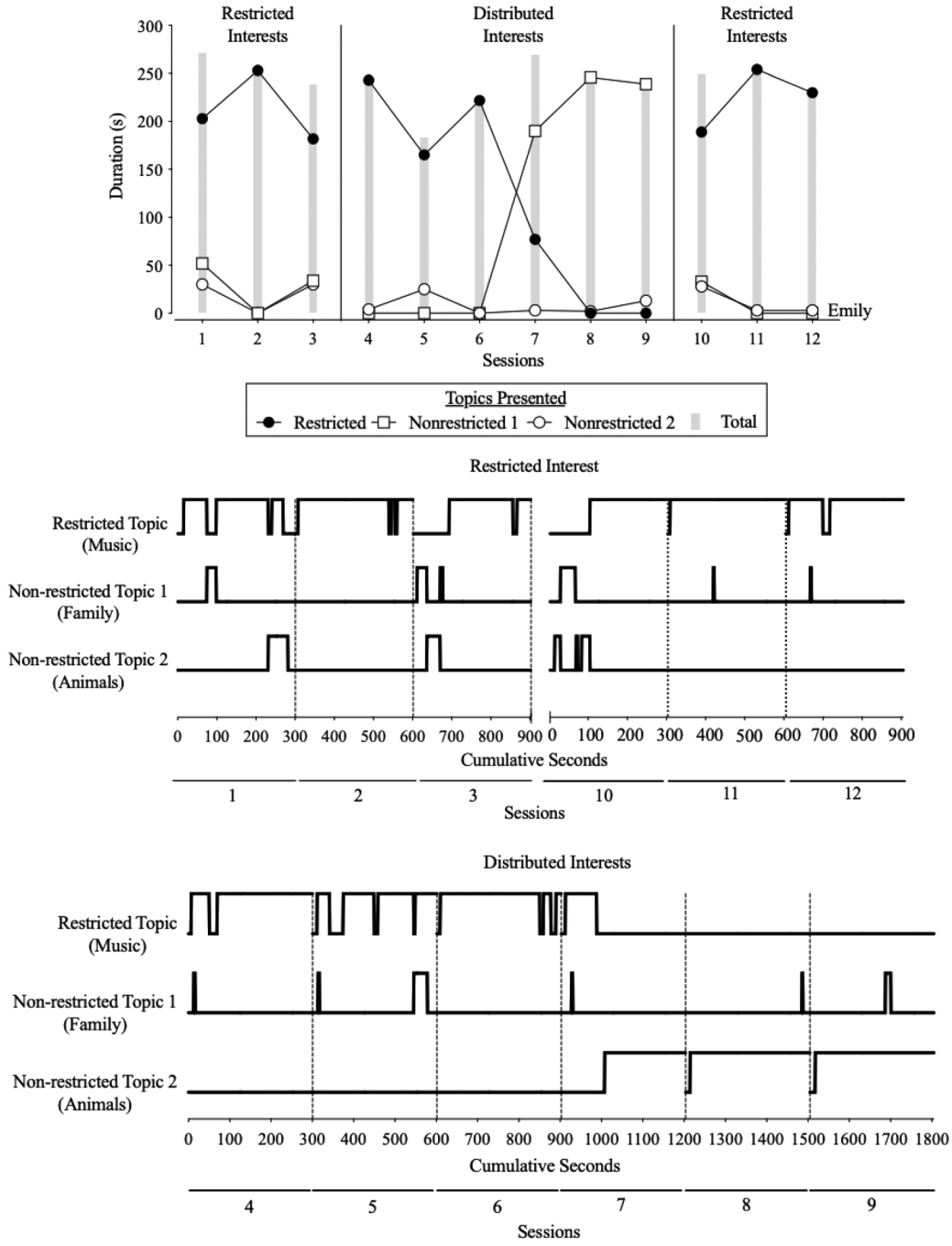
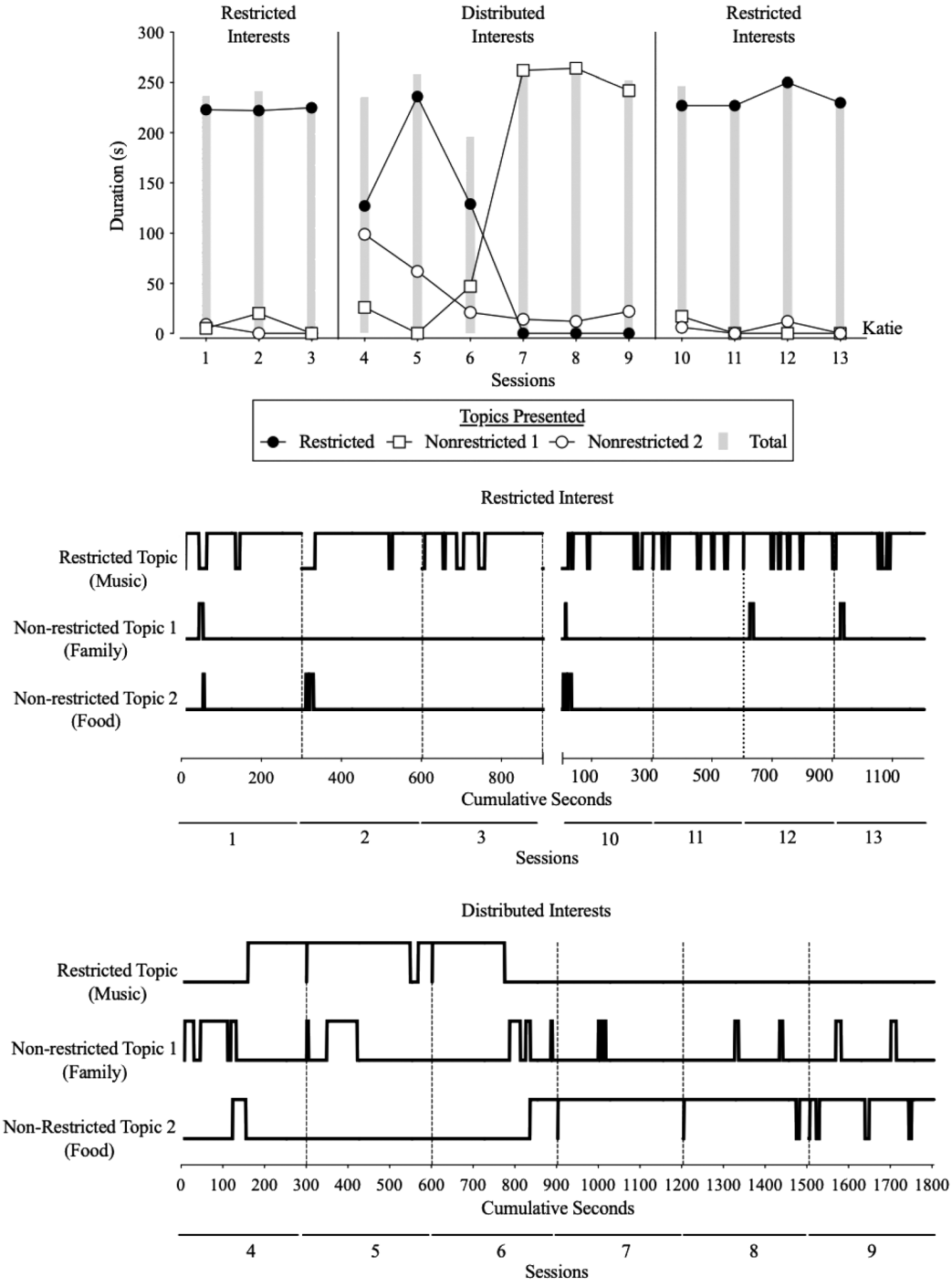


Figure 3

The Total Duration of Topics Presented by Session (Top) and Second-By-Second Within-Session Data for Restricted (Middle) and Distributed (Bottom) Interest Phases for Katie



simulation, the likelihood that the participant would participate in a similar simulation in the future, the acceptability of developing intervention goals that focus on decreasing restricted interests, and the believability of the simulation.

Results

Figures 1–3 illustrate the results for each participant. The top panel of each figure depicts the total duration of topics presented. During both restricted interest phases, all participants presented the restricted topic for longer durations than the nonrestricted topics, and during some sessions, we observed the exclusive presentation of the restricted topic. Exclusive presentation of the restricted topic occurred during three sessions for Emily and Katie in the restricted interest phases. The opposite effect was found in the distributed interests' condition in which all participants presented at least one of the nonrestricted topics for longer durations than the restricted topic, and during some sessions, we observed the exclusive presentation of one of the nonrestricted topics. Exclusive presentation of a nonrestricted topic occurred during three sessions for Elena and Katie and two sessions for Emily. This effect was a bit delayed for Katie and Emily as they continued to present the restricted topic for longer durations during the first three sessions of the distributed interests' condition and switched to presenting one of the nonrestricted topics in the last three sessions.

The grey bars depict the participant's total duration of topics presented per session. Mean duration of total topics presented during the first restricted interest condition was 231 s (range, 222–242 s) for Elena, 254 s (range, 239–274 s) for Emily, and 234 s (range, 225–242 s) for Katie. During the distributed interests' condition, mean duration of total topics presented was 227 s (range, 200–248 s) for Elena, 235 s (range, 184–270 s) for Emily, and 246 s (range, 197–266 s) for Katie. Mean duration of total topics presented during the second restricted interest condition was 267 s (range, 229–296 s) for Elena, 247 s (range, 233–257 s) for Emily, and 238 s (range, 227–251 s) for Katie.

The middle and bottom panels of Figures 1–3 are event diagrams that illustrate within-session data for each participant during the restricted and distributed interests' conditions, respectively. As depicted by the blip in the corresponding data path, all participants consistently presented the restricted topic for longer durations in the restricted interest condition. For example, Katie (Figure 3) presented music (restricted) at the beginning of Session 1. She then presented family (nonrestricted) and food (nonrestricted) before returning to music for the remainder of the session. In the distributed interests' condition, we observed participants present one of the nonrestricted topics for longer durations. For example, Elena

Table 1

Participant Social Validity Ratings

Questionnaire Items	Emily	Katie	Elena	Mean
Rate the acceptability of engaging in conversations with an experimenter.	6	6	5	5.67
How likely would you participate in this type of simulation in the future?	6	6	6	6
Rate the acceptability of developing intervention goals that focus on decreasing restricted interests.	7	5	5	5.67
Rate the believability of the simulation.	6	7	7	6.67

Note. 1 = not acceptable, not likely, not believable and 7 = highly acceptable, very likely, highly believable.

(Figure 1) presented family (nonrestricted) and food (nonrestricted) in Session 1. She did not present animals (restricted) as depicted by the flat data path.

Results from the social validity questionnaire are depicted in Table 1. Participants rated the procedures, goals, outcomes, and believability highly.

Discussion

This study evaluated the influence of listener interest on the topics presented by adult participants conversing with an experimenter acting as an individual with restricted interests. The results add to the literature on consumer variables that influence caregiver behavior (Addison & Lerman, 2009; Miller et al., 2010; Sloman et al., 2005; Stocco et al., 2011) by showing that listener interest influenced the presentation of topics by all participants. Despite receiving instructions to present each topic during the session, all participants presented the restricted topic for longer durations than nonrestricted topics when the confederate's interest was contingent on the presentation of the restricted topic. When the contingency was reversed and the confederate behaved as an interested listener for all three topics (i.e., distributed interests), the participant presented one (Elena, Emily) or both (Katie) of the nonrestricted topics for longer durations. Thus, the interest exhibited by consumers appears to be one variable that can influence the range of topics presented by caregivers or peers during conversations.

These outcomes correspond with studies indicating (Addison & Lerman, 2009; Carr et al., 1991; Sloman et al., 2005; Stocco et al., 2011) or demonstrating (Miller et al., 2010) behavioral processes that may influence countertherapeutic interactions with individuals diagnosed with ASD (Stocco & Thompson, 2015). However, there are multiple interpretations of the behavioral processes that might be responsible for these outcomes.

One interpretation has been described as a negative reinforcement trap (Patterson, 2002). Similar to research suggesting that the temporary cessation of problem behavior might reinforce caregiver reprimands (Addison & Lerman, 2009; Miller et al., 2010; Sloman et al., 2005), the avoidance of learning opportunities (Addison & Lerman, 2009; Carr et al., 1991), or caregiver presentation of restricted interest leisure items (Stocco et al., 2011), conversation patterns that lean more toward restricted interests might be reinforced by the removal of uninterested responses. As illustrated in the middle panels of Figures 1–3, participants presented nonrestricted topics for short durations during phases of restricted interests (i.e., when they produced uninterested responses). It is possible that uninterested responses established their removal as reinforcing and evoked the presentation of restricted topics that characteristically produced this outcome when conversing with the confederate.

A second interpretation has been described as a positive reinforcement trap (Patterson, 2002). When the participant presented restricted interest topics, the confederate oriented her body and head toward the participant, provided eye contact, smiled, and made statements or asked questions that indicated her interest in the topic. Interested responses may have reinforced the presentation of restricted topics and functioned as discriminative stimuli for continuing conversation about topics that produced listener interest.

It is possible that these two reinforcement traps explain how caregivers or peers inadvertently reinforce problematic patterns of conversation around restricted interests and why family members complain that they "can't talk about anything else" (Mercier et al., 2000, p. 414). However, little is known about how these findings correspond with the typical conversations between individuals diagnosed with ASD and their caregivers or peers. Future research should include observational studies that describe naturally occurring conversations

between individuals diagnosed with ASD who exhibit restricted interests and their family members, peers, teachers, or therapists. There may be important differences between how we manipulated listener interest and how individuals with ASD exhibit interest during conversations or in behavioral sensitivity to listener interest across types of conversation partners (see also Baer, 1973).

Despite demonstrating the influence of listener responses, topic presentation may have been influenced by at least two other factors. First, additional reinforcement could occur through participants listening to themselves talk about certain topics (Palmer, 1998; Schlinger, 2008). We attempted to include topics that were equally preferred, but it is possible that our preassessment did not capture important differences in the topics that participants self-reported as highly preferred. For example, Elena consistently presented family (Nonrestricted Topic 1) for longer durations than food (Nonrestricted Topic 2) as a topic of conversation across all phases. Moreover, none of the participants presented topics equally when any topic produced interested listener responses during distributed interests' phases. For instance, when performance stabilized in the last three sessions of the distributed interests' phase, Emily and Katie engaged in near exclusive presentation of animals or food (Nonrestricted Topic 1), respectively. This indicates that talking about some topics may have been more reinforcing than others. Future research could incorporate procedures that identify more objective hierarchies of preferred topics for participants. For example, researchers could use a free-operant assessment that measures the relative duration about which a participant talks about a given topic. Second, instructions provided by the experimenter at the start of sessions or rules derived by participants during sessions could have influenced patterns of topic presentation (see Baron & Galizio, 1983). For example, Elena's presentation of nonrestricted topics during restricted interests' phases, despite contacting uninterested listener responses, could be due to the instruction to present all three topics. Alternatively, Elena's performance could have been impacted by self-generated rules that occasioned the presentation of topics in a certain order. As illustrated in the middle panel of Figure 1, Elena frequently presented a nonrestricted topic either before or at the same time as presenting the restricted topic. Given the potential influence of instructions or self-generated rules, future studies could manipulate experimenter-delivered instructions or include additional measures, such as asking participants to think aloud during sessions (Austin & Delaney, 1998), that would allow for further evaluation of the influence of instructions or rules on topic presentation.

Uncovering the behavioral processes that influence the presentation of restricted interests may be a necessary step toward understanding nonadherence and, therefore, designing interventions that promote adherence (Allen & Warzak, 2000; Stocco & Thompson, 2015). Although studies have reported effective interventions for excessive speech about restricted topics (Fisher et al., 2013; Kuntz et al., 2020; Lepper et al., 2017; Noel & Rubow, 2018; Rehfeldt & Chambers, 2003; Roantree & Kennedy, 2012; Stewart et al., 2007; Stocco et al., 2021), adherence to interventions has not been evaluated. These results suggest that adherence might depend on behavioral sensitivity to escape from uninterested listener responses. Despite receiving instructions to present all three topics, Emily and Katie rarely presented nonrestricted topics and sometimes exclusively presented the restricted topic during phases of restricted interests (Figures 2 & 3). Based on these findings, interventions that require caregivers to present nonrestricted topics may not be implemented with fidelity if they produce high rates of uninterested responses. For example, a majority of published studies have included interventions for decreasing speech about restricted interests in which high-quality attention is delivered only for speech about nonrestricted topics and withheld for speech about restricted topics (Kuntz et al., 2020; Rehfeldt & Chambers, 2003; Roantree & Kennedy, 2012). Because intervention entails withholding conversation about restricted topics, caregivers may

experience higher rates of uninterested responses. As a result, caregivers may stop presenting nonrestricted topics, while continuing to withhold reinforcement for restricted topics, which could lead to fewer social interactions between individuals diagnosed with ASD, who have restricted conversation interests, and their caregivers.

In contrast with Emily and Katie, Elena adhered to the experimenter's instruction and persistently presented nonrestricted topics. It is important to note that Elena largely avoided or minimized uninterested responses by either (a) pairing the presentation of the restricted topic with one of the nonrestricted topics or (b) sequencing the presentation of topics by presenting the restricted topic after a nonrestricted topic (Figure 1). The results for Elena suggest that adherence might be more likely when interventions incorporate restricted interests (see Gunn & Delafield-Butt, 2016; Harrop et al., 2019), such as using access to restricted topics as reinforcement for speech about nonrestricted topics (Fisher et al., 2013; Stocco et al., 2021). Future research could compare caregiver adherence across interventions with (Fisher et al., 2013; Stocco et al., 2021) and without (Kuntz et al., 2020; Rehfeldt & Chambers, 2003; Roantree & Kennedy, 2012) using restricted topics as reinforcement.

Although these results and the implications for applied practice are promising, it is unclear if specific listener responses, or combination of responses (Michael et al., 2011), reinforced participant presentation of topics. It is also possible that topic presentation was reinforced by the content of the confederate's verbal responses during conversation when they engaged in interested responses. A component analysis would reveal the listener responses that reinforced presentation of restricted topics, and future caregiver training programs could focus on developing interventions that incorporate reinforcement for caregivers and consumers. For example, eye contact may not be as influential as vocal feedback (e.g., "Uh huh") and speech content. As a result, social skills interventions could focus on teaching caregivers to provide reinforcement (e.g., access to restricted topics) for listener responses that reinforce targeted caregiver responses such as the presentation of nonrestricted topics.

This study showed that the presentation of conversation topics was controlled by listener interest and added to literature on manipulation by proxy (e.g., Miller et al., 2010; see also Stocco & Thompson, 2015). These findings support the viability of manipulation by proxy when evaluating the influence of the behavior of consumers on the behavior of their caregivers. By using confederate consumers, we controlled for the relevant variables (e.g., facial expressions) and minimized the likelihood of unsystematic variations in consumer responses. Moreover, participants rated the simulation as highly believable. These findings suggest that the listener interest exhibited by individuals diagnosed with ASD could contribute to countertherapeutic outcomes. Moreover, interventions that do not account for contingencies of reinforcement that influence implementation might be prone to nonadherence (Allen & Warzak, 2000; Stocco & Thompson, 2015). More research is needed on the applied relevance of these results. Research describing naturalistic conversations between individuals who exhibit restricted interests and their caregivers or peers is a necessary step toward validating the relations uncovered in this study and identifying variables that warrant further analyses (Baer, 1973). Effective intervention for excessive conversation about restricted interests, or other problems of social significance, depends on a thorough understanding of the behavioral processes that govern the social interactions of individuals diagnosed with ASD and those in their verbal communities.

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