SCRIPT FADING TO PROMOTE UNSCRIPTED BIDS FOR JOINT ATTENTION IN CHILDREN WITH AUTISM

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We used a script-fading procedure to teach 3 children with autism to initiate bids for joint attention. We examined the effects of (a) scripts, (b) varied adult scripted responses, and (c) multiple-exemplar script training on promoting unscripted language during bids for joint attention. All 3 participants learned to initiate bids for joint attention, and the response generalized to untrained stimuli, conversation partners, and the classroom environment.

Key words: autism, joint attention, script fading

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Children with autism often display rote and repetitive language and have difficulty initiating social exchanges in a variety of contexts (e.g., play, conversation). An identified component of language development is joint attention, which involves the sharing of attention between two social partners and an object or event (Charman, 2003) and is marked often by behaviors such as pointing and shifting eye gaze from an individual to the object. Children with autism exhibit deficits in both initiating and responding to bids for joint attention (Charman, 2003).

Script-fading procedures have been used to teach children with autism to initiate bids for joint attention (Krantz & McClannahan,1998; Mac-Duff, Ledo, McClannahan, & Krantz, 2007). However, one limitation of previous studies is that unscripted language was scored if the response was emitted in the absence of the script. Thus, after the script was removed, the participant could have used only scripted statements, and all would have been scored as unscripted. Given that one of the defining characteristics of autism is rote and repetitive behavior, it is important to investigate whether scripts promote language that deviates from trained statements.

The primary purpose of this study was to replicate and extend MacDuff et al. (2007) by

examining the use of written scripts to teach children with autism to initiate bids for joint attention. A secondary purpose was to examine the effects of (a) scripts, (b) varied adult responses to participants' bids, and (c) multiple-script training on unscripted bids for joint attention.

METHOD

Participants

Three children with autism participated in the study. All participants could communicate using at least four- to five-word sentences and did not initiate bids for joint attention reliably. Kevin, a 7-year-old boy, attended a public school classroom; Jillian and Drew, a 4-year-old girl and boy, respectively, attended a university-based preschool. All three participants had a complex language repertoire (e.g., they could initiate conversation and use five- to seven-word sentences). Kevin and Jillian could read five- to seven-word sentences; Drew was able to read one- to two-word phrases.

Setting and Materials

We conducted preteaching in the participants' individual learning area or in a quiet area of the classroom. Teaching sessions were conducted in an infrequently used hallway at the school, and generalization to untrained stimuli and conversation partners was assessed in either the same or similar hallways. Generalization to the natural

Table 1
Scoring Criteria and Examples of Unscripted and Scripted Bids

Condition	Criteria	Unscripted	Scripted
Teaching and adult scripted responses	Addition of words or phrases	"Look, it's a little doll"	"Look, a baby" "Look, it is a baby"
	Omission of the word "look" or the item name	"It's a car"	"Look, baby"
	Same unscripted bid or variations of same statement emitted to multiple objects	"Hey, it's a ball" "Hey, it's a car"	
Multiple-script training	All of the above including combination of trained scripts	"Look, it's a Potato Head, it has eyes"	"Look, it's a Potato Head" or "Hey, it has eyes"

environment occurred in another classroom or school hallways.

We identified 30 two- and three-dimensional stimuli and assigned 10 of them to the generalization condition. The remaining 20 stimuli were used during teaching, adult statements, and multiple-script training conditions. We chose stimuli that participants frequently contacted and were of potential interest (e.g., colorful objects and toys). We attached the text script "Look, it's a —" to each stimulus during teaching sessions.

Dependent Variables

Independent bids for joint attention were scored if the participant (a) oriented to the object, (b) emitted a contextually appropriate vocal statement, and (c) oriented to the conversation partner by physically turning the head or body toward the person within 2 s of making a vocal statement. Independent bids did not need to occur in the specific sequence listed above and were scored regardless of whether the script was present or whether the participant referred to the script (e.g., orienting to the adult and then to the object while making a statement or orienting to the object and then to the adult after reading the script were both scored as independent if no prompts were used).

Next, participants' verbal statements were scored as scripted or unscripted. We defined *scripted statements* as those that were trained specifically (i.e., "Look, it's a —"), independent of whether it was emitted in the presence or

absence of the script. We defined *unscripted statements* as contextually appropriate statements that deviated from the originally trained script by more than the addition, subtraction, or alteration of articles and conjunctions (see Table 1 for scoring criteria and examples).

Preteaching

We first determined whether the participants could tact all stimuli and read all words used in the scripts. Unknown stimuli and words were taught in structured teaching sessions until participants responded correctly for 100% of trials in one session. We also taught participants to read a different script of similar length to ensure that they could read and follow a script.

Conditions

We used a multiple baseline design across participants to evaluate the effects of several conditions on scripted and unscripted bids for joint attention. Before each session, we prepared the hallway with 10 two- and three-dimensional stimuli. We randomly chose stimuli from the pool of 20 and varied their location between sessions (e.g., wall, floor, table). An adult walked down the hallway within approximately 1 m of the participant. To control for other variables that may influence unscripted language, the adult verbally responded to any verbalizations with the generic phrase "yes, that's right" throughout all conditions except the adult statements condition. Each session began with the adult saying "Let's take a walk"

and ended either when the participant initiated a bid or walked past all 10 stimuli.

Baseline. The adult did not provide any prompts. Sessions ended when the participant walked pass all 10 stimuli.

Teaching. We attached the printed script, "Look, it's a —," to all stimuli. As the participant approached each stimulus, we physically prompted the participant from behind (a) to orient to the object, (b) to point to the script, and (c) to orient to the adult. We used a 2-s prompt-delay procedure to prompt the participant verbally to follow the script. Prompts were faded from most to least within sessions. Jillian and Drew required an error-correction procedure to reach criterion. If they missed a component, they were prompted to start the bid from the beginning (e.g., reorient to the object) and to complete the bid without errors. These prompts continued for errors made during the remainder of the study.

The scripts were faded by removing the last word until the script was no longer present. Fading occurred when the participant independently read the script for 90% of the stimuli across two consecutive sessions or for 100% of stimuli in one session. The teaching condition ended when no scripts were present and when independent bids were initiated for 90% of the stimuli across two consecutive sessions or for 100% of stimuli in one session. We ended the remaining conditions when participants' unscripted statements were maintained at stable levels.

Adult scripted responses. The purpose of this condition was to evaluate the extent to which adults' language models increased participants' unscripted bids. Sessions were identical to the previous condition, with the exception that the adult responded to bids with one of three statements pertaining to the feature, function, or class of the stimulus. For example, if the participant said, "Look, it's a car," the adult responded with one of the following: "Yes, it's red," "Yes, it goes fast," or "Yes, it says 'vroom.'" Prior to the session, we assigned adult responses and unsystematically varied statements throughout sessions.

Multiple-script training. The purpose of this condition was to determine if training multiple scripts simultaneously would further increase participants' unscripted bids. We used the same stimuli as in the previous phases and created eight to 10 new scripts that could be used across several stimuli (e.g., "Look, it has eyes" pertained to five stimuli). Prior to each session, we unsystematically varied the scripts and placed them on all stimuli, ensuring that statements matched the features of the stimulus. We prompted participants to initiate bids with the new scripts using the same procedures described in the teaching phase. Due to the quantity of scripts and projected amount of time it would have required to fade the scripts, typical fading procedures were not used. Instead, we conducted probes throughout the phase; all scripts were removed to assess unscripted language because participants typically followed scripts when they were present and unscripted language could not be assessed. During probes, sessions were identical to baseline, with the exception that error correction was used for incomplete bids.

Generalization and maintenance. We assessed generalization of bids to untrained stimuli and conversation partners (peer and adult) once for each condition except the teaching condition. Procedures were identical to baseline. Next, we assessed generalization to the natural environment using a classroom and untrained hallways of the school with naturally occurring stimuli (e.g., pictures on wall, bulletin boards). One or two sessions were conducted during each condition except the teaching condition. Sessions lasted approximately 2 to 5 min and ended after the participant had walked the perimeter of the room or length of the hall.

During classroom probes, sessions were identical to baseline, with the exception that error correction (i.e., the participant was

prompted to complete a scripted bid) was used to maintain high levels of independent bids so we could assess unscripted language during independent bids. During school hallway probes, we used a model prompt because it was less intrusive than a physical prompt. The adult initiated bids for joint attention to the participant using a statement similar to the participants' trained scripts. Last, we conducted a follow-up 6 weeks after training in either the classroom or hallway. Procedures were identical to those used in generalization probes.

Treatment Fidelity and Interobserver Agreement

We assessed interobserver agreement for all components of initiating bids for joint attention. An agreement was scoredwhen both observers recorded a correct or incorrect response for the individual components in the bid. Interobserver agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100%. Agreement was assessed for an average of 29% (range, 27% to 32%) of sessions and was 96%, 98%, and 97% for Jillian, Kevin, and Drew, respectively.

We assessed treatment integrity for an average of 34% (range, 29% to 39%) of sessions, with an average integrity of 99.6%, 99.7%, and 99.6% for Jillian, Kevin, and Drew, respectively. We scored whether the adult correctly prompted the participant to initiate a bid and responded with the correct scripted statement. Treatment integrity was calculated by dividing the number of correctly implemented components by the total number of components and multiplying by 100%.

RESULTS AND DISCUSSION

Figure 1 displays data for independent bids and unscripted statements during independent bids. During baseline, participants emitted few to no independent bids. Independent bids emitted during baseline for Kevin and Drew were merely one-word tacts of the items

(e.g., ''ball''). All participants learned to initiate bids for joint attention during teaching. Independent bids were maintained at high levels during the adult scripted responses and multiple-script training conditions for all participants.

During the teaching condition, we observed a slight increase in unscripted language for Jillian and an increasing trend for Drew; however, we did not observe an increase for Kevin. During adult scripted responses, we observed a slight increase in unscripted language for Jillian and Drew and a large increase for Kevin. Because scripts were reintroduced during the multiple-script training condition, we initially observed a decrease in unscripted bids for Kevin because he was following the scripts precisely. However, Jillian's and Drew's unscripted statements remained stable. During the unscripted probes in the multiple-script condition (i.e., scripts were removed from stimuli; open circles in Figure 1), Jillian's and Kevin's unscripted bids increased to nine and 10 responses, respectively. Drew's responding occurred at rates similar to the previous condition.

We also assessed generalization to novel conversation partners (i.e., peer and adult) and novel stimuli during baseline, the adult scripted responses phase, and the multiple-scripts phase for all participants (Figure 1). Only Drew made bids during baseline generalization probes (to a peer). Bids for joint attention increased for all participants in generalization probes during the adult scripted responses phase (range, 50% to 100%) and were even higher during the multiple-script phase (range, 80% to 100%).

The average rate of unscripted bids during generalization probes in the natural environment is represented in Table 2. Responding during baseline generalization probes was near zero for all participants. Unscripted bids during generalization probes in the classroom increased for Kevin and Drew in the adult scripted responses phase; however, Jillian's bids did not increase until the multiple-scripts
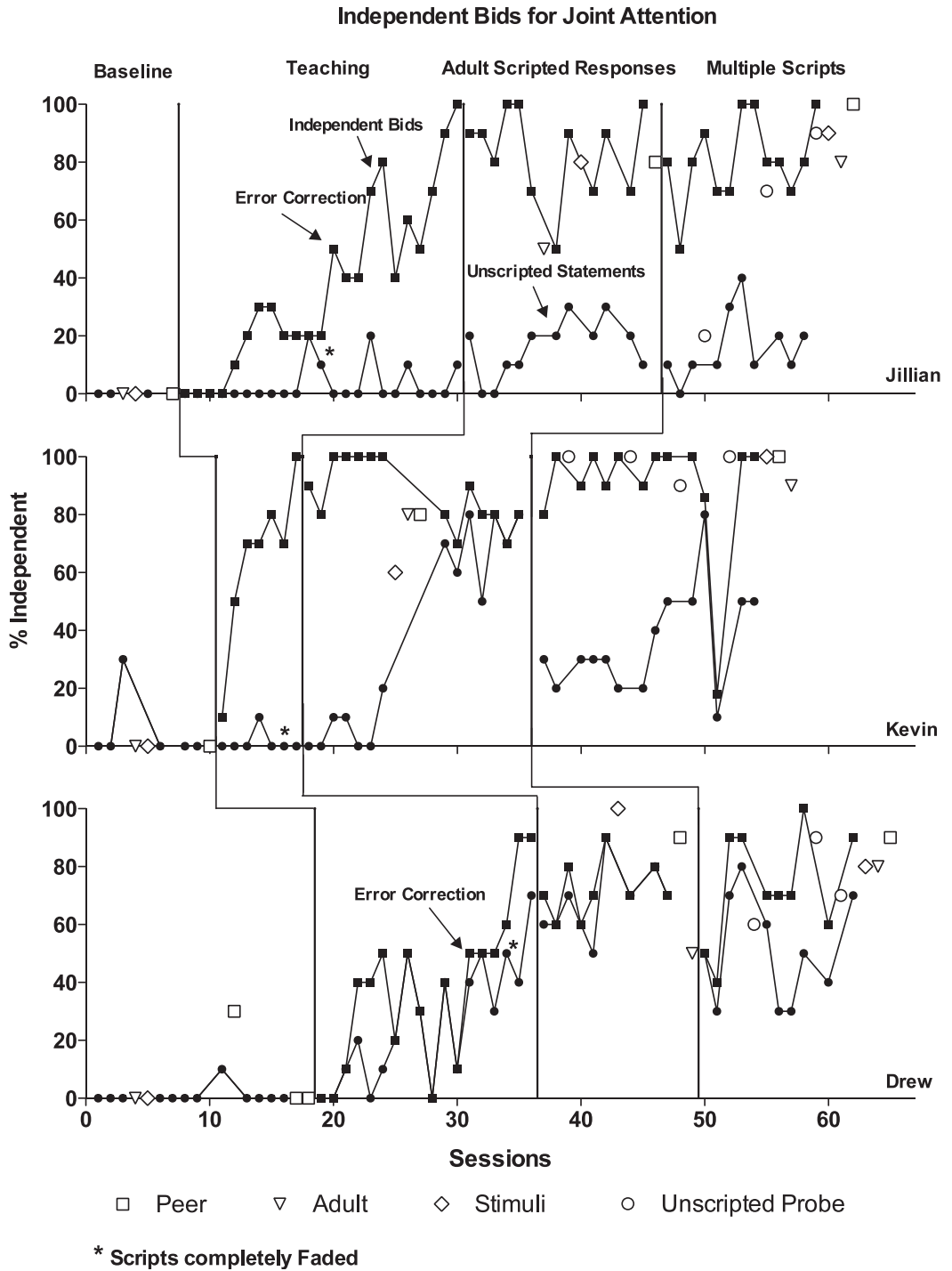
Figure 1.   Independent bids for joint attention (scripted and unscripted combined) and unscripted statements made during independent bids. Open data points reflect only unscripted independent bids.

Table 2

Rate of Unscripted Bids for Joint Attention in the Natural Environment

	Class		Hall	
	Baseline	Adult responses	Multiple scripts	Multiple scripts	Follow-up
Jillian	0	0	4	0.35[a]	1.63 (class)
Kevin	0	3.12	2.12	3.75[a]	6.7[a] (hall)
Drew	0	0.79	2.44	0.32[a]	1.99[a] (class)

[a] Response initially did not generalize or maintain; data represent responding after additional prompts.

phase. During the school hallway generalization probes (multiple-scripts phase), all three participants required an adult model before bids were observed. Only Jillian's unscripted bids were maintained at the 6-week follow-up. Additional training was implemented for Kevin and Drew because we did not want to end the study without participants demonstrating the response. For Kevin, the adult modeled the response; however, Drew needed booster sessions (i.e., prompts used during teaching were reintroduced) before responding was observed.

Overall, our results support those reported by MacDuff et al. (2007), by demonstrating that scripts are effective for teaching children with autism to initiate bids for joint attention. We extended previous research by assessing generalization to the natural environment and using a more stringent definition for unscripted responses.

We found that when adult responses were held constant during teaching, we observed an increase in unscripted language for only one participant; however, when adult language was varied, unscripted language increased for the other two participants. This may provide support for the importance of joint attention in facilitating language (Charman, 2003). Although the observed increase did not specifically include language from the adults' responses during the study, participants were observed to emit language from adult models during other parts of their day. Future research should continue to evaluate adult language models in the context of teaching joint attention

to determine if participants attend to the models and incorporate those statements into their bids for joint attention. It is also important to note that we used only social praise when training participants to initiate bids. Social praise often does not function as a reinforcer for children with autism, and external reinforcers may be needed to teach social exchanges. Thus, it is more likely that these responses were bids for joint attention rather than responses maintained by other consequences (e.g., edible items).

One limitation of the current study is that unscripted bids were scored even if bids were variations of the same phrase. Two participants often emitted the same unscripted bid or used variations of the same phrase, which raises the question: Were these responses rote and repetitive? In future studies, observers may score only the first occurrence of a statement. Further research also may include social validity measures in which novel adults identify whether statements are rote and repetitive. Another limitation is that prompts were used during generalization sessions for two of the three participants who were completing all steps except orienting back to the adult. This limits the conclusions that can be drawn about generalization of bids, because prompts cued responding.

In summary, script procedures were effective in increasing bids and unscripted language during either adult language models or multiple-script training. More research is needed to identify the necessary components to increase varied and unscripted language.

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