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Preschoolers' communication during scripted interactions*

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ABSTRACT

The communicative interactions of 15 dyads of four- to five-year-olds during pretend play involving routine, or scripted, events were investigated as a function of the children's knowledge of the scripts. Measures of the quantity and quality of interaction and the strategies that the children used to establish mutual knowledge (i.e. assess and adapt to their discourse partner's level of expertise), which is essential to good communication, were examined. Each dyad participated in a MATCHED condition (both members had extensive knowledge of the script) and a MISMATCHED condition (one member had extensive script knowledge and the other did not). Shared script knowledge facilitated communicative interactions, as indicated by more topic maintenance and fewer requests for clarification in the matched condition than in the mismatched condition. The children attempted to establish mutual knowledge more frequently in the mismatched condition than in the matched condition and, moreover, mutual knowledge establishment was related to the children's communicative effectiveness.

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INTRODUCTION

Scripts are temporally and causally organized representations of routine events that are constructed through experience (Slackman, Hudson & Fivush, 1986). They are flexible, dynamic organizations that can aid in understanding others' behaviours and in guiding one's own actions and behaviours (Schank & Abelson, 1977; Abelson, 1981; Bianco & Tiberghien, 1991). The results of numerous studies indicate that, by preschool age, children have organized their knowledge of events into scripts (e.g. Nelson, 1978; French, 1986; Nelson & Gruendel, 1986). Moreover, knowledge of scripted events enhances some aspects of children's conversational performance during dyadic pretend play (Nelson & Gruendel, 1979; Nelson & Seidman, 1984; Furman & Walden, 1990). The present study was designed to investigate further the impact of script knowledge on children's conversation by examining whether (*a*) conversation is enhanced when both discourse partners know the script compared to when only partner knows it, (*b*) children are able to accommodate their partner's level expertise with the scripted event by explicitly establishing mutual knowledge about it, and (*c*) establishing mutual knowledge affects the quantity and nature of children's conversation.

Conversation depends on the knowledge that each participant brings to the exchange (Nelson & Gruendel, 1979). For true dialogue to occur, the participants must share procedural knowledge, such as general rules of communication (e.g. for turn-taking, topic maintenance), and substantive knowledge, such as knowledge of the topic domain (Whitehurst & Sonnenschein, 1985). Knowledge of a routine event, or script, is one type of substantive knowledge. Therefore, when children participate in a communicative interaction revolving around a routine event, familiarity with the script may be an important determinant of the extent and nature of their interaction.

Nelson and her colleagues (Nelson & Gruendel, 1979; Nelson & Seidman, 1984) have examined the role of script knowledge in children's communicative interactions during play. Based on selected passages from transcripts of interactions, Nelson & Gruendel (1979) claimed that when preschoolers have incomplete knowledge of a script, their play involving that script tends to be unstructured, undirected, and includes little agreement as to goals or means. Nelson & Seidman (1984) found that the play sessions of dyads of preschoolers that were based on scripted routines that were highly familiar to the dyads were longer (i.e. had a greater mean length of conversational turn) and more structurally complex (e.g. involved making pretend birthday cakes in a sandbox rather than simply pouring sand from one bucket to another) than those that were not based on a script that the dyads shared. Nelson and her colleagues, however, concluded that the

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preschoolers did not have a shared script merely by examining the children's discourse during the play sessions rather than by assessing their script knowledge outside the discourse context. The direction of effect, therefore, is unclear; that is, a lack of script knowledge may have led to poor communication or limited communicative skills may have prevented an accurate display of script knowledge.

In an investigation of the effects of script knowledge on the communicative interactions of dyads of three- to five-year-olds, Furman & Walden (1990) compared the discourse that the dyads produced as they enacted a scripted event when they were experts on the script and when they were relative novices on the script. Each child participated in two sessions. During the first session, knowledge of routine events (e.g. taking an airplane trip) was assessed by asking the child to use script-based toys to explain the event to a puppet. On the basis of this independent assessment of script knowledge, same-sex, same-age dyads were formed such that both dyad members were familiar with one script and unfamiliar with another script. For the second session, the dyads were instructed to enact the two scripted events (in counterbalanced order) using script-appropriate toys. Analyses of the communicative interactions during the play sessions demonstrated that the dyads sustained the conversation to a greater extent (as reflected by fewer topic shifts and more conversational turns) and were more responsive to each other's talk (as reflected in the rate of nonresponses to obligating turns) when they were familiar with the script than when they were unfamiliar with it. There also was an interaction between script knowledge and age such that extensive script knowledge sustained the communicative interactions more for younger than for older children and increased responsiveness more for older than for younger children.

The conclusions that can be drawn from previous studies are limited because they have been concerned only with situations in which the discourse partners either both had or both lacked knowledge of the script of interest. Conversational interactions in the real world, however, often involve topics that are familiar to only one of the participants. This mismatch in knowledge is often precisely what motivates initiation of the conversation in the first place. Moreover, this mismatch has implications for the establishment of mutual knowledge as well as for the nature and course of the interaction. If the participants differ in their knowlegde of the script, they may need to describe referents completely (rather than elliptically), verify background assumptions, fill in gaps for the less knowledgeable partner, and so on; none of which will be necessary if both of the participants are knowledgeable about the script (Isaacs & Clark, 1987). Although young children possess the skills needed to deal with situations in which they are as knowledgeable about the script as are their partners, they may be less adept at dealing with situations in which there is a discrepancy in knowledge of the script. There is a need,

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therefore, to investigate children's communication under conditions in which the discourse partners hold unequal levels of knowledge about the topic. The first aim of the present study was to address this need.

In the present study, preschool children's script-related talk was investigated under two conditions: one in which the script was familiar to both participants (i.e. the MATCHED condition) and one in which the script was familiar to only one of the participants (i.e. the MISMATCHED condition). Measures of the extent to which the children (*a*) sustained the conversation, (*b*) remained on topic, (*c*) were responsive to each other's talk, and (*d*) understood each other's talk were compared across the two conditions. If script knowledge is as important to conversation as has been claimed by Nelson (Nelson & Gruendel, 1979; Nelson & Seidman, 1984) and by Furman & Walden (1990), substantial variations in quantity, responsiveness and comprehension of conversational participation should occur across conditions. It is also possible that older but not younger preschoolers would have the communicative skills and cognitive wherewithal to overcome the discrepancy in level of pre-existing script knowledge in the mismatched condition. In this case, an interaction between age and condition would occur such that the difference in performance across conditions would decrease with age.

There are several ways in which children's script knowledge may enhance their communicative interactions. Scripts reduce cognitive demands, which enables the interactants to devote more resources to language and communication (Lucariello, Kyratzis & Engel, 1986). Scripts also enhance children's communicative interactions by providing contextual support that aids comprehension (Yoder & Davies, 1992). Although it is likely that reduced cognitive demands and increased contextual support both play a role in the beneficial effects of script knowledge on children's communicative interactions, another factor that has not been addressed by previous researchers involves children's establishment of mutual knowledge.

If conversation is to be successful, the participants must establish a base of mutual knowledge by working to make explicit each other's level of expertise on the topic at hand (Clark & Carlson, 1981, 1982; Clark & Marshall, 1981). By doing so, the discourse partners create a context for making inferences, making semantic links between utterances, and planning responses (Nelson & Gruendel, 1979; Yoder & Davies, 1992; Halle, Chadsey-Rusch & Collet-Klingenberg, in press). In general, adults are highly skilled at using a variety of strategies to establish mutual knowledge with their discourse partners (Isaacs & Clark, 1987; Schober & Clark, 1989). For instance, Isaacs & Clark (1987) found that dyads of adults used three strategies to establish expertise on the conversational topic during a referential communication task: (*a*) the partners assessed each other's expertise on the topic; (*b*) experts realized that they were talking to novices and supplied the needed expertise; and (*c*)

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novices realized that they were talking to experts and tried to acquire the needed expertise. Isaacs & Clark also found that the extent to which the dyads assessed, supplied, and acquired expertise was associated with the efficiency of their referential communication. Although young children can often recognize differences in mutual knowledge (Ackerman & Silver, 1990; Ackerman, Szymanski & Silver, 1990; Kail & Hickmann, 1992; Ricard, 1993), it is not known whether they employ strategies like those of adults to establish mutual knowledge and do so under the same conditions as do adults. The second aim of the present study was to provide data on children's use of these strategies.

In the present study, the rate at which the preschool participants used adult-like strategies for establishing mutual knowledge was examined. It was expected that these strategies would be employed less frequently in the matched condition than in the mismatched condition. In the matched condition, it was presumed that a few turns would be sufficient to make clear that both members of the dyad 'knew what they were talking about' (i.e. they understood the roles involved and the functions of the various props). In the mismatched condition, it was anticipated that the dyad members would need to devote relatively more turns to establishing mutual knowledge (e.g. by supplying the less knowledgeable partner with more information about the props and roles that defined the routine event); these turns would function to provide the scaffold needed for the conversation to succeed.

If, as has been claimed (Isaacs & Clark, 1987), strategies for establishing mutual knowledge are the basis of successful conversation, we would expect that the use of such strategies should be correlated with measures of the quality and quantity of conversation in the present study; that is, conversation should be better organized, more effective and trouble free, and sustained longer for dyads of preschoolers who make appropriate use of such strategies than for dyads who do not. At the same time, however, there may be some features of successful conversation that are less dependent on the establishment of mutual knowledge than others. In this study, therefore, we examined, in a preliminary fashion, the relation between the use of turns devoted to establishing mutual knowledge and measures of communicative success. The measures of communicative success consisted of the quantity and topic maintenance of the children's conversation as well as their responsiveness to, and comprehension of, each other's talk.

In summary, a crucial facet of the context of a communicative interaction is the pre-existing content knowledge of the participants. In naturally occurring conversations, participants typically either both have adequate pre-existing knowledge or they hold unequal levels of pre-existing knowledge. In the present study, the effects of script knowledge on the communicative interactions of dyads of four- to five-year-olds was addressed using a repeated measures design. In the matched condition, both dyad

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members had adequate script knowledge, whereas in the mismatched condition one dyad member knew the script, but the other did not. Shared script knowledge was hypothesized to facilitate communicative interactions and, thus, it was predicted that communication would be more effective in the matched condition than in the mismatched condition. Possible sources of differences between the matched and mismatched conditions were investigated by examining several strategies for establishing mutual knowledge, namely (*a*) assessing level of expertise, (*b*) indicating level of expertise, (*c*) acquiring expertise, and (*d*) supplying expertise. The relation between the measures of establishment of mutual knowledge and the measures of communicative effectiveness also was examined.

METHOD

Participants

Thirty participants were chosen from a pool of 73 preschool and kindergarten children who participated in an assessment of script knowledge (described below). The children were assigned to same-age, same-sex dyads on the basis of their performance on the assessment. This resulted in eight dyads of girls, whose mean age was 5;1 (range = 4;1–5;7), and seven dyads of boys, whose mean age was 5;2 (range = 4;6–5;7). The mean difference in age between members of each dyad was 3 months (range = 0–6 months). The children were recruited from four public and parochial nursery schools, kindergartens and elementary schools. According to parental and teacher reports, the members of each dyad had not met previously. The participants were monolingual English-speakers, with the exception of one child who was fluent in both Lithuanian and English. Teacher reports indicated that no child had speech, language, hearing, vision or behavioural problems that would have interfered with their performance in the study.

Script knowledge assessment and dyad formation

Each child participated in (*a*) a script knowledge assessment session and (*b*) a communication assessment session. During the first session, the children's knowledge of four script events was assessed: taking an airplane trip; baking cookies; doing laundry; and going to the dentist. These events were used, in part, because they represent themes that have been used in previous research of children's scripts (e.g. Nelson & Gruendel, 1981; Eiser, Eiser & Lang, 1989; Furman & Walden, 1990). Moreover, in a pilot study there was high agreement among 18 adults as regards the defining components of the events as well as the prototypical temporal sequence of the components. The script components determined from the pilot research appear in Appendix A. Non-

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script components consisting of actions that are not typically part of the script (e.g. putting toast in the toaster is not a component of a baking cookies script) also were used. The non-script components were generated by the authors and none were named as script components by the adult participants in the pilot research (see Appendix B). Moreover, it was determined in pilot research (with a separate group of adults) that adults were able to distinguish between the script components and the non-script components (their mean scores ranged from 92 % to 100 % for each script). For each event, there were either 6 or 7 script components and an equal number of non-script components. Thus, the script knowledge assessment for each event involved a total of either 12 or 14 items.

Assessment of script knowledge consisted of a picture-recognition and picture-sequencing task, similar to that employed by Myles-Worsley, Cromer & Dodd (1986). Their procedure was designed as a measure of children's knowledge of a preschool routine. In the recognition phase of Myles-Worsley *et al.*'s task, each child was shown line drawings of school-like activities (half of which had occurred at preschool and half of which had not) in random order. The experimenter verbally identified each drawing and asked the child whether he or she remembered doing that at preschool. In their subsequent picture-sequencing phase, the child was given the drawings of the activities that had happened at preschool and was asked to put them in temporal sequence. This procedure has the advantage of being standardized and independent of verbal ability as well as yielding information about the child's knowledge of the temporal structure of the scripted event, which is crucial to the structure of children's scripts (Fivush, 1984; Eiser, Eiser & Lang, 1989). The results of the Myles-Worsley *et al.* study demonstrated that the children with direct preschool experience produced significantly fewer recognition errors and sequencing errors than did the children without preschool experience. This suggests that the picture-recognition and picture-sequencing task provides a valid measure of script knowledge.

In the present study, each child's script knowledge was assessed individually in a quiet room in his or her school. Each child was assessed on all four scripts in an order chosen randomly for each child. In the picture-recognition phase, the experimenter presented 11 × 14 cm line drawings one at a time to the child. Half of the pictures depicted script components and half were of non-script components. The pictures for each script were presented in random order. The experimenter labelled the action depicted in each picture as she presented it and then asked the child whether or not the depicted action was part of the event (e.g. *This is a picture of the lady turning on an oven. When she bakes cookies would she do that*?). The child's task was to respond *yes* or *no* for each picture.

In preparation for the picture-sequencing phase, the experimenter placed only the picture depicting the script components in random order in front of

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the child. The component that usually happens first for the event was identified by the experimenter and placed in front of and slightly to the left of the child. Then the child was asked what happens next (e.g. *I want you to look at these pictures and find the one that the lady would do next. Point to the picture of the thing that the lady does next. What does she do after looking for a recipe in a cookbook*?). The picture that the child selected was placed to the right of the first picture. The same procedure was followed for the remaining pictures. Thus, a horizontal (left-to-right) array of pictures was formed.

For each script, the child's responses in the picture-recognition and picture-sequencing task were evaluated to determine whether he or she had knowledge of (*a*) the defining components of the event and (*b*) the correct temporal sequence of these components. For the picture-recognition phase, the children's mean correct recognition and correct rejection scores were 89% (range = 33–100%) and 63% (range = 0–100%), respectively.

In addition, the child's knowledge of temporal sequence was evaluated by examining his or her serial positioning of the script components in the picture-sequencing phase. Namely, each contiguously placed pair of pictures was examined to determine whether the members of the pair were in the correct temporal order. The temporal sequencing score was the proportion of pairs in the correct sequence. (The first contiguous pair was not scored because the first component in the sequence was given to the child and, thus, the first contiguous pair always was sequenced correctly.) The children's mean sequencing score was 78% (range = 20–100%).

Each child was classified as having high or low knowledge for each script. Based on the criteria of Furman & Walden (1990), a child was judged as having low script knowledge if he or she attained a maximum score on the recognition phase of 58% for the 12-picture scripts or 57% for the 14-picture scripts. The mean recognition score of the children with low script knowledge was 56%. High script knowledge was attributed to a child if (*a*) based on the criteria of Furman & Walden, in the picture-recognition phase, he or she answered correctly (i.e. responded *yes* when presented with a script component or responded *no* when presented with a non-script component) 75% of the time for 12-picture scripts or 79% for 14-picture scripts and (*b*) he or she attained a temporal sequencing score of at least 75% for 12-picture scripts or 80% for 14-picture scripts. The mean recognition score of the children with high script knowledge was 88% and their mean temporal sequencing score was 89%.

The children were assigned to dyads that enabled each dyad to participate in the MATCHED condition with one script and the MISMATCHED condition with another script. That is, for each dyad, both members had high knowledge of at least one script, whereas for at least one other script, one member had high knowledge and the other member had low knowledge. The members of each dyad were matched (and mismatched) on their knowledge of the specific

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script components as closely as possible given these restrictions. The members of each dyad gave the same answer (i.e. both answered correctly or both answered incorrectly) for 82% of the components.

Some children could not be attributed with high or low knowledge for a particular script because they (*a*) scored in the middle range (e.g. 65%) on the recognition task or (*b*) although they performed well on the recognition task, they did not attain a sufficient temporal sequencing score to be attributed with high knowledge of the script. Children who did not meet the criteria for a particular scripted event did not participate in the second (i.e. communication assessment) session for that script. (Note that 43 children from the initial pool could not be assigned to a dyad because they did not meet the criteria for at least two scripts and/or same-age, same-sex matches with similar performance on the script assessment were not available; therefore, they did not participate in the second session.)

A series of *t*-tests was performed to determine whether the children who were classified as having high script knowledge differed on relevant dimensions (such as age) from the children who were classified as having low script knowledge. These analyses revealed that the children classified as having high script knowledge did not differ in age from those classified as having low script knowledge (high group: mean = 5;2, range = 4;7–5;7; low group: mean = 5;1, range = 4;1–5;7). Moreover, the high script knowledge children (mean = 3·91, range 2·95–4·88) did not differ from the low script knowledge children (mean = 3·77, range = 2·97–4·80) in the matched condition on mean length of utterance (MLU), a measure of syntactic complexity derived from the communication assessment (see below). Therefore, differences in performance for the variables of interest cannot be attributed to differences in the ages or general linguistic abilities of the two groups of children.

Communication assessment

An assessment of each dyad's communicative performance was conducted on a subsequent day following the script assessment session. The mean number of days intervening between these sessions was 19 days. The communication assessment was conducted in a playroom at a university research facility. Upon entering the playroom, the dyad participated in a warm-up period in which they were given a puzzle and instructed to put it together while the experimenter left the room for approximately 5 minutes. The experimenter then returned to the playroom and gave the children instructions for the communication assessment session.

The communication assessment session consisted of two 10-minute play segments: one for the matched condition and one for the mismatched condition. For each segment, the children were instructed to play together

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TABLE 1. *Toys for communication assessment for each script*

Script	Toys
Baking cookies	Oven, playdoh, cookie sheet, mixing bowl, mixer, spoon, measuring cup, ingredients (e.g. sugar, milk, eggs), rolling pin, cookie cutters, spatula
Airplane trip	Airplane, ticket counter, tickets, boarding passes, travel brochures, luggage, clothes, baggage checking counter, waiting area
Dentist office	Large chair, clip-on bib, toothbrushes, paper cups, X-rays, clipboard with forms, receptionist desk and chair, phone, calendar, paper, pens, waiting area with magazines
Doing laundry	Washer and dryer, ironing board, iron, hangers, clothes, laundry basket, laundry detergent, fabric softener

with a set of toys consisting of child-size objects appropriate to one of the scripts. These consisted of commercially available toys, everyday objects and objects specially constructed for this study from cardboard (see Table 1). All toys were appropriately sized for the children's use (e.g. the airplane, which was constructed by the experimenter, was large enough for the children to enter and sit inside).

Eight dyads received the matched condition first and seven dyads received the mismatched condition first. Each event (i.e. baking cookies, laundry, dentist, and airplane trip) was used approximately as frequently in the matched condition as in the mismatched condition. The frequencies of each script in the matched and mismatched conditions, respectively, were as follows: cookies 5 and 4; laundry 3 and 5; dentist 3 and 4; and airplane 4 and 2. In addition, each event was employed approximately as frequently in the first segment of the communication assessment session as in the second segment. The two segments were separated by a 5–10-minute break. The experimenter observed the communication assessment session from an observation room and did not participate in the communication assessment session except when necessary (e.g. to settle disputes between the children, to give the children more playdoh). Each session was audio- and videotaped with hidden equipment.

Dependent measures

The communicative interactions during the communication assessment sessions were transcribed according to Systematic Analysis of Language Transcripts (SALT) conventions (Miller & Chapman, 1990). Each turn was coded for the presence of each dependent measure (i.e. the measures were not

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mutually exclusive). Thus, a turn often was coded for more than one measure. Turns (rather than utterances) were chosen as the unit of analysis because turns were more appropriate for the dependent measures of interest in this study (e.g. if any utterance within a turn maintained the topic, the turn was coded as maintained). Following Dorval & Eckerman (1984), a turn was defined as continuous talking by one child that ended when the child paused for 5 sec or more or was interrupted by the other member of the dyad.

It was expected that variations in script knowledge would be manifested in these transcripts in measures of the quantity and quality of talk, with matched dyads scoring higher than mismatched dyads on both dimensions. The dependent measures, which were designed to assess communicative effectiveness, were as follows.

(1) *Number of turns*. Quantity of interaction was assessed by the number of conversational turns produced.

(2) *Number of utterance attempts per minute*. Quantity of interaction also was assessed by the number of utterance attempts made per minute. Utterance attempts included those utterances that were completely intelligible, partly intelligible or completely unintelligible. Utterance attempts and turns were not mutually exclusive (i.e. one or more utterance by the same speaker comprised a turn).

(3) *Proportion of maintained topics*. A discourse topic was defined as 'the proposition (or set of propositions) about which the speaker is either providing or requesting new information' (Keenan & Schieffelin, 1983, p. 68). A topic was considered to be maintained if the same discourse topic was maintained for more than one successive turn (e.g. Speaker 1: *Let's say I'm the dentist*. Speaker 2: *First I'll be the dentist. Then you can be the dentist*.) or if a new topic was integrated with the preceding turn (e.g. Speaker 1: *I went on an airplane trip once. I took an airplane to Florida*. Speaker 2: *My grandma lives in Florida*.). If any utterance of the turn maintained the previous topic, it was coded as maintaining the topic. See example in Appendix C. (Note that if a child's turn was (*a*) partly or completely unintelligible and, thus, it was unclear to the coders whether the child indeed maintained the topic or (*b*) directed exclusively to the experimenter, such as asking the experimenter about the instructions, it was not coded for topic maintenance.) The proportion of maintained topics was formed by the number of maintained topics divided by the number of topics discussed.

(4) *Mean length of topic maintenance*. Duration of topic maintenance was assessed by the mean length of topic maintenance. The mean length of topic maintenance was computed by dividing the sum of the number of turns over which each topic was maintained by the number of maintained topics (i.e. topics discussed in at least two consecutive turns).

(5) *Proportion of off-script talk*. Off-script talk was defined as talk that was irrelevant to the script (*I have a new puppy*.) or inconsistent with it (*The pilot*

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sits in the back of the airplane.) See example in Appendix D. (Note that almost all of the instances of off-script talk were irrelevant to, rather than inconsistent with, the script.) The proportion of off-script talk was examined to investigate the extent to which the dyad's talk concerned, or was an enactment of, the script. This measure was more general than topic maintenance because maintaining the topic involved the topic of the preceding turn, whereas off-script talk involved the focus of the script. The proportion of off-script talk was calculated as the number of turns that contained off-script talk divided by the number of turns in the transcript.

(6) *Proportion of communicative failures*. Failures to respond contingently to conversational obligations were coded as communicative failures (Abbeduto & Rosenberg, 1980). Examples included failures to reply to questions and irrelevant replies. The proportion of communicative failures was computed by dividing the number of obligating turns that were not correctly responded to by the number of obligating turns.

(7) *Proportion of requests for clarification*. The proportion of requests for clarification was formed by the number of requests for clarification divided by the number of turns. As suggested by Gallagher (1981), requests for clarification included (*a*) requests for confirmation (i.e. repetitions of the original utterance that have a rising intonation, repetitions with elaboration, or repetitions with reduction); (*b*) neutral requests for repetition (e.g. *What*? and *I didn't understand you*.); and (*c*) requests for repetition of a specific constituent (e.g. Speaker 1: *After came a knock at the door*., Speaker 2: *After came what*?). See example in Appendix E.

(8) *Proportion of turns establishing mutual knowledge*. Four strategies for

TABLE 2. *Strategies for establishing mutual knowledge*

Strategy	Examples
Assessing level of expertise	Have you ever pretended to do laundry before?
	Do you know what a dentist does?
	Have you ever baked cookies?
	How many times have you gone on an airplane trip?
Indicating level of expertise	I know how to roll out the cookie dough.
	I'm not sure what the pilot does.
	I've never gone to the dentist before.
	I've helped my mom do laundry lots of times.
Acquiring expertise	What happens next?
	What do you do with the mixer?
	Do you put the soap in the washer or the dryer?
	What do you say to the secretary?
Supplying expertise	The stewardess's job is to help the passengers.
	This is what usually happens next.
	I'll show you how to mix the ingredients.
	Don't put all the laundry in the machine together.

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establishing mutual knowledge were coded: (*a*) turns designed to assess one's partner's expertise with the script, (*b*) turns designed to indicate one's own level of expertise with the script, (*c*) attempts to acquire expertise about the script from the dyad partner, and (*d*) supplying expertise about the script to the dyad partner (i.e. instructing the dyad partner). Examples of each strategy appear in Table 2 and Appendix F. Due to the low frequency of each strategy, they were combined into one measure to reflect mutual knowledge establishment.

One judge coded all the transcripts and a second judge independently coded 20% of them. Each judge made as many passes through each transcript as necessary to arrive at the codes. Interjudge reliability of coding was calculated for three matched play segments and three mismatched play segments; half were from dyads of each sex; half were from dyads of four-year-olds and half were from dyads of five-year-olds. Cohen's kappa statistic (Cohen, 1960) for reliability of coding for each of the dependent measures were as follows: topic maintenance 0·75, off-script talk 0·97, communicative failures 0·78, requests for clarification 0·87, establishing mutual knowledge 0·85.

RESULTS

Preliminary analyses

A separate sex × script knowledge (matched vs. mismatched) analysis of variance (ANOVA) was calculated for each dependent measure and indicated that there were no significant main or interaction effects involving sex for any of the dependent measures. A separate event (i.e. taking an airplane trip, baking cookies, going to the dentist and doing laundry) × script knowledge ANOVA also was conducted for each dependent measure and yielded no meaningful effects involving event for any of the dependent measures. Therefore, event and sex were not included as factors in subsequent analyses.

Analyses of covariance for the measures of communicative effectiveness

The data for each dependent measure were analysed in separate analyses of covariance (ANCOVA) with script knowledge (matched vs. mismatched) as a repeated measure. The deviation score of the total age of the dyad, which was calculated by subtracting the grand mean age from the observed age, was used as the covariate (Delaney & Maxwell, 1981). In the ANCOVA, the test of the dyad age × script knowledge interaction is equivalent to a test of the equality of the within-cell regressions for predicting the dependent measure from deviation age within the matched and the mismatched script conditions (Cohen & Cohen, 1983).

The means and standard deviations of the measures of communicative effectiveness appear in Table 3. The results of the ANCOVAs for topic

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TABLE 3. *Means and standard deviations of measures of communicative effectiveness*

Measures	Matched	Mismatched
Number of turns	99·60 (25·99)	99·53 (27·76)
Number of utterance attempts per minute	20·09 (3·81)	19·22 (4·83)
Proportion of maintained topics	0·63 (0·08)	0·59 (0·08)*
Mean length of topic maintenance	3·45 (0·98)	3·19 (0·46)
Proportion of off-script talk	0·31 (0·16)	0·21 (0·16)*
Proportion of communicative failures	0·18 (0·14)	0·17 (0·15)
Proportion of requests for clarification	0·02 (0·02)	0·03 (0·04)*

* $p < 0{\cdot}05$.

maintenance and clarification requests supported the hypothesis that shared script knowledge facilitates communicative interactions. The proportion of turns maintaining the topic was greater in the matched condition than in the mismatched condition, $F(1, 13) = 3{\cdot}27, p < 0{\cdot}05$. There was a medium strength of association between condition and the proportion of turns maintaining the topic ($\omega^2 = 0{\cdot}07$). The proportion of clarification requests was lower in the matched condition than in the mismatched condition, $F(1, 13) = 4{\cdot}14, p < 0{\cdot}05$. There was a medium strength of association between condition and the proportion of clarification requests ($\omega^2 = 0{\cdot}09$). The proportion of off-script talk, however, was greater in the matched condition than in the mismatched condition, $F(1, 13) = 4{\cdot}39, p < 0{\cdot}05$. There was a medium strength of association between condition and the proportion of off-script talk ($\omega^2 = 0{\cdot}10$). The only effect involving dyad age was for the proportion of turns maintaining the topic, which was found to increase with age, $F(1, 13) = 4{\cdot}14, p < 0{\cdot}05$. There was a medium strength of association between dyad age and the proportion of turns maintaining the topic ($\omega^2 = 0{\cdot}09$).

Analyses of covariance for establishment of mutual knowledge

The data for establishing mutual knowledge were analysed in an ANCOVA with script knowledge as a repeated measure. As in the previous set of ANCOVAs, the deviation score of the total age of the dyad was used with script knowledge condition to predict each dependent measure. The proportion of turns establishing mutual knowledge was greater in the mismatched condition (0·24) than in the matched condition (0·14), $F(1, 13) = 7{\cdot}68, p < 0{\cdot}05$. There was a large strength of association between condition and the proportion of turns establishing mutual knowledge ($\omega^2 = 0{\cdot}18$). There was no main effect of age and no interaction between age and script knowledge condition.

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Correlations between the measures of establishment of mutual knowledge and the measures of communicative effectiveness

Pearson product-moment correlation coefficients were computed between the measures of establishing mutual knowledge and each measure of communicative effectiveness for each of the script knowledge conditions. The proportion of turns establishing mutual knowledge was negatively related to off-script talk in both the matched and mismatched conditions ($r = -0{\cdot}66, p < 0{\cdot}01$ and $r = -0{\cdot}58, p < 0{\cdot}05$, respectively). In the matched condition, the proportion of turns establishing mutual knowledge also was negatively related to number of turns ($r = -0{\cdot}57, p < 0{\cdot}05$) and proportion of maintained topics ($r = -0{\cdot}54, p < 0{\cdot}05$). There were no other significant correlations.

DISCUSSION

The results of this study demonstrate that shared script knowledge improves the effectiveness of the children's communicative interactions on several dimensions. Script knowledge promoted topic maintenance for younger children as well as older children. This was manifested by proportionally more maintained topics when both dyad members had knowledge of the script than when only one child knew the script. This finding supports the claim of Abelson (1981) that script knowledge aids cognitive processing. Because script knowledge allows gaps to be filled, for example, it improves comprehension and inference-making (Bower, Black & Turner, 1979).

A second dimension of communication that showed improvement as a result of shared script knowledge was the use of clarification requests, and this also was true for younger as well as older children. There were proportionally fewer clarification requests when both dyad members had knowledge of the script then when only one child knew the script. This suggests that the discrepancy in level of script knowledge in the mismatched condition may have led to more misunderstandings than when script knowledge was shared. Requesting clarification is one method of resolving such misunderstandings. Thus, the claim of Bower, Black & Turner (1979) that script knowledge aids in comprehension is supported.

The fact that performance on some of the measures of communicative effectiveness was better when both dyad members knew the script than when only one dyad member knew the script suggests that communication is facilitated by script knowledge that is shared by the discourse partners. This supports the claim of Nelson & Gruendel (1979) that a script provides a shared structure and, therefore, that preschoolers' communicative interactions during play are more effective when a script is instantiated than when a script is not instantiated. A script provides a shared structure on many levels. For example, the fact that a script is centred around a goal defines the

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focus of communicative interactions based on the script. In addition, roles, props, temporal sequence, and spatial structure are often specified by the script and, thus, this information is known by both the interactants if they are familiar with the script. According to Nelson & Gruendel, it is this shared topic context that enhances communicative interactions. The present study employed a systematic, well-controlled method that substantiates the claims of Nelson & Gruendel. In addition, the present study extends the findings of Furman & Walden (1990) by investigating the effect of mismatched levels of pre-existing script knowledge on the communicative interactions of dyads of preschoolers. Inclusion of the condition in which only one dyad member had knowledge of the script as well as the condition in which they both knew the script indicates that sharing of script knowledge is, indeed, crucial to the effectiveness of communicative interactions.

Shared script knowledge, however, did not improve all aspects of the children's communicative interactions. For example, in contrast to the findings of Furman & Walden (1990), script knowledge did not increase the quantity of communicative interactions. In the present study, the number of turns produced by the dyad did not vary as a function of script knowledge. Quantity of interactions was impaired only in Furman & Walden's study when neither dyad member knew the script. This indicates, not surprisingly, that two children are unlikely to sustain discourse on a topic about which they are both unfamiliar, whereas familiarity of the topic to at least one of the children enables discourse to be sustained as well as if both were familiar with the topic.

Similarly, in this study communicative failures did not vary as a function of script knowledge. Furman & Walden (1990), however, found fewer communicative failures when both dyad members were familiar with the script than when neither child was familiar with it. This indicates that script knowledge does not need to be shared by the dyad members in order for them to respond appropriately to conversational obligations, whereas if neither member is familiar with the script, responsiveness is likely to be impaired.

Again in contrast to the findings of Furman & Walden (1990), script knowledge did not reduce off-script talk. In fact, there was more off-script talk when both dyad members had knowledge of the script than when only one child knew the script. Perhaps when script knowledge was shared, the task of enacting the script was easier than when only one child knew the script because they did not need to devote all their attention and cognitive resources to talking about the script. Thus, the shared script knowledge enabled the dyad members to play without discussing the script exclusively. That is, if it was apparent to both dyad members that they both knew the script, then they may have had more of an opportunity to talk about other things, including things that were irrelevant to the script. For example, consider a situation in which two children are pretending to bake cookies. If one child is familiar

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with baking cookies and his or her partner is not, their interaction may need to focus on how to enact this scripted event (e.g. 'What do I do next?', 'Here's the bowl where you mix it up', 'This is how you turn on the oven.'). On the other hand, if both children are familiar with and able to enact the event, minimal instruction from the partner is needed. In this situation, they can both enact it successfully while talking about other things (e.g. 'How old are you?', 'I'm in kindergarten.').

The ways in which the children accommodated discrepancies in level of script knowledge also were investigated in the present study. It was hypothesized that to communicate successfully, dyad members needed to establish mutual knowledge by engaging in various communicative behaviours that involved adapting to the level of expertise of the dyad partner. These communicative behaviours included assessing the partner's level of expertise, indicating one's own level of expertise, and, if necessary, acquiring or supplying expertise. The results demonstrated that level of script knowledge did affect the establishment of mutual knowledge. As predicted, the children attempted to establish mutual knowledge more when there was a discrepancy in level of script knowledge than when script knowledge was shared. Thus, even young children engaged in communicative strategies to assess and adapt to their discourse partner's level of expertise.

The correlations between the measures of establishing mutual knowledge and the measures of communicative effectiveness revealed several interesting relations. In particular, regardless of whether dyad members shared knowledge of the script, establishing mutual knowledge was negatively associated with off-script talk. This suggests that assessing and accommodating the discourse partners knowledge level is effective for remaining engaged in script-based play. However, when both discourse partners knew the script, establishing mutual knowledge was negatively associated with quantity of talk and topic maintenance. Thus, it appears that if the discourse partners have equal levels of script knowledge, then the frequent production of communicative behaviours designed to establish mutual knowledge may actually disrupt some aspects of the interaction. These associations must be interpreted cautiously, however, because the direction of effect is unclear. For instance, in the matched condition mutual knowledge establishment may have hindered topic maintenance or, alternatively, when the children had trouble maintaining the topic they may have engaged in more strategies for establishing mutual knowledge in an attempt to improve the communicative interaction.

It is important to note that even though script knowledge did play a role in children's communicative effectiveness and in their use of strategies for establishing mutual knowledge, the difference between conditions tended to be small, although statistically significant. This is rather suprising in light of claims made by Nelson and others (e.g. Nelson & Gruendel, 1979; Furman

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& Walden, 1990) concerning the central role of scripts in organizing children's social behaviour. It is possible, of course, that the influence of scripts is pervasive early in development but declines thereafter as communication skills become more flexible and decontextualized. Although children's initial strategies for communicating with others may be learned with and tied closely to specific routine contexts, these skills may become fairly context-independent by age four or five. This is earlier than thought by Nelson & Gruendel (1979) and Furman & Walden (1990). Interestingly, the effect of age on children's communication also was minimal in this study. The finding that topic maintenance increased with age was the only significant age effect. The fact that the age range of the participants in this study was small and that, due to the design of the study, the mean age of the dyad members was used as a covariate may have contributed to the lack of age effects.

In conclusion, our results suggest that other factors in addition to script knowledge must be considered when attempting to understand the communicative behaviours of older preschool children. In addition to substantive knowledge (i.e. knowledge about the script) and general communicative abilities (e.g. turn-taking, topic maintenance), successful communication also requires 'enabling skills' such as social-cognitive skills (Whitehurst & Sonnenschein, 1985). Social-cognitive skills, which involve the ability to reason about the thoughts and knowledge of others, are essential for establishing and using shared knowledge in communicative interactions. The fact that the children in this study were able to sustain their interactions even when one child was less familiar with the scripted event (i.e. the mismatched condition) suggests that they were able to reason about their discourse partner's level of knowledge and, moreover, accommodate discrepancies in level of pre-existing knowledge. These preschoolers, like Isaacs & Clark's (1987) adults, were able to monitor their discourse partners' level of expertise, relate it to their own expertise, and adjust their communication accordingly. This suggests that social-cognitive skills involved in these preschoolers' interactions can be applied quite broadly. That is, in addition to routine contexts with which the children are familiar, they can be applied to unfamiliar situations or with partners who are more or less knowledgeable than themselves. Finally, it may be that the preschool experience itself, which forces children to accommodate to the different perspectives and goals of others, and which often requires dealing with children slightly older and younger than the self, plays a role in helping children to decontextualize their communicative strategies.

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APPENDIX A

SCRIPT COMPONENTS DETERMINED FROM PILOT RESEARCH WITH ADULTS

For each event, the subjects' task was to produce a list of actions or activities that are typically part of the event. They were instructed to list, in temporal sequence, actions that typically would be performed during each of the events.

Taking an airplane trip script

Components (in temporal sequence)	Number of adults listing component ($N = 18$)
1. Pack.	15
2. Drive to the airport.	18
3. Give the lady suitcases.	14
4. Wait in the waiting area at the airport.	14
5. Get on the airplane.	16
6. Get off the airplane.	11

Agreement on sequence of contiguous pairs of components was 100%.

Baking cookies script

Components (in temporal sequence)	Number of adults listing component ($N = 18$)
1. Look for a recipe in a cookbook.	13
2. Turn on an oven.	17
3. Mix some things together in a bowl.	18
4. Put dough on a pan.	16
5. Put a pan in an oven.	17
6. Take cookies out of an oven.	16
7. Eat cookies.	13

Mean agreement on sequence of contiguous pairs of components was 97% (Range = 53–100%).

Going to the dentist script

Components (in temporal sequence)	Number of adults listing component ($N = 18$)
1. Walk into the dentist's office.	14
2. Tell the secretary your name.	16
3. Sit in the waiting room.	15
4. Read a magazine in the waiting room.	14
5. Go with the dentist's helper to the dentist's room.	16
6. The dentist working on your teeth.	16
7. Leave the dentist's office.	16

Agreement on sequence of contiguous pairs of components was 100%.

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Doing laundry script

Components (in temporal sequence)	Number of adults listing component ($N = 18$)
1. Put light and dark clothes into different piles.	17
2. Put dirty clothes in the wash machine.	17
3. Put soap in the wash machine.	18
4. Wait for the wash machine to finish.	14
5. Put clothes in the dryer.	18
6. Hang and fold clothes.	15

Mean agreement on sequence of continguous pairs of components was 99% (Range = 88–100%).

APPENDIX B

NON-SCRIPT COMPONENTS

Taking an airplane trip script

Non-script components
1. Give an umbrella to the pilot.
2. Ride bike to the airport.
3. Give a birthday cake to the stewardess.
4. Play a horn in the waiting area at the airport.
5. Make a paper airplane.
6. Climb on the wing of the airplane.

Baking cookies script

Non-script components
1. Put pizza in a microwave oven.
2. Take popsicles out of a freezer.
3. Put ketchup on some cookies.
4. Set the table.
5. Turn on a toaster.
6. Make a peanut butter and jelly sandwich.
7. Drink a cup of coffee.

Going to the dentist script

Non-script components
1. Talk on the secretary's telephone.
2. The dentist's helper takes your temperature.
3. The dentist puts a bandaid on your arm.
4. Give the secretary a letter to mail.
5. Sit on a couch in the dentist's room.
6. Watch TV in the waiting room.
7. Go with the dentist's helper to her car.

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Doing laundry script

Non-script components
1. Put soap in the dryer.
2. Put clean clothes in the wash machine.
3. Sew clothes.
4. Put the light and dark clothes together in one pile.
5. Turn on the dishwasher.
6. Pack clothes into a box.

APPENDIX C

TOPIC MAINTENANCE EXAMPLES

Extract from baking cookies play session

(Topic immediately prior was about trying to locate a stick of butter.)

A I like to taste the batter. [NEW TOPIC]
B Can I use it {spatula}?
B Can I do this for a minute? [NEW TOPIC]
A *You can use this*. [MAINTAINED TOPIC]
B *And then I'll stir it*. [MAINTAINED TOPIC]
A *Alright*.
A *Stir it*. [MAINTAINED TOPIC]
B Whoa!
B Whoa! [UNCODEABLE TOPIC]
A (Actually) actually I'll roll out the yellow one, alright? [NEW TOPIC]
B *Yeah*.
B *Stir it*. [MAINTAINED TOPIC]

APPENDIX D

OFF-SCRIPT TALK EXAMPLE

Extract from airplane trip play session

A (Where are you) where are we gonna sit?
B We have to use these for seatbelts.
B We can really buckle ourselves up.
A I know.
A I got mine buckled.
B I almost have mine buckled.
A *That's* 〉
A *How old are you*. [OFF-SCRIPT]
B *Four*. [OFF-SCRIPT]
A *I'm five*. [OFF-SCRIPT]
B *I'm almost five*. [OFF-SCRIPT]

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A *Oh*. [OFF-SCRIPT]
B *March eighth is my birthday*. [OFF-SCRIPT]
A *I'm almost five and a half*. [OFF-SCRIPT]
B Uhoh!
B This came off {pulls seatbelt apart}.
A Let me see.
A Oh {laughs}.
B We have to be very careful with these seatbelts, don't we?
A Yep.
: {pause}
A *My birthday's this February*.
A *My five and a half birthday*. [OFF-SCRIPT]
B *Today was your birthday?* [OFF-SCRIPT]

APPENDIX E

CLARIFICATION REQUEST EXAMPLE

Extract from laundry play session

A Those are my shorts.
B *These*?
B This is mine. [CLARIFICATION REQUEST]
A These are my pants.
B No.
B All of it can't be yours.
A Yeah.
A But we both share these clothes.
A And this big shirt is mine.
B *This big shirt*? [CLARIFICATION REQUEST]

APPENDIX F

EXAMPLES OF MUTUAL KNOWLEDGE STRATEGIES

Extracts from baking cookies play session

Assessing level of expertise

B Alright.
B Now to put this in the oven.
A Ok.
B *Know how I made a heart cookie*?
B I rolled it up in a ball.
B Then went like this. [ASSESSING]
A I know you do that then.
A And then you put the heart.
A You use the dough.

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Indicating level of expertise

B Know how I made a heart cookie?
B I rolled it up in a ball.
B Then went like this.
A *I know you do that then.*
A And then you put the heart.
A You use the dough. [INDICATING]

Acquiring expertise

A Here's the cookie.
A (That) that are all ready (that) that have to go on here.
A They have to go on here.
A But not on this time.
B *Now put them in the oven*? [ACQUIRING]
A Right.
A And we'll make some more.
A It's supposed to go on nine twenty {setting oven timer}.
B *Where's nine twenty*? [ACQUIRING]
A On the clock.
A Nine twenty's right there.

Supplying expertise

A Here's the cookie.
A (That) that are all ready (that) that have to go on here.
A *They have to go on here.*
A *But not on this time.* [SUPPLYING]
B Now put them in the oven?
A Right.
A And we'll make some more.
A *It's supposed to go on nine twenty* {setting oven timer}. [SUPPLYING}
B Where's nine twenty?
A *On the clock.*
A *Nine twenty's right there.* [SUPPLYING]

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