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ABSTRACT

The knowledge system of the young child is considered script-based, where script is used (in the Schank and Abelson 1977 sense) as a frame defining an expected sequence of actions in a given context involving props, scenes, and actors. This study was concerned with how scripts may be influenced by the structure of different events and the child's experience with them. Forty children, ranging in age from 2 years, 11 months to 5 years, 6 months, divided into younger (under 4,5) and older (over 4,5) groups, reported twice on 6 events selected to reflect differences in familiarity, social character, centrality of child's role, affectivity, and the basis for and variability in the temporal structure. Examples of events were: getting dressed in the morning, making cookies, going to the grocery store, going to a restaurant, going to a birthday party, and having a fire drill. Results indicated that older children reported more acts, and events low in personal involvement and/or familiarity elicited less output. There was no overall age difference for act consistency; however, there were age differences for individual events due to amount of child responsibility in events and event complexity. Both groups showed few errors on act sequence consistency. Temporal terms were apparently used by younger children only when temporal structure was compelling, while older children used temporal terms for all events. (Author/MP)

Children's Long-term Memory for Routine Events

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The research that I am reporting here relates to memory taken in its broadest sense, that is, as a knowledge system. It is concerned with long-term storage, the kind of memory referred to as "semantic," or preferably "generic." However, the type of knowledge involved is "episodic" in the sense of being concerned with knowledge about events that the child has taken part in. To avoid the implications of either term, semantic or episodic, we speak of the child's knowledge of scripts for different events, where script is used (in Schank and Abelson's 1977 sense) as a frame defining an expected sequence of actions in a given context, together with the props, scenes, and actors involved.

The assumption behind this research is that young children have already formed and have available such frameworks, that they do not need to be constructed ad hoc or on the spot, but that they form a basic representational system. Our research is basic to the notion of constructive memory--that is, we are trying to fill in the ground on which constructions and reconstructions are based. We have been testing this assumption in a number of ways over the past several years, and the study I will report here is one of an ongoing series that will eventually reveal, we hope, not only that children have scripts as basic cognitive representations, but the way in which they use scripts in other tasks and contexts, such as specific autobiographical and other episodic memory tasks, problem-solving, language comprehension.

If children's knowledge system is script-based, the following implications should follow:

1. Recall or report of an event should contain similar elements in a similar sequence at different times.
2. Recall should follow a specific sequence that maps the sequence of events in real life.
3. Because scripts are based on common experience, reports should be similar across children.
4. Reports should reveal indications of implicit underlying structure, such as reference to elements that have not been explicitly identified, for example, "the teacher," "the waiter."
5. The report should be couched in general rather than specific episodic terms.

In our previous studies, primarily concerned with the familiar events Lunch and Dinner, we have found support for each of these implications (Nelson 1977; Nelson and Gruendel 1979, in preparation). Note that these

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findings run contrary to accepted wisdom about young children's cognitive structures along a number of dimensions. First, they have shown that script knowledge or general event knowledge is organized as temporal sequences, not as disordered snatches of episodic information. It is general rather than egocentric and idiosyncratic and is consistent across children and over time. Children's scripts, in short, are general in form, temporally organized, socially accurate.

The study that I will report here was concerned with how the structure of different events and the nature of the child's experience with them influences the child's script, as that is reflected in the child's report. In this study we compared children's responses to the question "What happens when you..." take part in each of 6 different events with which they had had varying experience: getting dressed in the morning, making cookies, going to the grocery store, going to a restaurant, going to a birthday party and having a fire drill. Note that we did not ask for a specific memory but a general report. Each child was asked about each event twice with a lag of three to four weeks between interviews. Forty children ranging from 2 years, 11 months to 5 years, 6 months, divided into younger (less than 4,5) and older (over 4,5) groups, took part. To get some feeling for the types of responses we got refer to Table 1.

The events were chosen to reflect differences in familiarity, social character, centrality of the child's role, affectivity, and the basis for and variability in the temporal structure. On the basis of our intuitions about how these variables might affect the script, we could make some predictions about the characteristics of the children's reports. Predictions are shown in Table 2 for the 6 events in the study. I will briefly describe these dimensions and the basis for the predictions before turning to results and their implications.

The first measure of interest is amount of recall, which is measured in terms of number of Acts reported. Acts form the building blocks of the script. Some events include more distinct acts at a given level of generality than do others, and thus might lead to greater output for this reason alone. In addition, however, familiarity of the event, affectivity and personal involvement might all be expected to influence how much is recalled. In general, of course, we expect both theoretically and on the basis of previous research that older children will report more acts than younger children. We can also predict that Grocery Store, Fire Drill and Making Cookies will produce relatively low amounts of recall because of their lack of personal involvement and/or their unfamiliarity.

If recall is based on an underlying script it should be consistent over time. Within child consistency reflects the reliability of the stored script. We measure consistency in terms of the ratio of common acts reported in the two interviews to the average number of acts reported on each occasion. A figure of .33 for example, indicates that 1/3 of the acts reported for that event were repeated a second time.

The higher the consistency the more reliable and established the script. Child consistency is presumably some function of experience with the event and we would expect that the highly familiar Getting Dressed routine would be high on consistency while Restaurant and Fire Drill might also be high because of their high salience and affect. On the other hand, if the experience of Making Cookies is unfamiliar and of low involvement, that should lead to low consistency. Grocery Store and Birthday Party might also be expected to be low, not simply because of lack of familiarity and/or involvement but because each has a less highly structured and invariant temporal sequence.

The structure of the event may also be reflected in how the child links its component Acts. The use of temporal terms such as "then," "when," "before" and "after" indicates sensitivity to the temporal structure of the event. Such use increases with age, of course, but it also varies with events. Just as with the consistency measure, the structure of the event itself may influence the extent to which these terms are used. Some events, such as going to a restaurant or making cookies are very tightly woven in terms of their causal and temporal relations. Others, such as grocery shopping and getting dressed, are composed of similar acts loosely strung together. Birthday Party, on the other hand, is composed of a number of essential elements (candles, cake, singing happy birthday and playing games) but these elements can be put together in varying ways. Thus the temporal structure in the child's report and therefore the temporal terms used can be expected to vary.

Turning to the results in Table 2, it can be seen that some of our predictions are borne out while others are not. In terms of amount of output, we expected grocery store, making cookies and fire drill to be low for the reasons suggested above and birthday party to be high. These expectations were borne out. And as can be seen, there is a substantial difference between the older and younger children in terms of amount of output.

With respect to consistency, there was no overall age difference. Getting dressed, restaurant and fire drill were expected to be high; the first two were as predicted, at least for the older children, but fire drill showed low consistency, presumably because the children had had too few experiences with it. Although there were no consistent and reliable age differences on consistency, there were age differences for individual events. Getting dressed was relatively low for the younger children and high for the older. This is an interesting outcome that leads to the following speculation: although both groups of children have had considerable experience with this routine, the three-year-olds are only beginning to take responsibility for it themselves and thus to have to predict its details. To the extent that a person must plan ahead, the script must become much more reliably established and indeed automatic. The younger children presumably had not yet reached this point. Note that for restaurant the situation is almost reversed: the younger children show higher consistency than the older. Clearly this cannot reflect the effect of responsibility as suggested for getting dressed. Rather it

seems likely to reflect the effect of greater experience in that older children are more likely to have had experience with a wider variety of restaurants; thus their restaurant scripts may be more complex, consisting of different paths that may be taken. Thus complexity of the event itself enters into the structure of scripts to complicate any comparisons that we might be inclined to make. The less complex the script, the greater consistency over time should be. A measure that is not reported in this table supports a similar explanation. How common across children are the acts that are reported? Here we did not find differences by events, but older children were considerably more in agreement with each other than were the younger on all events. Familiarity leads to both within child and across child agreement.

Grocery store, making cookies and birthday party were expected to be low on the consistency measure. This was true for making cookies, and for the younger children for birthday party (less for the older), but grocery store had the highest degree of consistency at each age. Grocery store appears to be a more highly structured script than we had anticipated, although as our temporal terms analysis will show, it does not seem to reflect a high degree of temporal structure. We will need to look more closely at the specifics of the output for this event.

Another type of consistency that we have measured is consistency of the sequence in which acts are recalled. Here the index is formed by taking the ratio of acts recalled in the same sequence to the total number of overlaps between the two outputs. As shown in Table 2 these ratios are very high, as we expected from prior research: on this type of tasks young children make very few sequencing errors. The lowest value here is for Getting Dressed (.84 - .89) which has a number of components that can be interchanged, e.g. shirt and pants.

Consider next the extent to which children used temporal terms to link acts. The numbers here reflect the total number of explicit temporal links used--including "then," "and then," "before," "after," "when," "if," "because," exclusive of "and." These numbers are aggregated across children and terms for each event and cannot be compared statistically. We expected, on the basis of the event structures, that Restaurant and Making Cookies would be relatively high on the use of temporal terms while Grocery Shopping, Getting Dressed and Birthday Party might be relatively low. Grocery Shopping was consistently low and Birthday Party was also low for the younger group. Getting Dressed was in the mid-range for the younger group. Birthday Party and Getting Dressed for the older children, contrary to expectation, showed the greatest use of temporal terms. This may be understood in conjunction with the further observation that while Restaurant and Making Cookies were both high for the younger children, as predicted, this was true only for Restaurant and not for Cookies for the older children.

It seems probable that the use of temporal linking terms is a function of amount of output as well as its structure. While the two measures were not highly correlated for the younger children ($r. = .24$), they were for the older ($r. = .64$). Since Birthday Party was a high output event and

Making Cookies a low one, this could well explain the reversal in ranks for the different age groups. Why should these two measures --amount and temporal terms--be correlated for the older children and not the younger? Again we must speculate, but it seems likely that as the child is learning to use temporal terms productively she will use them first and most in those contexts where the temporal structure is most compelling. Thus at the younger age structure will determine use, as predicted, while at the older ages children will use temporal terms to indicate temporal sequence regardless of how tight that structure is felt to be. In effect, they will impose the same temporal structure on all events.

I hope that I have been able to suggest some of the ways in which event structure may influence children's experience and their representation of that experience. The study of memory in natural settings must take into account this representational background if memory for specific episodes is to be understood.

We have just completed a study comparing the two types of memory--memory for a specific episode and that for a general event. Even 3 year old children do distinguish between these cases although they seem to find the general report easier and more natural--they report significantly more acts when asked "what happens when you have dinner at home" than "when you had dinner at home yesterday or last week." They also reliably distinguish the present and past tense in their reports. We have not yet had a chance to look at the fine structure of these protocols but certainly on a first scan they support the hypothesis that the child's generic event memory is basic to specific memories and that the latter may in fact be derived from the former.

We have only begun to probe some of the variables that may be important to what and in what form children remember an event. Certainly it seems that their general event representations in script form can be expected to influence what they remember of a specific variation on that event. And as Janice Gruendel's (1979) and Kathleen McCartney's (1979) research has recently shown, it will influence also their memory for, and construction of stories. We expect that further research will continue to demonstrate the importance of this level of representation for children's memory and cognitive processing in general.

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Table 1: Examples of responses at 3 and 5 years

Well, you eat and then go somewhere. (Restaurant--3;1)

Well, you bake them and eat them. (Making cookies--3;1)

You just put (on?) your clothes and you eat breakfast!!! (Getting dressed--3;1)

Well, you get the food you want and then...and you go home. (Grocery shopping--3;1)

You cook a cake and eat it. (Birthday party--3;1)

I first, I always first put my underpants on, then my socks, then my undershirt, then I put on my other shirt, then I put on my pants, then I always go and have breakfast, then I go to school and then after school I leave for home then have lunch, then I go to afternoon school and I'm right here in my afternoon school right now. (Getting dressed--5;6)

My, I help my mother roll the dough out after being freezed for a day, then I and then I, my mother bakes them, puts them in the oven, bakes them, then I decorate the cookies with different colors, and different things and sometimes I color the whole cookie. (Making cookies--5;6)

Yes, it'll be about when I go to Pathmark. I, my, when I first arrive, I go get a toy from a machine, then I go looking around at toys and every tiem, I look at, I look for my mother then I sometimes, I buy an extra toy, I did the one time I went to Pathmark and also, my mother and father do all the other work. (Grocery shopping--5;6)

Well, I'm very quiet in a restaurnat and one of my favorite restaurants is at Macy's, it's in Macy's, and it's called Macy's, and what I eat is some french fries that come with my Rascal Raccoon and I...and it comes with just a piece of bread around it and hot dog and I put my ketchup on it and I have a pleasant time and I eat, sometimes want dessert. (Going to a restaurant--5;6)

Table 2. Results: Mean Values for Response Characteristics for Different Ages

Event		# Acts Reported		Act Consistency[2]			Sequence Consistency[3]			# Temporal Terms Used[4]		
	Prediction	Young[1]	Old	Prediction	Young	Old	No Predictions	Young	Old	Predictions	Young	Old
1. Getting Dressed	None	2.21	3.70	High				.89	.84	Average	19	62
2. Grocery Store	Low	2.21	3.29	Average	.71	.67		1.00	1.00	Average	14	40
3. Making Cookies	Low	1.30	2.15	Low	.36	.43		1.00	.95	High	20	46
4. Restaurant	None	2.91	4.68	High	.70	.49		.94	.94	High	27	49
5. Birthday Party	High	2.95	4.22	Average	.35	.53		.90	1.00	Low	15	62
6. Fire Drill	Low	1.22	2.55	High	.35	.53		.90	.94	High	16	49
Means		2.12	3.42		.48	.55		.94	.95		18.5	51.3

[1]Young = Less than 4, 5 years; old = 4,5 to 5,6 years; 20 children in each group.

[2]Act Consistency = Number of acts reported on both interviews/mean total number of acts reported.

[3]Sequence Consistency = Number of common acts reported in same sequence/mean number of common acts.

[4]Total number of temporal terms such as then, when, before, after, first used by all children in the age group.