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Story Episode Length and Memory

If we ask ourselves what makes a story different from an unrelated group of sentences, the first distinction that comes to mind is that the sentences in a story fit together meaningfully. That is, they are connected by various cohesive relations into a coherent whole. These interstitial cohesive relations are of various kinds: for example, the different statements talk about the same people and objects, one action causes or fulfills the preconditions of the next, etc.

But this is not the whole story. Not only is a story a group of statements integrated by cohesive relations, but these statements also tend to cluster into subgroups. Thus in addition to inter-statement cohesive relation, stories also have a substructure--that is, a constituent structure. What are these constituents? One distinction that comes to mind is that a story has a setting and a plot. A plot then typically describes a character's various attempts to attain some goal. Hence the basic substructures or constituents of a plot seem to be the attempts to attain the goal. First, I will focus on these attempt constituents of the plot, but I will return to the setting-plot distinction later.

When we say that story statements cluster into constituents, we mean that the statements in a constituent are more related or connected to each other than they are to the statements in another constituent. Thus if these constituents are psychologically real, we expect the statements in a constituent to have a greater psychological effect on the other statements in the same constituent than on statements in another constituent. If we choose accuracy of recall as our psychological measure, then a variable we expect to have an effect on it is the number of items to be remembered--that is,

the number of statements in the constituent. Hence a validation of our constituent notion would be if the number of statements in a constituent affected the recall accuracy of the statements in that constituent, but did not affect the recall of the statements in the other constituents. Figure 1 on the first page of the handout illustrates how we designed the story materials used in the experiments. The example story is about a recent college graduate who is trying to get a job (the goal of the story). First he tries an employment agency (attempt 1). In describing this employment agency attempt, the story explicitly states either four actions and an outcome, or nine actions and an outcome. In particular, the short version of the attempt mentions only four Target actions together with the Outcome. Figure 1 illustrates this short version by the first row of pluses labeled as the Target actions. The long version of the attempt then has five more Filler Actions (the second row of pluses in the figure) interspersed with the four target actions.

As you can see from the "no job" Outcome in the figure the employment agency strategy fails, so next our graduate decides to try getting a job through his father's contacts. Again this attempt constituent has a short version with four Target actions and an Outcome, and a long version which adds five Filler actions to the Target actions and Outcome. This second attempt then ends with the graduate attaining his overall goal of getting a job.

In the first experiment, 32 Stanford students read four such two-episode stories. Each story had four versions. A Short/Short version where both the first and second attempts have only the four Target actions and Outcome. A Short/Long version where the first attempt has only the four Outcome. A Long/Long version where both the first and second attempts have only the four Target actions and Outcome. A Short/Short version where both the first and second attempts have only the four Target actions and Outcome. A Short/Long version where both the first and second attempts have only the four Target actions and Outcome. A Long/Long version where both the first and second attempts have only the four Target actions and Outcome. A Short/Short version where both the first and second attempts have only the four Target actions and Outcome. A Short/Long version where both the first and second attempts have only the four Target actions and Outcome. A Long/Long version where both the first and second attempts have only the four Target actions and Outcome.

of each story. Since the Target actions are common to both the short and long versions of the episodes, their recall accuracies provide a way to compare the versions. The recall of the Outcome statements would be another comparison, but they were essentially always recalled. Table 1 on the top of the second page of the handout gives the results. Looking first at the bottom row of the table, we see that when an attempt was short, the subjects recalled on the average 79% of the Target actions; whereas, when the attempt was long, the subjects recalled on the average 89% of the target actions. This 10% difference is significant. The length of the other attempt had no significant effect (85% versus 83%). Hence adding the Filler actions affected the recall of the Target actions in that attempt, but had no effect on the recall of the target actions in the other attempt. Hence these attempts fulfill the recall independence properly we expected for different constituents, so these attempts do indeed seem to be constituents of the stories.

Target actions and Outcome, but the second attempt also adds the five Filler actions. A Long/Short version where the first attempt has both Target and Filler actions, but the second attempt has only the Target actions and the Outcome. And a Long/Long version where both attempts have Target and Filler actions. A given subject read one story in each of the four versions and across subjects each story appeared in each of the four versions. After the subjects read the four stories, they performed a 20 minute intervening task, then were cued with the story titles (e.g., "Jobs") and wrote a free recall

We also conducted a similar experiment to test the idea that there is a setting constituent and a plot constituent. In this experiment we varied the number of setting statements and the number of plot statements, but in this case the number of setting statements did affect the recall accuracy of the plot statements, and the number of plot statements did affect the recall accuracy of the setting statements. While this result does not prove that there are no separate setting and plot constituents, it does cast doubt on this separation.

There is one at first curious aspect of our recall accuracy results with different attempt lengths. Usually we expect that the more items we give people to remember, the less accurate will be their memory for any given item. But, as Table 1 shows, adding the filler actions to the attempts improved the recall of the Target actions. Hence we are left with the question of why memory improved rather than deteriorated with the addition of more actions to be remembered.

To help answer this question, we had another group of Stanford students rate how important each of the Target and Filler actions were for the story. Table 2 on the handout gives the average ratings on a seven point scale where seven means very important and one means unimportant. The Target actions were on the average given a 4.31 rating, whereas the Filler actions only received an average rating of 3.26. Thus the subjects rated the Target actions as significantly more important to the story than the Filler actions. Hence we now have a new hypothesis that adding related unimportant statements to a story constituent will improve the memory for the more important statements in that constituent.

Examining the individual target action ratings we discovered one type of action statement that always received a high importance rating (i.e., at least five on our seven point scale). These actions are summaries of all the actions in the attempts to which they belong. For example, the first attempt in the "job" story contains the following statement: "First he tried a local employment agency." This statement summarizes the entire attempt. We call such statements "superordinate" actions and we call the more detailed further specifications of them "subordinate" actions. Some subordinate actions for this "tried a local employment agency" superordinate action are "He had to pay a fee", "He filled out a veritable mountain of forms", "Finally he was able to look through their job file", etc.

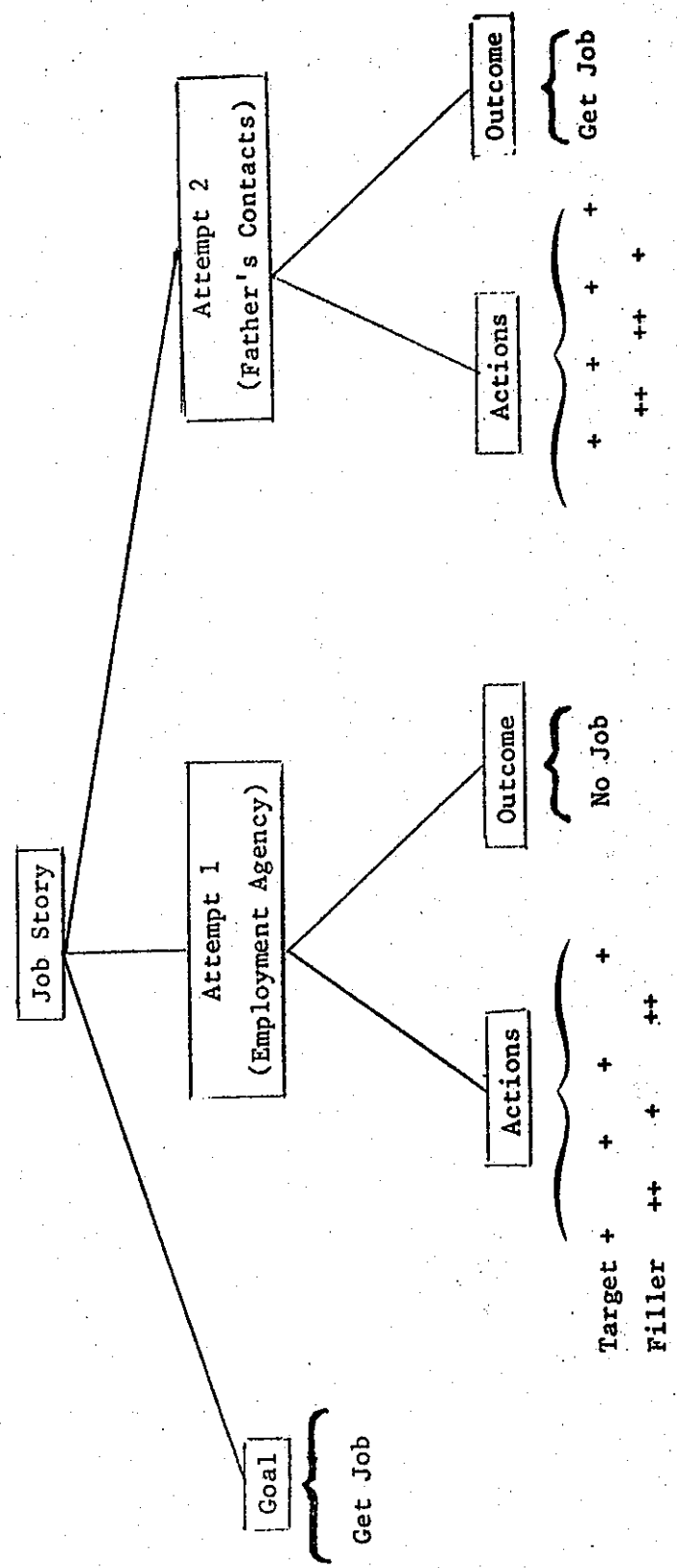
We conducted another experiment to see whether increasing the number of subordinate actions would increase the recall probability of the corresponding superordinate action. We revised the stories used before so that now each attempt had a superordinate action statement and either three (the short version) or six (the long version) supporting subordinate actions. Again 32 Stanford students read four of these stories, then free recalled them to title cues after a 20 minute intervening task. Table 3 on the handout gives the average recall accuracies of the superordinate actions as a function of the number of subordinate actions. The subjects recalled 80% of the superordinate actions with three supporting subordinates, but they recalled virtually all (98%) of the superordinate actions with six supporting subordinate actions. Hence we have validated our hypothesis, at least for this superordinate subordinate action case, that adding unimportant actions increases the recall probabilities of the important actions in a constituent.

To summarize, then, we first demonstrated that the actions that form different attempts to attain the goal of a story are clustered into separate attempt-constituents in memory. We showed this separation by showing that the number of actions in an attempt-constituent affects the recall of the actions in that constituent, but not in the other constituent. An unexpected result, however, was that adding more actions to an attempt increased the recall accuracy of the original action. We then hypothesized that this result occurred because the added actions were of less importance to the story than the original actions. We tested a special case of this hypothesis in another experiment by showing that the recall probability of superordinate summary actions increased with the number of subordinate actions that further specified them.

Thus from these results we conclude first that stories have a goal-oriented constituent structure and second that the greater the number of supporting further specifications a story action has, the more salient it will be in the memory representation of the story.

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Figure 1
Example Story



Mean Percent Recall Accuracy for Target Actions
Length of Same Attempt

	Short	Long	
Short	81	88	85
Long	77	89	83
	79	89	

Table 1

Mean Importance Ratings
(1 = Unimportant, 7 = Very Important)

Target Actions	4.31
Filler Actions	3.26

Table 2

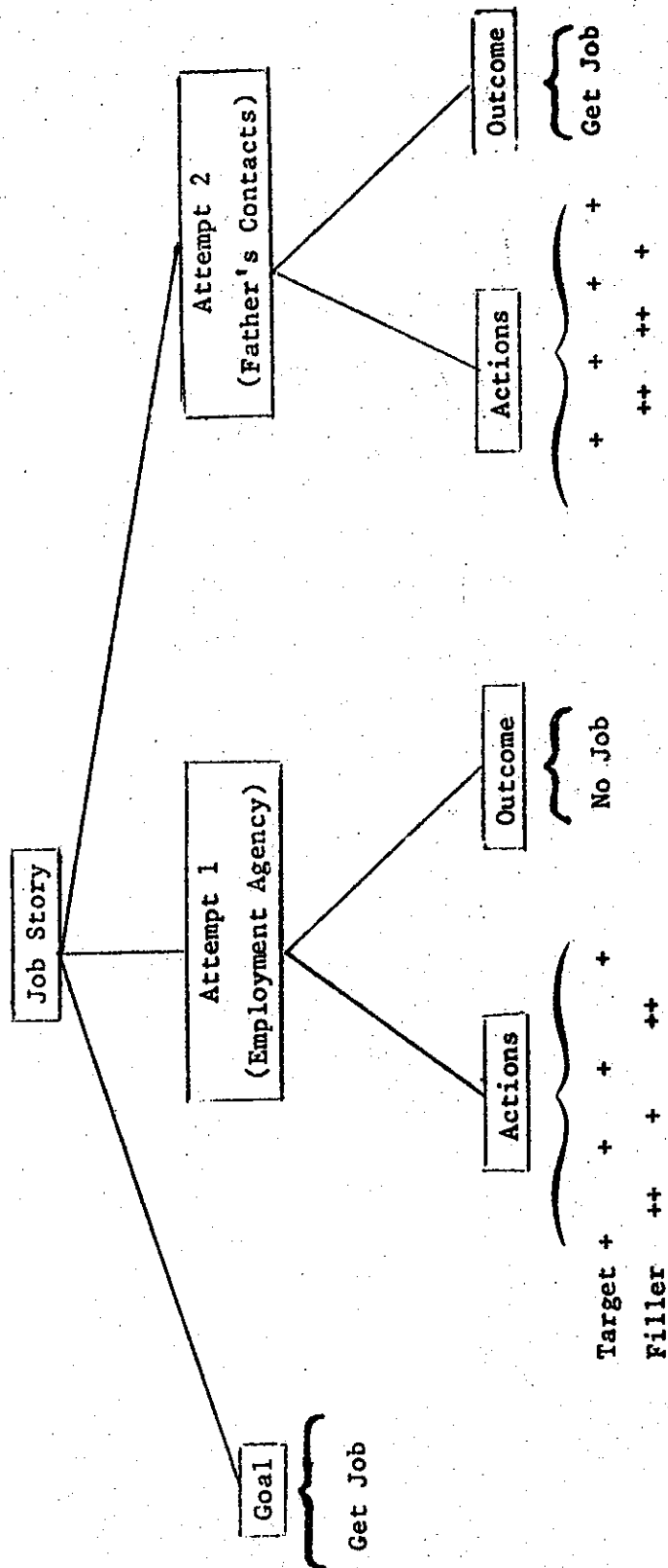
Mean Percent Superordinate Action Recall

Three Subordinate Actions	80
Six Subordinate Actions	98

Table 3

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Figure 1
Example Story



Mean Percent Recall Accuracy for Target Actions

Length of Other Attempt	Short	81	88	85
	Long	77	89	83
	Short	79	89	

Length of Same Attempt

Table 1

Mean Importance Ratings

(1 = Unimportant, 7 = Very Important)

Target Actions	4.31
Filler Actions	3.26

Table 3

Mean Percent Superordinate Action Recall

Three Subordinate Actions	80
Six Subordinate Actions	98