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AUTHOR Lang, Annie; And Others
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ABSTRACT

To test the hypothesis that news stories written in chronological order are remembered better than news stories written in typical broadcast format, a study used a mixed model factorial design to examine factors of style (traditional or chronological), subject (content of news story), and order (placement of the story within the newscast). Two target stories were produced and imbedded in a 15 minute student-produced newscast containing a total of ten stories. Conditions were identical except for the style of the target stories and their placement within the newscast. Subjects, 111 undergraduate communications and public relations students at a western university, were randomly assigned to eight viewing groups. Immediately following the newscast viewing, subjects were given a free recall test, in which they listed all the stories they could remember, and also wrote down everything they remembered about each story. A cued recall test for the two target stories was then administered, and finally, subjects completed a multiple choice test on information contained in the target stories. Results showed that the recollections of subjects who viewed the chronological presentation were more accurate than those of subjects who viewed the traditional broadcast presentation. (One table of data and 14 references are appended.) (MM)

The Effects of Chronological Presentation of Information on Processing and Memory for Broadcast News

Annie Lang
with
Garrett H. Seick
Josh Baldi
Jeff Douglas
and
Kristie Peterson

Washington State University
Communications Department
Pullman, WA 99164-2520
(509) 335-2795

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The Effects of Chronological Presentation of Information

Information on Processing and Memory for Broadcast news

This study shows that the order of information presentation in broadcast news stories influences the level of recall and recognition for information contained in the newscast. Specifically, it is theorized that chronological presentation of events (rather than what is new followed by the causes and consequences) will decrease the need for semantic memory access and allow the viewer to process the news story episodically. This, in turn, reduces the amount of effort demanded of viewers and increases the amount of information making the translation from the television screen to the viewers' memory. Results show greater memory for newstories written in chronological order than for those written in typical "broadcast" form.

The Effects of Chronological Presentation of Information on Processing and Memory for Broadcast News

How the information contained in a television newscast gets from the screen into the memories of television viewers is a question of prime interest to newscasters, broadcast professionals, and researchers. Many studies (Miyo, 1983; Findahl and Hoijer, 1981) demonstrate very low levels of memory for the content of television newscasts and low levels of information holding by those who rely on the broadcast media for news (Woodall et al.,1983; Wade and Schramm, 1969; Patterson and McClure, 1976; Clarke and Fredin, 1978). Several possible reasons for this finding have been proposed.

Miller and Reese (1982) suggest that the content of television news is brief, presented as entertainment, and "videocentric", all of which lead to low levels of attention and, as a result, poor memory for the content presented.

It has also been suggested that the viewer's lack of control over the timeframe of presentation inherent in television is responsible for this lack of memory (Miyo, 1983; Garramoni, 1983) . Because viewers cannot back up and "re-view" material that was poorly understood or incompletely perceived they fail to fully process and store the information in the newscasts, resulting in low levels of recall for television news information.

Miyo (1983) suggests that television news is simply processed at a lower level than newspaper news because it is presented at a constant (and invariable) rate, is visual rather than verbal, and is perceived as entertainment. Because of this lower-level processing, less attention is paid to the stimulus and therefore less information is recalled.

In general all of these explanations for viewers' inability to recall the content of television newscasts (low attention, incomplete processing, and low-level processing) imply that the amount of effort viewers expend while watching television is not sufficient to result in high levels of learning and memory for the information in the newscasts. One way to improve viewers' memory for the information in newscasts might be to make the newscast easier to process, that is, to reduce the amount of effort required to fully process and store the information contained in them. It is likely that decreasing the amount of effort required to process and store the incoming information will result in more information making the translation from the screen to the viewer's memory.

Findahl and Hoijer (1981) have suggested that television news is produced mainly for the initiated: that the format of television news, which presents what is new or different first, followed by what caused the change, followed by the consequences of that change, requires the viewer to have previous knowledge of the situation. In other words, the broadcast news style described by, for example, Stephens (1980) as having a lead which points the viewer toward the heart of the story, followed by information supporting the claims made by the lead, and ending with the "snapper" (which might be one last fact, the other side of an issue, or even the main point of the story) is designed, not to ease processing, but to maintain attention. From a cognitive processing point of view, however, this style of writing may demand a much more effortful type of cognitive processing than is generally engaged in by the television viewing audience.

In order to adequately process a news story written in this manner, the viewer must immediately access, in his memory, what he already knows about the subject in the story, in order to understand the information in the lead, while simultaneously processing the incoming information. Theories of human memory suggest that this may require a

high level of processing and effort on the part of the viewers since it requires the viewers to activate both their semantic and their episodic memories in order to comprehend and store the information contained in the story.

Generally episodic memory is defined as memory for the episodes or day-to-day activities of your life, while sematic memory is where your general world knowledge is stored (Ortony, 1978; Friestad and Thorson, 1985, Shoben et al., 1978; Tulving and Donaldson, 1972). It has been argued that no information gets into semantic memory without first being a part of episodic memory (Friestad and Thorson, 1985; Thorson and Friestad, 1985; Ortony, 1978). In other words, when we learn something, initially, it is remembered as what we did today -- only later is it stored as simply a fact that we know.

Thorson and Friestad (1985) suggest that all information must be originally entered into memory as episodes and that the mental operations performed on episodic memory create semantic memory. Similarly, Ortony (1978) theorizes that when we experience something we create an episodic "subgraph" which contains three types of information: the surface structure, corresponding to what actually happened; the semantic structure. made up of semantic information that was required to understand the experience; and input associates, which he describes as concepts related to the subject of the experience. According to Ortony's theory, episodic processing requires the creation of the complete subgraph. Only later, he argues, if time is available, is the information contained in the episodic subgraph "stripped of source and circumstances" (p. 59) and stored in semantic memory.

According to this theoretical perspective, all semantic memory (or world knowlege) must begin as episodic knowlege and the completeness of the episodic processing determines, to a great extent, whether episodically stored and processed information will make the

transition from episodic to semantic memory.

In addition, Friestad and Thorson (1985), among others, suggest that the strength of the episodic memory trace helps determine whether it will become a part of semantic memory. Theories suggests that episodic trace strength, or intensity, is influenced by a variety of factors. Among them are the intensity of the experience, the subjective importance or relevance of the experience, the ability of the person to understand the experience, the emotional content of the experience, the completeness of the episodic trace, and the temporal ordering of the experience (Friestad and Thorson, 1985; Ortony, 1978; Tulving, 1972). This view of information processing suggests, in other words, that in order to gain information a person must first perceive the information, process and store it episodically, and only then, as a result of these determinants of episodic memory strength, store the information in semantic memory. Thus, whether the information becomes a part of a person's general knowledge or semantic memory depends on its relevance or importance, its comprehensibility, its temporal order, and the amount of effort expended on the creation of the episodic trace.

If we apply this perspective to the processing of television news, recognizing the low-involvement style of processing often associated with television viewing (Findahl and Hoijer, 1981; Miyo, 1983; Miller and Reese, 1982), it suggests that the accepted style of broadcast news writing, while successful at maintaining interest, may demand levels of processing and effort that are too high to reasonably expect, resulting in incomplete and weak episodic "subgraphs" or traces, and correspondingly low levels of information transfer from episodic to semantic memory. This, in turn, would lead to poor recall for broadcast news and low levels of information holding among those who rely primarily on the broadcast media (and in particular television) for information.

This theory suggests that in order to process a news story

written in the accepted broadcast style (from now on referred to simply as "broadcast" style), the viewer must first identify, from the lead, the subject of the story. It is then likely that in order to understand that lead, the viewer must immediately access his semantic memory to retreive what information he has on that subject (Findahl and Hoijer, 1981), while simultaneously processing the incoming story episodically. Later, the viewer must shift that information from episodic to semantic memory for later recall. Now, if a viewer is processing at a low-level, or in a low-involvement mode, this may be more cognitive work than he or she is capable of doing. As a result, much information may be lost.

One way to alleviate this problem would be to design newscasts so as to reduce the necessity for viewers to access semantic memory while they are processing incoming information. Newscasts should be designed to reduce the need for semantic processing, thereby decreasing the amount of cognitive work required by the viewer. Further, news stories should be written so as to increase the episodic memory strength.

It seems reasonable to suggest that if television newscasts were designed to require only on-line episodic processing and to maximize the strength of the episodic traces being layed down, more information would be recalled from the newscast. One simple way to achieve both of these objectives would be simply to write news stories in an episodic manner. In other words, rather than leading with a tease, what is new, or what has changed, followed by its causes and consequences, the story should be presented in chronological order with the causes first, the change next, and the consequences last. This way, the viewer can episodically process the entire story without accessing semantic memory since information is presented in the order necessary for comprehension without additional information or inference. Further, the maintenance of temporal ordering of the experience described in the story (i.e., the

chronological presentation of events) is one of the factors hypothesized to increase episodic trace strength.

News stories written chronologically should require less semantic processing and therefore less effort to process, should result in stronger episodic traces being created, and should be remembered more completely. This study was designed as a preliminary test of the hypothesis that news stories written in chronological order will be better remembered than news stories written in typical broadcast format.

METHODS

Stimuli

A mixed model 2 (Style) X 2(Subject) X 4 (Order) factorial design was designed to test the hypothesis. The levels of the Style factor were "broadcast" (that is stories written in traditional broadcast style) and chronological (stories written in chronological order). The two "levels" of the Subject factor consisted of two different stories, one about law enforcement in a remote area of a western state and the other about that state's drunk driving law. These target stories were chosen from a pool of already written broadcast style news stories because they were judged to be of moderate interest to student subjects, were not referenced to a particular time, were of similar length and contained similar amounts of information. Each of these two stories was then rewritten in chronological style. The last factor, Order, had four "levels" designed to control for which anchor person read which story and where in the newscast our target stories appeared.

Our target stories were then produced and imbedded in a 15 minute student produced newscast. The background newscast used had the same anchors, one male and one female, as our target stories. Four versions of each target story were created controlling for anchor person and story type. The four orders of the stimulus tapes were then created.

Two of them contained the target stories as originally written (broadcast condition) and the other two contained the target stories rewritten in chronological order (chronological condition). The newscast contained a total of ten stories. The target stories always appeared towards the middle of the newscast in the third or the sixth position, in order to minimize changes in recall due to serial position effects. In the four orders each story appeared twice in the third position and twice in the sixth position.

The rewriting of the news stories into chronological order was done solely by reordering the sentences so that they appeared in the order in which the reported events must have occurred. No other changes were made in the news stories. In other words, all of the words, sentences, and information in the two styles (broadcast or chronological) were the same. Only the order in which the sentences were presented varied between the two conditions. Stories were chosen which did not have strong narrative characteristics in order to minimize the effects on memory of "story telling". Thus, for example, one story contained an interview. In the broadcast version, the story begins with what the subject of the interview had said. The chronological version, on the other hand, begins with the sentence explaining that someone was interviewed.

Subjects

Subjects were 111 undergraduate communications and public relations students participating in the experiment for extra credit at a western university . Students participated in the experiment in 8 groups of approximately 15. Groups were randomly assigned to condition.

Procedures

Subjects viewed the videotaped newscast in a small classroom. Seats were arranged in a semi-circle so that all subjects had a clear view

of the television set. The tapes were played on a Panasonic 3/4" VCR and subjects viewed the newscast on a RCA 19" color television set. Subjects were instructed to watch the newscast.

Immediately following viewing subjects were given a free recall test, in which they were asked first to list all the stories they could remember from the newscast and second to write down everything they could remember about the stories they nad listed. These responses were collected and then subjects were given a cued recall test for the two target stories. After these were collected subjects were given a multiple choice test on information contained in the two target stories.

Dependent Measures

The free recall and cued recall data was coded as the number of facts (defined as the major informational points of the story) recalled from the news story controlling for total number of facts. First, the number of facts contained in each story was ascertained by a group of raters. Because both stories were independently rated to contain five facts, number of facts, rather than percentage of facts, was used as the dependent variable.

The items in the multiple choice test were included in the analysis as levels of the repeated measure factor Items. The means for each condition are reported in terms of percent accuracy.

Hypotheses

The hypotheses were as follows.

Free Recall Test:

1. Subjects in the chronological condition will remember more information (that is more facts) from the target stories than subjects in the broadcast condition.

Cued Recall Test

2. Subjects in the chronological condition will remember more facts from the target stories than subjects in the broadcast condition.

Multiple Choice Test

3. Subjects in the chronological condition will have higher accuracy scores than subjects in the broadcast condition.

RESULTS

Hypothesis 1:

This hypothesis states that subjects who viewed the chronologically ordered stories should remember more information from the target stories than subjects who viewed the broadcast stories. A 2 (Style) X 2 (Subject) X 4 (Order) mixed model ANOVA was run on the data. No order effects were found in any of the analyses. The prediction was for a main effect of story type. The hypothesis was not supported ($F= 1.32$ $p< .27$). However, of the 111 subjects, only 15 recalled both target stories in the free recall test; thus, this ANOVA was run on only 15 subjects. The results of a power analysis, estimating a medium effect size, show that this ANOVA run on 15 subjects has a power of only 19%. Thus, there is an 81% chance of committing a Type II error, that is an 81% chance of failing to reject the null hypothesis when it is, in fact, false.

Because of the extremely low power of the test, and because this is an exploratory study, it was decided to examine this free recall data further despite the initial insignificant results. First, the means for each story by Style were computed (See Table 1). As can be clearly seen the means are in the predicted direction with more facts being remembered for both stories when the sentences are ordered in chronological, rather than broadcast, order.

Next, because the means were in the predicted direction, separate one-way Style ANOVAs were run for each of the target stories in

order to increase the number of subjects in the analysis. This resulted in n=49 for story 1 and n=26 for story 2. For Story 2, the predicted main effect for Style was significant ($F=7.7$, $p<.01$) and in the appropriate direction. Computation of the group means showed that subjects who viewed Story 2 written in chronological order remembered an average of 2.2 facts from the story, while subjects who viewed Story 2 written in broadcast order remembered on average only 1.3 facts. For Story 1, however, the main effect for Story Type was not significant ($F=1.2$, $p<.6$).

Thus, there seems to be preliminary support for the hypothesis that chronological presentation results in greater amounts of free recall.

Hypothesis 2:

This hypothesis states, again, that subjects who viewed the chronologically ordered stories will recall more facts than subjects who viewed the broadcast stories, this time using the cued recall test. A 2(Style) X 2(Subject) X 4 (Order) ANOVA was run on the cued recall data. The prediction is again for a main effect of Style.

As was the case in the free recall data the predicted main effect was not significant, though it approached significance ($F=2.11$, $p<.15$), and the means were in the predicted direction with subjects in the chronological condition remembering an average of 2.0 facts and subjects in the broadcast condition remembering on average only 1.6 facts.

Hypothesis 3:

This final hypothesis predicted greater accuracy on a multiple choice test for subjects in the chronological condition compared to subjects in the broadcast condition. A 2(Style) X 2(Subject) X 13(Test Item) X 4 (Order) Anova was run on the mulitple choice data. The prediction was for a main effect for Style.

The main effect for Style was significant ($F=5.5$, $p< .022$).

Subjects viewing in the chronological condition had an average accuracy of 53% while subjects in the broadcast condition averaged only 46%.

CONCLUSION

This study provides fairly convincing preliminary evidence supporting the hypothesis that broadcast news stories presented in chronological order will be remembered better than those presented in typical broadcast style. It is clear that the recollections of subjects who viewed the chronological presentation are more accurate than those of subjects who viewed the broadcast presentation. In addition, there is some evidence that the unaided recall and cued recall of subjects in the chronological condition may be somewhat better than the unaided and cued recall of subjects in the broadcast condition. It seems that if simple reordering of sentences results in measurable differences in recall, than actually developing a style of writing and presentation that would maximize the chronological nature of news might have even greater effects on viewers' ability to recall the information in a newscast.

When assessing these results, it is critical to keep in mind the extreme weakness of the manipulation used in this experiment. Rather than maximizing our chances of finding support for our hypotheses we designed the experiment so as to minimize all effects on memory except those related to the chronological order of the stories. However, by doing this, we were forced to choose a design which increased the likelihood that our stories would not be recalled at all.

For example, we chose stories that were not naturally narrative and chronologically powerful since research suggests that strong narratives are remembered better than other types of stories. We were also careful not to change anything about the story except for the order of the sentences, so that the chronological stories did not use more

immediate language, more powerful adjectives, or the more simple sentence structure ussually association with narration, since all of these variables are also associated with recall strength. Lastly, we imbedded our stories in the middle of the newscast so as to minimize serial position effects. In addition, our target stories were "talking head" stories, that is, they had no accompanying video or graphics, both of which have been shown to increase both recall for news stories and episodic memory trace strength (Findahl and Hoijer, 1981). Yet, in spite of these obstacles, the predicted effects did surface.

At a minimum, the results of this study indicate a need for further research. The implications of this experiment are far reaching. If these results are replicable, and the nature of the process through which chronological presentation improves memory is further explicated, the suggestion is that broadcast news should be written to stress its narrative and story telling nature. Possibly, by writing stories as stories, we may actually be able to increase levels of learning in the viewing population.

Clearly, before any such major change can even be considered, it is necessary to test the factors that were simply controlled in this experiment. In addition, the many variables that have been hypothesized to influence episodic processing and episodic trace strength should also be included in future research to provide a more complete test of the theory behind the study.

Variables such as emotion, bias, intensity of the experience, comprehensibility, and relevance or importance of the subject have all been theorized to increase episodic trace strength (Thorson and Friestad, 1985; Hastie and Park; 1986). All of these variables could and should be tested to see how they affect memory for broadcast news stories. Many of them seem, intuitively, to be factors that should have a strong influence on recall for broadcast news.

The effects of production variables, such as graphics and accompanying video, should also be tested in conjunction with the episodic variables and chronological order. Findahl and Hoijer (1981) have already theorized that video reinforces episodic traces by increasing a story's emphasis on where and when it occurred. For example, stories written in chronological order with accompanying video stressing the episodic nature of the story might be predicted to improve recall dramatically compared to stories that were only chronological or only video oriented.

Lastly, future research should include attention as a variable. In this experiment we instructed subjects to watch the newscast. However, theoretically, we are arguing that the effect of chronological presentation should be greatest in subjects who are paying low levels of attention. In other words, it is the subject who is timesharing his television viewing with some other task who is most likely to lose the information being presented if the level of processing required is too great. These subjects, who are paying less attention and investing less effort in the television viewing task, are the ones most likely to be helped by the ability to process the newscast primarily in episodic memory. Thus, the theory predicts an interaction between attention level of viewer and the chronological or episodic nature of the news story. In addition, studies designed to test the effects of chronological or episodic presentation on cogntitive capacity and attention might also be revealing.

Clearly future study on the effects of chronological presentation of broadcast news on ease of processing and amount of recall is called for. The possible conclusions for the broadcast professional are far reaching. The theoretical implications for the mass communication researcher are equally intriguing.

Table 1

Mean Facts Recalled in the Free Recall Test

By Story and Style

	STORY	
STYLE	1	2
Broadcast	1.8 (a)	1.1 (a)
Chronological	2.2 (a)	1.7 (b)

Table entries with the same letter do not differ significantly.

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