DOCUMENT RESUME

ED 376 522 CS 508 733

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TITLE	The Effect of Television on Dyadic Interaction.
PUB DATE	Aug 94
NOTE	31p.; Paper presented at the Annual Meeting of the Association for Education in Journalism and Mass Communication (77th, Atlanta, GA, August 10-13, 1994).
PUB TYPE	Speeches/Conference Papers (150) -- Reports - Research/Technical (143)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	Communication Research; Higher Education; *Interpersonal Communication; Mass Media Effects; Recall (Psychology); Television Research; *Television Viewing
IDENTIFIERS	*Communication Behavior

ABSTRACT

A study examined the effects of television on dyadic interaction. Subjects, 41 dyads (mostly same sex dyads) consisting of a student in an introductory communication course (students were given extra credit for participation in the research) and a friend, were randomly assigned to one of four treatment conditions and were videotaped by a hidden camera as they watched either 3.5 minutes of "distractor material" followed by 3.5 minutes of blank tape; 7 minutes of blank tape; blank tape followed by the distractor material; and 7 minutes of distractor material. Dyadic interactions were then coded. Results indicated that television exerted a concurrent effect on dialogue, with shorter utterances, longer response latencies, fewer contingent responses, and less eye contact in the presence of television. Results also indicated that television exerted a carryover effect such that greater response latencies persisted even after the television had gone off, and that recall of conversations (both topics and approximate verbatim recall) was poorer for conversations that occurred with the television on than for those in the control group. (Contains 45 references and 2 tables of data.) (RS)

The Effect of Television on Dyadic Interaction

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This paper examines the effects of television on dyadic interaction. Television was found to exert a concurrent effect on dialogue, with shorter utterances, longer response latencies, fewer contingent responses, and less eye contact in the presence of television. Television exerted a carryover effect such that greater response latencies persisted even after the television had gone off. Recall of conversations (both topics and approximate verbatim recall) was poorer for conversations that occurred with the television on than for those in the control group.

The possibility that television adversely affects performance on cognitive tasks has been examined at a macro level with respect to academic achievement (Anderson & Collins, 1988, Hornik, 1981) and at a micro level with respect to reading comprehension (Armstrong & Greenberg, 1990, Weinstein, 1977) and recall of semantic information (Smith, 1985). These studies have demonstrated that television, a medium that is both visual and auditory, can hinder cognitive processing. But cognitive processing is not simply performance on laboratory tasks such as the ideational fluency task (Kaltsounis, 1973), or a syntactic reasoning test (Smith, 1985). Cognitive processing can be measured by more ecologically valid tasks that, in every day life, do occur in the presence of television. Conversation, for example, often occurs in front of the television, and, in fact, as much as 50% of the verbal interaction in American families may be taking place in the presence of television (Kubey, 1991).

As a distracter, television may exert greater influence than other environmental stimuli for several reasons. First, television is both a visual and an auditory medium, exerting influence on both the auditory and visual receptors (Armstrong & Greenberg, 1990). Second, images and sounds on television are relatively continuous, with few, if any pauses between the visual or auditory changes. Third, the very structure of television as a medium (zooms, cuts) elicits an orienting response in viewers (Lang, 1990). So television as a distracter is successful in producing stimuli, and capturing our attention. If the television is on in the home, we need a picture of what may be occurring in terms of its effects on cognitive processing and its effects on conversation.

Conversation as Information Processing

Although researchers interested in television and the family (Kubey, 1990; Kubey & Csikszentmihalyi, 1990) have examined in some detail what happens around the TV and even what gets discussed by family members, their findings have largely indicated that conversations around the TV are different from those that occur without the TV on. For instance, many of the utterances that occur when the TV is on are comments on the content of the TV programs, or are made to the TV. But studies of this sort do not examine the effects of TV on more specific tasks such as conversational turn-taking, eye contact or response latency. In order to examine television's effect on the structure of conversation, conversation itself must be placed in an information processing framework.

Face to face conversation consists of the production of semantic and syntactic messages, the intake and processing of semantic and syntactic information, and the processing of visual stimuli such as gesture and facial expression. Each of these three processes takes up cognitive capacity. For example, Waldron and Cegala (1992) claim that the conversational environment has many cognitive requirements. These include, but are not limited to the processing of large amounts of information from both the external and internal environment, performance of multiple tasks simultaneously, and interpreting verbal and nonverbal messages that are at times conflicting. Clearly, both visual and auditory attention is necessary (although not sufficient; see Waldron & Cegala, 1992) to accomplish these multiple tasks.

In another study, taxing the capacity of the cognitive system was shown to have deleterious effects on conversation. Capella (1985) found that turn taking rules such as eye gaze aversion, body-focus gesture and pausing are used differently by socially anxious and socially secure persons. One reason for these differences is the higher cognitive load for the socially anxious individuals. Kitayama & Burnstein (1988) also argued that conversation is a cognitively complex phenomenon, that relies heavily on the ability to process information quickly. In their study of dyadic interaction, they found that the recall of idiosyncratic surface features was better than a theory of perfect automaticity would suggest. If casual conversation is indeed automatic, they argue, recall for surface features of conversation would be extremely low.

Conversation, then, can be said to require cognitive capacity, and can be hindered when the cognitive processing system is taxed, either by external environmental factors or internal factors. Television, as an external factor, may hinder the processing of conversation. Because interference from televised stimuli can gain access to the cognitive structures used in conversation, performance in the conversation itself and processing of the secondary stimulus could be mutually hindered.

From a practical stand-point, social interaction aids in the development and maintenance of relationships (Bell, 1987); directs the organization of memory for discourse and, is a major contributing factor in children's acquisition of language (Chapman, 1981). Practically speaking, then, information about television's effect on interaction would add to our knowledge of the processes mentioned above. From a theoretical stand-point, information about the effect of television on verbal interaction is also important. For example, we know that television can be very successful in affecting our mood and emotions (Zillmann, 1991). How does the presence of television, and its emotion-enducing messages interact with stimuli in our non-mediated environment? Information is building constantly on television's effect on our intrapersonal attitudes and emotions, but theory must also be built about television's effect on our interpersonal lives.

A good place to begin answering these broader questions is to examine television's effect on a specific process: verbal interaction. A review of the literature revealed that this issue of television's effect on conversation has not been specifically addressed. Therefore, related studies that examined the effect of different types of noise on verbal/ cognitive processing are discussed. How are each of the processes described above: the processing and production of verbal information, the processing of visual information, turn taking and coordination affected by television? First, we will examine the encoding of meaningful utterances. Fisher (1972) found that the execution of a verbal response in a serial reaction time task was negatively affected by noise, especially if the noise bursts occurred during the production of the response. He found that noise bursts interrupted production and lowered the frequency of production. Interestingly, Fisher used white noise (noise without verbal content) in this experiment. White noise has typically been found to have a less deleterious effects than semantically meaningful noise

(Smith, 1985). Because semantically meaningful noise has obligatory access to the portion of the brain that processes verbal material, when the primary task relies on verbal processing (e.g. reading, talking) both the primary task, and processing of the noise are less efficient (Baddeley, 1990). However, Fisher's finding that *white* noise is also deleterious to verbal production is relevant precisely because TV contains both white noise and semantically meaningful noise. Colle (1980) found similar effects using background speech such that even low intensity speech can exert its influence. In his experiment, subjects were hindered in their performance through the presence of speech which was just above the threshold for auditory perception. In television viewing, then, taxing of the information processing demands by a medium which gains access to the same structures necessary for speech may hinder the capacity for speech producti n.

We would expect, therefore, that television would hinder several aspects of conversation. Specifically, as discussed by Fisher (1972), speech production may be affected by the presence of television. Thus,

H1a: In the presence of an operating television, subjects will produce fewer utterances.

H1b: In the presence of an operating television, the utterances produced by subjects will be shorter than those produced when the TV is not on.

Studies of cognitive processing in conversation have used verbal disfluencies to index cognitive strain during encoding. Specifically, these studies have used verbal disfluencies as the dependent measure in order to ascertain if the cognitive system was taxed to the extent that greater speech errors were noted. For example, when subjects were assigned multiple goals within a single conversation, cognitive strain was said to be increased as indicated by increased speech dysfluency(Waldron and Cegala, 1992; see also Berger, Karol and Jordan, 1989; Cegala, Alexander and Sokuwitz, 1979). Consistently, experimental outcomes indicate that greater cognitive load leads to greater numbers of speech disfluencies. For example, Berger, Karol and

Jordan (1989) found that the more complex one's communication plans (and conversely, the greater the cognitive load), the less fluent respondents were.

As the presence of television has been found to put a strain on cognitive processing of concurrent tasks (Armstrong & Greenberg, 1991) we would expect television to affect the production of speech, particularly in terms of speech dysfluency.

H1c: In the presence of an operating television, utterance produced by subjects will contain more speech errors and disfluencies.

We have stated that the intake and processing of semantic information is necessary for conversation. In fact, cognitive processing that is both quick and accurate is necessary for conversation to occur successfully (Waldron and Cegala,1992). What happens to the ability to process conversation when television is on?

Greene, Lindsey & Hawn (1990) discovered that the more goals one pursues at any given time (i.e. the greater the cognitive load), the slower the speech onset latency (response latency). In addition, participants with multiple goals had longer onset latencies than counterparts with a single goal (Greene & Lindsey, 1989). Therefore, we know that response latency is a function of cognitive load such that the greater the load, the larger the response latency. But responding promptly is not adequate for successful conversation. Responding accurately is also necessary. For example, in an analysis of naturally occurring conversations, Clark (in press) argues that discourse occurs with the participants working jointly, and that requires coordination at all levels of planning and execution. Coupled with the finding that cohesive conversation requires cognitive capacity (Waldron and Cegala,1992) we might ask how the taxing of the cognitive system (by the presence of television or otherwise) would effect the accuracy of conversational responses.

Research on background noise and its effects on cognitive processing provides information relating to cognitive strain and conversational responses. Smith (1985) found that subjects performed more poorly on a test of semantic processing when that test was taken in the presence of semantically meaningful noise. The test required subjects to read, process and indicate the degree of correctness of sentences. Similarly, subjects ability to process the syntax of sentences was hindered by the noise. In both tests subjects were slower and less accurate. Clearly, noise effects both speed and efficiency in processing. If noise affects speed and accuracy in the processing of the primary verbal material (e.g. a conversation), we would expect people to process that conversation more slowly in the presence of television and conversely, respond more slowly to their conversational partner. Television, itself (as opposed to noise) has also been examined in terms of its effect on the intake and processing of semantic information. Armstrong (1991) found that subjects exposed to television while working on the Nelson-Denney reading comprehension task performed less well than the control subjects. Armstrong and Greenberg (1990) also found that background television hindered cognitive processing, in this case, as indexed by both spatial and verbal tasks. Again, because both reading and TV attempt to gain access to the same cognitive structure, both are hindered. We might expect conversation, which also uses the same cognitive structures as reading, to be similarly affected.

What happens in conversation when semantic information is processed both more slowly and not as accurately-when decoders have less speed and efficiency? If their rate of processing decreases we would expect their verbal response time to increase. If they process less efficiently, we would expect responses to their conversational partner to be less relevant to the previous utterance. That is, we would expect responses to be less contingent.

H2a: In the presence of an operating television, subjects will have a greater response latency than the control group.

H2b: In the presence of an operating television, subjects will make fewer contingent responses than the control group.

Conversation also involves the processing of visual stimuli. The most common, and perhaps strongest evidence of this is the "McGurk effect." McGurk and MacDonald (1976) demonstrated that if a listener hears and sees linguistically dissonant information (as one might see in a poorly dubbed film) the listener is likely to report hearing some conflation of the two For example, a subject hearing 'bait' but seeing 'gate' are more likely to report that they heard 'date' and be quite confident in that assessment. In addition to this purely phonetic decoding, conversation is reliant on turn taking dictated by visual information. In fact, subjects have a harder time coordinating turn-taking without visual cues (Argyle & Cook, 1976) and interrupt less frequently when their visual information is limited to exposure to the other person's eyes (Argyle, Lalljee & Cook, 1969). Miller (1990) has also examined the effect of face and facial cues on conversation and argued that "the elimination of words...exposes a level of communication of unsuspected richness in which human beings express their true meanings" (p. 113). The interpretation of verbal information, then, is heavily reliant on, (although clearly not impossible without) visual cues.

Television has been demonstrated to generate an orienting response in viewers (Lang, 1990). The orienting response is the response which occurs to significant stimuli in the environment and is indicative of the allocation of mental processing resources in the organism. The OR can be measured through a small decrease in heart rate, or head and/or eye orientation towards the stimulus of interest. Lang (1990) as well as Lang & Thorson (1989) found that certain structural features of television, such as cuts, zooms and loud noises caused subjects to orient towards the television. In a dual task situation, orienting towards one task (i.e. television) means orienting away from the other task. In addition, processing effort has been given over to the distraction material (in this case, the television). During a conversation, a subject orienting to the television may be giving over important processing resources to the TV, thus missing visual and facial cues necessary to process the incoming information from the conversation.

H3: In the presence of an operating television, subjects will make less eye contact with their conversational partner than control subjects.

We are also interested in the differences between qualitatively similar quiet conditions and between qualitatively similar TV conditions. Above, we have argued for a general effect of television on interaction., But in the real viewing conditions, TV is turned on or off as daily life presumably continues. How, for example, does conversation differ in two conditions of quiet: quiet during an entire conversation and quiet after the TV is turned off. No research that we are aware of looks at possible carry-over effects of television. After the TV has gone off, we again have a quiet condition. But does this differ from a condition that has been quiet the entire time? Lang (1990) and Lang and Thorson (1989) have found that the structural features of television invoke the orienting response and conversely, viewers attention. In fact, at the exact point that these structural features such as cuts and zooms occur, processing of the TV messages becomes less efficient (Lang, et al, 1993). But the negative effects of the orienting response are so short-lived, that within a tenth of a second after the cut, processing is not only back to normal, but is actually improved (Lang et al, 1993). So the orienting response does not seem to have long term effect. However, as argued earlier, TV may hinder processing for other reasons as well. For example, television messages that are emotionally arousing are recalled less (Mundorf et al, 1990). The authors argue that because emotional arousal takes up cognitive capacity, viewers are less likely to recall the material that causes the emotional arousal. Furthermore, because arousal diminishes slowly over time (Zillmann, 1991) even the material presented directly after the emotionally arousing message is recalled less. But how long does this interference last? Can the interference continue briefly, even after the television is off?

Because television is an arousal invoking medium (Lang, 1991) and arousal has been shown to dissipate gradually over time (Zillmann, 1991) the effects of television on conversation may continue after the TV is off. We have argued above that TV will effect conversation. We argue for similar reasons here that:

H4a: Television will exert a carryover effect such that there will be less conversation after the TV has gone off that there will be in the control (no TV) condition.

H4b: There will be larger response latencies after the TV has gone off than in the control (No TV) condition.

Conversational Recall

Cohesive discourse often relies on recall of what was said earlier in the conversation. Specifically, as suggested by Baddeley (1990) "memory is potentially important for producing and comprehending spoken discourse" (p. 95). It is important, then, to not only investigate the actual process of producing and comprehending discourse, but also to look at recall of conversation. Recall from word to word is necessary to comprehend full utterances. For example, during discourse processing, recall within a clause boundary is better than recall of the previous clause (even when the number of words are held constant) because words are held in short term memory until an entire coherent phrase can be processed (Fletcher, 1994). Therefore, we may argue that during the on-line processing of verbal material, recall of words is necessary to the cohesive processing of phrases. Similarly, recall from sentence to sentence is necessary to engage in cohesive processing of discourse. And of course recall of conversations shared with a specific person, over time help build a cohesive relationship with that individual. Study of the recall of conversation, then, is crucial to the study of communication overall.

In general, "the encoding of contextual information is essential....for efficiently storing and retrieving information in memory" (Baddeley, 1990, p. 35). That context is an important part of encoding and retrieval of information has been empirically demonstrated in a number of studies. Most notably (Eich, 1980) subjects were asked to recall information that they originally been exposed to while under the influence of alcohol. Subjects' recall was better when they were again under the influence in the 'retrieval' portion of the experiment. These results have been obtained using the influence of marijuana (Eich, 1980) and by putting subjects under water (or not) during learning and retrieval (Godden & Baddeley, 1975). What this obviously suggests is that we tend to use context cues in storing and retrieving information.

In conversation, then, we use facial and visual stimuli to help store information. The facial and visual stimuli become part of the memory. They act as context for the encoding and retrieval of the information. If we find that TV distracts us from looking at our conversational partner, it is possible that fewer cues will be stored in the memory of that conversation, and subsequently, the conversation will be recalled less clearly.

So far, we have discussed the extent to which context influences recall, and, how distraction from the visual cues of conversation (the speaker's face) might negatively impact recall of conversation. However, context is surely not the only aspect of conversation which helps or hinders recall of that event. For example, recall of semantic information is affected by the attention paid to that information (Baddeley, 1990). In an experiment examining the effect of recall for semantic information, it was discovered that distraction material which is semantically meaningful, in particular tended to attract the attention of the listener. Recall of the primary semantic information was, in turn, impaired (Martin, Wogalter & Forlano, 1988).

In a similar study, memory of semantic information was found to be impaired by semantically meaningful noise but not by white noise (Salame & Baddeley, 1987). In fact, semantically meaningful information was harmed as a function of the degree of similarity between the distraction material and the primary attention material. The closer the distraction material was to the primary focus material, the less recall subjects demonstrated. Recall for conversational utterances then, might also be affected by phonetically similar distraction material, or, most broadly, spoken material in the language in which one is conversing.

Above, we have argued that television distracts from the primary task-in this case-the conversation. We have also argued that visual and auditory cues are necessary to efficiently encode and recall information from the conversation. When the TV is on, then, neither the auditory nor visual cues are processed as efficiently. As a result:

H5a: In the presence of an operating television, subjects will recall fewer topics covered during their conversation than will the control group.

H5b: In the presence of an operating television, subjects will have poorer recall of the specific utterances made during the conversation.

METHOD

Sample. Subjects were recruited from introductory communications courses and were given extra credit for their participation in the research. Subjects were told that they had to bring a same sex friend to the experiment and a total of 45 dyads participated. A majority of the dyads (39) were same sex although subjects who arrived to the experiment with friends of the opposite sex were allowed to participate. In total, 29 dyads were female, 12 were male and 4 were mixed. Two of the dyads were not used for analyses because their conversations were not in English, making coding difficult. One dyad turned off the stimulus tape during the experiment and another dyad was not used due to experimenter error during the experiment. In total, 41 dyads were used in the analyses.

Stimulus Materials. A segment of Rescue 911 was selected as the 'distracter material' for the experiment. For the stimulus tape, a segment that contained a complete plot within a short time frame was desired. For this reason, the genre of realistic-type news program was chosen. From programs such as COPS and Rescue 911, the experimenter taped one night's programs off the air and selected one as the stimulus. The segment, which was originally 8 minutes long, was edited down to 3.5 minutes. During pilot testing, subjects were informally asked if the segment was 'cohesive and easily understood.' All subjects stated that the tape was understandable and none were able to detect where information had been removed from the tape. Next, the tapes were edited to either contain 3.5 minutes of blank tape before the edited 911 segment or 3.5 minutes of blank tape after the 911 segment.

Design. Four different conditions made up the experimental design. In the first condition, an edited segment of "Rescue 911" ran for the first three and a half minutes, followed by three and a half minutes of blank tape. In the second condition, the same edited segment played after three and a half minutes of blank tape. In the third and fourth conditions, there was either nothing on the tape (quiet condition), or the 911 segment played during the entire experiment. There were two sets of dependent measures: one set featuring the structure of the conversation itself, and the other featuring subsequent recall of the conversation. In order to measure the structure of the conversation, utterance length, response latency and eye contact were coded. The second dependent measure, the recall test, was made up of two sections. In the first section, subjects were asked to recall up to five 'general topics' that they'd discussed during their time in the experiment room. In the second portion, they were asked to list up to five exact quotes they recalled either having said themselves or having heard their partner say.

Procedures. Subjects were randomly assigned to one of the four experimental conditions. They were brought into the experiment room and asked to be seated. Two chairs were angled towards each other at approximately 90 degrees and a television was placed in front of the chairs six feet away at 45 degree angles to the chairs. After briefly explaining that the experiment had to do with 'communication between friends' the experimenter stated that she would start by showing a brief video tape. When the video tape began, the experimenter claimed to have accidentally brought the wrong tape and would need to go and retrieve the correct one. The subjects were left alone with the television on while their interactions were unobtrusively videotaped by a hidden camera in the lab. After the subjects' interaction was recorded, the experimenter returned.

Next, subjects were debriefed on the actual purpose of the study; they were told that they had been videotaped and were asked to sign a consent form allowing the use of their videotaped interactions for analysis. Although they were given the option to have the tape immediately erased, each dyad gave their consent. Finally, the subjects were asked to take a recall test. Subjects completed their own recall test and were asked not to discuss the test with their conversational partner. Subjects were given as much time as they wanted to finish filling out the recall form.

Coding. In order to ascertain the effects of television on conversation, dyadic interactions were coded using a coding scheme developed for the experiment. The unit of analysis for the coding was the speaking turn. Length of speaking turn was measured to the tenth of a second, using a stop watch. Number of disfluencies were counted by coders per speaking turn. Coders had been instructed to count hesitancy, mazing, and use of incomplete words or phrases as disfluencies. Direction and duration of gaze during the speaking turn was coded by determining if the speaker was looking at his/her conversational partner, the television or neither of these; length of time for this gaze was recorded to the tenth of a second using a stop watch. The same coding categories were used for the listener for each speaking turn. Response latency was also measured using a stop watch and measured to the tenth of a second. A single coder viewed and coded all of the interactions while a second coder analyzed ten percent of the tapes in order to test reliability. Reliability was achieved for all categories but one. For this category, coders counted the number of times speakers glanced at the screen during a speaking turn (alpha=.26). This category was dropped from the analyses. Reliabilities were averaged across categories for interval data (alpha=.90) with a range of .76 to .99 (See Table 1). For categorical data, Scott's pi was used with agreement ratios ranging from .76 to .94. Mean agreement ratio was .85.

To standardize total interaction time across the four conditions, the first three minutes of each condition were used for analysis. In addition, for the two conditions which contained a change in the interaction context (i.e. TV on for only the first or only the second half of the interaction) an additional three minutes were used after the change took place (i.e. after the TV turned on, or turned off).

Recall forms were scored, using the videotaped interactions as a reference. In the first portion of the recall test, general topics were scored in two ways. First, the raw score or actual number of correctly recalled topics were coded, then, the proportion of correctly recalled topics to total recalled topics was calculated. Next, the verbatim recall portion of the test was scored. One fourth of the recall tests were coded by a second coder in order to test reliability. Topic recall and verbatim recall were both found to be reliable (alpha = .96 and .85, respectively).

In the verbatim recall section, four individual scores were assigned. First, total number of recalled quotes was calculated. Next, quotes that were identical to the original were counted. Finally, those quotes that were close to verbatim (i.e. were incorrect by only one or two words) were counted. A fourth set of scores was assigned to gain a more precise indicator of the subjects' performance. In this section of the recall test, a perfect score was a 0, indicating no errors. One point was assigned for each word 'recalled' that was not in the original, one point for each word forgotten and, for words correctly recalled, but misplaced, an additional point was added for number of spaces off the recalled word was from the original.

Results

All dependent variables and covariates of interest were averaged across turns for each pair of subjects(except number of speaking turns). These averages provide a standard level of comparison for each pair and provide more normally distributed scores. Where no interactions or covariates were expected simple analysis of variance was conducted (TV off versus TV on). Where interactions or covariates were expected, regression analysis was used with TV off versus TV on entered as a dummy variable. Mean scores for our dependent variables are shown in Table 2.

Amount of Conversation

Hypothesis 1a predicted fewer utterances with TV on than off. The average number of turns with the TV off was 22.33 and the average number with the TV on was 16.05. However, because of slight variations in the total time of conversation that was coded, the total number of turns was divided by time coded for each pair. For the TV on conditions, the average number of turns per second was .084. For the TV off conditions the average turns per second was .143. This difference was significant ($F(1,40)=7.965$, $p<.01$) and is consistent with hypothesis 1a.

Hypothesis 1b predicted shorter length of utterances with the TV on than with the TV off. Average length of utterance with the TV on was 3.624 seconds. Average length of utterance with the TV off was 7.194 seconds. Consistent with Hypothesis H1b, this difference is highly significant ($F(1,40)=12.541$, $p<.01$).

Number of Speech Errors

Hypothesis 1c predicted a greater number of speech errors and disfluencies with the TV on than with the TV off. The average number of errors per turn with the TV on was 0.673. The average number of errors per turn with the TV off was 1.200. This difference is significant ($F(1,40)=5.301$, $p<.05$), however the difference is in the opposite direction than predicted. This does not support hypothesis 1c.

A confounding variable in this hypothesis may be length of utterance. In our sample, there was a correlation of $r=.65$ between length of utterance and number of speech errors. Given the large difference in length of utterance that we found (see above), it seemed likely that the greater number of speech errors with the TV off is due mainly to longer turns with the TV off. We reran the analysis with the average length of utterance as a covariate and found that there were no significant differences in number of disfluencies when controlling for length (Beta(1,40)= -.08, p>.10).

Response Latency

Hypothesis 2a predicted greater response latencies while the TV is on than while it is off. The average response latency with the TV on was 16.709 seconds. The average response latency with the TV off was 1.639 seconds. This is not a typographical error. There were several response latencies of over a minute long when the TV was on. The difference is quite significant (F(1,40)=10.746 p<.01) and is consistent with hypothesis 2a.

It could be argued that the response latencies we found over a minute long were not really response latencies, but simply decisions not to engage in conversation. To test whether the differences we found were due solely to these long latencies, we conducted the analysis again using only latencies less than 15 seconds long. The average response latencies in this re-analysis are 3.60 seconds for the TV on condition and 1.35 seconds for the TV on condition. This difference remains significant (F(1,38)=14.273, p<.01), and provides conclusive support for our hypothesis.

Contingent Responses

Hypothesis 2b predicted fewer contingent responses in the TV on conditions than in the TV off conditions. The average percentage of contingent responses for the TV on conditions was 42.27%. The average for the TV off conditions was 78.52%. Consistent with Hypothesis 2b, this difference was significant (F(1,40)=31.102 p<.01).

Eye Contact

Hypothesis 3 predicted less eye contact when TV is on than when TV is off. Percentage of turns for which speaker directed eye contact at listener with the TV on was 55.17% and for TV off was 81.87%. This difference was significant ($F(1,40)=15.66, p<.01$). Percentage of turns for which the listener directed eye contact at the speaker was 38.58% for TV on and 83.65% for TV off. This difference is also significant ($F(1,40)=61.14, p<.01$). This analysis provides support for Hypothesis 3.

Carryover Effects

Hypotheses 4a and 4b predicted carryover effects such that less conversation and greater response latency will continue after TV has gone off in comparison to the control group. Comparisons between these conversations indicated that speaking turns were shorter in the carryover condition (mean=5.857 seconds) than in the control group (mean=6.385) but these differences were not statistically significant ($F(1,21)=1.21, p>.10$). Differences were in the direction predicted, but were not significant, therefore, Hypothesis 4a was not supported. Hypothesis 4b predicted larger response latencies while the television was off in the carryover condition than in the control condition. In the carryover condition, latencies were longer (mean=48.521) than in the control group (mean=25.846). Consistent with hypothesis 4b, differences were statistically significant ($F(1,21)=3.84, p<.10$).

Recall

Hypotheses 5a and 5b predicted poorer recall for topics and for specific utterances for the TV on conditions. We had one measure of topic recall, and two of verbatim recall: exact verbatim recall and approximate verbatim recall (off by one or two words). To test hypothesis 5a, the total number of speaking turns in the conversation was used as a covariate. This was done to control for the possibility that recall of verbal material was an artifact of total amount of conversation, and condition was entered into the regression equation to test if the presence of television affected topic recall. Subjects in the TV on condition recalled significantly fewer topics [Beta= -.425, (2, 21), p<.10] than subjects in the TV off condition. Hypothesis 5a was supported. Hypothesis 5b predicted better verbatim recall in the TV off condition. We tested this hypothesis first using exact recall as the dependent measure, and second, using approximate verbatim recall as the dependent measure. To test exact recall, we used total number of turns as the covariate. Next, condition was entered. The presence of television did not significantly affect exact verbatim recall [Beta=-.021, (2,21), p>.10). One possibility is that because the total sample had poor verbatim recall, floor effects attenuated possible findings. However, approximate verbatim recall was affected by the presence of television (Beta=-1.086, (2,21), p<.10). This provides partial support for hypothesis 5b.

Discussion

Overall, we hypothesized that the presence of television would effect concurrent conversation, would have a carryover effect into conversation after the TV had gone off and would effect recall of the conversation. Results of this experiment provide support for these hypotheses.

Television does exert an influence on ongoing conversation. While the television was on, dyads spoke less frequently and utterances were shorter. One possibility is that while the TV is on, conversation decreases because participants felt that they *should* attend to the television. However, in each of the conditions, the experimenter claimed to have "the wrong tape." There was no reason for them to watch the television at all. Yet, in each of the conditions, conversation died down when the television was on, and in many cases, participants left their utterances mid-word to attend to the TV. This may account for the shorter utterance length in the TV condition. We also hypothesized that there would be more disfluencies in the TV condition. This hypothesis was not supported. Another effect of television on conversation is the way in which participants responded to one another during conversation: responses were slower and less contingent. In many cases, when one member of the dyad said something, the other would either not respond, or would respond slowly, directing his/her attention back to the conversation only after a delay. When a response was made, it would often be unrelated to the previous question or comment, accounting for the high number of non-contingent responses. Eye contact was also affected by the presence of television. Several speaking turns would be taken, without any eye contact between the speakers. In fact, the low level of eye contact in the TV condition could also be responsible for the slow response latency. Because conversational partners have a hard time coordinating speaking turn without the aid of eye contact (Argyle & Cook, 1976), the large response latencies may reflect poor conversational coordination, rather than a more global lack of attention.

We also hypothesized that television would exert a carryover effect. This hypothesis was only partially supported. Although less verbal interaction did occur in the carryover condition, as predicted, differences were not statistically significant. Perhaps a larger sample size would reveal significant differences. On the other hand, it is possible that the actual length of the speaking turns in conversations in the carryover condition is similar to the control group, but responses occur more slowly, as would be suggested by the significantly longer latencies in the carryover condition.

Finally, we hypothesized that recall would be poorer in the TV on condition. This hypothesis was partially supported. Topics were recalled better when the television was off, but verbatim recall did not differ significantly. Poorer recall for topics in the conversation could have resulted from one of two processes, or a combination of the two. Baddeley (1990) states that recall of information is affected by the attention paid to that information. As was noted in the experiment (by indexing visual attention to one's conversational partner and by indexing utterance cohesion) subjects paid less attention to the other member of the dyad in the television condition. Therefore, using Baddeley's framework, we might argue that subjects did not attend enough to the conversation to properly encode it. Similarly, inability to recall topics in the TV on condition might be due to the lack of contextual cues encoded about the conversation. Context has been demonstrated to be crucial in recalling messages (Eich, 1980). In the television condition, subjects were less likely to make eye contact during conversation. Without important visual contextual information, it is possible that subjects were less likely to clearly encode, and later retrieve, important information about the conversation. Although topic recall did differ between conditions, verbatim recall did not. Apparently, the presence of television does not significantly harm the recall of specific utterances, although it should be noted that verbatim recall was quite low across the conditions, making a floor effect possible.

The above findings do suggest that television impacts dyadic interaction; however, several limitations existed in the study. First, only one program type was used as a stimulus material. Effects may be due to the particular program (Rescue 911) and not television, per se. Although much of the supporting literature suggests that any white noise or semantically meaningful noise affects cognitive processing in general and verbal processing in particular, this study did not use more than one type of distraction material. In addition, due to the arousing nature of the distraction program, arousal, and not the negative impact of noise on cognitive processing, may account for the above findings. Arousal was not considered in this study and should be examined more closely in future research in this area. A third limitation is that the study was not fully ecologically valid. Although subjects neither knew they were being video taped, nor were impelled to watch the tape, the fact remains that laboratory conditions are not identical to home viewing conditions. Volunteer samples as well as the uniqueness of the situation for the subjects may have made them feel restricted in their conversations. Despite this latter limitation, however, differences were found between the experimental conditions.

Overall, television does hinder conversation. Perhaps the most critical findings are those that suggest poor verbal cohesion (as indexed by fewer contingent responses) and poorer topic recall in conversations that occur with the television on. Why might these findings be of interest? One reason is that many family interactions occur in the presence of an operating television (Kubey, 1990). Meals are eaten, games played and evenings spent with the television on. Some researchers have attempted to argue that because these activities take place with the television on, families, and family interactions are not affected by the presence of television: family life continues without change or is even enhanced by the presence of television (Lull, 1980, 1990). But the results above suggest that interactions in front of the TV do not continue without change. Conversations are held, but they are both quantitatively and qualitatively different. Individuals respond to one another less and recall less about those conversations. Given that relationships are in part built and sustained through the process of cohesive verbal interaction (Berger & Kellerman, 1989; Douglas, 1984) the disruption of cohesive discourse by television is an issue worth investigating both in the domain of media effects and interpersonal communication. Furthermore, verbal interaction builds relationships over time (Werner and Haggard, 1985). Therefore, the fact that topics discussed while the television is on are recalled less should also be of interest to researchers interested in relationships over time.

This study examined the immediate and short-term effects of television on conversation at a single point in time. Many questions remain to be answered. On the micro-level, we might ask what aspects of television are most likely to affect conversation. Lang (1990) found that structural features of television cause an orienting response in the viewer. Would we expect, then, that structural features eliciting an orienting response would also affect conversation. Do some messages encourage interaction, while others discourage it? Answering these questions would help us understand, more specifically, how interactions occur in the presence of television. On a macro-level, we might begin to examine the effect of television on the structuring and maintaining of relationships. For example, is there a difference in initial interactions in terms of information gained? Self-disclosure? Relational satisfaction?

The study of television's effect on social interaction is a relatively untapped area. This study demonstrated that interactions do differ as a result of television's presence. Further exploration of the effects, both short-term and long should be pursued; what will emerge is a more accurate picture of social interaction as it occurs in the presence of television.

TABLE 1

Coding Category	Reliability
# Disfluencies	.76*
Utterance Length	.98*
Latency Length	.97*
Glance Time (to TV)	.26
Turn Category (non/contingent)	.95*
Speaker orientation	.92*
Listener orientation	.88*

*category used in final analyses

Table 2

Variable	Mean TV on	Mean TV off
Number of turns	16.05	22.33
Turns per second	.084	.143**
Length of Utterance	3.624	7.194**
Disfluencies per Turn	0.673	1.200
Response Latency	16.709	1.639**
% Contingent Responses	42.270	78.520**
% Speaker Eye Contact	55.170	81.870**
% Listener Eye Contact	38.58	83.65**
Topics Recalled	6.64	8.130**
Verbatim Recall (exact)	1.01	1.13
Verbatim Recall (approximate)	5.00	7.140**

** $p < .01$

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