

Is the Medium the Message?: An Experimental Comparison of the Effects of Radio and Television on Imagination

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This study explored the hypothesis that radio would be more stimulating to the imagination than television. The hypothesis was tested using a within-subjects experimental design in which children at two different age levels (Grades 1-2 vs. 3-4) were exposed to one story in a television format, another in a radio format. Our measure of imaginative activity was the ability to complete an incomplete story by introducing original new elements that had not been part of the audio-visual or audio stimulus. In accord with the hypothesis, radio presentations led to more imaginative story completions than did television presentations. In addition, there was a carry-over effect such that a radio version at Time 1 led to more imaginative responses to a televised story at Time 2, while a television story at Time 1 led to less imaginative responses to a radio story at Time 2. As far as imagination is concerned, our results support Marshall McLuhan's (1964) thesis that "the medium is the message" (p. 23). While we found some specific effects on imaginative activity stemming from story content, all the more general effects are attributable to the medium in which that content is presented.

The media constitute an extremely important set of nonformal learning environments for American children (Greenfield, 1984). Most important among them is of course television. More than 10 years ago Lesser (1970) estimated that, by the age of 18, the average American child will have spent more of his or her life watching television than in any other single activity but sleep. In the face of this overwhelming presence, radio has been almost forgotten. The impetus for our research was the desire of the Pacifica Foundation, the umbrella organization for

The research reported in this article was supported by a grant to Patricia Greenfield from the National Institute of Education (NIE-G-0172). We would like to thank the Torrance Unified School District and the teachers and children at Steele, Towers, and Victor Elementary Schools for participating in our study. We also appreciate the help given by Weston Woods Studios in furnishing audio and videotapes of the stimulus stories. Finally, our thanks to Laurene Meringoff Brown for inspiration and help at the outset and to Kathy Pezdek for her thoughtful comments on our first draft.

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listener-sponsored radio stations in Los Angeles, Berkeley, Houston, New York, and Washington, DC, to develop children's radio programming as an alternative to television. Hence, our research focuses on the impact of radio in comparison with its obvious competitor, television.

As their planning and pilot program development got started, Pacifica wanted to stimulate research that would explore the strengths of radio as an intellectual tool. This seemed like an important and interesting area of research, for complaints about television had been rife for a number of years. These complaints were not only about content (e.g., Berry, 1980; Liebert, Davidson, & Neale, 1977; Liebert, Neale, & Davidson, 1973), but also about the medium itself (e.g., Mander, 1978; Singer & Singer, 1979; Thomson, 1956; Winn, 1977). Most pertinent to our research is the complaint that, overall, television encourages passive mental processes (e.g., Carnegie Commission, 1979) and lessens creativity (Stern, 1973) and imaginative play (Caldeira, Singer, & Singer, 1978; Singer & Singer, 1977). On the other hand, there had been speculation extending over a period of more than 50 years that radio may serve as a stimulus for imagination (Carnegie Commission, 1979; Morisett, 1976; Palmer, 1926). Thus, it seemed that one of radio's special strengths could lie in its ability to stimulate imaginal processes.

Our study compares television and radio with respect to imagination. The theoretical idea and hypothesis was that radio would stimulate the imagination more than television simply because, lacking the visual images of television, it leaves more to the imagination. We define imagination as any form of representational activity that creates entities or events not found in the present or immediately preceding stimulus situation. Thus, there are many possible operational measures of imagination and imaginal activity. As it is as yet unknown whether the various measures assess a common underlying trait or process, and as there is a paucity of studies in this area, we will try to review studies relating media to a wide variety of measures of imagination.

The first and only study assessing the impact of radio on imagination was published in 1951 by E. A. Ricclutti. The subjects were fifth, sixth, and seventh graders in the public schools of Waterbury, CT. Radio listening habits, as assessed by questionnaire, were correlated with two tests of imagination, a sentence completion test in which children were asked to imagine the most interesting thing possible about the stimulus word or words and then to furnish a completion, and a prediction test in which children were confronted with strange occurrences and asked to predict what would happen. For drama, quiz, and news programs, various subgroups of listeners (categorized by sex and grade) showed more imaginative responses than non-listeners. In no case was a particular type of radio program associated with lesser imagination. While this study is supportive of our basic hypothesis, its correlational nature makes it impossible to know to what extent radio was a causative factor in the results, to what extent more imaginative children chose to listen to these particular types of program. Al-

though television was available on a limited basis at the time, no assessment of the interaction of the two media was undertaken in the study.

One possible corollary of our hypothesis is the claim that television is not only less stimulating to the imagination than radio, it is actually detrimental. Much of the relevant empirical work in this area centers around this claim. For example, the Caldeira, Singer, and Singer (1978) report that light television viewers report significantly more imaginary playmates (one index of imaginative play) than heavy viewers. There is of course the problem that simple correlations do not tell you anything about causality. Even the correlational results are not consistent, however. Murray, Kwiatek, and Clarke (1982) found that neither fantasy predisposition nor fantasy performance was related to amount of television viewing. Further complicating the matter, correlational data indicate that regular viewing of certain types of programs (situation comedies) is positively correlated with imaginativeness of play in a preschool setting, while watching other types (action-adventure) is negatively correlated (Singer & Singer, 1981). Thus, any causal relationships that might exist vary with the particular type of program.

In line with this pattern of results, Himmelweit, Oppenheim, and Vince (1958) found no relation between teacher ratings of imaginativeness of school children and television viewing in England (at a time when it was still possible to compare children with television to those without). However, many years later in the U.S. Zuckerman, Singer, and Singer (1980) found a negative relation between teacher ratings of imaginativeness of third, fourth, and fifth graders and amount of time spent watching fantasy-violence programs in particular. (This type of program would not have been available to Himmelweit et al.'s sample at that time.)

Not only type of program, but also type of child seems to mediate television's effect on children's imaginal processes. In an experimental study involving the television program *Mister Rogers*, Singer and Singer (1976) found that 2 weeks of *Mister Rogers* was associated with a modest increase in imaginative (make-believe) play, while a control group subjected to no special treatment showed a decline. A second experiment showed that the positive effect of *Mister Rogers* on imagination held only for the initially less imaginative children, while there seemed to be a slightly negative effect of the show on children who were initially more imaginative (Tower, Singer, Singer, & Biggs, 1979). A similar pattern of results held for 2 weeks of *Sesame Street* or 2 weeks of nature films. As in the first study, the overall effect of the three shows on imagination is positive, but the effect (which is largest for *Mr. Rogers*) occurs exclusively among children who are less imaginative to begin with.

In a natural experiment in Canada, Harrison and Williams (1977) had the opportunity to compare children's imaginal activity before and 2 years after the introduction of television to their town. They were also able to do cross-sectional comparisons of children from three towns, Notel (no television), Unitel (one television channel), and Multitel (many television channels). Two years after

Notel received television reception, the cross-sectional comparison was made again. There was no effect of television on an imaginal task where the child was asked to say all the things a line drawing could be. However, television did have a negative effect on another task in which the child is asked to name as many uses as possible for a common item such as a newspaper. Notel children in Grades 4 and 7 scored significantly higher on this imaginal task than their age-mates in the other two towns before they had television. Two years after the introduction of television to their town, Notel children in Grades 4 and 7 had lower scores and there was no difference between them and the children in the other two towns. Of the studies reviewed so far, this one is the only one to experimentally demonstrate an overall negative effect of television in general on imaginal activity.

Most pertinent, but most rare, are studies that compare radio and television with respect to their impact on imagination. The first comparative observations of this sort occurred in a 1970 paper by Forsythe documenting the experience of WHA-AM and WHA-TV with an instructional drawing series. The series started on radio and then shifted to television when that medium became available. Production of the series was later shifted back from television to radio because it was found that children tended to copy the television artist. When taught by radio, in contrast, they were stimulated to use their own imaginations in the drawing process.

This point was confirmed experimentally in a study conducted simultaneously with our own by Meringoff, Vibbert, Kelly, and Char (1981). These researchers investigated radio and television (as well as picture-book) presentations of the same story to see what kind of visual images each stimulated. The children participating in the study were asked to draw pictures about the story. The radio version stimulated more imaginative drawings in that children "chose a wider variety of story content to represent graphically and incorporated more extra-story content in their drawings" (p. 11). However, if we consider not the originality of the drawings but their quality, then children exposed to television and the picture book did better. For example, they more often depicted characters from unusual perspectives and they included more unusual details. These results make the important point that each medium has its own pattern of strengths and weaknesses and that, from a practical point of view, imagination must be seen in the context of other qualities.

In some ways, these results are not surprising. When imagination is assessed through a visual measure, it seems quite natural that the group lacking a visual stimulus would create their own, while the group viewing visual images would make use of them in their drawings. A more stringent experimental test of the comparative effect of radio and television would involve a verbal measure of imagination. Because both radio and television can, in principle, present the same verbal stimulus to their audience, a verbal measure of imagination would be less biased in favor of the radio medium. The first study of this kind was published by Meline in 1976. In her study, children had to write their ideas for

the best and most creative solution to a real social problem (such as the recycling of waste materials) after seeing a sample solution in one of three media: print, audio (equivalent to radio), or video. Creative solutions as defined by Meline fall under our rubric of imaginative responses, for the essential criteria were a departure from or transformation of the given stimulus information. Although only indirectly relevant to our study, it was hypothesized that audio and print would be equivalent stimuli for the imagination, since both are purely verbal, without visual imagery. Video, it was thought, would be less stimulating to creative or imaginative solutions. This was precisely the pattern of results that emerged. In terms of the present study, this study indicated that, even with a verbal measure, radio is more stimulating to imaginal processes than television is.

Our study extended the comparison between audio and video media to the area of story telling. In our study, the measure of imagination was the ability to complete a story by introducing new elements that had not been in the stimulus story presented to the child in either a radio or television version.

Note that our emphasis is on situationally induced imaginative activity rather than on imagination as a stable individual trait. Our assumption is that even if some individuals are more imaginative than others, there are also some environmental conditions which stimulate imaginative activity more than others; it is the latter issue which is the focus of our study. We were interested in finding out if, over the range of imaginative abilities found in an ordinary unselected sample, radio could be more stimulating to imaginal activity than television. We leave it as an open question at what point repeated situational stimulation of imaginative activity (or the lack thereof) will turn into a habit that might be considered a stable individual trait. It was thought that, whereas radio would stimulate more original output, television might elicit more repetition of the stimulus story.

METHOD

Materials

Stories were selected as the media content to be presented because they comprise a familiar, entertaining, and effective means of exposing children to information (Meringoff, 1980). The fictional aspect of stories also made them suitable for the investigation of imaginal processes. A variety of animated films available in both video cassette and audio cassette were previewed. The selected materials were supplied by Weston Woods Studios. Each story selected was an adaptation from a children's storybook which had been made into: (1) an animated film in $\frac{3}{4}$ inch video cassette for viewing on a television monitor, and (2) an audio cassette for listening to a tape recorder. In both the video and the audio versions of the selected stories, the storybook's verbal text is largely preserved. To ensure that narration and length of video and audio formats were comparable, identical soundtracks were developed for both the video and audio versions of each story. In addition, the two stories were of similar length. The incomplete versions used

for this study (see below) had running times of 6 min, 59 s and 7 min, 52 s for *Strega Nona* and *A Story, A Story*, respectively.

In order to improve the potential generalizability of the results, two dissimilar stories were selected. Should a parallel pattern of results be found for both stories, it could then be concluded that the results were not story-specific. The two stories selected were *A Story, A Story* (Haley, 1970), an African folk tale about the origin of stories, and *Strega Nona* (de Paola, 1975), a sorcerer's apprentice style tale of a young man's misadventures with a witch's magic pasta pot. Besides differing in content, these two stories also differed in complexity, the former being the more complex of the two. *A Story, A Story* which was conceptually more difficult than *Strega Nona*, contained foreign words and names, included unusual usages of English words, had more main characters, and was made up of three sub-plots in contrast to the one plot and the more familiar language of *Strega Nona*. Pilot testing indicated that these two stories were interesting and enjoyable enough to hold children's attention. In addition, both stories were unfamiliar. Conversation with 29 children in the pilot study revealed that none of them was familiar with either story.

Subjects and Design

This study involved middle-class Caucasian children from three elementary schools in the Torrance Unified School District in Los Angeles County. Children for whom English was not a first language and those identified as learning disabled were eliminated. Two age groups were used, the first made up of children in first and second grades and the second made up of children in third and fourth grades. The choice of grade levels and groupings for the analysis was based on Meringoff's study (1980), so that our results would be comparable to hers.

A total of 48 children participated in the study, half in each age group. All 24 children in each age group were exposed to both stories. Half of the children in each age group, a total of 12, were exposed to an animated television version of *Strega Nona* and an audio version of *A Story, A Story*. The other half were exposed to an animated television version of *A Story, A Story* and an audio version of *Strega Nona*. Within each of the two treatment conditions, half of the subjects received the video first, and half received the audio first. In this way, each age group was divided into four treatment conditions with 6 subjects in each treatment condition for each age group. Within an age group, equal numbers of boys and girls were randomly assigned to one of the four conditions, so that there were 3 boys and 3 girls in each of the eight treatment age groups. The two stories were presented approximately 1 week apart.

An attempt was made to minimize contagion effects as follows. First, no treatment condition was assigned twice within a single classroom. This was accomplished by sampling four classes per school and four children per class. In this way, children in the same condition and age group were always selected

from different classrooms. Second, children were asked not to discuss the experiment with their classmates until it was concluded.

Procedure

In contrast to the subjects in the pilot study who attended a private school, many of the middle-class children in the Torrance school district felt uncomfortable and were hesitant to talk freely with the experimenter, let alone allowing their imaginations to run free. To eliminate this problem, the experimenter got acquainted with the children prior to the first experimental session by spending one morning as a volunteer assistant teacher in each classroom where subjects for the study were in school.

Then, children were individually tested by the experimenter in an unused classroom in the school. The child was seated to the right of the experimenter at a table. Each session began with a brief informal conversation to help the child feel at ease, and to make certain that he or she understood that the experiment had nothing to do with formal grades or testing.

The story was introduced as follows: "We are going to look/listen to a story. It is called *Strega Nona/A Story, A Story*. After we have heard/seen this story, we are going to talk about it." Then the story was presented once to each child, after which the child was asked to complete the story. Pilot testing had revealed that some children found the request to complete an already-completed story incomprehensible. Therefore, both the video and the audio presentations were stopped just prior to the end of each story. This created an open-ended task, as no particular continuation was logically implied (contrary to the hypothesis of Runco & Pezdek, 1984).

In the video presentation condition, the story was presented to the child on a television monitor. The television monitor was located in front of the subject at the child's eye level. In the audio presentation condition, an audio tape was played on a combination radio/cassette recorder which stood in front of the child. In this way, the audio presentation of the story stimulated radio listening conditions, just as the video presentation simulated television watching conditions.

Immediately after the video or audio presentation, the child was asked by the experimenter to continue the story with these words: "Now, I would like you to tell me a story about what *you* think is going to happen next." In case the child did not respond, the experimenter used a series of systematic prompts, all of which were restatements of the original question, for example, "What do you think is going to happen now? Can you tell me?", and so forth.

Each child's response was tape recorded and later transcribed.

Coding

Our basic coding unit was the simple proposition, termed an event. It would be considered imaginative if the predicate (verb or verb plus object) was not found in the stimulus story. An imaginative event could contain novel or imaginative

characters (vague or specific), settings (time or place), feelings, or dialogue (direct or indirect). The production of novel elements constituted the basic definition of imagination used in the study.

Novel or imaginative characters were subdivided into two categories, vague and specific. Vague characters were introduced with either a pronoun such as *he* or *she* or a general term such as *the man*, the child, and so on. Specific characters were introduced with a specific noun or a modifying adjective. Novel dialogue was subdivided into two types, direct and indirect. Direct dialogue was whatever would go in quotation marks in a written transcript. Indirect dialogue consisted of paraphrases of a character's speech.

In addition to these qualitative variables, there were two quantitative variables, number of imaginative words and number of repeated words. Repeated words are words that directly echo the general plot, events, or other parts of the stimulus story (words or images) to which the child has been exposed. Imaginative words are computed by subtracting repeated words from the total words in the child's story (excluding endings such as "That's all"). Because the correlation between imaginative and repeated words was very low (.155) and did not reach significance, it seemed justified to treat these two variables as independent of each other for in the data analyses. Their statistical independence also showed that imaginative words were not just an artifact of total output and justified the use of an absolute measure of number of imaginative words, rather than a relative measure of imaginative words divided by total words.

In order to demonstrate that the stories could be reliably coded, the second author and another rater scored 12 stories, and achieved an inter-rater reliability of .90. The second author scored all stories twice, the two codings separated by an interval of 2 weeks. Any inconsistencies between the two scorings were then resolved. The few discrepancies between scorings were straightforward to correct and did not involve problems of judgment.

Data Analysis

Each dependent variable described above was subjected to two multiple regression analyses using each subject's average score as a covariate (Pedhazur, 1977). This covariate provides a way of building within-subjects comparisons into a regression analysis. The analysis is therefore analogous to a repeated-measures analysis of variance. It was used instead of a repeated measures analysis of variance because of the desirability of an experimental design in which, for any individual subject, a given story was presented in only one medium. This exigency, which made sense in terms of the purpose of the study, created an incomplete design unsuitable for analysis of variance. Between- and within-subject variables were analyzed separately in order to obtain the correct error terms to compute *F* values. A subject's average score was used as a covariate on the between- as well as the within-subjects analyses because each subject contributed two scores (one

for each medium) in both analyses. The variables and their interactions were entered in the equations in the fixed order indicated by the sequences below:

Between-Subject Variables:

Age (first and second grade vs. third and fourth grade)
Order of media (radio first vs. television first)

Within-Subject Variables:

Medium (radio vs. television)
Story (*Strega Nona* vs. *A Story, A Story*)
Interview (first vs. second)

The major reason for entering variables in a fixed order was so that the analyses would be comparable between the many different dependent variables.

All effects significant at least at the .05 level will be reported in the results section which follows.

RESULTS

As predicted, in all cases of significant effects the radio format elicited more imaginative story completions than the television format. A significantly greater number of imaginative events, $F(1, 35) = 6.17, p < .025$; vague characters, $F(1, 35) = 5.73, p < .025$; and imaginative words, $F(1, 35) = 7.48, p < .01$, were produced in response to a radio story than to a television story. Essentially, these significant effects include all the high-frequency dependent variables. The imagination variables for which significant media effects did not take place were all very low-frequency phenomena, occurring less than 1.5 times per story completion.

A possible objection to these results might be that our measures do not assess imagination, but merely measure inaccurate, intrusive responses to what was perceived as a recall task. Under this interpretation, radio is not more stimulating to the imagination; it is simply less understandable. However, the statistical independence of repeated words (taken as a measure of accurate recall) and novel words (a measure of imagination) shows that imagination, as we measured it, is not simply the absence of comprehension.

Conversely, a greater number of words *repeating* the initial story followed a television story than a radio story, but this difference was not statistically significant. (However, when additional groups were added later, the effect of television in producing more repetitive words became significant [Greenfield & Beagles-Roos, 1985].) There was no effect of medium on the introduction of new dialogue, new locations, new time settings, or new specific characters. Means for all variables, broken down by medium of presentation, are shown in Table 1.

TABLE 1
Mean Scores for Story Completion Measures by Medium

Response Measures	Medium	
	Radio	Television
Imaginative events	9.04	6.96 ^a
Specific characters	.31	.31
Vague characters	6.04	2.92 ^a
Direct dialogue	.53	.52
Indirect dialogue	.52	.33
Time settings	.82	.72
Location settings	1.38	1.02
Emotional feelings	.48	.46
Imaginative words	95.77	71.31 ^b
Repetition words	2.60	9.11

^aSignificant effect of medium at .025 level.

^bSignificant effect of medium at .01 level.

Thus, medium differences in favor of radio occurred in the most general and high-frequency variables, imaginative events and number of imaginative words. Overall, the pattern of media differences indicates that radio facilitated more imaginative completions of the story.

Because half the children were exposed to radio first, half to television first, it was possible to see that each medium not only affected the immediate imaginative response, but also affected the subsequent imaginative response to the other medium, which followed a week later. This carry-over influence was revealed in the interactive effect of medium and interview (first vs. second) on the production of imaginative events, $F(1, 35) = 4.87, p < .05$. The experience of a radio presentation in the first testing session was associated with overall greater imaginative response to both media, while the experience of a TV presentation in the first session was associated with lower overall imaginative response. Both the overall superiority of radio in stimulating imaginary events and its positive effect on later imaginative response to TV can be seen in the graph (Figure 1). The same pattern of interaction was also statistically significant for the variable of imaginative time settings, $df F(1, 35) = 8.10, p < .01$. The overall pattern of results is further strengthened by the finding that order of media had a significant main effect on imaginative time settings, $F(1, 44) = 6.11, p < .025$, such that more imaginative time settings were produced by children who were presented a radio story first.

Because sex was not a focus of interest, the sample was not designed to include this variable in the overall analysis. However, separate two-way analyses of variance were carried out to see whether sex had an influence on imaginative response and whether it interacted with medium. The results showed that there was no effect of sex on any measure. Nor was there any interaction of sex with

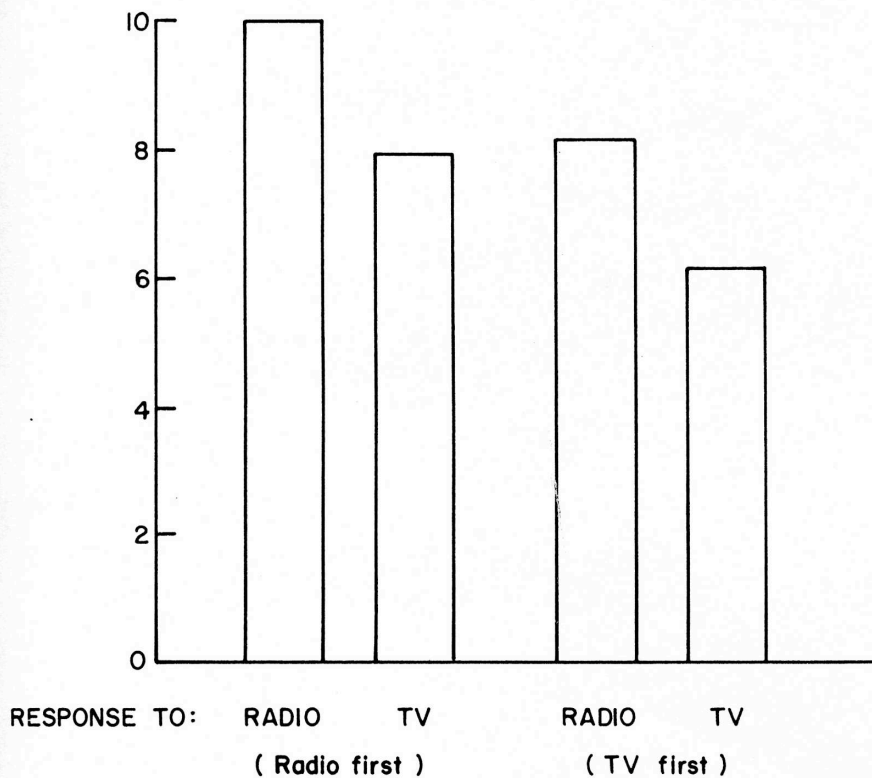


FIG. 1. Number of imaginary events produced under different conditions of medium and order.

medium. Hence, sex of subject was not a factor in the medium effects that constitute the heart of our study.

Looking at the data developmentally, we see that there were no main effects of age on any of the imagination variables. However, there was an interactive effect of age and story on the number of imaginative words produced, $F(1, 35) = 4.20$, $p < .05$. This interaction, shown in Figure 2, indicated that the African folktale, *A Story, A Story*, depressed imagination for the younger children (relative to *Strega Nona*), but enhanced it for the older children. This was probably because the younger children did not understand *A Story, A Story* as well as the older children, a result that emerged from our analysis of a parallel study which investigated comprehension of the same two stories in both media (Greenfield & Beagles-Roos, 1986).

The different structures of the two stories made a difference in the number of imaginative words produced. This effect was manifest in the significant interaction between story and medium, $F(1, 35) = 5.62$, $p < .025$. As Figure 3 shows,

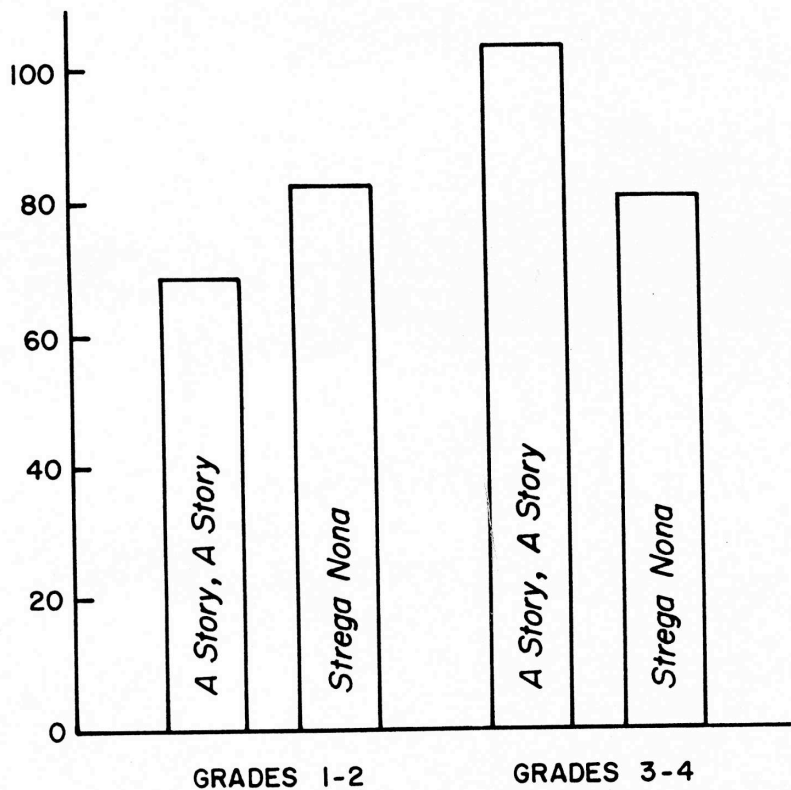


FIG. 2. Number of imaginative words produced in response to two different stories by younger and older children.

medium made more of a difference in the imaginative response to *Strega Nona* than it did to *A Story, A Story*. Post hoc tests of simple effects indicated that medium made a significant difference for *Strega Nona*, but not for *A Story, A Story*. However, for *A Story, A Story*, there was a significant Age \times Medium interaction present, $F(1, 41) = 23.26$, $p < .001$, indicating that the medium difference was in the expected direction for the older children, but in the opposite direction for the younger children. This pattern of results fits in with the observation that *A Story, A Story* was difficult for the younger children to comprehend, for our other study of comprehension of the two media indicates that comprehension difficulties would have been particularly acute in the radio medium (Greenfield & Beagles-Roos, 1986).

For direct dialogue, there was no main effect of medium, but an interaction between story and medium. Although the frequency of imagined direct dialogue was low overall (Table 1), the effect of radio was positive for *Strega Nona*, negative for *A Story, A Story*, $F(1, 35) = , p < .01$. Each of the corresponding

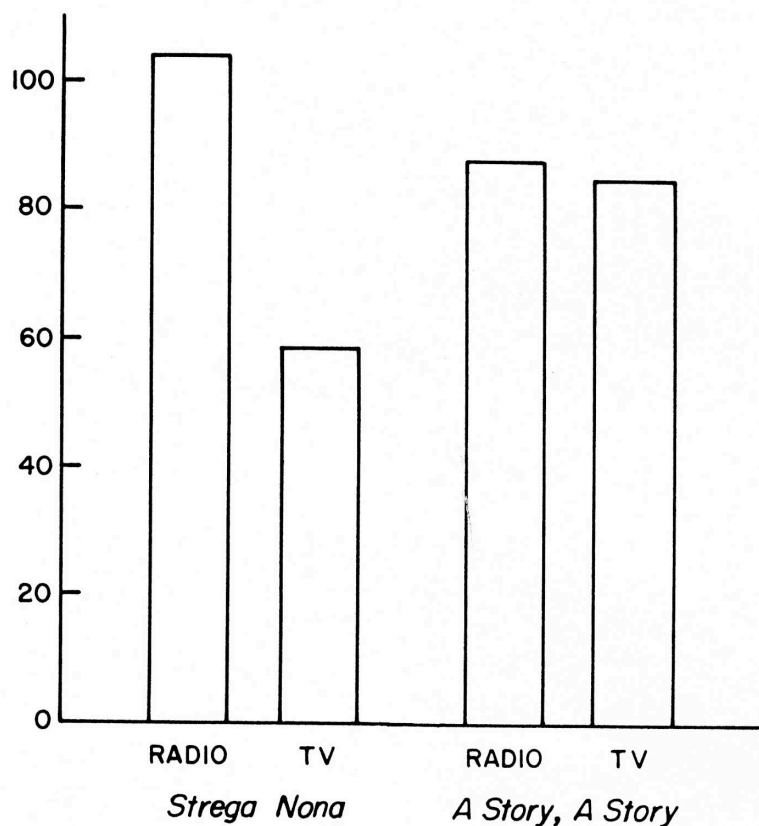


FIG. 3. Number of imaginative words produced under different conditions of medium and story.

simple medium effects is also statistically significant, $F(1, 41) = 13.82$, $p < .001$; $F(1, 41) = 9.90$, $p < .01$, respectively. For *A Story, A Story*, there is also a significant Age \times Medium interaction, $F(1, 41) = 9.90$, $p < .01$. This result for *A Story, A Story* is an exception to the general pattern of radio's greater stimulation of novel responses. Novel direct dialogue also tended to increase from the first interview to the second, across media and stories, $F(1, 35) = 5.58$, $p < .025$.

There were two main effects of story. More specific new characters, $F(1, 35) = 5.94$, $p < .025$ and locations, $F(1, 35) = 4.41$, $p < .05$ were introduced following *A Story, A Story* than following *Strega Nona*. This was probably because the structure of the former contained a pattern for introducing a sequence of new characters and settings within the stimulus story itself; this was not the case for *Strega Nona*, which had no such pattern and contained fewer specific characters within the story itself. This finding indicates that imaginative activity

is not just a function of the medium of representation; it is also influenced by the specific content which the medium carries.

DISCUSSION

Our study confirmed our hypothesis that radio is more stimulating to imaginal processes than is television. The two most general of the imagination variables, number of imaginative events and number of imaginative words showed an effect of medium in favor of radio. In addition, a more specific variable, number of vague but novel character references, also occurred more often in response to radio than to television. It is important to note that a significant medium effect on imagination in the predicted direction was found for every dependent variable that occurred with reasonable frequency.

In addition, the results indicated that one medium influenced the imaginative response to another. Having a radio story as one's first stimulus enhanced the imaginative response to the subsequent television story, while having a television story as one's first stimulus depressed the imaginative response to the subsequent radio story. This carry-over effect indicates that there is generalization of the influences of each medium to other similar situations. It constitutes experimental evidence that supports the results of the natural experiment of Harrison and Williams (1977) as well as the correlational data of Caldeira, Singer, and Singer (1978).

This moderating influence of earlier exposure to one medium on later reaction to another is an interesting phenomenon. The explanation may lie in a line of reasoning developed by Salomon (1980). He argues that the amount of learning stimulated by a medium varies as a function of the amount of mental effort invested in it and that this effort is, in turn, partly a function of expectations about the medium. He finds that, in the U.S., television is perceived as an "easy" medium, little mental effort is invested in it, and therefore, relatively little learning from it takes place. It could be that exposure to a TV presentation in the first session set up expectations of relaxation rather than effort for the second session, a radio presentation, and that such expectations detracted from the effort expended on the story completion. Although nothing is known specifically about how children perceive radio, it is certainly much more unfamiliar as a story-telling medium. In addition, the emphasis on listening increases its similarity to the classroom, perhaps adding to the mental effort expended. It seems likely, therefore, that its appearance in our experiment would be perceived as a relatively difficult situation, one requiring a high degree of mental effort. This set may then have influenced the amount of effort actually expended, leading to more imaginative story completions. Indeed, Salomon (1980) has found that the amount of mental effort invested in TV does vary as a function of situational and cultural factors.

After our data had been collected, Runco and Pezdek (1984) used our stim-

ulus materials to do a parallel study utilizing an adaptation of a standardized creativity test, rather than our story completion measure. In their adaptation of Torrance's "Just Suppose" test, children had to use their imagination to think what would have happened if each story had turned out differently, for example, if Strega Nona had not come back when she did. Using third and sixth grade children, the researchers found no media effects. These results seem in direct contradiction to our own. However, two possible problems in the Runco and Pezdek study could explain the discrepancy. First, whereas we used a within-subjects design, Runco and Pezdek used a between-subjects design. It could be that their radio groups started out with higher creativity than their television groups and that this pre-experimental group difference washed out the medium effect. With 32 children exposed to each medium, such a sampling error is possible, even with random assignment to groups. Even without sampling error, between-subject variance may have been so great as to obscure medium effects. In order to settle the issue, a within-group study should now be done using Runco and Pezdek's measure.

A more likely source of the difficulty lies in the test itself. Runco and Pezdek completed each stimulus story before presenting an alternative event and asking for continuations from it. In our pilot work, we found that once we had exposed children to the completed story, further elaboration was impossible to elicit. There was too much closure. For this reason, we stopped our stories slightly before the end. Our hypothesis is that the procedure of Runco and Pezdek simply did not elicit enough creative material for medium to make any difference. This is supported by looking at the frequencies of creativity responses in their study. Their originality measure, the only one that would have qualified as an imagination measure in our study, yielded a mean response of less than one per subject. Compare our imaginative event measure, which has a mean frequency of eight per subject. Even in our study, we did not find medium effects on any variable with as low frequency as the variables in Runco and Pezdek's study. Therefore it seems highly probable that the low response rate elicited by their test prevented the effect of medium from manifesting itself in their study.

Other reasons for the low level of output and originality in their study could lie in the instructions and circumstances of testing. The instructions were so structured as to give a problem solving (one right answer) rather than creative (an unlimited number of equally "right" responses) flavor to the task, while the fact that children were brought by parents to the university campus for the test also lent a serious rather than playful tone. A new study in which both our test and Runco and Pezdek's test are used under identical circumstances could settle this question as to the source of our discrepant results.

Watkins and Coulombe (1981), using less well controlled story stimuli, did, in contrast to Pezdek and Runco, obtain results that converge on ours. They presented three different stories, one in a television format, one in a radio format, and one in a print format, to sixth grade children. Each story was presented in an

incomplete state, and the children were asked to write completions. Although story, order, and medium were completely confounded in the design of the study, it is interesting that the researchers found radio elicited more elements in the narrative that could not be directly observed in the stimulus stories. This measure of inference is not the same as, but seems related to our measure of imagination. Print, a verbal medium like radio, elicited the most such inferential elements.

The absence of age effects in our study indicates either that imagination as we measured it has stabilized in its development by approximately first grade or that our ages are too close together. The latter explanation is unlikely because we did find age differences using identical age levels in our study of the effects of medium on memory for the same stories (Beagles-Roos & Gat, 1983; Greenfield & Beagles-Roos, 1985). Our interaction between age and story, however, does indicate that basic comprehension is necessary for a story to reach its potential in stimulating imaginal processes. Our two main effects of story, in which *A Story*, *A Story* elicited more new characters and locations than did *Strega Nona*, showed that content, not just medium, is a factor in stimulating imagination. This agrees with the data of the Singers and their colleagues (Singer & Singer, 1981; Tower, Singer, Singer, & Biggs, 1979) showing that different television programs have different effects on imagination.

As far as imagination is concerned, our results support Marshall McLuhan's (1964) thesis that "the medium is the message" (p. 23). While we find some specific effects (on number of novel characters and number of novel locations) stemming from content, all the more general effects (on number of imaginative events and number of imaginative words) stem from the medium in which that content is presented.

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