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The effect of television viewing on college students : an EEG analysis of cerebral asymmetry

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THE EFFECT OF TELEVISION VIEWING ON COLLEGE STUDENTS: An EEG Analysis of Cerebral Asymmetry

A Thesis

by

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ABSTRACT

The controversy over the effects of television viewing on human behavior has drawn a great deal of attention over the last decade. This study sought to investigate this area by looking at cortical response to television viewing.

The subjects in the study consisted of 24 men and 24 women (m=19.6 years) who were monitored for bilateral EEG alpha (8-13 Hz) brain wave production while viewing a television commercial (verbal and nonverbal/spatial) and were then tested for recall at the end of the session.

The analysis of variance for a split-plot factorial design (S.P.F. 222.43; Kirk, 1968) revealed that while there were no differences between cerebral hemispheres, there were significant increases in the amount of alpha brain wave production ($p < .01$) during the trials.

The results of this study support the first hypothesis that "EEG alpha levels will increase with repeated exposure to televised commercials." The significance of this finding is that it contrasts sharply with earlier research and indicates that repeated viewing of the same commercial results in an erosion of the viewer's interest.

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INTRODUCTION

The controversy over the effects of television viewing on human behavior has drawn a great deal of attention over the last 15 to 20 years. Educators, clergymen, politicians and behaviorists have all become embroiled in the battle over whether or not the increasing incidence of violence in our country can be attributed to watching violent events on television. The apparent breakdown of "old fashioned morality," in the view of many, is due to the fact that television, and movies as well, are offering increasing frequencies of extremely graphic displays of human sex between unmarried partners. Screen plays and TV scripts detailing the triumph of "bad guys over good guys" has also been cited as a reason why our young people are confused about the moral issues of right and wrong. The old adage that "crime does not pay" loses its impact in the face of television stories about thieves and murderers who prove otherwise.

Because present research data is mixed at best and relies heavily on observation of the subjects' social interactions following the viewing of a particular television program, this author began to review studies which assumed a different approach, that of physiological measurements to determine the impact of television on human behavior. A pilot study (Sheffel, 1980) was conducted to investigate these physiological effects through a technique utilizing EMG, EKG, EEG, temperature, and respiration measurements. Only the EEG results seemed to demonstrate a change concurrent with those of the television program being viewed. It was determined to make a further study utilizing this technique in an attempt to establish a methodology which would prove useful in securing accurate data.

Current research on brain functioning is based largely on the assumption that all human experiences are reflected in the brain as some form or pattern of neural activity in each cerebral hemisphere (Sperry, 1969; Schwartz, Davidson, Maer, & Bromfield, 1974). In other words, the manner in which we tend to think and/or process information is characterized by a pattern of electrical activity over one or even both of the cerebral hemispheres. By looking at these emerging electrical patterns, in combination with a thorough understanding of both hemispheric functions, we may begin to shed some light on the effects of television on human behavior.

The brain is unique in that it has two distinct hemispheres that are similar in appearance but are quite different in size and function (Lezak, 1979). This phenomenon is known as cerebral asymmetry and refers to the difference in both size and function of the hemispheres.

Cerebral asymmetry has been established in the human fetus as early as the twenty-ninth week of gestation. At this time in the development of the human nervous system, the areas thought to mediate speech in the left hemisphere are significantly larger than the comparable areas (primarily receptive rather than expressive) in the right hemisphere (Wada, Clarke, & Hamm, 1975).

The right hemisphere is generally associated with depth perception, stereoscopic vision and general competency in dealing with space in three dimensions (Benton & Fogel, 1962; Benton & Hecaen, 1970; Carmon & Bechtoldt, 1969; Dunford & Kimura, 1971) as well as in two dimensions (McFie, 1970). The right hemisphere also plays a role in spatial reasoning (Zaidel & Sperry, 1973), including the ability to solve mazes (Ratcliffe & Newcomb, 1973).

The ability to recognize faces has been associated with right hemispheric function (Benton, Levin, & Van

Allen, 1974; Jones, 1979) as well as the processing of musical sounds including pitch and rhythm (McFie, 1970; Gates & Bradshaw, 1977). Another significant contribution is the perception of left visual fields and the memorization of visual, non-verbal material (Kimura, 1961, 1963; Milner & Taylor, 1972).

The right hemisphere is also important for discrimination of colors according to hue (Albert, Reaches & Silverberg, 1975), although this should not be confused with the ability to name a given color, which is a left hemisphere task. Basic verbal abilities of the right hemisphere are primarily receptive rather than expressive (Gazzaniga & Sperry, 1967).

The left hemisphere, on the other hand, is primarily verbal in nature. This includes the abilities to speak, write, read, and understand verbal material that is presented in any modality (McKeever & Huling, 1971; Pirozzolo & Rayner, 1977). It is also involved in spatial behavior but not to the same extent as the right hemisphere (Luria, 1973). The ability to cope with complex figures and spatial relationships, especially the verbal coding required in understanding the meaning of words like "above" and "below" is also a major contribution of the left hemisphere (Benton et al., 1974).

These differences between the hemispheres have been characterized by the left being the "analyzer" and the right, the "synthesizer." This description becomes evident in the fact that left hemisphere processing tends to break the visual perceptions down into details that can be identified and conceptualized verbally while the right hemisphere has a tendency toward processing the same visual stimuli as spatially-related "wholes" and/or "gestalts" (Nebs, 1974).

This distinction supports a conceptual model for the duality of brain function in which "reason" as formal logic, science-mindedness, or no-nonsense attention to detail characterizes left hemisphere thinking while right hemisphere thinking is "intuitive" and includes nonverbal perceptiveness, inspirational hunches, and uncritical imagination (Levy-Agresti & Sperry, 1968).

The phenomenon of cerebral asymmetry (lateralization of function) has been studied by Galin and Ornstein (1972), Doyle, Ornstein, and Galin (1974), Davis and Wada (1977), and Moore and Haynes (1980). All of these researchers demonstrated left hemisphere action during verbal and numeric tasks with right hemisphere activation during spatial and musical tasks in studies utilizing the bilateral EEG as a dependent measure on college students and adult subjects. This increase in EEG activation in one hemisphere is an indication that one hemisphere is attending to a task. In addition to providing support for the concept of cerebral asymmetry, these researchers provided some of the first evidence that the use of the EEG was valuable in assessing the phenomenon.

In summary, these researchers have provided some initial support for using EEG as a methodology for evaluating cerebral asymmetry. The results also provide some support for the notion that both cerebral hemispheres process different types of information. More specifically, when visual-spatial and/or musical stimuli are presented, the right hemisphere is activated (increased attention) and alpha suppression occurs. In contrast, when linguistic and/or segmental information is presented, the left hemisphere is activated (increased attention) and alpha suppression occurs (Galin & Ellis, 1975; Robbins & McAdam, 1974).

At this point, it seems clear that a rationale has been established for the use of EEG in evaluating cerebral asymmetry. The data presented so far have involved the presentation of stimuli that clearly effect changes in one or both cerebral hemispheres. A question arises concerning the effect that television viewing has on the cerebral hemispheres. The process of viewing television could be conceptualized as the simultaneous presentation of stimuli which effects changes in both cerebral hemispheres.

This raises many interesting questions as to the specific effects of television on the cerebral hemispheres as represented by the EEG. The most obvious question that comes to mind concerns the stimulus properties of television. Do the stimuli associated with television break down into a dichotomy of verbal and/or spatial stimuli, which affect the cerebral hemispheres differentially? The next question concerns the effect that television has on the cerebral hemispheres as measured by the EEG. Does television viewing involve the hemispheres individually (either right or left) or simultaneously (both right and left)? The research by Krugman (1971) and Weinstein and Weinstein (1979) provides some answers to these questions and raises many more that remain unanswered.

Krugman (1971) was interested in the effects of printed and televised advertising (commercials) on the underlying electrical activity (EEG activity) of the cerebrum. Using an EEG (bipolar occipital placement) as his dependent measure of underlying neural activity, Krugman found that the process of reading printed advertising (verbal stimuli) and viewing televised advertising (verbal and spatial) were very similar (although he did not investigate the stimulus properties of the televised advertisements). In fact, Krugman found no significant differences in EEG alpha after exposure to both sets of stimuli. These results suggest that both reading and viewing televised advertising are primarily verbal experiences and are processed in very much the same way at the cortical level. If this assumption is true, then the question arises as to the extent that some televised commercials may be primarily verbal, spatial, or some combination of the two.

Weinstein and Weinstein (1979) improved on Krugman's (1971) methodology in an attempt to shed some light on these unanswered questions. These researchers investigated the underlying electrical (EEG) activity of each of the cerebral hemispheres (separately and in conjunction) while viewing televised commercials. It was hypothesized that the specialization of the two hemispheres would generate more right brain activity (decreased EEG alpha) while viewing television commercials than left brain activity. This hypothesis was developed with the assumption that viewing television commercials was primarily a visual/spatial experience, and thus; processed in the right hemisphere. This would lend support for the idea that some televised commercials may be primarily nonverbal and spatial in nature.

These researchers used 30 right-handed women between the ages of 18-49 who watched a minimum of 20 hours of television each week as subjects for their study. The subjects were tested in groups of five, and were exposed to two sets of tapes with 10 commercials on each (duration of 30 seconds [30 s]). All subjects viewed the tapes repeatedly for a total of three presentations.

The results indicated that the differences in the average amount of EEG alpha activity generated by the left and right hemispheres was insignificant. The small differences that were observed indicated that more EEG alpha activity (decreased activity and/or decreased attending) was present in the right hemisphere as compared to the left. The lack of significant findings did not support Weinstein & Weisntein's theory that viewing televised commercials was a right brain activity (increased activity and/or increased attending).

The small differences which were observed in alpha brain wave levels may indicate that the selection of commercials resulted in a bias for commercials that were primarily verbal in nature. This "selection bias" may also account for the results that Krugman (1971) found between printed and televised advertising.

Weinstein & Weinstein (1979) went on to evaluate the effects of repeated exposure to commercials on EEG alpha. As expected, EEG alpha was significantly higher during baseline (looking at a blank TV screen) than during any of the three trials. In addition, EEG alpha levels remained significantly unchanged across the three trials. This result is interesting in that we might expect alpha levels to increase with repeated presentations as subjects become familiar with the stimuli and pay less attention to each successive presentation. It should be noted that these results are better understood with a clear picture of the research methodology. Each of the subjects viewed 10 different commercials during the experimental session. It is conceivable that each new commercial was perceived as a novel stimulus, and thus; captured the subjects attention. This design problem may have been avoided if the authors had presented one commercial and exposed the subjects to it repeatedly.

Weinstein & Weinstein (1979) also hypothesized that commercials that produced the highest recall scores would produce more left brain activity (decreased EEG alpha) than right. This hypothesis was not supported and the results are consistent with those discussed above. It is important to note that Weinstein & Weinstein (1979) did not dichotomize their commercials into verbal and nonverbal categories. This concept brings up a question concerning the stimulus properties of the commercial, and the amount of recall they produce. An interesting area to investigate would be to evaluate the effect of verbal and nonverbal commercials on recall. Another area of interest would be to investigate the effect that verbal and nonverbal commercials have on lateralized EEG production (increased alpha = decreased attenting and/or activation).

The data presented by Krugman (1971) and Weinstein & Weinstein (1979), indicate that televised commercials may be processed at the cortical level as primarily verbal stimuli, nonverbal/spatial stimuli, or some combination of the two. The basic questions about the way in which televised commercials are processed at the cortical level have yet to be answered at this point in time. In addition, both studies (Krugman, 1971;

Weinstein & Weinstein, 1979) present some serious methodological problems and fail to provide an adequate basis for demonstrating the efficacy of using the EEG as a viable methodology in the evaluation of cerebral responses to viewing television commercials.

The purpose of the present study was to establish a methodology whereby pattern changes in brain function during the viewing of television commercials would be recorded by means of an EEG. The data recorded from both the right and left cerebral hemispheres of the brain were studied in an effort to gain more information regarding the manner in which the human brain processes information and/or stimuli from an external source. This study attempted to develop support for the following hypothesis:

1. EEG alpha levels would increase with repeated exposure to televised commercials.
2. Commercials that are primarily verbal in nature would produce a significant increase in EEG alpha over the right cerebral hemisphere as compared to the left hemisphere (activate the left hemisphere over the right hemisphere; verbal; alpha, R > L). It was predicted that any hemispheric differences would remain stable

regardless of the commercial presentation mode.

3. Commercials that are primarily <u>nonverbal</u> in nature would produce a significant increase in EEG alpha over the left cerebral hemisphere as compared to the right hemisphere (activate the right hemisphere over the left hemisphere; nonverbal; alpha, L > R).
4. Commercials that are primarily verbal in nature would produce higher recall scores than commercials that are primarily nonverbal in nature. Recall, $C_1 > C_2$.

METHOD

Subjects

The participants consisted of 48 college students (24 men and 24 women) between the ages of 18 and 23 ($\bar{X}$ = 19.6 years). All participants were selected from lower division psychology classes at the University of the Pacific in Stockton, California. Participants were approached in their classes and told that "a study will be conducted by Bill Sheffel, a graduate student in psychology, to evaluate television viewing in college students." Forty-eight right-handed volunteers (a control for lateral dominance) were recruited for the study. They were told to expect that the study would require approximately 1 hour of their time. Those students who were interested, provided the following: name, address, phone number, and the average number of hours per week that they watched television during summer vacation.

All participants were selected from the list of volunteers based upon their viewing habits (at least 5 hours per week during summer vacation). Each person was contacted individually so that a schedule could be constructed for the experimental sessions. In addition, each participant was given an informed consent form which was signed and returned to the experimenter before the experimental session (see Appendix I).

Setting

All meetings were conducted in the biofeedback laboratory at the University of the Pacific. Participants were situated in a 4.57 x 6.09 m room during the experimental sessions. Each participant was seated in a comfortable reclining chair directly across from a 38.1 cm color video monitor, at a distance of about 3.05 m. Each participant was completely alone during the experimental sessions so as to minimize distractions. All monitoring equipment (including the video tape player) was located in an adjoining room where data collection took place. The laboratory was maintained at an average temperature of 25.5 °C throughout the study.

Apparatus

EEG alpha was detected using a bipolar placement with active electrodes placed at sites T3 and 01 on the left hemisphere and T4 and 02 on the right hemisphere while the reference electrodes were placed at A1 and A2 to reduce possible sources of muscular artifact. All placement sites were determined through the use of the International 10-20 system, and electrodes were held in place by an Electro-Cap IX System (see Appendix 2). Impedance for all electrode placements was below 20,000 ohms.

EEG alpha was defined as a sinusoidal wave form, recorded from the scalp, having a frequency of 8 Hz to 13 Hz and having a minimum integrated amplitude of 10 microvolts.

EEG activity was amplified by two Colburn Instruments (CI) Hi Gain Bioamplifier Couplers (S75-01) with the low cutoff filters set at 8 Hz and the high cutoff filters set at 13 Hz (with a 12 db/octave roll off). Alpha frequencies were detected and digitized via two C.I. Alpha Detector filters (S75-15). The skirts for these analog filters roll off at an average of 12 db/octave, for a total combined roll off of 24 db/octave. The output of the filters was used to gate a 10 Hz signal through two C.I. and gates (R11-12) which then was directed through two C.I. Digital Counters (R11-02). A Universal Timer allowed the counters to accumulate data for five second periods before it ended the time interval and began a new one. Data for EEG recordings represented the time in band pass (alpha) during the 5 s periods.

Commercial Selection

The televised commercials used in the study were chosen for their stimulus features which were either primarily verbal in nature and/or primarily visual/spatial (nonverbal) in nature. The commercial that met the features of a verbal presentation was an advertisement for domestic automobiles. This commercial consisted of a 30 s dialogue with the words printed on the television screen. As the narration began, the words were brought up on the screen, line by line, until the dialogue ended. The printing was bold face type which was white set on a black background.

The commercial chosen for its visual/spatial (nonverbal) presentation was an advertisement for a weekly news program. This 30 s commercial presented a very colorful mixture of various images (such as a swimmer, golfer, hot air balloon, and children, to name a few) which gave the viewer an idea of the types of subjects that were presented on the show. These images were animated and were accompanied by a very upbeat musical score which seemed to add importance and meaning to each of the visual images.

Recall Test

A recall test was developed for each of the commercials. Each test used a multiple-choice format with 20 items. The participants were to pick 10 out of the 20 items, which they recalled from the commercial that they viewed. The recall test for the verbal format required the participants to choose 10 words or phrases that they recalled from the commercial (see Appendix III). The recall test for the nonverbal (visual/spatial) format required the participants to choose 10 images out of 20 that they remembered from the commercial which they viewed (see Appendix IV).

Design

The experimental design used in this study was a Split Plot Factorial design (S.P.F. 222.43, Kirk, 1968, see Table 1). This experimental design was composed of three between-subject variables with two levels each and two within-subject variables consisting of four levels of one and three levels of another (Kirk, 1968; pp. 284-307). The three between-subject variables included two levels of the following variables:

Table 1

			Trial 1			Trial 2			Trial 3			Trial 4			
			D_1			D_2			D_3			D_4			
			E_1	E_2	E_3	E_1	E_2	E_3	E_1	E_2	E_3	E_1	E_2	E_3	
A_1 Audio ON	B_1 Video ON	C_1	n=6												
		C_2													
	B_2 Video OFF	C_1													
		C_2													
A_2 Audio OFF	B_1 Video ON	C_1													
		C_2													
	B_2 Video OFF	C_1													
		C_2													N=576

This matrix is a visual representation of The Split Plot Factorial Design (SPF 222.43) used in this study.

A_1 = Audio ON
A_2 = Audio OFF
B_1 = Video ON
B_2 = Video OFF
C_1 = Verbal commercial
C_2 = Nonverbal commercial
D_1 = Trial 1 (Baseline)
D_2 = Trial 2 (First presentation)
D_3 = Trial 3 (Second presentation)
D_4 = Trial 4 (Third presentation)
E_1 = Right hemisphere
E_2 = Left hemisphere
E_3 = Left and right hemisphere combined.

The shaded boxes represent the 2 control conditions.

1. Audio presentation
   a) On (A_1)
   b) Off (A_2)

2. Video presentation
   a) On (B_1)
   b) Off (B_2)

3. Commercial format
   a) Verbal (C_1)
   b) Visual/spatial (nonverbal) (C_2)

The two within-subject variables consisted of the following:

1. Trials

   This variable included a control phase (baseline) lasting 10 min (D_1) and three separate presentations of the commercial segment (D_2, D_3, D_4), each 30 s in length. Thus, there were four experimental trials, each separated by a 1 min period (during which the television screen was blank). Thus, the experimental subjects were exposed to 1 commercial which was presented 3 times (Trials 1, 2, and 3) following an initial baseline period (Trial 1). The total time for this segment of the study was approximately 13.5 min.

2. Hemisphere

   This variable consisted of three levels which included the following:

a) Right hemisphere (E_1)
b) Left hemisphere (E_2
c) Left and right hemisphere combined (E_3)

Procedure

All participants met individually with the experimenter, for 30 min, (during a 3 week period) to participate in the study. Each participant was randomly assigned to one of the levels of the between-subjects treatment conditions so as to promote homogeneity between groups. The participants were seen individually and were alone during the period in which electrophysiological measures were being recorded so as to minimize distractions. Each subject was seated in a comfortable chair situated directly in front of the color video television monitor. The experimental room was decorated with plants, wall hangings, pictures and closely resembled a real living room rather than an experimental lab. The attention to interior decorating was aimed at minimizing participant reactivity to the setting. As soon as each participant had been seated, the experimenter and an assistant attached an electro-cap upon the participants head (total time, 15 min). During the application of the electro-cap, the experimenter explained what was being done (see Appendix 5) so as to alleviate any fears and/or make the subjects feel comfortable. At no time did the experimenter or the assistant discuss the experimental procedures other than to indicate what was being done to attach the electro-cap.

When the monitoring equipment was secured in place and all of the impedance levels were below 20,000 ohms, a 10 min baseline recording period began. Of the 8 experimental groups, 6 received a series of three identical segments from one of the two commercials that were displayed on the television monitor. Each segment lasted 30 s and was separated by a 1 min pause in which the screen was blank. The participants in the 2 control groups sat and looked at a blank television screen for the entire 13.5 min period. Total time in the experimental setting was 13.5 min.

At the end of the 13.5 min time limit, the participants in the 2 control groups and 8 experimental groups (see Table 1) were disconnected from the monitoring equipment (10 min). At this time, each of the participants completed the recall test which related to the particular commercial that they had finished viewing. After the recall test was completed, (5 min) the session was terminated. The total time for the entire session was approximately 43.5 min per individual.

RESULTS

Percent time in alpha was computed by dividing the sum of each of the experimental trials by the total number of 30 s intervals within all of the experimental trials and multiplying by 100. Sum of percent time in alpha was computed by adding the percent time in alpha for each of the subjects within the experimental matrix. An analysis of variance was conducted for percent time in alpha and the results are presented in Table 2 and 3.

The results presented indicate that the following main effects were significant:

Table 2

Significant Main Effects - % Time in Alpha

	$\bar{m}$	sd
D		
Trials		
1	0.23	0.08
2	2.27	0.80
3	2.88	1.02
4	3.26	1.71
E		
Hemispheres		
Right	1.50	0.77
Left	1.55	0.82
Both	3.43	1.96
(* *p* <.01)		

The results indicated that the main effect for the Trials and Hemisphere variables was significant

Table 3

ANOVA: % TIME IN ALPHA

MAIN EFFECTS	SS	df	MS	F	* p <.01
A (Audio)	70.128	1	70.128	----	
B (Video)	733.097	1	733.097	4.59	
C (Commercial)	496.679	1	496.679	----	
Error (MS subject W groups)		40	159.37		
D (Trials)	785.828	3	261.943	6.43	*
Error (MS D subject W groups		120	40.76		
E (Hemisphere)	468.071	2	234.035	10.69	*
Error (MS E by subject W groups)		80	21.88		
2-WAY INTERACTIONS					
AB	202.899	1	202.899	----	
AC	432.613	1	432.613	----	
AD	49.452	3	49.452	----	
AE	0.363	2	0.182	----	
BC	151.493	1	151.493	----	
BD	401.915	3	133.972	3.29	
BE	51.068	2	25.534	----	
CD	276.654	3	92.218	----	
CE	125.089	2	62.545	----	
DE	200.021	6	33.373	2.53	
3-WAY INTERACTIONS					
ABC	436.918	1	436.918	----	
ABD	163.718	3	54.573	----	
ABE	84.736	2	42.368	----	
ACD	196.430	3	65.477	----	
ACE	18.002	2	9.001	----	
ADE	41.886	6	6.981	----	
BCD	75.060	3	25.020	----	
BCE	6.187	2	3.094	----	
BDE	111.280	6	18.547	----	
CDE	120.686	6	20.114	----	
4-WAY INTERACTIONS					
ABCD	151.767	3	50.589	----	
ABCE	123.496	2	61.748	----	
ABDE	108.080	6	18.013	----	
ACDE	86.094	6	14.349	----	
BCDE	41.886	6	6.981	----	
5-WAY INTERACTIONS					
ABCDE	52.439	6	8.740	----	
TOTAL	12908.168	575	22.448		

(* p <.01). The significant Trials main effect resulted in a significant increase in % Time in Alpha over Trials.

The significant Hemisphere main effect resulted in a significant increase in % Time in Alpha when looking at both hemispheres as opposed to either the left or right hemisphere alone.

Recall scores were reported as an average of the scores that were observed within each of the experimental conditions. An analysis of variance was conducted for the average recall scores and is presented in Tables 4 & 5.

The results presented indicate that the following main effect was significant:

Table 4

Significant Main Effects - Recall

	$\bar{x}$	sd
Video		
On	8.06	0.14
Off	5.70	1.13
(* p <.01)		

The results were for the significant Video main effect indicated that recall scores were significantly higher with Video on than when Video was off.

Table 5

ANOVA: RECALL

SOURCE OF VARIATION	SS	df	MS	F	* p <.01
Main Effects	1027.527	8			
A (Audio)	229.943	1	229.243	5.36	
B (Video)	793.198	1	793.198	36.07	*
Error (MS subject W groups)	879.993	40	21.99		
C (Commercial)	3.371	1	3.371		
D (Trials)	0.328	3	0.109	0.00	
E (Hemisphere)	0.444	2	0.222	0.01	
2-WAY INTERACTIONS	333.831	24			
AB	139.858	1	139.858		
AC	139.858	1	139.858	6.32	
AD	0.346	3	0.115		
AE	0.121	2	0.060	0.01	
BC	51.447	1	51.447	0.00	
BD	0.346	3	0.115	0.01	
BE	0.121	2	0.060	0.00	
CD	0.346	3	0.115	0.01	
CE	0.121	2	0.060	0.00	
DE	1.128	6	0.188	0.01	
3-WAY INTERACTIONS	54.508	34			
ABC	51.330	1	51.330	2.33	
ABD	0.331	3	0.110	0.01	
ABE	0.333	2	0.167	0.01	
ACD	0.331	3	0.110	0.01	
ACE	0.333	2	0.167	0.01	
ADE	0.423	6	0.070	0.00	
BCD	0.331	3	0.110	0.00	
BCE	0.333	2	0.167	0.01	
BDE	0.423	6	0.070	0.00	
CDE	0.423	6	0.070	0.00	
4-WAY INTERACTIONS	3.474	23	0.151		
ABCD	0.374	3	0.125	0.01	
ABCE	0.145	2	0.073	0.00	
ABDE	0.992	6	0.165	0.01	
ACDE	0.992	6	0.165	0.01	
BCDE	0.992	6	0.165	0.01	
5-WAY INTERACTIONS	0.432	6	0.072		
ABCDE	0.432	6	0.072	0.037	
TOTAL	2299.765	575	3.999		

DISCUSSION

The data presented by the Trials Main Effect interaction and the Hemisphere Main Effect reached significance and provide support for the first hypothesis generated in this study.

The data from the Trials Main Effect provides support for the first hypothesis which states: "EEG alpha levels will increase with repeated exposure to televised commercials". When looking at both hemispheres combined, alpha production increases with repeated exposure to the commercial presentation. This suggests that the televised commercial loses its ability to hold a viewers attention with repeated viewings. These results are in opposition to those of Weinstein and Weinstein (1979). This difference may be due in part to the methodology which Weinstein and Weinstein used; as they presented ten 30 second commercials for a total of three trials. The variety of stimuli may have been great enough to hold the viewers attention across all three trials. It is interesting to note that there were no significant differences in alpha production between hemispheres. These results are consistent with the research of Weinstein and Weinstein (1979).

The data for the Hemisphere Main Effect reached significance and, at first glance, appears to be meaningful. A closer inspection of the data reveals that the third level of this variable (both hemispheres) is compiled from the sum of the first and second levels of the Hemisphere variable. It is this computational procedure which produced the significant effect. The results for the Hemisphere Main Effect can thus be considered invalid.

The data represented by the Video Main Effect (for recall data) reached significance, but failed to support hypothesis number 5, which states, "commercials that are primarily verbal in nature would produce higher recall scores than commercials that are primarily nonverbal in nature." These results seem to suggest that higher recall scores are obtained when the video portion of the commercial is ON. This finding may have some practical implications for the advertising industry. It appears that commercials which can attract a viewer's attention to the visual presentation of the commercial will produce a significant impact on the viewer's recall of the commercial.

Although many of the hypotheses were not supported in this study, there were some very interesting findings. The idea of brain lateralization (of the television experience), was not supported, and this is consistent with the results reported by Ornstein and Galin (1976), Ehrlichman and Weinberg (1978), and Weinstein and Weinstein (1979). This is not to say that hemispheric specialization does not exist as demonstrated by Sperry (1969); it is a statement which suggests that the over emphasis on the specificity of the hemispheres may be more indigenous to the specialized tasks, which (simple stimuli) Sperry's commissurized patients performed, rather than to normal, everyday tasks complexed stimuli which people engage in.

There seems to be a growing wealth of literature which supports the notion that many experiences are processed bilaterally (Hecaen & Sauget, 1971; Ornstein & Galin, 1976), and that the hemispheric specialization which exists, allows the brain to process divergent stimulus properties, simultaneously. Krech (1962) supports the idea with a review of the literature which concludes that no learning process or function is entirely dependent on any one area of the cortex. In addition, each area within the brain plays an equal role in different kinds of functions. Luria (1966) moves this concept forward in talking about functional systems, which represent a pattern of interaction among the various areas of the brain, necessary to complete a behavior. Luria's model of functional systems provides a more comprehensive understanding of the interdependent interactions of various brain structures as they work in conjunction to process complex stimuli.

The process of viewing television seems to be a highly complex experience and its perception is not processed solely in one cerebral hemisphere. The complexity of the stimuli involved in the perception of television result in the engagement of both hemispheres when processing this type of information. This is in contrast to the highly specialized tasks (which have been used to assess lateralization) which are predominantly processed in one of the cerebral hemispheres. In retrospect, this may account for the lack of significant differences in alpha as measured from both of the cerebral hemispheres in this study.

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APPENDICES

COLLEGE OF THE PACIFIC
a College of Arts and Sciences

UNIVERSITY OF THE PACIFIC Stockton, California 95211 Founded 1851

DEPARTMENT OF PSYCHOLOGY

APPENDIX I

INFORMED CONSENT

I understand that this study is being conducted by William B. Sheffel and supervised by Dr. Douglas W. Matheson of the Psychology Department.

I have been informed that my participation in this study is voluntary, and as a voluntary participant, I may withdraw my participation at any time during the course of the study, I understand that any information that concerns my personal identity will be held in strict confidence.

I have been informed that this study is of an experimental nature and as such will require my informed consent before I participate. I have been informed of the procedures to be used and understand that no harm will come to me from participating in this study.

Print Name ______________________ Date ______

Signature ______________________

APPENDIX II

The Electro-Cap IX system is a cap made out of light elastic which fits snugly over the head. There are plastic rings sewn into it which correspond to the standard EEG recording points. Electrodes are snapped into these rings so that EEG recordings can be measured. This cap allows for the consistent attachment of several electrodes to subjects quickly, accurately and with minimal discomfort.

This device was manufactured specifically for this study by:

Electro-Cap, Inc.
5518 Dyer Street
Dallas, Texas 75206
(214) 269-2803

NAME: ______________________ APPENDIX III Score: ______________

AGE: ______________________ Movie 41 ______________

DATE: ______________________ Mode: ______________

Please check (✓) ten (10) of the following words or phrases that you recall from the commercial.

_____ 1. Pontiac and your participating Pontiac dealer announce special cash bonuses on Grand Prix, Phoenix, and Firebird.

_____ 2. Announcing our Grand Sale on new Pontiacs.

_____ 3. Don't wait til it's too late.

_____ 4. Hurry.

_____ 5. See your participating Pontiac dealer.

_____ 6. Come pick up your cash bonus.

_____ 7. $500 bonus on Phoenix, V6's and 4's included.

_____ 8. Be sure to ask your Pontiac dealer about our easy financing plans.

_____ 9. Pontiac will send you a check.

_____ 10. $500 bonus on Pontiac of your choice.

_____ 11. All cars reduced for clearance.

_____ 12. Delivery between now and March 19th.

_____ 13. Cash bonus offer will end soon.

_____ 14. $700 bonus on Grand Prix, diesels included.

_____ 15. Come visit your local dealer.

_____ 16. You can apply the bonus to your down payment.

_____ 17. Cash bonus is gas in your tank.

_____ 18. $700 bonus on Firebird, V6's included.

_____ 19. Come see Pontiac's new fuel efficient models.

_____ 20. Take delivery between now and March 19th.

NAME: ____________

AGE: ____________

MAJOR: ____________

DATE: ____________

APPENDIX IV

SCORE: ____________

GROUP: ____________

MOVIE: 42

(for experimenter use only)

PLEASE CHECK (✓) TEN (10) OF THE FOLLOWING IMAGES THAT YOU RECALL FROM THE COMMERCIAL

_____ (1) MUSICAL NOTES

_____ (2) A MOUNTAIN

_____ (3) A TWO LANE HIGHWAY

_____ (4) A COWBOY RIDING A HORSE

_____ (5) A CHEERLEADER WITH POMPOMS

_____ (6) A PERSON RIDING A MOTORCYCLE

_____ (7) A PERSON SNOW SKIING

_____ (8) THE WORD WEDNESDAY

_____ (9) THREE COUPLES SQUARE DANCING

_____ (10) A GROUP OF PEOPLE SWIMMING

_____ (11) TWO BEER MUGS

_____ (12) A HOT AIR BALLOON

_____ (13) A MAN WAIVING A CHECKERED FLAG

_____ (14) A LADY WORKING IN A GARDEN

_____ (15) A RESTAURANT SIGN

_____ (16) PM MAGAZINE

_____ (17) A FAMILY ROLLER SKATING

_____ (18) A PERSON SURFING

_____ (19) AN AIRPLANE

_____ (20) A BATON TWIRLER

APPENDIX V

These standardized instructions were given to each of the participants while they were being prepared for the experimental session:

"We will begin by placing this cap on your head so that we monitor your brain activity. The cap has several sensors which are harmless to you. We will be squirting a water-based jell into each of the sensors so that we can get a good connection between your scalp and the sensors. As each site is filled with jell, we will gently massage it into your scalp and then check the connection. When all of the sensors are in place, we will be leaving the room; the television may come on and off periodically, so don't be alarmed. We will return in about 15 minutes, so just sit quietly till we arrive."