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Cognitive style induced by hemisphere priming: Consistent versus inconsistent self-report

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The method of induced lateral orientation of attention was used to selectively activate the right or left hemisphere in order to observe the consistency of behavior under each manipulated condition. Previous research has shown significantly lower consistency of behavior during relative right- than during relative left-hemisphere activation. With normal, right-handed, intact subjects this effect was replicated and extended to personality measures. These findings are discussed with respect to (1) the dynamics of selective activation of cortical regions, and (2) localization of complementary cognitive processes.

Cacioppo, Petty, and Quintanar (1982, Experiment 2) found that when students listened to persuasive arguments, they reported greater attention to statements consistent with their own attitudes when EEG measures indicated a preponderance of activation in the left hemisphere, but greater attention to statements inconsistent with their attitudes during relative right cerebral hemisphere activation. Attempts to verify this apparent complementarity of processing strategies have shown analogous effects for selective memory (Drake, 1987a) and selective discounting (Drake, 1987b).

Further evidence that the left hemisphere may be especially involved in consistency comes from the research of Seamon, Brody, and Kauff (1983), who studied the effects of frequency of exposure to geometric figures on subjects' ratings of frequency and preference for those figures. They found that when the figures were exposed directly to the right hemisphere by tachistoscopic presentation in the left visual field, the ratings of frequency increased with greater exposure, but preference did not. When presentation was directed to the left hemisphere, however, both ratings of frequency and preference increased as a direct function of exposure, and were consistent with each other.

This phenomenon has been demonstrated in three additional studies, using manipulated lateral orientation of attention as a means of producing selective activation of the processes of one hemisphere. When Drake (1984) measured perceived familiarity of and liking for famous persons, the correlation between these two measures was significantly greater during left- than during right-hemisphere activation. The same pattern of results was found for measures of attitude extremity and importance by Drake and John (1987). Drake and Sobrero (1987) measured their subjects' attitudes or traits before the experiments and then measured related behaviors during the experiments, while subjects were oriented to their right or to their left. These behaviors were consistent with the relevant attitudes or traits only during induced rightward orientation (selective left hemisphere activation); neither attitudes and behavior nor traits and behavior were consistent with each other during leftward orientation (selective right hemisphere activation).

In all of these experiments greater consistency was found during left- than during right-hemisphere activation, no matter whether the activation was based on lateralized tachistoscopic presentation (Seamon et al., 1983), correlational EEG measures (Cacioppo et al., 1982), or selective activation (e.g., Drake, 1984). The present experiment was an attempt to reproduce these findings using personality measures of perceived control that should be highly stable under all conditions of measurement and should be highly correlated with each other. It was hypothesized that there would be greater correlation among the scales during left- than during right-hemisphere selective activation.

METHOD

Subjects

Students from introductory psychology classes signed up for the experiment as a means of earning points toward their course grades. Only those who reported that they used only their right hand for four or more of six common activities were included in the analysis. There were 23 females and 14 males, ranging in age from 17 to 24, with a mean of 19.4 years.

Materials

The dependent variables were three personality scales measuring different aspects of control. The first was the 20-item Desirability of Control scale (Burger & Cooper, 1979). The second consisted of the five items from the Internal Locus of Control scale (Levenson, 1974) that showed

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the strongest correlation under a Varimax rotation with the whole scale. The third consisted of the seven items from the Chance Locus of Control scale (Levenson, 1974) that showed the strongest correlation under a Varimax rotation with the whole scale. The items from the three scales were intermingled on the response sheet; the subjects were to respond to each item by writing a number from 1 to 9 to indicate the extent of their agreement with the statement.

Procedure

Subjects came to the experiment individually and were randomly assigned to conditions of right or left orientation while responding. Each subject sat in a padded armchair beside a desk, with the chair turned so that the subject had to turn his/her upper body and head in order to use the desk to read and mark on the response sheet. The subject was asked to face a small dot placed on the wall about 4 in. (10 cm) above the center of the back of the desk.

Prior to filling out the response sheet, the subject was turned to face the dot and listened to a tape recording played through headphones to only the ear on the same side as the direction in which the subject was turned. The response sheet was filled out after the headphones were removed, so that it was filled out with the body and head turned but not during aural orientation of attention.

The method used for the selective activation of the right or left hemisphere was induced lateral orientation of attention in the direction contralateral to the hemisphere to be activated. This method was first suggested and demonstrated by Kinsbourne (1970, 1975). The direct effects of activation have been demonstrated by changes in cerebral blood flow (Malamed & Larsen, 1977). Lateral orientation of visual attention has altered receptivity in the ipsilateral visual field (Bowers, Heilman, & Van Den Abell, 1981; Hughes & Zimba, 1985) and increased cross-modal sensitivity on the same side in other senses (Hiscock, Hampson, Wong, & Kinsbourne, 1985; Honoré, 1982). This method has also been used effectively to produce other cognitive and emotional behaviors in accord with the hemisphere that is more activated (Gross, Franko, & Lewin, 1978; Merckelbach & van Oppen, 1987; Tressoldi, 1987; Walker, Wade, & Waldman, 1982).

RESULTS

As Table 1 shows, the hypothesis was supported. It is clear that during the experimental session the correlations among the three scales were very high during manipulated left-hemisphere activation. Of course, this coefficient was negative for correlations involving the Chance Locus of Control scale, which measured perceived lack of control. On the other hand, the correlation coefficients were much nearer zero during manipulated right-hemisphere activation.

For the first three of these comparisons, the differences between the coefficients were significant (for Desirability of Control vs. Chance Locus of Control, $z = 2.37$, $p < .01$; for Desirability of Control vs. Internal Locus of Control, $z = 2.14$, $p < .025$; for Chance Locus of Control vs. Internal Locus of Control, $z = 1.74$, $p < .05$, all one-tailed). The same pattern of effects was obtained when the Desirability of Control score in the experiment was compared with the score on the same scale taken in class approximately 2 months before (pretest), but the difference between the coefficients was not statistically significant ($z < 1$).

Table 1
Pearson Correlation Coefficients Between Personality Scales as a Function of Manipulated Relative Hemisphere Activation

	Left-Hemisphere Activation	Right-Hemisphere Activation
DC with CLC*	−.73 (18)	−.08 (19)
DC with ILC†	+.85 (18)	+.46 (19)
CLC with ILC‡	−.68 (18)	−.19 (19)
DC with pretest	+.74 (15)	+.58 (17)

Note— DC = Desirability of Control scale (Burger & Cooper, 1979); CLC = Chance Locus of Control scale (Levenson, 1974); ILC = Internal Locus of Control scale (Levenson, 1974). Pretest was the Desirability of Control scale given approximately 2 months before the experiment. Numbers in parentheses are the number of subjects in that cell. *$p < .01$. †$p < .025$. ‡$p < .05$.

DISCUSSION

As predicted, the lateral attention manipulation had a significant effect on the consistency among the measures of perceived control. There was much greater consistency of the three measures during relative left-hemisphere activation than during relative right-hemisphere activation. This finding replicates and extends earlier research (Drake, 1984; Drake & John, 1987; Drake & Sobrero, 1987; Seamon et al., 1983) and supports parallel findings for the cognitive processing of arguments that are or are not consistent with one's own attitude (Drake, 1987a, 1987b).

These findings may be generalized only to that population of normal right-handers from which the sample was drawn. It is remarkable that such large differences in behavior were obtained as a result of the manipulation while the complete brain was connected and functioning. Apparently this manipulation of selective hemisphere activation operates to temporarily silence or inhibit some of the complementary functions that are associated with that part of the brain that is relatively less activated.

Why were the responses not consistent with each other during leftward attentional orientation? These data do not indicate whether the reason was a deficit in cognitive capacity or a deficit in motivation to perform in a consistent manner. When the subjects in this experimental condition gave nearly random responses to the scale items, was it because they did not know or because they did not care?

Gazzaniga (1983) suggested a modular model of brain processes, in which only one module, localized in the left cerebral hemisphere, is aware of and concerned with behavioral consistency. Such a model would explain the present results. Another explanation is offered by the argument that the right hemisphere is more involved with the processing of external information (Heilman & Van Den Abell, 1980; Jutai, 1984; Kimura, 1973), whereas selective left-hemisphere activity is related to self-attention (Cacioppo & Petty, 1980).

It is clear that the induced lateral orientation of attention manipulation does selectively activate different cognitive processing strategies as a function of the direction of orientation. A knowledge of the dynamics of regional activation of the brain, as demonstrated in the present experiment and by Malamed and Larsen (1977), combined with a knowledge of the static localization of complementary cognitive functions (e.g., Walker et al., 1982), can be applied to specific situations to enhance a particular desired behavior. For example, inconsistent responses on personality inventories such as those used here make the measuring instrument unreliable and therefore useless. Thus the present findings suggest that inducing rightward orientation during personality assessment will produce more consistent and valid results.

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