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A dichotic listening task within the context of hemispheric specialization provides evidence for enhanced affective responses toward correctly recognized stimuli and toward words transmitted to the right ear and music transmitted to the left ear. These findings appear to support the cognitive-affective model over the independence hypothesis.

Affective judgments are a key part of many everyday consumption experiences. Typically, consumer researchers have regarded such judgments according to a *cognitive-affective model* in which affective responses are the last step in a series of cognitive processes. Earlier steps in the model include the registration of stimuli and the retrieval of meaningful information via evaluative assessment (Fishbein and Ajzen 1975) or cognitive elaboration (Calder and Sternthal 1980). Further, communication strategies in accord with this cognitive-affective model often aim to teach consumers information about a brand and to evaluate the effectiveness of that advertising by viewer recall or message recognition.

Two prominent psychologists with very different views challenge the pervasive assumption on which such practices rest. Zajonc and his colleagues (1980, 1982, 1984) contend that, according to the *independence hypothesis,* affect and cognition involve separate and partially independent systems; affective responses, therefore, do not depend on prior cognitions. In contrast, Lazarus (1982, 1984) vigorously defends the cognitive-affective model by arguing that affect depends on cognition that may occur at the unconscious level (cf. Tsal 1985).

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Given this debate, specification of the conditions that mediate the relationship between cognitive appraisal and affective response is of fundamental importance. Toward that end, in the present study we seek evidence for cognitive mediation in the formation of affect. First, we examine the conditions that produce the independence phenomenon via what we believe is an artifact involving the type of stimuli used in previous studies. Second, we suggest some factors associated with hemispheric specialization that should interact with these conditions. Third, we test the view that the extent of cognitive processing determines the level of affect by selecting laterality-related variables that enhance or undermine cognitive activity (i.e., words versus music presented in different ears). We expect this test to support the cognitive-affective model over the independence hypothesis.

CONDITIONS FAVORING THE COMPETING HYPOTHESES

Supporters of the independence phenomenon marshall evidence from two primary sources: (1) studies indicating that in the absence of recognition, preferences are enhanced for previously shown stimuli (Wilson 1979) and (2) studies suggesting that regardless of the extent of processing, stimuli presented to the left hemisphere are liked better than those presented to the right hemisphere (Seamon, Brody, and Kauff 1983). We refer to these two main effects as the *objective familiarity effect* and the *lateralized valence effect,* respectively.

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Objective Familiarity Effect

In a study by Wilson (1979), subjects performed a dichotic listening task during which they tracked a verbal passage presented in one ear while a series of musical tones was presented in the other ear. The findings indicated a more positive affect toward previously heard tones than toward new ones, despite only chance recognition of the objectively familiar tones. Wilson interpreted these findings as a support for the independence hypothesis.

That affective evaluations are not so much independent of cognition as they are mediated by the level of uncertainty in recognition has been suggested in other studies. Obermiller (1985) partially supports this theory. By varying processing demands (minimal, structural, and elaborated) and the number of exposures to pairs of simple melodies, Obermiller showed that confidence and affective evaluation were enhanced when subjects correctly identified previously heard stimuli as familiar. These findings do not provide unequivocal support for the accuracy explanation, however, because processing demands may have enhanced evaluations (Obermiller 1985).

In the present study, processing demands are held constant and the number of exposures (one or two) is consistent with previous studies examining the independence phenomenon. If our results indicate a pure main effect of objective familiarity—that is, if previously shown stimuli are liked better than unfamiliar stimuli, regardless of recognition accuracy—then we will obtain support for the independence hypothesis. By contrast, we will obtain support for the cognitive-affective model if there is a significant interaction between objective and subjective familiarity such that an increase in recognition accuracy is accompanied by more positive affective responses.

Lateralized Valence Effect

Zajonc et al. (1982) claim neurological support for the independence phenomenon on the grounds that cognitive and affective responses engage different hemispheres of the brain. In a study that supports this theory, Seamon et al. (1983) presented visual shapes to the left (primarily right-hemisphere) or right (primarily left-hemisphere) visual field. On a subsequent recognition test, subjects performed better when the stimuli were first processed primarily in the right hemisphere. By contrast, they tended to prefer the shapes first processed in the left hemisphere. The fact that a differential effect on recognition and affective judgments occurs for stimuli presented to the left versus the right visual field supports the notion that cognitive and affective judgments are made on a different basis.

Seamon et al. (1983) explain these outcomes in terms of the lateralized valence effect in which information processed in the left hemisphere of the brain generally is evaluated more positively than information processed in the right hemisphere (Tucker et al. 1981). However, Seamon et al. presented visual shapes in all their experimental conditions (see also Sackeim, Gur, and Saucy 1978; Schwartz, Ahern, and Brown 1980). Because the right hemisphere dominates the cognitive processing of these nonverbal stimuli, the decrements in affective responses observed in the right hemisphere actually might result from these elevated processing demands. In other words, affective functions might compete for processing capacity with the cognitive operations in each hemisphere (Tucker et al. 1981). This theorizing would support the view that cognitive and affective systems are independent and compete for resources. Thus, if we observe decrements in affective responses toward nonverbal (verbal) stimuli presented to the right (left) hemisphere, our findings will support the independence hypothesis.

This resource competition view, which supports the independence hypothesis, directly opposes the cognitive-affective model, which suggests that an increase in cognitive processing should result in greater positive affect that should move cognition and affect together. Abundant evidence indicates that the left hemisphere is more specialized than the right hemisphere for processing verbal information (Beaton 1985; Kimura 1967). To a more variable extent, the reverse is true for nonverbal information (Holbrook and Moore 1981). Therefore, the cognitive-affective model simply predicts more favorable affect toward verbal (nonverbal) stimuli in the left (right) hemisphere.

Summary of Competing Hypotheses

If we refer to the presentation of verbal material to the right ear (left hemisphere) and nonverbal material to the left ear (right hemisphere) as the "efficient conditions" (an assumption to be justified later), we can summarize the competing independence and cognitive-affective hypotheses concerning the objective familiarity and lateralized valence effects as follows:

	Independence hypothesis	*Cognitive-affective model*
Objective familiarity effect	Simple main effect in which affect increases with prior exposures	Interaction effect in which affect increases with correct identification of stimuli as familiar or unfamiliar
Lateralized valence effect	Less favorable affect in the efficient conditions	More favorable affect in the efficient conditions

OVERVIEW: PREVIEW AND JUSTIFICATION

Preview

We attempt in the present study to assess these two competing interpretations by creating an experimental situation that pits the cognitive-affective model against the independence hypothesis. Specifically, we will use a dichotic listening task to assess the role of hemispheric specialization in the formation of affective responses to words and music. We will vary the nature of the stimulus and hemispheric access by transmitting a passage of verbal text to one ear and a passage of instrumental music to the other (Kimura 1967). Subjects will be instructed to attend to both passages. Their overall experience, their affective reactions, and their recognition judgments for the words and music will serve as the dependent variables. Some general considerations to justify our approach are discussed next.

Justification

The conventional approach for testing hemispheric specialization, using normal subjects, is based on the assumption that task requirements will be met better if the information is transmitted to the more proficient hemisphere *directly* rather than indirectly through the corpus callosum (Kinsbourne 1970; Olson and Ray 1983). This assumption is supported by evidence indicating that some information is lost in the transfer across the corpus callosum (Porter and Hughes 1983).

We will use a dichotic listening task to vary hemispheric access. The relationship between ear transmission and hemispheric access is well established in the literature. Kimura (1967) first showed the validity of dichotic listening as a tool for testing hemispheric dominance for verbal and nonverbal stimuli. Using a dichotic listening task, her experiments on recognition indicated a significant right ear advantage for verbal functions and left ear advantage for music tones for split-brain patients as well as normal subjects. These ear advantages in normal subjects were attributed to a combination of two factors. First, the crossed auditory pathways inhibit the uncrossed pathways in a way that stimuli presented to the right (left) ear arrive intact at the left (right) hemisphere. Second, verbal (nonverbal) information either is degraded in passing from the right (left) to the left (right) hemisphere or is less efficiently processed by the right (left) hemisphere. Use of dichotic listening tasks to assess hemispheric asymmetry for verbal and nonverbal functions has been replicated in more than 50 subsequent studies (Witelson 1977; Young 1982).

Following publication of Kimura's study, the dichotic listening technique has been widely adopted as a valid and reliable means of accessing cerebral hemispheres in normal populations. Substantial evidence from clinical studies and experiments (Celesia 1976) supports the view that the crossed pathways dominate the uncrossed pathways when transmitting auditory information. This pathway domination occurs because impulses travelling along the crossed pathways suppress or inhibit impulses travelling to the cortex by way of uncrossed fibres. Supression may take place at different levels, subcortical as well as cortical, within the auditory system. The effect of suppression, wherever it occurs, is that stimuli presented to the left ear are destined primarily for the right hemisphere whereas stimuli presented simultaneously to the right ear are destined primarily for the left hemisphere.

METHOD

Textual and Musical Stimuli

The target stimuli consisted of 24 passages—12 textual and 12 musical—recorded on two different tapes (A and B) with six randomly paired textual and musical passages presented simultaneously in channels one and two of each tape. The verbal text contained test reports on the Pioneer CLD-900 laserdisc/CD player. The musical material came from 12 piano sonatas by Domenico Scarlatti. From these sources, six carefully synchronized one-minute passages of words and of music were recorded in randomized order on channels one and two of Tapes A and B. Thus, Tapes A and B each contained six different 60-second passages of verbal and nonverbal material, ordered randomly and recorded simultaneously on channels one and two, respectively. Though all of the passages were discriminably different, they purposely were taken from reviews of the same piece of audio equipment and performances of sonatas by the same composer and pianist to maintain a certain amount of difficulty in the recognition task (described next). Use of passages from different sources might have made it too easy to spot previously unexposed stimuli, resulting in a bias toward the recognition test.

Procedure

Thirty graduate students from two large Eastern universities each performed the dichotic listening task alone. Each subject was told to wear the headphones, to relax, and to listen to the words and the music. We used four different, randomly assigned exposure patterns that counterbalanced ear transmission and words/music selections. A quarter of the subjects heard Tape A with the words in the right ear (primarily left-hemisphere processing) and the music in the left ear (primarily right-hemisphere processing). Another quarter heard Tape A with the directionality reversed. A similar procedure was followed for the other two groups who heard Tape B.

After listening to the appropriate tape in one or the other hemispheric directionality, the subjects heard the recognition trials (transmitted to both ears). Each trial lasted 15 seconds and consisted of verbal text or instrumental music. Among the 12 randomly arranged text trials, six of the selections had appeared during the exposure phase, whereas the other six came from the previously unheard text passage contained on the other tape. A similar procedure was followed for the music trials. For half of the subjects, the music trials preceded the text trials. The subjects were instructed to listen to each trial and to indicate how much they liked each selection and whether they had previously heard it. The order of these affect and recognition ratings also was counterbalanced.

Because the recognition and affect ratings were collected separately for 24 passages, time constraints and subjects' fatigue precluded using multi-item scales for each separate passage. Therefore subjects' recognition was measured on a category scale, with "yes" indicating that they had heard it before (subjective Familiarity) and "no" indicating that they had not (subjective Unfamiliarity). The affect measure consisted of a single seven-point scale with "disliked it" and "liked it" as the bipolar extremes. Though this verbal affect scale does not necessarily incorporate all nonverbal aspects of affective response, it does conform to the practice of previous research on the independence phenomenon (e.g., Wilson 1979; Zajonc 1980). Indeed, Zajonc explicitly claims that like-dislike ratings are "reliable affective discriminations" (1980, p. 151).

General Approaches to Data Analysis

The first step of our analysis was to examine whether recognition accuracy mediates the objective familiarity effect by comparing affective responses toward stimuli that were and were not correctly recognized. The second step focused on testing the hypotheses associated with the lateralized valence effect by examining affective responses to the efficient versus inefficient conditions.

RESULTS AND INTERPRETATION

The Objective Familiarity Effect

Analysis of variance for the effects of objective and subjective familiarity on affective ratings showed a significant main effect of objective familiarity. Evaluations of stimuli heard during the exposure phase (Old = 4.03) were more favorable than those for previously unexposed stimuli (New = 2.88; $F(1,27) = 41.88$; $p < 0.001$). By contrast, the main effect of subjective familiarity was not significant ($F < 1$).

By itself, the significant main effect of objective familiarity is consistent with the independence hypothesis. However, in accord with the cognitive-affective model, the objective familiarity effect was moderated by a significant objective × subjective familiarity interaction ($F(1,27) = 62.78$; $p < 0.001$). Results indicated a greater liking for old stimuli correctly recognized (Old/Familiar = 4.57) than for those not recognized (Old/Unfamiliar = 3.48; $F(1,27) = 20.09$; $p < 0.001$). Similarly, new stimuli correctly identified as not recognized (New/Unfamiliar = 3.60) were liked more than new stimuli erroneously recognized (New/Familiar = 2.15; $F(1,27) = 15.79$; $p < 0.001$). In other words, for both old and new stimuli, affect depended positively on the accuracy of the cognitive process involved in correct identification. This finding suggests a mediating role for cognition in the familiarity effect and therefore supports the cognitive-affective model.

The Lateralized Valence Effect

Additional evidence for cognitive mediation involved the combined effect of stimulus type and ear transmission on the lateralized valence phenomenon. Affective scores were combined across music and verbal stimuli as two 12-item affective indices. Reliabilities for these indices as measured by coefficient alpha were 0.73 and 0.84, respectively.

An ANOVA indicated a marginally significant main effect of hemisphere ($F(1,28) = 2.59$; $p < 0.10$; one-tailed) in which right- versus left-ear transmission (left- versus right-hemisphere processing) yielded a more favorable affective response (4.58 versus 4.00), thus supporting the general lateralized valence effect.

However, as expected, further analysis showed support for the cognitive-affective model. In accord with the cognitive-affective model and contrary to the independence hypothesis, stimuli should be evaluated more positively in the efficient than in the inefficient condition. Consistent with these predictions, the ear-transmission main effect was qualified by a significant ear-by-stimulus interaction in which more favorable affective responses occurred in the efficient (versus inefficient) condition with words in the right (versus left) ear and music in the left (versus right) ear ($F(1,28) = 3.00$; $p < 0.05$). Simple effects tests indicated that text evaluations were significantly more favorable in the left versus the right hemisphere (4.84 versus 3.25; $F(1,28) = 11.98$; $p < 0.001$). The comparable simple effect was marginally significant for the music trials ($F(1,28) = 2.25$; $p < 0.10$), with music selections better liked when they were received primarily in the right versus the left hemisphere (4.75 versus 4.31). In all, these results support the cognitive-affective hypothesis that the lateralized valence effect is mediated by hemispheric specialization for verbal versus nonverbal stimuli.

DISCUSSION

Marketing practitioners have typically designed communication strategies based on the cognitive-affective model. However, such assumptions have been challenged by recent evidence in support of a rival independence hypothesis in which the formation of affect might occur without extant knowledge about the brand. Clearly, the relative validity of these two hypotheses is important from conceptual and practical points of view. In the present study, we examined this issue in a carefully controlled experimental setting.

Our findings replicate the conventional main effects of objective familiarity and lateralized valence; affective responses toward previously heard stimuli were more favorable and judgments were marginally more positive when the stimuli for processing were presented in the left rather than in the right hemisphere. However, in support of the cognitive-affective model, the findings also indicate enhanced affect for stimuli that were judged correctly on familiarity and for verbal (nonverbal) passages transmitted to the left (right) hemisphere.

As in virtually any research of this type, our results might differ if we used some other type of subjects (e.g., professional musicians versus business students), different cultural contexts (e.g., Japan versus the United States), or different stimuli (e.g., jazz versus classical music). We suggest these possibilities as potentially interesting topics for future research.

Meanwhile, our findings suggest the presence of some cognitive mediation in the formation of affective responses toward correctly/incorrectly recognized objects. Enhanced affect may be due to reduction in uncertainty (Obermiller 1985)—that is, as learning about a stimulus increases, aversive tension due to unfamiliarity decreases. (cf. Sawyer 1981). However, the increase in positive evaluations also may stem from subjects' rewarding themselves for task performance (i.e., correct recognition of old and new stimuli). Because our design did not allow us to distinguish between the relationships of recognition judgments and reduced uncertainty versus recognition judgments and increased rewards, the possibility requires further investigation.

Our results also indicate that the nature of the stimulus interacts with the lateralized valence effect in such a way that the left hemisphere's association with positive affect is stronger for verbal but not for nonverbal stimuli. Thus, the affective and cognitive systems do not appear to compete for resources in each hemisphere. Rather, an increase in hemispheric specialization in the efficient conditions exerted a positive effect on liking. Our findings therefore suggest that a more favorable affect resulted from the appropriate or efficient match between the verbal (nonverbal) stimulus and left (right) hemispheric specialization.

Overall, the present research extends theorizing on the cognitive-affective model versus the independence hypothesis as competing views of consumer affect. In accord with the cognitive-affective model, our findings suggest that the objective familiarity effect increases with accuracy of recognition, while the lateralized valence effect shows a sensitivity to hemispheric specialization for handling verbal versus nonverbal material. These results tend to advance the cognitive-affective model over the independence hypothesis as an explanation for the formation of affective judgments.

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