

INDIVIDUAL DIFFERENCES IN PUNISHMENT-INDUCED INHIBITION OF
INFORMATION
TRANSFER BETWEEN THE CEREBRAL HEMISPHERES

by

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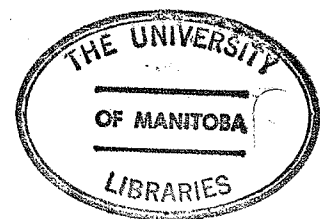
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ABSTRACT

In recent years researchers have developed an increasing interest in lateralization of cerebral functions in normal subjects for both cognitive and emotional capacities. The process of repression may lie at an interface of these complementary functions. Galin (1974) suggests that some instances of repression, one type of defensive response to threatening stimulation, may be mediated by inhibition of information transfer across the corpus callosum.

As a neurophysiological mechanism for repression, Galin(1974) suggests that material from the right hemisphere may be inhibited from crossing the corpus callosum and consequently cannot be verbalized.

Words presented to either visual field must be processed in the left hemisphere in order to be verbalized. With repeated exposure to stimuli a process of faster recognition is to be expected. It has been found that when stimuli are associated with punishment, their processing will be delayed or inhibited. If, when punished, there is a differential delay in reaction time for words presented to the left versus right visual field, it will represent an inhibition or alteration of callosum crossing or right hemisphere processing.

Direct tests of Galin's theory have presented identical verbal stimuli independently to each cerebral hemisphere and examined the rate of inhibition for each when the words are associated with punishment. Findings have been equivocal, with indications of individual differences among subjects.

The literature on defensive style suggests that individuals differ in their propensity to use avoidant and inhibitory mechanisms to deal with threatening stimuli. The present study attempted to identify those subjects with the strongest avoidant tendency, proposing that these subjects would most strongly demonstrate the mechanism suggested by Galin.

Subjects were classified as repressors and sensitizers according to their scores on Byrne's Repressor-Sensitizer scale. All subjects were asked to verbalize stimulus words presented independently to the right and left visual fields at an exposure time of 125 milliseconds.

Phase I consisted of establishing a baseline for vocal reaction time to the words.

During phase II, two of the eight words were followed by unavoidable punishment in the form of blasts of aversive noise, 1/2 second in duration. The other words were presented but not punished.

Phase III, postpunishment, was the same as phase I.

A process of faster recognition is to be expected with repeated exposure to a stimulus. It was hypothesized that words associated with punishment would, however, be subject to an inhibition effect and that this effect would be more marked for associates presented to the left visual field.

While overall reaction time decreased from the baseline to the postpunishment phase as expected, primary associates showed less improvement than control words. Furthermore, the inhibition effect was more pronounced for words presented in the left visual field, as predicted.

While the repressor and the sensitizer groups differed in their subjective ratings of the aversiveness of the noise bursts, they did not differ significantly in their pattern of responding to the experimental task. Both groups performed in a manner consistent with Galin's "inhibition of information transfer" hypothesis. In contrast to the extreme groups, subjects scoring moderately on the R-S scale did not conform to the predicted pattern of performance.

Two unexpected findings were differences in reaction time between control words and primary associates during baseline and a left visual field superiority for control words for all groups.

The results are discussed in terms of Galin's "inhibition of information transfer" hypothesis regarding repression,

cerebral differences in arousal properties and Byrne's "repressor-sensitizer" formulation of individual differences in defensive style.

In summary, the results of the present study are consistent with Galin's "inhibition of information transfer" hypothesis. Material associated with punishment appears to be differentially inhibited when presented to the left versus right visual field. The presence of the inhibition effect appears to be related to the extent to which subjects tend to use consistent defense mechanisms against anxiety. The reported positive findings suggest the present design as a fruitful format for future research in this area.

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INTRODUCTION

Theories of Repression

Any personality variable can be described by a variety of defining operations. Accordingly there are a number of conceptualizations of defense mechanisms, particularly repression. Repression can be broadly viewed as a type of response to anxiety-evoking stimuli.

While psychological and philosophical thinkers prior and contemporary to Freud postulated unconscious processes, these concepts became central to Freud's theory of psychoanalysis (see Millon, 1969).

Philosophical and semantic difficulties arise in defining states of consciousness. Kamiya (1969) suggests that concepts such as consciousness and unconscious be viewed as hypothetical constructs, retained according to their usefulness in ordering data and making valid predictions. In the context of theorizing and experimentation related to repression, the unconscious has been interpreted as that which cannot be verbalized. Although other cues may be relevant, verbal ones have been assumed to play a crucial role. Both learning theorists (e.g. Dollard and Miller, 1950) and psychoanalytic thinkers (e.g. Freud, 1925) agree that to the

extent that behaviour is affected by nonsymbolizable (e.g. nonverbal) processes, it is being influenced by unconscious factors.

In Studies on Hysteria (Breuer and Freud, 1955) Freud introduced the term "repression" in its psychoanalytic sense. At this period repression was considered equivalent to defense mechanism, a process which was postulated to operate outside one's awareness in a number of ways. Primal repression would deny entry of material unacceptable to the ego into consciousness. Repression proper would remove previously conscious material from consciousness. Thus repression might distort one's perception or memory of reality. While repressed ideas remain out of awareness, they are affectively operative. They may continue to develop in the unconscious, affecting behaviour or reaching expression through some physiological system. Hence many psychoanalytic thinkers suggest that various psychosomatic disturbances may stem from repression (Price, 1972).

Although the concept of repression has changed with the development and evolution of psychoanalytic theories, it has remained a central construct in psychoanalytic thinking. Once considered synonymous with defense mechanism, it is now conceived of as the primary ego defense. Theoretically, "the purpose of repression is to deal with moral, neurotic or reality anxiety by removing from consciousness the internal or external threat to the ego [Price, 1972, p.40]."

When repression is complete, no anxiety or neurotic symptomatology is in evidence. If much psychic energy is utilized in extensive repression, an "empty" personality is the result (Kessler, 1972). Freud (1915) suggested that "repression which is eventually successful... will for the most part elude our study [p.92]." It is when repression is incomplete that anxiety related to psychic conflict becomes manifest. "Repression denies translation of the rejected idea into words which are to remain attached to the object [Freud, 1925, Vol.II, p.134]." Therefore anxiety associated with incomplete repression is displaced from its original object. This is particularly evident in neurotic syndromes where anxiety is free-floating or attached to an object which realistically is not anxiety-producing.

Dollard and Miller (1950) describe unconscious processes in terms of learning theory. They state that "repression is the symptom of avoiding certain thoughts; it is reinforced by drive reduction [p.201]." According to their conceptualization, punishment motivates the inhibition of the recurrence of thoughts or perceptions which it follows. These ideas or percepts tend to become avoided or inhibited automatically. The person cannot verbalize the relevant cues which bring about the hesitation or blockage. It is thus unconscious.

Anxiety-arousing ideas are thought because they are motivated. Anxiety reduction motivates avoidance of these thoughts. The anxious person therefore engages in avoidance behaviours such as repression or obsessive thinking. When repression is incomplete, the anxiety-arousing ideas are only partially thought. The person then experiences anxiety, but its relationship to the original threatening material is distorted or blocked from his or her awareness (Martin, 1972).

Experiments on Repression

Experimental investigations of repression date back to the early 1900's. The literature is characterized by criticisms of the validity of experiments and alternative, conflicting interpretations of results. MacKinnon and Dukes (1962) provide a comprehensive review of this literature.

Experiments deriving from a learning theory approach have demonstrated repression-like phenomena. For example, Erikson and Kuethe (1956) demonstrated that verbal avoidance to shock-associated words could be conditioned without the awareness of subjects. Glucksberg and King (1967) found that subjects remembered distant associates of shocked words less well than distant associates of nonshocked words, though unaware of any relationship between the word groups. Hruska (1978) found that male subjects tended to make more errors in verbalization of tachistoscopically presented

words when these words had previously been followed by shock, as compared to nonshocked words. These differences were not statistically significant. Martin, in unpublished research, found a statistically significant inhibition effect for associates of punished words versus nonpunished words, using vocal reaction time as the dependent measure.

The diverse interpretations of the term repression have generated a variety of research paradigms for its investigation. Despite the related controversy and criticism, the fact remains that in many experimental situations, subjects tend to provide differential verbal report of materials presented under threat versus nonthreat conditions. Furthermore these differential responses occur outside the subject's awareness.

Freud contended that all behaviour has a constitutional basis, in particular a neurological basis. His early neurological formulation of the psychodynamic model (Freud, 1895) gave way to a more psychological focus. The neurology of his time was insufficient to merit continued attempts to relate mental processes to a structural basis. With advances in this field has come a renewed interest in the neurophysiological correlates of psychological processes (e.g. MacLean, 1962; Pribram, 1962). Martin (1972) invokes neurological processes to account for repression: "If the particular brain processes associated with a painful thought

lead to punishment, those particular brain processes will be less likely to occur in the future...It is through this process that unintentional...forgetting can occur [pp.54-55]."

Galín (1974) has proposed a specific neurophysiological mechanism which might mediate some instances of repression: inhibition of information transfer across the corpus callosum. This idea is based in part on our knowledge of lateralized differences in cerebral information processing which will be outlined below.

Asymmetries in Cerebral Hemispheric Functioning

There is extensive empirical evidence that consistent differences exist between the modes in which information is processed in the left and right cerebral hemispheres. The left hemisphere has been described as processing information in a verbal, analytic mode. The left hemisphere can be shown to demonstrate superiority in written and auditory language comprehension and calculation. The right hemisphere has been described as utilizing a gestalt, nonverbal mode of information processing. Right hemisphere superiority has been demonstrated for dealing with nonlinguistic perceptual and musical functions such as identification of emotion, facial recognition and visual-spatial relations (see Bogen and Bogen, 1969; Kimura, 1973; Ley and Bryden, 1978).

Early evidence regarding cerebral lateralization of cognitive functions emerged from the study of clinical populations, particularly brain damaged and commissurotomed patients (Penfield and Roberts, 1959; Milner, Branch and Rasmussen, 1964). The generalizability of this data to the functioning of the intact brain was therefore suspect. Within the past decade, similar lateralization of cerebral functioning has been demonstrated in normal individuals for cognitive and emotional capacities using several techniques: dichotic listening (Kimura, 1967), reaction time (Filbey and Gazzaniga, 1969), tachistoscopic split-field presentations (Rizzolatti, Umiltà and Berlucchi, 1971), electroencephalographic readings (e.g. Galin and Ornstein, 1972), recordings of eye movements (Galin and Ornstein, 1974), evoked potentials (e.g. Galin and Ellis, 1975) and chimeric figures (Rapoport, 1978; Schwartz, 1978).

Cerebral lateralization with regard to language and speech has been particularly well-documented. Disorders of both expressive and receptive language functions are commonly associated with lesions of the left cerebral cortex (Eccles, 1973; Geschwind, 1972; Zangwill, 1960; Penfield and Roberts, 1959). Investigations using the Wada test and the performance of commissurotomed patients on a variety of tasks suggest the predominant representation of verbal communication in the left cerebral hemisphere (e.g. Blakemore, Iverson and Zangwill, 1972; Milner, Branch and Rasmussen,

1964). There is a consensus that a relationship exists between preferred hand use and hemispheric dominance for speech functions (e.g. Levy, 1974; Penfield and Roberts, 1959). Milner, Branch and Rasmussen (1964) conclude that while speech is typically represented in the left hemisphere regardless of handedness, for any individual, the probability is greater if he is right handed.

The projection of optic fibres from the retinae to the visual cortex are such that stimuli in the left visual half-field are processed first in the right hemisphere and stimuli in the right visual half-field project to the left hemisphere (Gazzaniga, 1970). Presentation of stimuli may be restricted to one cerebral hemisphere by rapid presentation in one visual half-field with the subject focusing on a central fixation point and stimuli projected equal distances right or left of this point. If the duration of exposure is less than that necessary for saccadic eye movements, the information is provided to only one hemisphere through visual channels. In a review of such tachistoscopic techniques, White (1969b) notes that most studies use exposure times of less than 150 milliseconds.

In relation to the structure of the visual system and left hemisphere superiority for processing verbal stimuli, investigators have found quicker reaction times and more accurate recognition for verbal material presented to the

right visual field (e.g. Kimura, 1966; McKeever and Huling, 1970).

Galín's Hypothesis Regarding Repression

The foregoing discussion of repression and cerebral functioning provides a context in which to view Galín's hypothesis regarding repression.

"Certain aspects of right hemisphere functioning are congruent with the mode of cognition which psychoanalysts have termed primary process [Galín, 1974, p.574]": nonverbal mode of representation, gestalt information processing, non-syllogistic logic and imagic use of words. Freud assigned this form of thought to the unconscious. When the two cerebral hemispheres are surgically disconnected, the mental processes of each one are inaccessible to deliberate conscious retrieval from the point of view of the other. Although each hemisphere may continue to affect overt behaviour, it is dominated by the left hemisphere (Sperry, 1968). This may be analogous to the domination of behaviour by conscious, verbalizable processes. If disconnection of the cerebral hemispheres and domination by one could occur functionally, by inhibition of neuronal transmission across cerebral commissures, it could serve as a neurophysiological mechanism for repression. As selective gating at the level of the central nervous system has been demonstrated for processing of sensory input, Bogen and Bogen (1969) and