Reports

Enhancement of Punitive Behavior by Audio-Visual Displays

Abstract. A group of male hospital attendants watched the knife-fight scene from the motion picture *Rebel Without a Cause*. A second, control, group watched an innocuous educational film. The group who watched the fight (the motion picture with aggressive content), and who were then required to run a conditioning experiment, punished errors more severely, using a significantly higher level of intensity of the punitive electric shock, than did the control group.

Recent studies (*1*) have demonstrated that exposure to film-mediated aggressive content may result in an increase in aggressive behavior rather than in the aggression-reduction that the much-publicized and popular catharsis hypothesis (*2*) requires. For a number of reasons, these studies do not permit the kinds of generalizations that many students of social issues would like to make—for example, that the portrayal of aggressive activities in films and other mass media stimulates antisocial aggressive impulses. In the first place, the stimulus material was not taken from commercial movies portraying aggressive human activities; second, the subjects were very young children whose susceptibility to film-mediated social influences may be particularly high; and, third, the testing situations were essentially play-situations in which the recipient of aggressive responses, for example, inflated rubber toys, could experience no pain or harm.

In the present study the aggressive stimulus was a scene, depicting a switch-blade knife-fight between two adolescent boys taken from the well-known film, *Rebel Without a Cause* (*3*). A sequence from an innocuous film, *Picture Making by Teenagers* (*4*), was chosen as the control stimulus. Experimental and control subjects were treated exactly alike throughout the study, except that the former witnessed the knife-fight, while the latter saw adolescents engaged in constructive activities. Twenty-eight male hospital attendants served as subjects, 14 being randomly assigned to the experimental condition and 14 to the control condition.

A measure of punitiveness was secured through the use of equipment very similar to the "aggression machine" described by Buss (*5*). The subject was told that he and another subject, who was in fact a confederate of the experimenter, would be required to watch a scene in a film and then, after a lapse of a few minutes, to answer some questions concerning the scene they had witnessed. The experimenter explained that he was also collecting some data on the effect of punishment on learning and would need an assistant to help operate the equipment used in this study, a service which the subject was requested to perform. The "assistance" provided by the subject was ostensibly to administer punishment, in the form of electric shocks, to the experimenter's confederate.

The equipment consisted of three units. The subject's unit contained a panel with an 11-point rotary switch for administering shocks of varying intensity, four stimulus keys, a red and a green signal light, and a spring-loaded toggle-switch which the subject raised to indicate to the confederate that he had made a correct response or lowered to administer punishment. The confederate's unit included a panel of four lights and a dial which permitted a selection of one of twelve settings. This unit was entirely a "dummy" unit used only to show the subject what the confederate (the pseudo-subject) was required to do. The experimenter's unit consisted of a panel with ten lights, indicating which of the ten intensities of shock was selected by the subject, stimulus keys to activate the red and green lights on the subject's panel, and a standard electric timer for recording the duration of the shocks.

The confederate was not visible to the subject during testing. The experimenter was stationed at the far end of the laboratory and could observe the subject and the confederate, both of whom faced away from the experimenter.

After the subject had consented to act as an assistant he was shown how to operate the equipment and was given a few shocks to familiarize him with the pain-levels corresponding to sample settings of the dial on his panel. He was given a program of settings for the signal switches, each setting consisting of a pairing of two of the numbers 1 through 4. He was told that on each trial he must depress two of the four stimulus keys in the order indicated by his program, and that these would light up two of the lights on the "subject's" (that is, the confederate's) panel. He was informed that if the "subject" responded correctly, the green panel light would go on and that he should signal to the "subject" that he was correct by raising the spring-loaded lever. However, if the red light came on, indicating that the "subject" had made an incorrect response, he was told to punish him by selecting one of the shock intensities and depressing the lever. A few practice trials were given to familiarize the subject with the apparatus.

At this point the confederate arrived, and was also told, in front of the subject, that this was a study of memory for events in a movie but that, during the break between the movie and the recall test, the experimenter wished to gather additional data concerning the effects of punishment on learning. The confederate's consent to serve as a "subject" was then obtained.

A "trial" run, which supplied a pretest measure, was then carried out. The subject was given a program of 30 settings to present to the confederate. The latter was seated at the "receiving" end of the punishment equipment with an electrode strap placed around his wrist. During the pretest period, the subject was required to punish the confederate 15 times—that is, the experimenter illuminated the red button on

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Type manuscripts double-spaced and submit one ribbon copy and one carbon copy.

Limit the report proper to the equivalent of 1200 words. This space includes that occupied by illustrative material as well as by the references and notes.

Limit illustrative material to *one* 2-column figure (that is, a figure whose width equals two columns of text) or to *one* 2-column table or to *two* 1-column illustrations, which may consist of two figures or two tables or one of each.

For further details see "Suggestions to contributors" [*Science* **125**, 16 (1957)].

Table 1. Summary of results for experimental and control subjects and significance of differences of changes from pretest to posttest. ($N = 14$ in each group)

Measure	Group means				t	p
	Experimental		Control			
	Pretest	Posttest	Pretest	Posttest		
Change in punitiveness indices:						
1. Shock intensity level	4.34	4.92	5.03	4.89	2.37	$<.025$
2. Level × duration	42.84	47.22	41.11	35.32	1.93	$<.05$

15 occasions. Since the experimenter had surreptitiously removed one of the electrodes from the strap, the confederate in fact received no shocks.

Immediately after the "trial" run, the experimental subjects and the confederate were shown the knife-fight scene, while the control subjects and the confederate were shown the painting scene.

The posttest series of trials on the learning task followed. Another program of 30 settings was handed to the subject and again he was required to punish the confederate 15 times during the run.

The mean intensity setting (in terms of shock levels numbered from 1 to 10) was calculated for each subject for the pretest and posttest sets of trials. The difference between these two means was used as one index of the effect of exposure to the audio-visual display. On the supposition that a lower shock level administered for a relatively long period of time might represent as high a degree of punitiveness as a higher level administered for a shorter period, a mean shock level × duration index was also calculated for both sets of trials, duration being recorded in 0.1-second units. The pretest-to-posttest change in this index formed the second behavioral measure of punitiveness.

Table 1 gives the group pretest and posttest means on both indices of punitiveness. Differences between group pretest means were not significant. ($p > .05$ in each case). Changes were in opposite directions, with experimental subjects showing a mean increase in punitiveness and control subjects a mean decrease. Tests based on individual pretest-to-posttest changes yielded significant group differences for both the shock level ($p < .025$) and the shock level × duration ($p < .05$) measures (one-tail tests). Comparable findings have since been obtained for both male adolescent and female adult subjects.

The results of this study indicate that exposure to audio-visual displays containing aggressive content can result in a significantly greater willingness in adults to inflict pain. It is of interest to note that they were obtained with a group of hospital attendants, whose training in a modern psychiatric hospital is definitely oriented toward the inhibition of aggression (*6*).

RICHARD H. WALTERS
EDWARD LLEWELLYN THOMAS
C. WILLIAM ACKER
University of Toronto and
Ontario Hospital, New Toronto, Canada

References and Notes

1. A. Bandura, D. Ross, S. A. Ross, *J. Abnormal and Social Psychol.* **63**, 575 (1961); O. I. Lovaas, *Child Develop.* **32**, 37 (1961); P. H. Mussen and E. Rutherford, *J. Abnormal and Social Psychol.* **62**, 461 (1961).
2. I. Hendricks, *Facts and Theories of Psychoanalysis* (Knopf, New York, 1948); S. Feshbach, *J. Abnormal and Social Psychol.* **50**, 3 (1955).
3. Warner Bros. Pictures Distributing Co. kindly provided this film on extended loan.
4. This film was provided on extended loan by the Toronto Metropolitan Film Library.
5. A. H. Buss, *The Psychology of Aggression* (Wiley, New York, 1961).
6. This study was supported by the Ontario Department of Health and by grants to one of us (R. H. W.) from the National Research Council of Canada (APA-47) and Canadian Mental Health (605/5/293).

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Central Cholinolytic Action of Chlorpromazine

Abstract. Chlorpromazine was found to have an antagonistic action against the electroencephalographic (EEG) alerting produced in rabbits by cholinergic agents, particularly eserine salycilate and acetylcholine chloride. This cholinolytic action occurs at a prepontine, precollicular level where adrenergic agents fail to elicit EEG alerting. These results emphasize the importance of cholinergic mechanisms in EEG alerting.

Chlorpromazine is known to exert an adrenolytic action both peripherally on the terminations of the sympathetic nerves and centrally in the brain. Chlorpromazine's peripheral antiadrenaline activity was described by Courvoisier *et al.* (*1*) and was confirmed by Kopera and Armitage (*2*). Dell (*3*) and his co-workers, whose experiments became the prototype of subsequent investigations, demonstrated that the cortical pattern of EEG arousal, which normally accompanies the intravenous injection of adrenaline, was reduced by chlorpromazine. Bradley and Hance (*4*) made a further contribution by observing that the characteristic behavioral arousal and EEG alerting of amphetamine are jointly blocked by chlorpromazine. Anochin (*5*), in a series of studies conducted in the U.S.S.R., reported that chlorpromazine blocked adrenaline "mobilization" at the level of the brain stem reticular formation. Brodie *et al.* (*6*) have classified chlorpromazine as a central adrenergic blocking agent.

Most chemical agents evoke a multiplicity of responses from the body, and peripheral cholinolytic effects of chlorpromazine have been reported (*1, 2, 7*), including a diminution of salivation and pupillary dilation. In patients receiving chlorpromazine, such atropine-like characteristics as a fast heart, dilated pupil, and dry mouth have been observed. Quantitatively, however, chlorpromazine is a weaker cholinolytic agent than atropine.

The purpose of the present communication is to show that chlorpromazine also exerts a central cholinolytic action on the brain. Experiments from our laboratory indicate that chlorpromazine effectively antagonizes the EEG alerting produced by eserine, a cholinergic agent. Twenty-seven adult New Zealand male albino rabbits weighing approximately 3 kg each were employed in these preliminary experiments. Animals were tracheotomized under ether and local pontocaine anesthesia, curarized, and artificially respired prior to the administration of the drugs (*8*). Ten of the animals were studied under special procedures involving a prepontine, precollicular transection of the brain.

In the first series of experiments, rabbits were given 0.3 mg/kg of eserine salicylate by femoral vein. Within 3 to 5 minutes, the EEG pattern from the motor and limbic cortices, caudate nucleus, thalamus, hippocampus, amygdala, and reticular formation was one of sustained arousal. Chlorpromazine was then administered by femoral vein every 4 minutes in alternating 1 and 2 mg/kg injections at a concentration of 10 mg/ml until a complete reversal of the eserine arousal pattern had been obtained. Chlorpromazine typically effected this reversal at a total drug level of 6 to 8 mg/kg within 15 to 20 minutes. The normal period of