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Annoyance, Type and Duration of Postannoyance Activity, And Aggression: The "Cathartic Effect"

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SUMMARY

A series of experiments was conducted to elucidate the conditions conducive to a decrease in aggression following annoyance. The potential capacity of expression of aggression to bring about a reduction in the amount of subsequent aggression was of particular interest. This empirical concern was supplemented by tests of several influential and competing theoretical concepts dealing with the cathartic aspects of human aggressive behavior. Given the failure of such concepts to account for major portions of the data, an integrative theoretical model was proposed.

Experiment 1 evaluated the usefulness of the hydraulic, self-arousal, and dissipation of anger concepts in accounting for the earlier demonstrations of the cathartic effect. In a $2 \times 3 \times 2$ design, half of the subjects were annoyed by a confederate, while the other half were treated neutrally. During the next stage (the interpolated period), a third of all subjects gave "shocks" to the confederate, another third simply waited, while the remaining third worked on mathematical problems. Orthogonal to the first two factors was the duration of the interpolated period (7 or 13 min). The main dependent measure was the number of shocks administered to the confederate in the final stage of the experiment.

It was found that annoyed subjects gave more shocks than nonannoyed ones did, and that only the former were substantially affected by other manipulations. In the case of the annoyed wait and annoyed math subjects, the anger dissipation hypothesis correctly predicted that the mere passage of time would decrease the amount of subsequent aggression, presumably due to the action of homeostatic processes. The self-arousal hypothesis correctly predicted that the annoyed math subjects would give fewer shocks than the annoyed wait ones would. Since the subjects were engaged in an absorbing activity, the likelihood of their arousing themselves by ruminations about the preceding annoying incident was minimized, and the amount of subsequent aggression reduced. Yet, when annoyed subjects had given the confederate a moderate number of shocks in the interpolated period, they subsequently gave him fewer shocks than the 7-min annoyed wait and annoyed math subjects; this was the only outcome predicted correctly by the hydraulic model. In contrast, when a large number of shocks had been administered in the interpolated period, the amount of subsequent aggression was relatively high. The interpretation of the latter result in terms of an "adaptation effect" was tested by further experiments.

In Experiment 2 (representing three conceptually independent experiments), the variable of major interest was the change of mode of aggression from the interpolated to the dependent-measure stage. This variable was studied in conjunction with the duration of the interpolated period and the amount of interpolated aggression. The dependent measure was again the amount of subsequent aggression directed at the confederate. It was found that the change of mode of aggression eliminated the adaptation effect observed in Experiment 1, and that under such conditions, the large number of interpolated punishments supplemented the aggression-decreasing effect of the passage of time. However, when the duration factor had been kept constant, the large number of punishments did not lead to a decrease in the amount of subsequent aggression beyond that produced by a moderate number of interpolated punishments.

The most parsimonious interpretation of the results was in terms of a relationship of bidirectional causality between the degree of anger and the amount of aggression expressed. The level of anger, an important determinant of the amount of aggression, is apparently affected by the cognitive labeling processes, and by various factors which have an effect on arousal level. An important implication is that nonaggressive activities may decrease the amount of annoyed people's aggression. However, expression of aggression against the annoyer appears to be a particularly potent anger- and aggression-reducing factor. Possible reasons for this result were examined, and additional data supporting the anger–aggression theoretical model reviewed. ■

■ Catharsis is commonly regarded as a concept which emerged in the psychoanalytic literature and is vitally related to the "hydraulic" model (Hendricks, 1948) through the frustration–aggression propositions (Dollard, Doob, Miller, Mowrer, & Sears, 1939). There is no doubt that the catharsis hypothesis has profoundly influenced the theory and research in the area of human aggression during the last 35 years. However, skepticism about its validity has been steadily growing, culminating in a recent suggestion that a "moratorium" on the hypothesis be imposed (Bandura, 1973). Some of the reasons for such a drastic proposal will therefore be outlined first.

In its most orthodox version (e.g., Hartmann, Kris & Loewenstein, 1949; Lorenz, 1966), the catharsis hypothesis predicts that, regardless of the aggressor's state, any form of expression of aggression should bring about a decrease in the amount of subsequent aggression. This position, based on the idea of endogenously generated energy that must be released, has been cogently criticized on a variety of grounds (e.g., Bandura, 1973), and shown to be empirically untenable. When nonannoyed people engage in or observe aggressive activity, an increase in subsequent aggression, rather than a decrease, is a likely consequence (e.g., Doob & Climie, 1972; Doob & Wood, 1972; Walters & Thomas, 1963). On the basis of such evidence and the work of Dollard et al. (1939), Buss (1961) and Berkowitz (1962) have suggested that a person must first be angry if a decrease in aggression is to be observed following an expression of aggression. However, since this revised version of the hypothesis has been linked to the broad Dollard et al. definition of expression of aggression ("cathartic activity"), it has not fared well either. When angered people watch aggressive films (e.g., Zillmann, 1971), attack inanimate targets (Mallick and McCandless, 1966), aggress verbally (e.g., Ebbesen, Duncan, & Konečni, in press; Kahn, 1966), or engage in strenuous physical activity (e.g., Zillmann, Katcher, & Milavsky, 1972), an increase in the amount of subsequent physical or verbal aggression is usually observed.

There have been unsuccessful attempts to save the concept of catharsis in its hydraulic sense by suggesting that expression of aggression has three kinds of effects: a discharge of the aggressive drive, the learning of aggressive responses, and guilt (Feshbach, 1970). If an increase occurs following expression of aggression, it can be claimed that the learning effect was unusually pronounced, thus obscuring the cathartic discharge that has actually occurred. By postulating factors which have opposite effects, the catharsis hypothesis is made invulnerable to any experimental result (Bandura, 1973).

Finally, there has been some uncertainty with regard to the decision about what constitutes a relevant result. Berkowitz (1962) has implied that the findings of a decrease in aggressive activity following expression of aggression are contaminated by the potential influence of guilt and "aggression anxiety." In addition, the same author has suggested that situations which involve instrumental aspects of aggression are not directly relevant to the catharsis hypothesis. According to Berkowitz (1962, p. 215), "hostile actions that eliminate the frustration lessen anger because the emotion-inducing obstacle to goal attainment has been surmounted and not necessarily because the behavior has resulted in an emotional 'purge'" (cf. Buss, 1961, for whom instrumental aggression is, by definition, not the consequence of anger).

Criticisms of the catharsis hypothesis thus seem to be quite justified. An unconditional

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acceptance of such criticisms, however, would have the unfortunate side effect of throwing the baby out with the bathwater. At the empirical level, it is now clear that a decrease in the amount of aggressive responding does occur in angered people following *some* forms of aggressive activity. The amount of people's future aggression against an annoying person may be reduced: (a) by their seeing the annoyer get hurt in some way (e.g., Bramel, Taub & Blum, 1968; Doob, 1970); (b) by their hurting the annoyer themselves (Doob & Wood, 1972; Konečni & Doob, 1972); and (c) by their hurting an innocent scapegoat (Konečni & Doob, 1972). It is also clear that annoyance raises the level of physiological arousal of people exposed to it, and that hurting the annoyer brings about a fast decrease in the level of arousal, in comparison to situations where the annoyed individuals are not given the opportunity to express aggression (e.g., Baker & Schaie, 1969; Gambaro & Rabin, 1969; Hokanson & Burgess, 1962; Hokanson, Burgess, & Cohen, 1963; Hokanson & Shetler, 1961).

Thus there are symptoms of a deadlock in the controversy over the catharsis hypothesis. An obvious strategy in this situation is to delimit the concept and submit the phenomena subsumed under it to empirical scrutiny. In the present paper, *catharsis* is treated strictly as a label. As a *paradigmatic label,* it denotes the research approach concerned with the consequences, both in terms of the physiological changes within an aggressor and his subsequent behavior, of his expression of aggression. This research approach usually implies the use of a three-stage experimental design: (a) frustration (annoyance), (b) expression of aggression, (c) dependent measure of aggression and/or arousal. As an *effect label,* catharsis is regarded as synonymous with a decrease of the amount of subsequent aggression and of the physiological arousal level displayed by an aggressor. The two meanings of the label are not defined circularly; both cathartic and noncathartic effects can be obtained in the catharsis paradigm.

Several points should be made about this operational approach to catharsis. First, catharsis is kept as a paradigmatic label to specify an area of research and a broad class of relevant experimental variables. It has been stressed before (Konečni & Doob, 1972) that factors such as the experimental manipulation of subjects' anger (or lack of it), the particular operationalization of expression of aggression, the dependent measure employed, and the relationship between the latter two must all be taken into account for meaningful predictions to be made.

Second, the present approach severs ties with explanations in terms of a specific aggressive drive that are habitually offered for findings obtained within the mentioned paradigm. For example, using the operational approach, one would not try to eliminate guilt as an alternative explanation in order to prove that the decrease in aggression is a "pure" consequence of an energy discharge; one would manipulate it or control it simply because it may be an important variable. Similar purity demands are contained in claims that instrumental aggression is not relevant to catharsis. The cathartic effect may be due precisely to the instrumental value of aggressive acts for angry people, perhaps because such acts bring about a fast decrease of the level of arousal (anger) from an aversively high level.

Third, it is clear that one could not view catharsis as an effect label signifying a decrease in the amount of aggressive behavior and at the same time agree with Feshbach's (1970) speculation that an increase in the amount of such behavior may be only concealing an actual drive discharge.

In short, the importance of the consequences of annoyance and expression of aggression makes a thorough parametric approach imperative, regardless of the validity of the psychoanalytic, ethological, and frustration–aggression versions of the catharsis hypothesis. This position is offered as a constructive alternative to the moratorium proposals mentioned earlier. Moreover, this approach may eventually lead to more satisfactory theoretical analyses of this important area of human aggression.

The research reported here is based on the above reasoning. It builds directly on the studies by Doob and Wood (1972) and Konečni and Doob (1972), and the alterna-

tive explanation provided by Bandura (1973, pp. 150–152) for the results of these studies. In the Konečni and Doob 2 × 4 design, half of the subjects were annoyed by a confederate; the other half were treated in a neutral manner. One fourth of the subjects then gave 14 "electric shocks" to this confederate, another fourth gave 14 shocks to a different confederate, and the remaining half gave no shocks to anyone. Finally, all subjects in the first three groups were given the opportunity to administer shocks ad libitum to the confederate with whom they first interacted; subjects in the fourth group gave them to another confederate (a scapegoat).

The results of the experiment are shown in Table 1. Both main effects were significant, as well as the interaction. All these effects were due to the large number of shocks given by annoyed subjects who had not had a prior opportunity to express aggression. By using nonannoyed controls, like the Doob and Wood (1972) study, the Konečni and Doob experiment ruled out the explanation in terms of guilt (Berkowitz, 1962); in addition, results in the scapegoat conditions made the retaliation hypothesis (Bandura, 1973) appear rather implausible.

However, Bandura (1973) has suggested that the results under consideration may be explained in terms of self-arousal. He focused on the fact that angered controls spent the interpolated period waiting alone, with nothing to do. According to Bandura, this was not an appropriate control for expression of aggression because waiting, rather than being devoid of influence, actually fosters aggression: These idle subjects may have spent the time ruminating about the preceding annoying incident with the confederate, and this process of reviving the unpleasant occasion may have aroused (annoyed) them further. In contrast, angered subjects who gave shocks during the interpolated period had their time taken up by the task and little chance to think about the confederate's behavior. By this logic, the fact that the aggression-expressing subjects subsequently gave fewer shocks than the waiting controls was due to an increase in anger on the part of the waiting subjects, rather than to a decrease mediated by shock-giving in the former group. In Bandura's (1973) opinion, a different control group must be used to invalidate the interpretation that the differences in the amount of aggression displayed by the two groups are due to "differences in opportunities for resentful self-stimulation" (p. 151). What is mandatory is "an experimental design in which changes in physiological arousal are compared in angered subjects who counteraggress and in those who engage in equally absorbing but nonaggressive activities" (p. 151).

TABLE 1

MEAN NUMBER OF SHOCKS BY EXPERIMENTAL CONDITION

Condition	Shocks to annoyer in IP; shocks to annoyer as DM (Group 1)	Shocks to scapegoat in IP; shocks to annoyer as DM (Group 2)	Wait in IP; shocks to annoyer as DM (Group 3)	Wait in IP; shocks to scapegoat as DM (Group 4)
Annoyed	10.5	10.5	16.8	15.4
Nonannoyed	10.8	10.8	10.6	11.0

Note. IP = interpolated period; DM = dependent measure. Terms such as annoyer and scapegoat are applicable only for subjects who were annoyed; for the nonannoyed subjects, the confederates were simply two different people. Adapted from "Catharsis through displacement of aggression" by V. J. Konečni and A. N. Doob, *Journal of Personality and Social Psychology*, 1972, *23*, 379–387. Copyright 1972 by the American Psychological Association. Reprinted by permission.

This argument contains propositions about the relationship between arousal and aggressive activity. As indicated above, the annoyance manipulation may indeed produce a state of heightened arousal. Given that the nature of the instigation is not ambiguous, subjects are likely to label this state as anger. Physiological arousal, of course, subsides with the passage of time—a routine consequence of homeostatic processes. However, since it has been labeled as anger by subjects experiencing it, and since, according to Bandura (1973), thoughts may influence arousal, arousal is likely to be maintained at a high level if the original arousing incident is continuously the topic of rumination. In other words, anger would dissipate if the waiting subjects were prevented from thinking about the preceding noxious events. According to Bandura (1973), shock-giving, like any other intellectually engrossing task, leads to the diminution of anger and fewer subsequent shocks merely because the occurrence of self-arousing thoughts is made less likely.

Experiment 1 represented a test of the explanatory validity of the concepts of self-arousal and dissipation of anger, with reference to the design and results of the Konečni and Doob (1972) study. The critical cells of this earlier experiment were incorporated into a larger design which permitted the evaluation of the self-arousal and dissipation of anger concepts.

Experiment 1

Overview, Design, and Predictions

Annoyed and nonannoyed subjects individually engaged in one of three different activities during the interpolated period. Some had an opportunity to give a fixed number of shocks to a confederate who had annoyed them (or treated them neutrally, in the case of nonannoyed subjects). Other subjects spent the interpolated period waiting alone in the room with absolutely nothing to do. The third group tested the self-arousal notion: These subjects were engaged in the involving, but nonaggressive, task of solving mathematical and logical problems. The instructions were composed with the intention of motivating the subjects to work continuously while conveying to them that they should not be disturbed by the failure to solve some of the problems. The objective was to preclude thinking about the annoying incident as much as possible, while not affecting substantially the subjects' level of arousal. It was recognized that perhaps all problem-solving and epistemic activities may be somewhat arousing because of conceptual conflict (Berlyne, 1965), but such conflict could be expected to be encountered by the shock group also.

To make possible a test of the dissipation of anger concept, the time variable, duration of interpolated activity (two levels: 7 and 13 min), was made orthogonal to the previously mentioned factors of annoyance/no annoyance and type of interpolated activity. *Time* simply reflects the hypothesized occurrence of homeostatic processes presumably involved in the lowering of the level of arousal and the dissipation of anger. It was assumed that the effectiveness of these processes is positively correlated with the passage of time.

The rate of the interpolated activity was held constant over the two levels of the duration factor in the wait and math groups (in the latter case, subjects were given a sufficiently large set of problems). However, shocks were administered in discrete units, and shock-giving was therefore a discontinuous activity. The 7- and 13-min shock groups cannot simultaneously be made equivalent in terms of both the total number of shocks administered and the rate of administering them, yet both of these variables may be of theoretical importance. In the case of Experiment 1, it was decided to hold the rate of shock-giving constant, and thus confound the total number of shocks with the time variable. In Experiment 2, the number of shocks administered during the interpolated period was fully crossed with the duration factor.

In summary, the design of Experiment 1 was a $2 \times 3 \times 2$ factorial (annoyance $\times$ activity $\times$ duration). The main dependent measure was the number of shocks given to the confederate by subjects in different experimental conditions following the interpolated activities.

Only a limited set of predictions could be made about the outcome of Experiment 1 on the basis of the Konečni and Doob (1972) study. Angered subjects in the shock conditions could be expected to give fewer shocks to the confederate than those who waited in the interpolated period. In contrast, nonangered subjects were expected not to be differentially affected by the interpolated activities and to give fewer shocks than the angered wait subjects.

Nothing could be said on the basis of earlier results about the math group, or the effects of the duration variable. More specific predictions depended on the validity of the self-arousal and dissipation of anger concepts. Since Bandura (1973) had used these concepts in his criticism of the hydraulic model, it was advantageous to formulate predictions which would be made on the basis of the latter model also.

Hydraulic model. The hydraulic model, based on the notion of a specific aggressive

drive which persists or increases over time until discharged through the infliction of injury (e.g., Lorenz, 1966), appears to predict that (a) annoyed subjects should give more shocks than nonannoyed ones (main effect of annoyance); (b) annoyed shock subjects should give fewer shocks than either annoyed wait or math subjects (main effect of activity); (c) annoyed wait and math cells should not differ, since a neutral, nonaggressive activity is involved in both cases; (d) annoyed 7-min shock subjects should give more shocks than annoyed 13-min shock ones, because the former express less aggression (give fewer shocks) in the interpolated period; and (e) apart from the prediction under (d), which is the consequence of the confounding of the number of shocks with the duration factor, time is an irrelevant variable.

Self-arousal. The self-arousal model predicts that (a) since anger increases the likelihood of aggression, annoyed subjects should give more shocks than nonannoyed ones (main effect of annoyance); (b) this main effect is due to the fact that annoyed wait subjects arouse themselves by thinking about the preceding incident, and they should give more shocks than any other group (main effect of activity; Annoyance × Activity interaction); and (c) annoyed shock and math subjects should not differ from each other because both groups are largely prevented from indulging in arousing ruminations. The model makes no meaningful predictions about the effect of the duration factor.

Dissipation of anger. The dissipation of anger model predicts that (a) annoyed subjects should give more shocks than nonannoyed ones (main effect of annoyance); and (b) since anger may be expected to dissipate with the passage of time, annoyed 13-min subjects should give fewer shocks than annoyed 7-min subjects, irrespective of the type of interpolated activity (main effect of duration and/or an Annoyance × Duration interaction; no effect of activity).

Self-arousal + Dissipation. Predictions based on the dissipation concept could quite meaningfully be treated as qualifiers for those given for the self-arousal hypothesis. In this case, the wait subjects would be expected to give more shocks than the shock and math subjects, but only at the annoyed level (main effects of annoyance and activity; Annoyance × Activity interaction). More importantly, the 7-min subjects would be expected to administer more shocks than the 13-min subjects, irrespective of the type of interpolated activity, provided they have been annoyed (main effect of duration; Annoyance × Duration interaction; no Activity × Duration or three-way interaction).

Method

Subjects and confederates. Subjects were 152 experimentally naive high school students from the metropolitan Toronto area (16–19 years old), who were recruited through newspaper advertisements and paid $2 for their participation, and University of Toronto freshmen, who participated for credit in an introductory psychology course. Eight subjects had to be discarded: 3 refused to give shocks, 2 could not follow the instructions because of language difficulties, and 3 spontaneously announced, at the first mention of shocks, that they knew about the "Milgram kind of study". This left a total of 144 subjects, 12 in each of the 12 experimental cells. Each group of 12 consisted of 7 women and 5 men.

The confederates were 4 female and 1 male University of Toronto freshmen, and 3 high school (Grade 13) females; all looked and dressed like the subjects. All confederates served in each of the conditions an approximately equal number of times.

Procedure. A confederate arrived for the experiment at about the same time as a subject, and the two were seated at a table in a small room. Any reading material which they brought along was taken from them on the grounds of lack of space, but actually to prevent distraction if the subject happened to be in the wait condition. Through a door that was left open, the subject was able to see an impressive array of electrical equipment in an adjoining room. The subject was always seated next to a large glassless curtain-covered window which connected the two rooms. On the table in front of the subject and the confederate there was a small box with a bar sticking out of it, and a microphone. From both of these, wires led through the window into the adjoining room. Otherwise the room was completely devoid of any objects.

The procedural details and instructions given for the first part of the experiment were identical to those reported by Konečni and Doob (1972, pp. 382–383). The experiment was said to deal with problem solving, and the two participants were given identical lists containing 7 anagrams on which they were to work independently for 7

min. The subject was "randomly" chosen to free associate while working on the task, ostensibly so that the effect of thinking aloud on problem solving could be examined. A cumbersome microphone was hung around the subject's neck, and it was explained that the microphone was insensitive and would pick up the subject's voice only. The real purpose of the microphone was to discourage the subject from speaking back to the confederate during the annoyance manipulation; subjects presumably thought that whatever they said would be recorded, while the confederate's voice would not be.

After audibly starting the tape recorder, the experimenter left the room, saying that he would return in 7 min. The experimenter did not know whether the subject would be annoyed by the confederate, nor did the confederate know in which condition the subject would be after the first part of the experiment.

Annoyance–no annoyance. This manipulation was identical to that employed by Konečni and Doob (1972), with the exception of the frustration aspect previously described by Konečni, Crozier, and Doob (Note 1). Approximately 2.5 min after the experimenter's departure, the standardized annoyance manipulation began, if the subject had been randomly assigned to that condition. The confederate finished all the anagrams quickly and began to disturb the subject, calling the subject slow and inarticulate (since most subjects found it difficult to free associate under these conditions). If the subject tried to speak into the microphone, he was made self-conscious by being criticized for the way he was doing it. He was alternately told to hurry up and to give up. About 2 min before the end of the 7-min period, the confederate snatched the sheet with the subject's anagrams, saying that he wanted to look at it. The subject's attempts to retrieve the sheet were countered by remarks such as "What's the point? You can't do them anyway," and by holding on to the sheet. While the confederate indicated that he could solve the anagrams on the subject's sheet, he refrained from writing them down, lest the subject interpret this as helping. Just before the experimenter's return, the confederate rudely slid the sheet across the table in the subject's direction. The comments were accompanied by an assortment of staring, foot tapping, and detached humming. Thus, the subject was both insulted and frustrated by not being able to work on the task.

If the subject had been assigned to the nonannoyed condition, the confederate sat quietly throughout this part of the experiment, working continuously on the anagrams. The anagrams were quite difficult, and even in the nonannoyed condition few subjects solved more than three or four. The confederate had all the anagrams done in the nonannoyed condition also, but the subject was not aware of this, and his failure was less likely to disturb him. The confederate always did all the anagrams so that the experimenter remained blind to the subject's condition when he came to collect the sheets at the end of the first part of the experiment.

Activities in the interpolated period. Upon his return, the experimenter switched off the tape recorder and removed the microphone from the subject. If the subject attempted to make some comment, the experimenter interrupted by saying that all questions would be answered at the end of the experiment.

At this point, the second part of the experiment began. If the subject had been assigned to the *shock* condition, the experimenter immediately proceeded to give further instructions. These were identical to those reported by Konečni and Doob (1972, pp. 383–384). This part of the experiment was said to investigate the effects of punishment on recall. The confederate was "randomly" appointed the learner and the subject the teacher. It was explained that the confederate would have 4 min to learn a list of word–number paired associates, after which the subject would read from the list the word in each pair, and the confederate would try to recall the associated number. If the response was correct, the subject was to say aloud *correct*; if it was not, the subject was to press a bar sticking out of a small box in front of him, which would deliver an electric shock to the learner. The shock was described as "relatively painful, for otherwise there would be no effect on learning," but it was stressed that "no tissue damage would result." The subject was told to press the bar just once for each wrong response, thus "delivering a shock of fixed length and voltage."

Following a brief exchange that "clarified" the task, the confederate was escorted to the adjoining room, and given the list to learn. After absenting himself for 4 min, the experimenter returned and gave the list to the subject. He then attached palm electrodes to the confederate, fumbled with some dials and switches, and asked the subject and the confederate not to communicate except as required by the task. During the shock task, carried out in the experimenter's absence, the two participants were in auditory but not visual contact.

The above procedure was followed in both the 7-min shock and 13-min shock conditions. In the former case, there were 30 paired associates on the list, which took approximately 3 min to do, and the confederate always made the same 14 programmed errors. In the latter case, the list contained 90 items, took 9 min to do, and the confederate made 42 programmed errors. Thus, when the time during which the confederate learned the list is counted, the duration of the interpolated period for the former group was 7 min, and for the latter 13 min. The subjects in the 7-min shock condition were given the opportunity, indeed, forced by the instructions, to give the confederate 14 shocks. The 13-min shock subjects gave the confederate 42 shocks.

If the subject had been assigned to the *wait* condition, the experimenter removed the confed-

erate from the room at the end of the first part of the experiment by saying, "You should [to the confederate] now go and see Dr. Stephenson in Room 560, which is on this floor; you won't have any problem finding it, and you [to the subject] will go later." The confederate made additional inquiries about how to find the room, was told that he should return and wait outside after he had finished with Dr. Stephenson, and then left. The experimenter glanced at his watch, and said to the subject, "Well, I guess I have nothing for you to do until the next part of the experiment. So please just sit here and wait for me to return. I won't be long, and then we'll continue." The experimenter did not return until the final part of the experiment. The subject had nothing to do except sit and wait for either 7 or 13 min, depending on the condition.

In the *math* condition, the experimenter removed the confederate at the end of the first part of the experiment in a manner identical to that described for the wait condition. However, in this case, he said the following to the subject: "The next part of the experiment will begin in a fairly short time. In the meanwhile, I wonder if you could help me with something. I am presently designing an experiment which will investigate the mathematical and logical ability of high school students [college freshmen]. For this experiment, I need appropriate tasks of graded difficulty, and the grading obviously has to be done by people like yourself, of comparable age, education, and ability. Here are some mathematical and logical problems on which I would like you to work. They differ in difficulty and I hope that you will find them interesting. You should try to solve the problems and grade them on this difficulty scale from 1 (easy) to 5 (difficult). Do them in the order they are presented here, but do not spend a great deal of time and energy on any single problem. If you see that you cannot do a particular problem within a reasonable length of time, don't worry about it: Make a guess, mark it 5, and go on to the next one. Obviously, the more problems you solve and grade, the more you will help me. However, remember that you are *not* competing with anyone; also this by no means represents a test of your ability, and there will be no score for you, I assure you. So, take your time and work at a pace that suits you best. You can start now, and I'll return shortly, in time for the next part of the experiment."

At this point, the experimenter left and did not return for either 7 or 13 min, depending on the condition. The booklet which the subjects were given contained a large number of problems, so that no subject ever solved or attempted them all. The problems were arithmetical and logical (analogies); they were selected from among the easier problems in a collection purported to prepare students for the Graduate Record Examination.

Dependent measure. At the end of the 7- or 13-min interpolated period, the experimenter returned to the experimental rooms. In the shock condition, he removed the electrodes from the confederate and brought him back to the front room. If the subject was in the wait or math condition, the experimenter said that he would see if the "other subject" had returned, and proceeded to bring the confederate from the hallway where he had been waiting.

Instructions for the final part were identical to those reported by Konečni and Doob (1972, pp. 384–385). The experiment was said to deal with creative imagination, and the subject was "randomly" assigned the role of experimenter, whereas the confederate was to be the subject. The real subject was instructed to read words from a list he was given, and the task of the confederate was to provide a "creative one-word response" to each of the list words within 3 sec. The real subject was told to say *good* if he thought a response was creative, and to deliver one or more shocks for each response he considered uncreative. Shocks were again described as quite painful, but not damaging. It was made clear that the evaluation of the confederate's responses was completely up to the subject, "since no objective criterion was available."

At this point, the confederate asked about the shocks, and the experimenter reiterated what he had already said. He then took the confederate to the adjoining room, attached the electrodes and other wires, turned a few dials, and started the event recorder. The subject was able to hear these operations. After reminding the subject that no conversation other than what was part of the task should be carried on, the experimenter left.

During this part of the experiment, the confederates gave predetermined responses that were the same for all subjects. Subjects had the opportunity to give any number of shocks; although there were only 30 items on the list, they could give more than one shock per item.

After this session was over, the experimenter returned, stopped the event recorder, and asked the confederate to go to a nearby room. The subjects first rated the confederate on eight 100-mm scales, then did a few self-ratings.

A thorough debriefing session, usually lasting 15–20 min, brought the 1-hr experiment to a close. Obviously, at no point in the experiment did anyone receive electric shocks.

Results

Main analyses. The first step was to examine whether the annoyance manipulation had been effective. Judging by the ratings which the confederate received from subjects at the end of the experiment, this indeed seems to have been the case. In comparison to nonannoyed subjects, annoyed people rated the confederate as less

TABLE 2

MEAN NUMBER OF SHOCKS BY EXPERIMENTAL CONDITION

Condition	Duration 7 min	13 min
	Shock	
Annoyed	8.33	11.92
Nonannoyed	7.83	9.17
	Wait	
Annoyed	16.75	11.58
Nonannoyed	6.67	7.17
	Math	
Annoyed	13.67	9.58
Nonannoyed	6.92	7.42

Note. n = 12 per cell. Adapted from "Self-arousal, dissipation of anger, and aggression" by V. J. Konečni, *Proceedings of the Division of Personality and Social Psychology*, 1974, 192–194. Copyright 1974 by the American Psychological Association. Reprinted by permission.

likable, F (1, 132) = 104.60, $p < .01$),[1] less pleasant and warm ($F = 69.71$ and 32.38), more aggressive and domineering ($F = 114.12$ and 95.52), and they did not want him as a friend ($F = 61.38$). The ratings given by annoyed and nonannoyed subjects did not differ with regard to the confederate's intelligence and interestingness. This was probably due to the annoying confederate's apparent anagram-solving ability and somewhat bizarre behavior. Except for a main effect of activity on the intelligence scale, $F(2, 132) = 4.74$, $p < .05$—the shock subjects, perhaps impressed by the confederate's relative success on the paired associates, rated him as more intelligent than the wait and math subjects did—there were no other significant main or interaction effects on any of the eight scales. The above results fully replicate those of Konečni and Doob (1972) and Konečni et al. (Note 1).

After rating the confederate, subjects indicated on three scales how they felt before and after the creativity task (the shock dependent measure). The analysis for each scale thus involved a before–after within-subjects factor. While the relaxed–tense ratings yielded no information, the annoyed subjects rated themselves as more angry than the nonannoyed ones did ($F(1, 132) = 4.04$, $p < .05$). On the friendly–hostile scale, there was again a significant main effect of annoyance ($F = 7.37$, $p < .01$), the annoyed subjects rating themselves as more hostile, as well as a significant four-way interaction ($p < .05$). A three-way analysis of the before ratings on this scale yielded only a main effect of annoyance ($F = 10.22$, $p < .01$), whereas there were no significant effects on the after ratings. These data suggest that the shock dependent-measure period had differentially affected the annoyed and nonannoyed subjects' self-perceptions. The annoyed subjects considered themselves more hostile than the nonannoyed ones before administering the shocks to the confederate in the creativity task, but there were no differences in how the two groups felt after this period. These results must, of course, be treated with caution, since the before–after ratings were made retrospectively. Overall, however, it is clear that the annoyed subjects regarded themselves as both more angry and more hostile than the nonannoyed subjects.

Differences between the annoyed and nonannoyed subjects were also clearly reflected in terms of the main dependent measure in the experiment, the number of shocks given to the confederate on the creativity task. Means for all 12 cells and the three-way analysis of variance are presented in Tables 2 and 3, respectively.

There was a large main effect of annoyance, the annoyed subjects giving more

TABLE 3

ANALYSIS OF VARIANCE (EXPERIMENT 1)

Source	*df*	*MS*	*F*
Annoyance (A)	1	711.11	35.91**
Activity (B)	2	26.65	1.14
Duration (C)	1	11.11	<1
A × B	2	94.93	4.79**
A × C	1	64.00	3.23
B × C	2	82.64	4.17*
A × B × C	2	55.27	2.79
Within-groups error	132	19.80	
Total	143		

* $p \leq .05$.
** $p < .01$.

[1] The only probabilities given in this report are $p < .01$ and $p < .05$.

shocks than the nonannoyed ones. Much more interesting, however, were the significant Annoyance × Activity and Activity × Duration interactions.

The Annoyance × Activity interaction is presented in Figure 1. When subjects were not annoyed, what they did in the interpolated period did not seem to affect the number of shocks they subsequently gave to the confederate ($F < 1$, for activity at the nonannoyed level). However, when subjects were angered by this person, differences between activities emerged: $F(2, 132) = 5.06$, $p < .01$, for the simple main effect of activity at the annoyed level. Subjects who waited after being annoyed gave considerably more shocks than did those who worked on mathematical tasks in the interpolated period: for the contrast annoyed 7-min wait + annoyed 13-min wait vs. annoyed 7-min math + annoyed 13-min math, $F(1, 132) = 3.92$, $p < .05$; they also gave more shocks than annoyed subjects who had the opportunity to express aggression toward the annoyer during that period: for annoyed 7-min wait + annoyed 13-min wait vs. annoyed 7-min shock + annoyed 13-min shock, $F(1, 132) = 9.90$, $p < .01$. Annoyed aggression-expressing subjects did not differ from those who had also been annoyed by the confederate but worked on mathematical problems in the interpolated period, $F = 1.36$ *ns*, for the appropriate contrast. When, however, annoyed and nonannoyed subjects were compared within the three activities (simple main effects of annoyance at shock, wait, and math), it was clear that these groups of subjects had not been differentially affected by shock ($F = 1.60$, *ns*), but had been by wait, $F(1, 132) = 31.85$, $p < .01$, and math, $F(1, 132) = 12.04$, $p < .01$. Whereas giving shocks decreased the amount of subsequent aggression to that of nonannoyed shock controls, annoyed subjects who waited or engaged in a neutral activity gave far more shocks than the respective nonannoyed control groups.

Differential effects of interpolated activities on annoyed subjects were particularly striking when these activities were carried on for 7 min. While there were no significant differences between the three groups of annoyed subjects who gave shocks, waited, and did mathematical problems for 13 min ($F < 1$), the situation was drastically different for annoyed groups who had carried on the three activities for 7 min, $F(2, 132) = 10.99$, $p < .01$, for activity at annoyed 7-min. The annoyed 7-min wait and annoyed 7-min math groups did not differ from each other ($F = 2.88$, *ns*), but both gave considerably more shocks than the annoyed 7-min shock group did: Fs$(1, 132) = 21.46$ and 8.62, respectively, $p < .01$ in both cases.

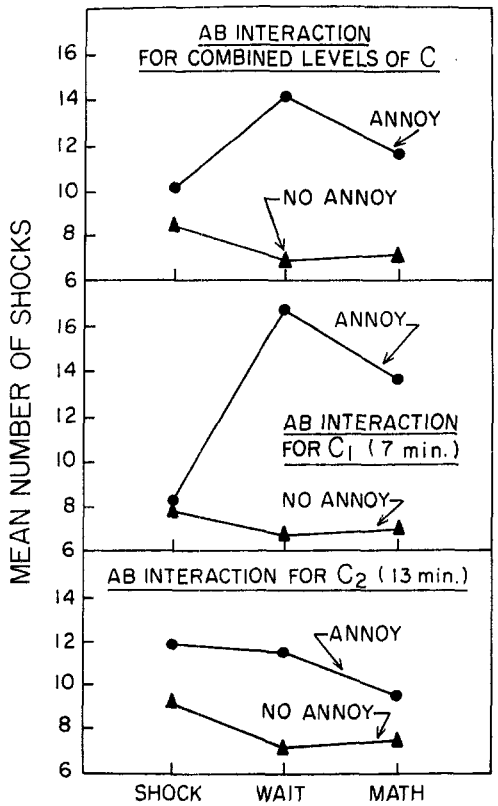

FIGURE 1. The Annoyance (A) × Activity (B) interaction (Experiment 1).

The Activity × Duration interaction is presented in Figure 2. Giving shocks, waiting, and doing math problems differentially affected subjects who engaged in these activities for 7 min, $F(2, 132) = 4.04$, $p < .05$, the wait and math subjects giving somewhat more shocks than the shock subjects; but the differential effects of levels of the activity

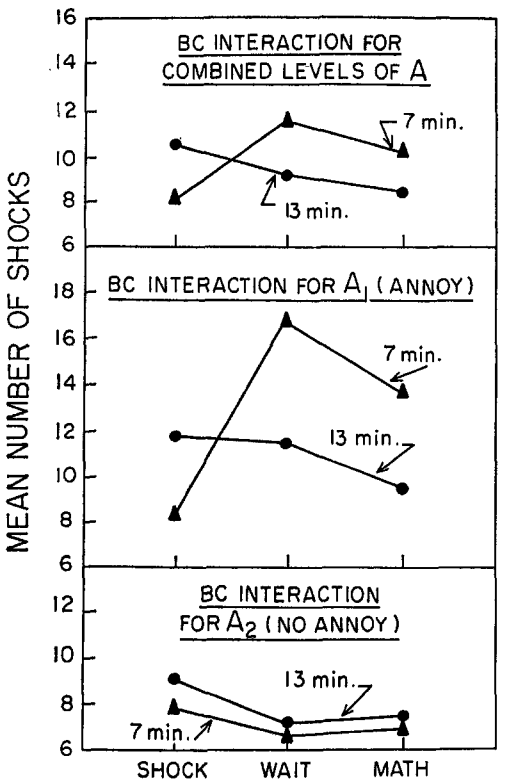

FIGURE 2. The Activity (B) × Duration (C) interaction (Experiment 1).

factor were not apparent when the interpolated period was 13 min long ($F = 1.27$, *ns*). In the latter case, a reversal occurred, so that the 13-min shock subjects gave more shocks than the 13-min wait and 13-min math subjects, though not significantly so.

It is clear from Figure 2 that the Activity × Duration interaction was almost completely due to the differential effects that the duration of the interpolated activities had on the annoyed subjects. After the annoyed subjects had waited for 7 min, they gave significantly more shocks than after they had waited for 13 min, $F(1, 132) = 8.09$, $p < .01$. The outcome was similar when the annoyed 7-min math group was compared to the annoyed 13-min math group, $F(1, 132) = 5.05$, $p < .05$. However, the annoyed 13-min shock subjects, who had given the confederate 42 shocks in the interpolated period, subsequently gave him more shocks than did the annoyed 7-min shock subjects, who had previously given the confederate only 14 shocks, $F(1, 132) = 3.89$, $p \approx .05$.

Secondary analyses. The number of shocks given to the confederate by the different groups was also analyzed for male and female subjects separately. Analysis of variance on the data provided by the seven female subjects in each of the twelve cells revealed the ubiquitous main effect of annoyance, $F(1, 72) = 27.28$, $p < .01$, and an Activity × Duration interaction, $F(2, 72) = 4.31$, $p < .05$. This interaction, as well as the nonsignificant Annoyance × Activity interaction, had patterns similar to the corresponding interactions based on twelve subjects per cell. The analysis based on the five male subjects in each cell disclosed only a significant Annoyance × Activity interaction, $F(2, 48) = 3.50$, $p < .05$, and, of course, the main effect of Annoyance $F(1, 48) = 8.67$, $p < .01$. Again, both the Annoyance × Activity and the nonsignificant Activity × Duration interactions were similar in form to the corresponding ones obtained in the overall analysis.

As an additional check on the experimental manipulation, an analysis was carried out on the number of problems attempted and the number solved correctly by the four groups involved (the annoyed and nonannoyed 7- and 13-min math groups). Subjects in the 7-min groups attempted somewhat over half (.59) of the number of problems attempted by those in the 13-min groups, and solved correctly .65 of the number solved correctly by the latter subjects. These figures were close enough to the 7:13 min ratio (.54) of the groups' respective work-time durations to suggest that fatigue and loss of interest had not come to play a substantial part in the performance of the 13-min groups, i.e., that the activity of the latter groups had been as continuous as that of the 7-min groups. It is interesting to note that the annoyed subjects attempted significantly more problems than the nonannoyed ones, but that there were no differences between these groups in the number of problems solved correctly. The general pattern of results indicated that the annoyed subjects had devoted as much attention to the task as the

nonannoyed ones, and that it is therefore reasonable to assume that they were effectively prevented from thinking about the insults received from the confederate.

Discussion

On the whole, the results of Experiment 1 formed quite a coherent pattern even though none of the three models turned out to be completely accurate.

Bandura's (1973) self-arousal hypothesis correctly predicted that the annoyed wait subjects would deliver more shocks to the confederate than would either the annoyed math or annoyed shock subjects, and that the latter two groups would not differ from each other. This result seems particularly interesting in view of the frequency with which waiting has been used as a control activity in prior research on human aggression. Earlier studies have generally ignored the possibility that idle annoyed subjects may cognitively maintain arousal (anger) at a high level.

The dissipation of anger concept correctly predicted that the annoyed 13-min wait and the annoyed 13-min math subjects would administer fewer shocks than would the annoyed 7-min wait and annoyed 7-min math subjects, respectively. The mere postponement of the taking of the dependent measure in these conditions resulted in a decrease of the amount of aggressive behavior. This may be attributed to a gradual normalization of the level of arousal, i.e., a diminishing physiological basis for the 13-min subjects to label themselves angry, with a decrease in the amount of aggression as the observable outcome.

It may be concluded that the combination of the self-arousal and dissipation concepts was quite a reliable source of predictions, with some important exceptions to be discussed shortly. The amount of subsequent aggression was considerably reduced when subjects were prevented from thinking about the annoying incident, and when the measure of aggression was delayed. These two independent factors appeared to be additive, so that the amount of aggression was reduced most in annoyed subjects who had engaged in a neutral task for a longer period of time (the focus here is on wait and math groups only). Both of these effects seem to be intimately related to the level of arousal and the degree of anger.

The annoyed shock and math conditions did not differ from each other when the duration factor was summed over. However, the outcomes for the 7- and 13-min levels were radically different. The annoyed 7-min shock subjects administered far fewer shocks than either the annoyed 7-min wait or 7-min math subjects did. This result cannot be accounted for by the self-arousal concept. In addition, neither the self-arousal nor the dissipation concepts can account for the fact that only when shock-giving represented the interpolated activity did the amount of the annoyed subjects' subsequent aggression *not* differ from that of the nonannoyed controls. As can be seen by comparing Tables 1 (Groups 1 and 3) and 2, data for the annoyed and nonannoyed 7-min shock and 7-min wait subjects in the present experiment fully replicated the Konečni and Doob (1972) results. The marked contrast between the annoyed 7-min shock and 7-min math cells of the present experiment strongly indicated that the difference between the annoyed shock and wait subjects in the Konečni and Doob study had not been entirely due to an increase in the level of arousal in the wait condition, but also to a decrease in the shock condition.

Thus, under certain conditions, aggression is superior to a neutral activity in decreasing the amount of subsequent aggression displayed by angered subjects. There appears to exist a special relationship between the hurting of the annoyer, the level of arousal, and the amount of subsequent aggression. Apparently, delivering shocks to the annoyer cannot be dismissed as just another intellectually absorbing activity, as suggested by Bandura (1973).

However, Bandura's criticisms of the hydraulic model seem quite justified. This model fared rather poorly in the present experiment. The fact that a neutral activity and the mere passage of time could reduce the amount of angered subjects' aggression is a serious threat to a model based on the notion of a specific, annoyance-produced, ag-

gressive drive that persists or even intensifies during time periods free of aggressive activity. The still more orthodox hypothesis of "endogenous accumulation" (without annoyance) of an aggressive drive and its release through aggression is disconfirmed by the lack of differences between groups of nonannoyed subjects. If the hydraulic model were correct, one would expect the nonannoyed shock subjects subsequently to deliver fewer shocks than the nonannoyed wait subjects.

The small number of shocks administered by the annoyed 7-min shock subjects relative to appropriate comparison groups was the only result correctly predicted by the hydraulic model. However, as will be seen later, this result may also be accounted for by a more general model linking the level of arousal, the cognitive labeling processes, and aggression. In contrast to the hydraulic model, this general formulation can successfully handle other aspects of the present results.

The discussion up to this point has ignored the annoyed 13-min shock cell. None of the three models predicted the high number of shocks given by subjects in this condition. It could not be expected on the basis of the Konečni and Doob (1972) results, and the self-arousal and dissipation models clearly cannot handle the fact that being engrossed in an activity for a relatively long time leads to an increase in aggression. The hydraulic model, of course, predicted that the annoyed 7-min shock subjects would subsequently give more shocks than the annoyed 13-min shock subjects would, whereas the very opposite was the case. This result was one of the concerns of Experiment 2.

Experiment 2

The Activity × Duration interaction in Experiment 1 was due primarily to the relatively large number of shocks administered to the confederate by subjects who had previously given him 42 shocks (the 13-min shock conditions). The reversal was particularly clear for the annoyed subjects: While both the wait and math subjects gave fewer shocks after the interpolated activity had been carried out for a longer period of time, the annoyed 13-min shock subjects administered significantly more shocks than the annoyed 7-min shock subjects.

The annoyed 13-min shock condition differed from the 7-min shock cell with regard to both the duration of the interpolated activity and the amount of aggression expressed during the interpolated period. Given the variables involved, the annoyed 13-min shock cell is anomalous from two points of view. First, the condition involved interpolated shock-giving, which had been observed to reduce the amount of angered people's subsequent aggression in prior experiments (such was also the case in the annoyed 7-min shock cell of Experiment 1, with other annoyed 7-min cells as comparisons). Second, judging by results obtained in the annoyed–wait and annoyed–math conditions, the greater length of the interpolated period per se tended to lead to a decrease, rather than an increase, of subsequent aggression.

The explanation may lie in an adaptation effect. Clearly, subjects in this condition did not subsequently give a relatively large number of shocks because they had got used to a high *rate* of shock-giving during the interpolated period, because the rate of aggressive activity was kept constant across the shock conditions of Experiment 1. However, it may be argued that what the subjects adapted to was the administration of a large number of shocks. In other words, the increase in the annoyed 13-min shock cell may be regarded as a set-learning effect, i.e., the subjects' adoption of a many-shocks standard in the execution of the task and/or the evaluation of a particular confederate's performance. It is plausible that the administration of a large number of shocks may result in the adoption of a many-punishments standard when shock-giving does not produce changes in physiological feedback, i.e., when it does not any longer lead to decrements in arousal (anger) level. This may have occurred in the later part of the interpolated period in the annoyed 13-min shock group, by which time the previously given shocks had presumably substantially decreased the level of subjects' anger.

Dollard et al. (1939) vaguely suggested

TABLE 4

OVERALL DESIGN AND RESULTS OF EXPERIMENT 2

Stage	Conditions									
	1	2	3	4	5	6	7	8	9	10
I	Annoyed								Not annoyed	
II (interpolated period)	42 shocks in 13 min	42 noises in 13 min	42 shocks in 13 min	42 noises in 13 min	14 shocks in 7 min	14 noises in 7 min	42 shocks in 7 min	14 shocks in 13 min	Wait 7 min	
III (dependent measure)	shock	shock	noise	noise	shock	shock	shock	shock	noise	shock
Results (number of shocks or noises)	11.5	7.3	6.4	11.8	9.5	9.8	12.0	6.3	8.1	7.1

Note. $n = 10$ per condition.

the possibility that the "repetition of a mode of release . . . may produce learning of it" (p. 50). While the notion of an aggressive drive which persists until released through aggressive activity has not obtained any experimental footing, these authors' suggestion that the enhancement of aggressive behavior is made more likely when the *same* mode of "release" is repeatedly employed warrants attention. In Experiment 1, aggressive activity was operationalized as the administration of electric shocks both in the interpolated period and as the dependent measure. It is clear that such operationalizations were by no means essential from the theoretical point of view for the demonstration of a decrease in angered subjects' aggression following their expression of aggression (the cathartic effect). Thus, from one angle the increase in the annoyed 13-min shock cell may be regarded as an important finding, while from the other it may be considered as an artifact of the method of operationalization. It is important to find out whether the employment at the dependent-measure stage of a mode of aggression that is different from that used in the interpolated period may make possible the demonstration of the cathartic effect despite the large number of interpolated aggressive acts.

Finally, the increase in the annoyed 13-min shock cell may not be a main effect of either the duration of the interpolated period, or of the large number of shocks given during this period. It may be due to the interaction of the type of activity (shock-giving) with the relatively long duration of the period in which the behavior is carried out, regardless of the number of punishing instances.

Overview, Design, and Predictions

Experiment 2 was concerned with the issues discussed above. The design is presented in Table 4. Subjects were randomly assigned to 1 of 10 experimental conditions. In Conditions 1–8, subjects were first annoyed by a confederate, and then, in Conditions 1, 2, 3, 4, and 7, they delivered 42 punishments to the annoyer. In some of these conditions (1, 3, and 7), aggressive activity was operationalized as the administration of "relatively painful shocks", whereas in others (2 and 4) it was described as the delivery of "very loud blasts of noise". The two modes of aggressive activity were virtually identical from the morphological point of view, but they differed in terms of the kind of aversive event they ostensibly produced. In Conditions 1, 2, 3, and 4, the administration of 42 punishments took 9 min, and the total duration of the interpolated period was 13 min (including the 4 min during which the confederate learned the list). In Condition 7, the administration of 42 punishments took 3 min (the total duration of the interpolated period was 7 min).

Subjects in Conditions 5, 6, and 8 administered 14 punishments to the confeder-

TABLE 5

DESIGN OF EXPERIMENTS 2A, 2B, AND 2C

Experiment 2a		
Dependent measure	Mode of expression of aggression (interpolated period)	
	Shock	Noise
Shock	(1)	(2)
Noise	(3)	(4)

Experiment 2b		
Duration (min.)	Mode of expression of aggression (interpolated period)	
	Shock	Noise
7	(5)	(6)
13	(1)	(2)

Experiment 2c		
Duration (min.)	Amount of aggression (number of shocks)	
	14	42
7	(5)	(7)
13	(8)	(1)

Note. Numbers in parentheses refer to conditions shown in Table 4.

ate after he annoyed them. In Conditions 5 and 8, subjects believed they were giving shocks to the confederate; these two conditions differed in that in one case the interpolated period was 7 min long (Condition 5), while in the other it lasted for 13 min (Condition 8). Subjects in Condition 6 believed they were delivering blasts of noise to the confederate, and the interpolated period was 7 min long.

Subjects in Conditions 9 and 10 were not annoyed by the confederate, and then waited alone for 7 min.

Following these manipulations, all subjects had the opportunity to punish the confederate on the creativity task as many times as they wished. In Conditions 1, 2, 5, 6, 7, 8, and 10, subjects believed they were delivering shocks; in the remaining three conditions, subjects thought they were administering blasts of noise. Conditions 1, 5, and 10 were identical to three of the cells of Experiment 1.

While Experiment 2 was carried out as a one-factor experiment with 10 conditions, it in fact consisted of three conceptually independent 2×2 experiments with some overlapping cells, and two additional control conditions. Table 5 makes clear the designs of these 2×2 experiments (designated as Experiments 2a, 2b, and 2c), their overlap, and their relationship to the overall design of Experiment 2. This strategy was adopted for two reasons. One was economy, and the other the fact that the single random-assignment procedure permitted meaningful comparisons between the cells which constituted the three 2×2 experiments. The risk of drawing too heavily upon the information provided by a cell common to two or three of the 2×2 experiments was minimized by carrying out planned comparisons only (listed below), and by keeping the number of such comparisons low (not exceeding the number of degrees of freedom for the overall experiment).

Experiment 2a involved Conditions 1, 2, 3, and 4. In all of these conditions the interpolated period was 13 min long, and subjects punished the confederate 42 times during this interval. However, in two of the conditions there was no change of mode of aggressive activity from the interpolated to the dependent-measure period (shock–shock and noise–noise), while in the other two such a change occurred (shock–noise and noise–shock). The shock–shock cell (Condition 1) was, of course, identical to the annoyed 13-min shock cell of Experiment 1. Given the reasoning that subjects in this cell of Experiment 1 delivered a relatively large number of shocks because they adopted a many-punishment standard, and provided that this standard is mode specific, an interaction could be expected in Experiment 2a. Subjects in conditions where no change of mode took place should subsequently deliver more punishments than those whose experimental treatment involved a change of mode of aggression.

Experiment 2b was designed to elucidate further the anomalous annoyed 13-min shock cell of Experiment 1. The design allowed the comparison between this cell (present Condition 1), and three other cells in which the cathartic effect could be expected to occur (Conditions 2, 5, and 6).

While Conditions 5 and 6 were characterized by a moderate number of aggressive acts in the interpolated period (14 shocks or blasts of noise), subjects in Condition 2 first delivered 42 blasts of noise, but were then switched to the shock dependent measure. For these two different reasons, the number of shocks given by these three groups could be expected to be low in comparison to Condition 1. In addition, the comparison between Conditions 5 and 6 was planned in order to examine the possibility that effects of the change of mode of aggression and of the moderate number of interpolated punishments are orthogonal (implying a very low level of aggression in Condition 6).

Experiment 2c (Conditions 1, 5, 7, and 8) involved no change of mode; the duration of interpolated activity and the number of interpolated punishments were fully crossed. It was important to unconfound these two variables and to estimate their effects independently. The dissipation hypothesis would predict a main effect of the duration of interpolated activity, so that subjects in the 13-min conditions should give fewer shocks than those in the 7-min conditions. The hydraulic model, on the other hand, would predict a main effect of the number of shocks in the interpolated period, with fewer shocks delivered subsequently by the 42-shock groups. Both of these predictions were unlikely given the high annoyed 13-min shock cell of Experiment 1. On the basis of that experiment, the most reasonable prediction was a main effect of the number of shocks, so that the 42-shock subjects should subsequently give more shocks than the 14-shock subjects. Not only Condition 1 subjects, but also those who administered 42 shocks over 7 minutes (Condition 7) could be expected to give a large number of shocks subsequently; in the latter cell, dissipation of anger was less likely, in addition to the hypothesized adoption of the many-shocks standard.

The direct comparison of Conditions 5 and 8 would reveal whether the longer duration of the interpolated period might reduce the amount of subsequent aggression even with shock-giving as the interpolated activity. (In Experiment 1, this outcome was observed for waiting and a neutral activity.) The occurrence of the adaptation effect was made unlikely by the fact that subjects in both conditions (5 and 8) administered only 14 interpolated shocks.

A few other contrasts were planned which involved cells from more than one of the three 2×2 experiments. These contrasts could provide important information about the effect of the large number of interpolated punishments when the hypothesized adaptation effect is controlled (Conditions $2 + 3$ vs. Conditions $5 + 6$), and when both the adaptation effect and the duration variable are controlled (Conditions $2 + 3$ vs. Condition 8). An estimate of the extent of the expected cathartic effect in Condition 5 (the annoyed 7-min shock cell of Experiment 1) could be obtained by comparing Condition 5 and the parallel Condition 6 to Conditions 9 and 10, which involved nonannoyed subjects.

In addition to the above comparison, the reason for including the two control conditions of nonannoyed subjects was to obtain ratings of the neutrally behaving confederate. These could be contrasted to those given by subjects in the eight conditions in which the confederate behaved in an obnoxious manner (a check on the annoyance manipulation). Moreover, the shock and noise data yielded by the nonannoyed subjects could be expected to serve as a stable reference point for the experiment as a whole. Finally, it was desirable to find out whether the nonangered subjects differentially perceived the punishing potential of shocks and blasts of noise; such information would be particularly useful if consistent differences of this kind were to be observed in the annoyed subjects' data. In view of the uniformity of data for annoyed subjects in Experiment 1 and previous studies, the type of activity in which the control groups engaged during the interpolated period was felt to be relatively unimportant.

Method

Subjects and confederates. Subjects were 101 experimentally naive high school students from the metropolitan Toronto area (16–19 years old), who were recruited through newspaper advertise-

ments and paid $2 for their participation. The data for one subject were not obtained because she refused to administer what she thought were electric shocks. This left a total of 100 subjects, 10 in each of the 10 experimental cells. The assignment of subjects to conditions was random with the restriction that each group of 10 subjects consisted of 7 women and 3 men.

The confederates were 2 female and 1 male University of Toronto undergraduates, and 3 high school (Grade 13) females: all looked and dressed like the subjects. All confederates served in each of the conditions an approximately equal number of times.

Procedure. With minor exceptions to be described below, the procedure, setting, experimenter's and confederate's behavior, and instructions were identical to those in Experiment 1. The subject and confederate were brought together to the experimental rooms. On the table in front of them, in addition to the previously described microphone and box with a bar sticking out of it, there was another box with a button mounted on it. A wire from the latter box also led through the window into the adjoining room. At this point, the experimenter gave the instructions for the anagram task; both the task and the instructions were identical to those in Experiment 1.

Annoyance–no annoyance. Subjects in Conditions 1–8 were annoyed and frustrated by the confederate exactly as described earlier. Those in Conditions 9 and 10 were treated in a neutral manner. The confederate did not know in which condition the subject would be next.

Activities in the interpolated period. Subjects in Conditions 1, 3, and 5 were given the (unmodified) instructions prepared for the shock groups of Experiment 1. In all three groups, the confederate was first given 4 min to "learn" the list of paired associates. If they were assigned to Conditions 1 or 3, the subjects examined the confederate on a 90-item list, and gave him 42 shocks for the mistakes he made intentionally. This took 9 min (the total duration of the interpolated period was 13 min). The two groups differed with regard to the mode of aggression used as the dependent measure. Subjects in Condition 5 examined the confederate on a 30-item list, and gave him 14 shocks. The examination took 3 minutes (7-min interpolated period).

Subjects in Conditions 9 and 10 were told exactly what the wait subjects of Experiment 1 had been told. After the confederate had been sent away, the experimenter himself departed, and subjects waited for 7 min with nothing to do.

If they were assigned to Conditions 2, 4, or 6, which involved the delivery of blasts of noise to the confederate during the interpolated period, subjects were given slightly modified instructions for the shock groups. The changed part of the instructions read as follows:

> You [subject] will say aloud "correct" if the response is correct; if the response is not correct, you will press this bar, which will cause a very loud blast of noise to be delivered to the learner through the earphones he'll be wearing. The noise will be very unpleasant, for otherwise there would be no effect on learning, but will, naturally, produce no hearing loss. For each wrong response, you will press the bar just once, and a blast of noise of fixed length and loudness will be delivered.

It was also explained that the earphones were of a type that would enable the confederate to hear the subject without difficulty when not exposed to the prerecorded noise. The procedure following these instructions closely resembled that described for the shock conditions. The only differences were that earphones, rather than palm electrodes, were placed on the confederate, and that a tape recorder, located in the room in which the confederate was seated, was activated by the experimenter prior to his departure. No blasts of noise were, of course, delivered to the confederate.

In all three conditions (2, 4, and 6), the confederate was again given 4 min to learn the list. Subjects in Conditions 2 and 4 examined the confederate on a 90-item list, and delivered 42 blasts of noise to him. This again took 9 min (the total duration of the interpolated period was 13 min). The two conditions differed with regard to the mode of aggressive activity used as the dependent measure. Subjects in Condition 6 examined the confederate on a 30-item list and administered 14 blasts of noise to him. This took 3 min, and the total duration of the interpolated period was 7 min.

Finally, if they had been assigned to Conditions 7 or 8, subjects received the complete (unmodified) shock instructions. However, the following was added at the end of these instructions for subjects in Condition 7:

> Speed is extremely important in this kind of task. You [the confederate] should respond with the number literally as soon as you hear the associated word. And you [the subject] should press the bar or say "good" immediately after hearing the response, and almost at the same instant read the next word. Both of you must contribute to the speedy execution of the task.

By answering promptly, the confederate dictated a very fast tempo, and the examination on a 90-item list (42 shocks) took about 3 min (the total length of the interpolated period was 7 min, counting the initial 4-min learning interval). For subjects in Condition 8, the following was added to the standard shock instructions:

> Speed is completely unimportant in this kind of task. You [the confederate] should take your time after hearing each word, and try to remember which number goes with it. So, don't hurry and take all the time you need to be accurate.

As in Condition 7, the confederate paced his answers with the help of a stopwatch, of which

the subject was unaware. The examination on a 30-item list (14 shocks) took about 9 min (the total duration of the interpolated interval was 13 min).

Dependent measure. At the end of the 7- or 13-min interpolated period, the experimenter returned. He removed palm electrodes or earphones from the confederate, and brought him back to the front room. In Conditions 9 and 10, where nonannoyed subjects spent the interpolated period waiting by themselves, the experimenter brought the confederate from the hallway.

Except for those in Conditions 3, 4, and 9, all other subjects in the experiment at this point heard the standard dependent-measure instructions used in Experiment 1. Subjects in all of these seven conditions were given the opportunity to administer shocks ad libitum to the confederate in the process of evaluating his creative responses. Subjects in Conditions 1, 5, 7, and 8, who delivered shocks to the confederate during the interpolated period by pressing the bar, were again told that bar pressing would deliver shocks. This was also so for subjects in Condition 10 who had not previously delivered any punishments to the confederate. No mention was made of the button-box to any of the above five groups of subjects at any point in the experiment. For subjects in Conditions 2 and 6, who believed that they had administered blasts of noise to the confederate in the interpolated period by pressing the bar, instructions were changed only to the extent that pressing the button on the other box was said to cause shocks to be delivered.

The dependent measure for subjects in Conditions 3, 4, and 9 was the number of blasts of noise delivered to the confederate on the creativity task. These subjects were given the standard instructions except that each mention of *shock* was replaced by *blast of loud noise*. Also, while shocks were described as "quite painful," blasts of noise were said to be "very unpleasant indeed." Subjects in Condition 4, who had administered blasts of noise in the interpolated period by pressing the bar, continued to do so. Those in Condition 9, who had not previously punished the confederate, also pressed the bar to deliver blasts of noise. Finally, subjects in Condition 3, who pressed the bar in the interpolated period to deliver shocks, were now instructed to press the button to administer blasts of noise.

After the session was over, the experimenter returned and told the confederate to go to a nearby room. All subjects then rated the confederate on the eight scales used in Experiment 1. A thorough debriefing session brought the 1-hr experiment to a close.

Results and Discussion

The effectiveness of the annoyance manipulation was first examined. Results for each of the scales on which subjects rated the confederate were submitted to an analysis of variance which treated the 10 conditions as levels of a single factor. On six out of eight scales, the conditions factor was significant at the .01 level: $F(9, 90) = 6.52$ (likable–not likable), 8.56 (aggressive–passive), 6.52 (pleasant–unpleasant), 4.12 (warm–cold), 8.93 (domineering–not domineering), and 3.07 (would like as a friend–would not like as a friend). The intelligence and interestingness scales again failed to discriminate between the conditions (Fs < 1). More interesting than the overall conditions effects were the results obtained by the planned contrasts between the eight annoyed and two nonannoyed conditions on each of the six scales (Conditions 1–8 vs. 4 × Condition 9 + 4 × Condition 10; $df = 1, 90$). In comparison to the nonannoyed subjects, the annoyed ones regarded the confederate as less likable ($F(1, 90) = 48.72$, $p < .01$; 83% of $SS_{\text{Conditions}}$ was accounted for by this contrast), more aggressive ($F = 68.06$, 88%), less pleasant (49.23, 84%), less warm (31.40, 85%), and more domineering (73.11, 91%); they also did not want this person as a friend (20.55, 74%). The above results fully replicated those of Konečni and Doob (1972), Konečni et al. (Note 1), and Experiment 1.

The means for the main dependent measure (number of shocks or blasts of noise) are presented in the bottom row of Table 4. The analysis of variance revealed that differences between the 10 conditions were significant, $F(9, 90) = 3.94$, $p < .01$; $MS_e = 12.81$, but the results of greatest interest were those obtained by the planned comparisons. These comparisons used the error term from the overall analysis of variance.

The principal contrast planned for the four cells which constituted Experiment 2a (see Table 5) was highly significant; for Conditions 1 + 4 vs. 2 + 3, $F(1, 90) = 17.99$, $p < .01$. Thus, when the mode of aggression in the interpolated period differed from that used as the dependent measure, the large number of the interpolated punishing instances did not have the aggression-enhancing effect observed in Experiment 1. The variance caused by the differences between the two modes of expressing aggression was completely negli-

TABLE 6

SEPARATE 2 × 2 ANALYSES OF VARIANCE FOR EXPERIMENTS 2A, 2B, AND 2C

Source of variance	*df*	*MS*	*F*
Experiment 2a			
Dependent measure (A)	1	.90	<1
Mode of expression of aggression (B)	1	3.60	<1
A × B	1	230.40	13.20*
Within-groups error	36	17.46	
Experiment 2b			
Duration (A)	1	.62	<1
Mode of expression of aggression (B)	1	38.02	2.84
A × B	1	50.63	3.78
Within-groups error	36	13.41	
Experiment 2c			
Duration (A)	1	34.22	2.45
Amount of aggression (B)	1	148.22	10.60*
A × B	1	18.23	1.30
Within-groups error	36	13.98	

*$p < .01$.

gible. Table 6 provides the 2 × 2 analysis of variance for Experiment 2a considered separately.

The main contrast of Experiment 2b (see Table 5) was also significant: 3 × Condition 1 > Conditions 5 + 6 + 2, $F(1, 90) = 4.06$, $p < .05$. In agreement with Experiment 1, delivering 14 shocks over 3 min (7-min interpolated period) produced the cathartic effect; i.e., there was a decrease in the number of shocks given to the confederate subsequently. The delivery by the annoyed subjects of 14 blasts of noise over 3 min had a similar effect on the subsequent shock-giving. Since these effects were of comparable magnitude, the consequences of the moderate number of punishments and the change of mode (Condition 6) apparently did not summate. Yet, when the number of interpolated punishments was large, the change of mode was clearly responsible for decreasing the amount of subsequent aggression (Condition 2). (See Table 6 for the separate analysis for Experiment 2b.)

When there was no change of mode of aggressive activity, and the number of interpolated punishments was large, subjects subsequently gave a considerable number of shocks to the confederate. The adaptation effect occurred irrespectively of the duration of the interpolated period. This was shown by the highly significant contrast based on the four cells of Experiment 2c: Conditions 7 + 1 > Conditions 5 + 8, $F(1, 90) = 11.57$, $p < .01$. (The design of this experiment is presented in Table 5, and the separate analysis of variance in Table 6.) Condition 7, where a large number of shocks was delivered by subjects over a relatively short time, was the highest of all 10 cells. However, when the amount of interpolated aggression was kept at a moderate level, the absence of a change of mode did not erase the effects of the dissipation of anger: Condition 5 > Condition 8, $F(1, 90) = 4.00$, $p < .05$. In both of these cells, subjects delivered 14 shocks in the interpolated period; while the standard cathartic effect was demonstrated in Condition 5 (the annoyed 7-min shock cell of Experiment 1), the amount of subsequent aggression was brought down further in Condition 8, where the interpolated period lasted 13 min. Results in the low Condition 8 and high Condition 7 ruled out the explanation of the annoyed 13-min shock condition of Experiment 1 in terms of the interaction between the long duration of the interpolated period and the shock-giving activity. The form of the main effect of the amount of interpolated aggression in Experiment 2c also disproved the prediction of the hydraulic model: On the basis of this model, the 42-shocks subjects would be expected to deliver fewer shocks than the 14-shocks subjects.

However, when the adaptation effect was prevented from occurring by the change of mode of aggressive activity, the greater amount of interpolated aggression, if anything, supplemented the demonstrated influence which the long duration of the interpolated period had on bringing about a decrease in subsequent aggression: Conditions 2 + 3 < Conditions 5 + 6, $F(1, 90) = 6.12$, $p < .05$. Yet, when the duration of the interpolated period was kept constant at 13 min, the greater amount of interpolated aggression did not produce a further decrease (Conditions 2 + 3 vs. 2 × Condi-

tion 8, *ns*). Due to the nature of the contrasts, however, these findings must be treated with caution.

Subjects in Condition 5 (the annoyed 7-min shock cell of Experiment 1), and those in Condition 6 (identical to Condition 5 except that 14 blasts of noise were delivered in the interpolated period), displayed a level of aggressive activity which was at the approximate midpoint of the dependent-measure range. Specifically, as shown above, these subjects delivered significantly more punishments than did those who had administered 42 shocks or blasts of noise during the interpolated period, and were then switched to a different mode of aggression (Conditions 2 and 3). Subjects in Conditions 5 and 6 administered fewer punishments, however, in comparison to levels in Conditions 1 and 4, but this difference was not statistically significant, $F(1, 90) = 3.12$. Nevertheless, while subjects in Conditions 5 and 6 did not differ significantly from the nonannoyed controls, $F(1, 90) = 3.28$, those in Conditions 1 and 4 did, $F(1, 90) = 12.80$, $p < .01$.

To summarize the results of Experiment 2:

1. When a large number of punishments was delivered to the confederate by the annoyed subjects during the interpolated period, with the same mode of aggressive activity used as the dependent measure, no decrease in the amount of subsequent aggression occurred (in comparison to conditions which involved a change of mode, and to those in which subjects had not been annoyed), irrespective of the duration of the interpolated interval.

2. When, however, there was a change of mode of aggressive activity from the interpolated period to the dependent-measure stage, a substantial decrease occurred.

3. There was evidence for the conclusion that when the confounding factors were eliminated, the duration of the interpolated interval had an effect on the amount of aggression exhibited subsequently; fewer punishments were delivered to the confederate by the annoyed subjects after a longer interval was allowed to elapse from the end of the annoyance manipulation. The fact that the interpolated activity was aggressive in itself did not obstruct the duration effect.

4. In fact, when the adaptation effect was neutralized through the change of mode of aggressive activity, the large amount of interpolated aggression seemed to supplement the duration factor in bringing about a decrease in subsequent aggressive activity.

5. However, when the duration of the interpolated period was kept constant (at 13 min), and the adaptation effect prevented from occurring, the large number of interpolated punishments did not produce a decrease beyond that substantial one produced by a relatively small amount of interpolated aggression.

6. Whether shocks were used as the mode of aggressive activity in the interpolated period and blasts of noise as the dependent measure, or vice versa, made no difference. Results indicated that shocks and blasts of noise had been perceived by subjects as equally punishing.

Implications of these findings for those of Experiment 1 are clear. The relatively large number of shocks delivered by subjects in the annoyed 13-min shock cell of Experiment 1 (the present Condition 1) was not due to the large number of punishments per se administered during the interpolated period. When one is annoyed, hurting the annoyer a great many times does not necessarily lead to more aggression than hurting him fewer times. Nor was the result due to the interaction of the long duration of the interpolated period with the type of behavior (shock-giving) being carried out, regardless of the number of punishing instances. Findings of Experiments 2a, 2b, and 2c indicated that the delivery of a large number of punishments by angered people produced the cathartic effect just as well as the administration of a more moderate number of punishments did, provided that a different mode of aggressive activity was used as the dependent measure. These findings provided support for the interpretation of the result in the annoyed 13-min shock cell in terms of adaptation (the adoption of a many-punishments standard).

On the basis of Experiment 1 it was concluded that none of the three models

were capable of accounting for all of the data, but that the combination of the self-arousal and dissipation concepts was a more useful source of predictions than the hydraulic model. This conclusion remains valid. Additional items may be added to the previously compiled list of the latter model's failings. It cannot account for the effect of duration of the interpolated period when the number of interpolated punishments is kept constant at a moderate level. While none of the models predicted the occurrence of the adaptation effect, the hydraulic model has difficulties with the variable of the amount of interpolated aggression even when the adaptation effect was eliminated through the change of mode. Specifically, it cannot account for the fact that, with the duration of the interpolated period kept constant at 13 min, a large amount of interpolated aggression did not produce a decrease more marked than that caused by a three times smaller amount.

While no additional limitations of the self-arousal and dissipation concepts were revealed by Experiment 2 (dissipation, in fact, received further support), the problems with these concepts demonstrated by Experiment 1 still remain.

General Discussion

The purpose of this section is to integrate the results obtained, note the implications of the integrative theoretical model, and describe briefly the results of some experimental attempts to test these implications.

An Integrative Model

The most parsimonious explanation of all the data seems to be in terms of a relationship of bidirectional causality between the level of arousal (anger) and the amount of aggression expressed. On one hand, it is suggested that the level of anger may be one of the major determinants of the amount of aggressive behavior; on the other, expression of aggression appears to be a particularly potent factor leading to a decrease in the level of anger, and thus to a decrease in the amount of aggressive behavior. *Anger* (an emotional state) has been placed in the above statements to indicate the assumed importance of cognitive processes in the interpretation of the feedback from changes in the physiological arousal level (cf. Schachter, 1964, pp. 49–80).

There is considerable evidence, cited in the introduction, that the annoyance manipulation described has as a consequence an increase in the level of subjects' physiological (sympathetic) arousal. Since both the physiological feedback and situational cues (the confederate's obnoxious behavior) were available to subjects in the present experiments, it can be expected that they labeled their changed physiological (emotional) state as anger. The manipulation of additional factors—activity and time variables—that were expected to affect the level of arousal (anger) has a powerful effect on the amount of aggression expressed. Substantial decreases in aggression were observed when anger was allowed to dissipate for a relatively long time, when the anger-increasing ruminations were made less likely, and, especially, when subjects were exposed to the combination of these factors. These results offered good support to the first part of the postulated anger–aggression relationship. Simultaneously, the data showed that the expression of aggression is *not* a *necessary* condition for a decrease in angered people's aggressive behavior. Although the degree of anger clearly affects the amount of aggressive behavior, anger should not be equated with a specific aggressive drive which can be discharged only through the infliction of injury. Anger, and the amount of aggression, may be decreased in nonaggressive ways.

Yet, the results indicated that, everything else equal, the expression of aggression on the part of angered people may be a *sufficient* condition for a decrease in the amount of their subsequent aggression to occur. Contrary to Bandura's (1973) expectations, the present experiments demonstrated that aggression is superior to some nonaggressive activities with regard to the reduction of the amount of subsequent aggression. It also appears that this effect is mediated in part by the anger-decreasing properties of angered people's aggression (cf. the cited work of Hokanson and his colleagues).

Moreover, the present studies indicated that the effect of aggression is augmented, under certain conditions, by the effects of other variables (notably the duration of the interpolated period) shown to decrease the level of anger. All in all, the above results supported the second part of the postulated bidirectional-causality relationship between anger and aggression.

It should be noted that the present experiments did, in fact, address the "everything else equal" proviso in the above sufficiency statement concerning the anger- and aggression-decreasing effects of aggression. The data suggested that the issue is not one of the contaminating effect of self-arousal, as Bandura had claimed, but rather of the *degree* and *kind* of the expression of aggression factor. Only when a change of mode of aggression was introduced in the situation where the amount of interpolated aggression was large did the hurting of the annoyer have its customary aggression-decreasing effect.

While the expression of aggression probably prevented the occurrence of self-arousing thoughts as much as a neutral activity did, and while aggression was clearly expressed over time, it appeared to contain an anger- and aggression-decreasing component in addition to those on which the self-arousal and dissipation effects were presumably based. The possible reasons for this must be examined. Extending a proposition put forward by Sears, Maccoby, and Levin (1957), Hokanson (1970) suggested that any response which succeeds in terminating or decreasing noxious stimulation emanating from others would acquire arousal-reducing properties. Hokanson's data (Hokanson, Willers, & Koropsak, 1968; Stone & Hokanson, 1969) suggest that any response (e.g., friendly, self-punitive) may be conditioned to produce a drop in arousal if it leads to the removal of a threat. However, while Hokanson's work demonstrates that nonaggressive responses *could* come to decrease the level of arousal, the prevailing real-life contingencies may favor the performance of aggressive over nonaggressive responses in noxious situations. This may be particularly true when aversive stimulation stands for others' aggression toward oneself, and when the resulting state of aversively high arousal is labeled *anger* by the recipient of aggressive stimuli (as opposed to, for example, *fear*). There is a substantial body of evidence obtained in naturalistic settings that shows that acts of aggression may be very efficient in ending others' aggression (e.g., Patterson & Cobb, 1971; Patterson, Littman, & Bricker, 1967). Whereas the passage of time (following annoyance) free of aggressive activity and involvement in a neutral activity may be said to reduce the amount of subsequent aggression in a passive manner, by merely allowing homeostatic processes to act, the expression of aggression may have a more active influence on the level of arousal, because of its proven usefulness in ending others' aggression.

On the basis of the above discussion, it can be argued that the cathartic effect was observed in the annoyed 7-min shock cell of Experiment 1 and Conditions 5 and 6 of Experiment 2 because the interpolated expression of aggression substantially reduced the high level of anger produced by the annoyance manipulation. When the physiological basis for anger had almost completely dissipated by the end of the interpolated period, the amount of subsequent aggression was low. On the other hand, in the annoyed 13-min shock cell of Experiment 1 and Conditions 1, 4, and 7 of Experiment 2, subjects were forced to carry out numerous aggressive acts *after* anger had already dissipated (in the later part of the interpolated period). Lacking aggression-produced feedback from decreases in anger level, these people adopted, in a problem-solving fashion, a standard with regard to the behavior (aggression) and the target in question. For the many-punishments standard to be applied later, the mode of aggression apparently had to be identical on the two occasions. (Thus the adoption of a many-punishments standard is an effect of considerable specificity.) When the standard-adoption effect was eliminated by a change in the mode of aggression, expression of aggression had its customary decreasing effect. However, when the time

factor was kept constant, in addition to eliminating the standard-adoption effect, the large number of interpolated punishments did not decrease the amount of subsequent aggression any more than a moderate number of punishments did. Again, it can be argued that this "basement effect" was due to the fact that additional punishments had no influence on the already low level of anger.

Determinants of aggression are extraordinarily complex, even as revealed by the study of a narrow range of situations. While the hypothesized relationship between anger and aggression appears to account for the data reasonably well, the model is hardly a sweeping one: Numerous constraints and qualifiers have been pointed out.

Further Implications

A few specific implications of the proposed model will be examined in this subsection, and some relevant experimental findings described. Finally, a tentative account will be given of the possible implicaitons of the present results for the long-term effects of expression of aggression.

The emphasis on the relationship between anger (rather than merely arousal) and aggression reflects the importance of the role assigned to the cognitive labeling of the perceived physiological changes in the present theoretical formulation. A high level of arousal may indeed be necessary for the resulting state to be designated as anger by the subjects, and an increase in the amount of aggression may follow. However, an increase in the level of arousal by itself, produced by stimuli not conducive to the adoption of the anger label, should not noticeably affect the amount of aggression. While any number of manipulations may bring arousal to a sufficiently high level for the state to be aversive, by no means should all such manipulations lead to the label of anger and consequently affect the amount of aggression.

A related implication of the present model has to do with situations where a person is exposed within a short period of time to, for example, two arousal-raising treatments. Provided that at least one of the treatments is conducive to the label of anger, more aggression should be observed than if either one of the treatments is administered in isolation (particularly the treatment not conducive to anger). This is because the higher overall arousal-level provides more justification for the labeling of anger.

A recent experiment by the author (Konečni, in press) addressed the above implications of the proposed model. For the present purposes, the design may be described as a $2 \times 2 \times 2$ between-subjects factorial. Subjects were first either annoyed or treated neutrally by a confederate (with the procedure identical to that employed in the present Experiments 1 and 2). All subjects then received on each of the 50 creativity test trials a 10-sec tone sequence while deciding whether or not to shock the confederate. The stimulation was either simple (an uncertainty level of 4.00 bits/tone), or complex (9.17 bits/tone), and presented at either a comfortable (73 db re $20\mu N/m^2$) or loud (97 db) listening level. A particular subject received the same treatment combination on all trials (e.g., 9.17 bits/tone at 97 db), irrespective of whether or not he shocked the confederate. The dependent measure was the total number of shocks administered by subjects in various conditions. Prior work had shown that all three manipulations (annoyance, complex tones, loud stimulation) raise the level of physiological arousal. However, only the annoyance treatment was expected to result in the label of anger. That is, the subjects knew that the auditory stimulation was not administered by the confederate (in fact, they though that he received the same stimulation as they), so they saw little reason to be angry with him. While both the complex and loud tones were expected to raise the level of arousal, and while neither was expected to lead to anger, these two treatments presumably differed in aversiveness.

The cognitive labeling aspect of the present theoretical model was fully supported. All three main effects were significant: Subjects exposed to annoyance, complex, and loud tones delivered more shocks than those exposed to no annoyance, simple, and soft

tones, respectively. More importantly, however, the Annoyance × Complexity and Annoyance × Loudness interactions were significant. These interactions were clearly due to the fact that both the complex and loud stimulation (in comparison to simple and soft stimulation, respectively) led to more aggression only in subjects who had been annoyed (cf. Zillmann et al., 1972).

The potential relevance of the cathartic effect to behaviors other than aggression represents still another implication of the proposed anger–aggression model. Prior work in the areas of exploratory choice and experimental aesthetics has shown that various arousal-raising procedures (e.g., loud white noise, expectation of electric shocks, methamphetamine) typically lead human and infrahuman subjects to decrease self-exposure to complex auditory and visual patterns (Berlyne, Koenig, & Hirota, 1966; Berlyne & Lewis, 1963; Day, 1967). In other words, when the level of arousal is well above normal, the reward value of complex stimulus patterns is not as high as it ordinarily is. If the emotion of anger indeed presupposes a state of aversively high arousal which can be reduced by the angered people's hurting of the annoyer, then one would expect such anger- and aggression-related activities to influence aesthetic choice behavior in situations where, for example, musical patterns of different complexity are the choice alternatives. In comparison to the nonangered subjects, who are presumably characterized by an intermediate (normal) level of arousal prior to choice, the highly aroused, angered subjects should choose the more complex patterns relatively less often. Conversely, the angered subjects who have had an opportunity to administer shocks to the annoyer should display choice behavior similar to that of the nonangered controls.

The above implication of the cathartic effect in its present conceptualization was tested in the Konečni et al. (Note 1) experiment. There were three experimental conditions: annoyed shock, annoyed wait, and nonannoyed wait. These conditions were in every way identical to the annoyed 7-min shock, annoyed 7-min wait, and nonannoyed 7-min wait conditions, respectively, of Experiment 1. After these treatments, the dependent-measure task was introduced, as a "quite different experiment, involving preference judgments." Each subject was asked to press one of two buttons every 10 sec and told that while he would hear a melody in either case, its type would differ depending on the button pressed. The melody would go on for 10 sec and could not be discontinued during that interval. It was stressed that there were no right or wrong responses. Two 10-sec examples of each of the two types of melodies were demonstrated to each subject. A trial consisted of pressing a button and hearing either a simple (4.00 bits/tone) or a complex (9.17 bits/tone) melody for 10 sec. There were 50 such trials for each subject, but the number was not announced in advance. Loosely speaking, while the 4.00 bits/tone melodies were reminiscent of nursery tunes, the 9.17 melodies resembled avant-garde music. However, earlier work had indicated that normally aroused subjects choose the two types of melodies equally often, and listen to them equally long (Crozier, 1973).

In terms of the main dependent measure —the percentage of complex choices made —there was a highly significant effect of experimental conditions. As predicted, the annoyed shock and nonannoyed wait subjects did not differ from each other and chose the two types of melodies about equally often (50% and 56.17% of complex choices were made by the annoyed shock and nonannoyed wait subjects, respectively, over 50 trials). However, the annoyed wait subjects clearly preferred the simpler melodies and made only 29.33% of complex choices. Thus, the highly aroused, angered subjects (annoyed wait) shunned the complex melodies. Yet, when equally angered subjects had been given an opportunity to hurt the annoyer (annoyed shock), which presumably decreased their level of anger, their aesthetic preference became indistinguishable from that of the nonangered, normally aroused subjects.

On three different dimensions it is now possible to distinguish nonangered individ-

uals and the ones who had been made angry but were given an opportunity to hurt the annoyer from the angered subjects without such an opportunity. Compared to the latter group, people in the former two groups tend to hurt the person they interacted with less, their level of arousal is lower, and they expose themselves relatively more often to melodies of greater complexity.

Generally speaking, the above studies (Konečni et al., Note 1; Konečni, in press) provide good support for some important components of the present anger-aggression model proposed to account for the cathartic effect and other results of Experiments 1 and 2. Moreover, the model appears to have considerable heuristic value and provides a medium for relating the work on human aggression to research in other areas.

Statements made so far on the basis of the research reported here about the cathartic effect clearly have to do with the *immediate* consequences of angered people's aggression. In conclusion, however, it seems important to consider briefly the implications of the present model for the long-term effects of aggression expressed in the presence of anger. Needless to say, the following comments must be treated as conjectures only.

Several aspects of the present results suggest that it is likely, in the long run, that aggression breeds aggression. This may be so in spite of, or perhaps partly because of, the cathartic effect as discussed in the present paper.

First, if real-life contingencies favor aggressive over nonaggressive responses in anger-inducing noxious situations, and if the former are superior in decreasing the level of arousal (labeled anger) from an aversively high level, it follows that every instance in which aggression alleviates anger increases the probability that aggression will occur in future cases of anger inducement. Second, even in experimental conditions in which angered people's expression of aggression reduced the level of subsequent aggression, these subjects evaluated the annoyer very negatively at the end of the experiment. Such an outcome was anticipated by Buss (1961): *"After the anger subsides,* there remain negative language responses, consisting of resentment, . . . [and] belief that others are threatening" (p. 13, italics added). This evaluative bad aftertaste may easily later lead to anger (and aggression) through the self-arousal mechanism. Third, if aggression is associated often enough in a person's life history with the elimination of others' aggression and the reduction of anger, it is likely that his aggressive responses will come to be elicited by the progressively weaker anger-inducing stimulation. An ever lower level of anger may accompany successive instances of aggression, where these instances are removed in time from each other. This is suggested by the interpretation of the annoyed 13-min shock cell of Experiment 1 in terms of the many-punishments standard adopted by subjects who presumably delivered the majority of interpolated punishments in the virtual absence of anger. A person who performs aggressive acts in anticipation of the onset of anger may adopt a similar standard. This seems particularly likely in the case of a prolonged dyadic interaction with a well-defined status and power structure, such as that between a parent and a child. Fixed behavioral sequences often characterize such relationships, and aggressive responses, if performed, are likely to be in the same mode. Aggression may then become the routine treatment, devoid of anger and other emotions and needing hardly any provocation.

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