The influence of attack, arousal, and information about one's arousal upon interpersonal aggression*

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Three determinants of the magnitude of interpersonal aggression were investigated: attack, drug-induced arousal, and information regarding arousal. Under the guise of a stress and problem-solving experiment, 72 male college students participated in a 2 by 2 by 2 factorial of Arousal (Dexedrine)/No Arousal (placebo) by Information ("stimulant" or "vitamin") by Attack/No Attack. After having their solution to a problem evaluated either favorably or unfavorably via a digital counter by a confederate, Ss used electric shocks to evaluate a solution supposedly produced by the confederate. Attack and arousal each reliably increased the amount of shock delivered. Ss told that they had received a stimulant rated themselves significantly higher in tremor and palpitation but not in anger and, unexpectedly, were slightly higher in aggression than the other Ss.

In recent years, physiological arousal has featured prominently in theoretical discussions and experimental investigations of aggression. Arousal has been invoked as a hypothetical construct intervening between attack or task failure and aggression (e.g., Berkowitz, 1969), and amount of arousal following attack or failure is correlated with subsequent aggression (Hokanson & Burgess, 1962; Gentry, 1970; Rule & Hewett, 1971).

Despite the ubiquity of the term in the aggression literature, in only one study has arousal been a manipulated variable. In that study, Geen & O'Neal (1969), using nonprovoked Ss, found that those who had been exposed to white noise—presumably at an arousing but not annoying intensity—delivered more electric shocks to another person than did those who had not heard the noise. One purpose of the present study was to extend the generalizability of the Geen and O'Neal findings regarding the influence of artificially induced arousal upon aggression: a drug arousal agent was used in order to avoid the potentially frustrating quality of white noise, and provoked Ss were included in the investigation. Specifically, it was hypothesized that arousal would increase the aggressiveness of persons both attacked and not attacked.

Another purpose of the experiment

was to examine the influence of an individual's information regarding his arousal state upon his aggression. Persons possessing only equivocal information regarding the nature of their arousal have been particularly vulnerable to suggestions, provided experimentally, which have led them to label the arousal in a particular way (Schachter & Singer, 1962); these labels strongly influence behavior (e.g., Nisbett & Schachter, 1966; O'Neal, 1971). Undoubtedly, an attacked individual is provided with unambiguous information regarding the origin of his arousal and therefore rather reliably labels his arousal as anger or insult (e.g., Baron, 1971). It would seem reasonable that if an attacked person were provided with additional arousal from an unknown source, he would regard himself as more angry or insulted. This would come about presumably because information from his attack would be used to explain his total arousal state. Since insult or anger is often correlated with subsequent aggressiveness (cf. Geen, 1968), it was hypothesized that such a person would display more aggression than an individual either not so aroused or aware of the (nonattack) source of the additional arousal.

METHOD¹

Overview and Design

Under the guise of an experiment investigating the effect of drugs upon "stress and problem solving," Ss received either a favorable or unfavorable evaluation of their solution to a problem from an experimental confederate (C) posing as another S. This evaluation was communicated in the form of a digital-counter number rating. Following this, Ss used a number of

electric shocks to evaluate a standard solution—supposedly the C's—to another problem.

The experimental design was a 2 by 2 by 2 factorial of Arousal (Dexedrine)/No Arousal (placebo) by Source (stimulant or vitamin) by Attack (rating of six)/No Attack (rating of two). Nine Ss were assigned randomly to each of the eight experimental conditions. In the attack condition, Ss were given an unfavorable evaluation of their solution to the problem by C; in the no-attack condition, Ss received a favorable rating. In the aroused/vitamin conditions, Ss were given 7.5 mg of Dexedrine and told that they had received a vitamin; in the aroused/stimulant condition, Ss were given the same amount of Dexedrine but told that they had received a stimulant; in the not-aroused/vitamin condition, Ss were given a placebo and told it was a vitamin; in the not-aroused/stimulant conditions, Ss were given a placebo and told that they had received a stimulant.

Subjects

The medical histories of 147 male students in introductory psychology were examined by the staff of the University Health Center for the purpose of excluding those with contraindications for Dexedrine. The resulting 97 potential Ss were contacted by telephone. Four students refused to participate because the study involved the use of drugs. The 72 Ss, drawn from this pool of potential Ss who were willing to participate, were assigned randomly to the eight experimental conditions.

Apparatus

Aggression was measured by an aggression machine, an adaption of that first used by Buss (1961). The S and C were seated at adjacent tables separated by an opaque partition. On each table was a small aluminum box on which a counter and toggle switch were attached. Wires connected the two boxes to each other and to a variable shock generator. Also coming out of one of the boxes were wires connected to plastic shock cuffs with brass electrodes that fastened to the arm of the confederate. When the switch on S's box was depressed, it advanced the counter displayed for the C, enabling him to record the number of shocks supposedly delivered by S. Depression of the switch on C's box passed a current to the box on S's side, advancing S's counter by one.

Pulse rate was measured via the use of an Offner Type RB Dynograph with a cardi tachometer coupler. Pulse rate was selected because of its reliability, relative freedom from artifact (cf. Rule & Hewitt, 1971), and, perhaps

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Table 1
Mean Number of Shocks Given by Ss

	Aroused		Not Aroused		
	Stimulant	Vitamin	Stimulant	Vitamin	
Attack	4.22 _c	3.11 _{bc}	3.45 _c	3.11 _{bc}	3.47
No Attack	2.11 _{ab}	3.00 _{bc}	1.78 _a	1.67 _a	2.14
	3.16	3.05	2.62	2.39	2.80

Note—Nine Ss per cell. Cells having common subscripts are not significantly different at the .05 level by a Duncan multiple-range test.

more importantly, because it was the only physiological measure accessible to the investigators. Pulse rate samples were taken 5 min after the recording electrodes were attached to the S, and again immediately following attack and immediately following the S's opportunity to retaliate. On each occasion, the sample constituted the rate during five successive 15-sec intervals.

Procedure

At the laboratory, S was met by E, who introduced herself and then led the S to a waiting room. The E then excused herself, ostensibly to collect some data at another part of the building. At the end of a 5-min interval, the E returned and stated that before any further explanation about the experiment was made, she would like to take S's resting pulse. The S's pulse was taken at the wrist for a full-minute interval by E. The S was then asked to read a description of the effects of four drugs, identified by the letters A, B, C, and D, and to sign a statement indicating his consent to take one dose of one of them. Drug A was described as a vitamin which might result in slightly increased appetite. Drug B was described as a stimulant which might result in slightly increased heart rate. Drugs C and D were described as aspirin and a depressant, respectively. The drug description sheet included a statement that experimental considerations might not permit informing the S which one of the four drugs he would be given.

After signing the consent sheet, the S was informed that the experiment might also involve electric shock and was given an opportunity to withdraw. No S expressed any desire to withdraw at this point. E then explained that both the S and another S (actually an experimental confederate) would participate in two somewhat related experiments. One person would take part in an experiment being conducted on the effects of drugs and stress—the anticipation of shocks—upon problem solving, while the other would serve in another experiment evaluating the effects of drugs alone on problem solving.

Just before receiving the capsule, the E mentioned to the S that he

would be in a condition which would allow him to know which drug he would be taking. The E then inquired whether or not the S could remember the side effects of the stimulant (or vitamin) on the consent sheet. If Ss were unable to remember, E then read the description once again. Depending upon the condition to which the S had been assigned, E took out a bottle labeled either "stimulant" or "vitamin" and gave the S either the Dexedrine or a placebo capsule. Just before ingesting the capsule, the S was reminded once again that the drug he had been assigned to take was the stimulant (or vitamin). The S was then instructed to wait in the waiting room for an interval of 50 min while the drug had time to take effect.

On the basis of pretests with eight graduate student volunteers, the dosage level of 7.5 mg was selected as that quantity of Dexedrine which produced an increase in heart rate without excessive feelings of shakiness. Dexedrine was selected as an arousal agent because, as a sympathetico-mimetic and central nervous system stimulant, it produces some of the specific physiological effects—increases in diastolic and systolic blood pressure (Goodman & Gilman, 1955, p. 520)—which often follow attack (Hokanson & Burgess, 1962; Gambaro & Rabin, 1969; Gentry, 1970).

At the end of the waiting period, the E returned to the waiting room and again took S's pulse. The S was then taken to a room where C and an experimental assistant were waiting.

At this point, E explained that both the S and the C would be serving in two simultaneous conditions: one in which both the effects of drugs and stress (shock) upon problem solving were being assessed and another concerned only with the effects of drugs on problem solving. Supposedly to insure random assignment to the conditions, both the S and the C were instructed to draw slips of paper. The C always reported that he had received the paper labeled shock and received his evaluation via a number of electric shocks.

Both the S and C were seated at tables, separated by a partition, and given instructions on how to communicate evaluations. The S was

told that he would receive his evaluation via the digital counter and that C would receive his via a number of electric shocks delivered by the S. The evaluation of the solutions was explained as follows: One shock or a counter rating of 1 would signify that the solution was excellent; seven shocks or a counter rating of 7 would signify that the solution was very poor. Numbers in between signified levels of performance between poor and excellent. Then, both S and C were given their problems to solve, with instructions that they had 5 min in which to do so. Recording electrodes were then placed on S (and ostensibly on C) for monitoring of pulse rate.

At the end of 5 min, E took up the solutions and exchanged them. The S was actually given a standard solution which was used for all Ss as the one written by C. The C was then instructed to read the S's solution and convey his evaluation via the digital counter. In the attack condition, the S received an evaluation of 6; in the no-attack condition, the S received an evaluation of 2. The S was then given a self-descriptive questionnaire designed to measure anger, insult, tremor, and palpitation. Following this, the S was then given the opportunity to evaluate the C's solution by delivering a number of electric shocks, which the C recorded. To increase the credibility of C's shock, following the first shock, C moved suddenly and audibly in the squeaky chair in which he was seated.

After completion of the experiment, Ss were informed of the name and dosage of the drug they had ingested. All of those given Dexedrine were provided with an accurate explanation of the drug effects and were given the opportunity to remain at the laboratory until the effects of the drug wore off.

RESULTS

Number of Shocks

Mean number of shocks delivered by Ss in each of the eight treatment conditions appears in Table 1. The corresponding analysis of variance appears in Table 2. It can be seen that attacked Ss gave more shocks (3.47) than Ss not attacked (2.14), a difference that held across the treatment conditions. This difference was highly significant ($F = 22.22$, $df = 1/64$, $p < .01$). In confirmation of the first hypothesis, aroused Ss reliably ($F = 4.67$, $df = 1/64$, $p < .05$) delivered more shocks than those not aroused. It should be noted that the greatest number of shocks were delivered by Ss who had been exposed to both arousal and attack, while the least were obtained for those who were exposed to neither.

It appears from examination of

Table 1 that Ss who had been attacked delivered more shocks when they thought they had received a stimulant, although a similar tendency was not apparent for Ss who had not been attacked. This trend barely failed to obtain conventional levels of significance ($F = 3.82$, $df = 1/64$, $p < .07$). No main effects were detected for information.

Self-Ratings

Attacked Ss reliably reported themselves higher in anger ($F = 10.43$, $df = 1/64$, $p < .01$) and in insult ($F = 28.50$, $df = 1/63$, $p < .01$). The mean self-ratings (on a 5-point scale) of anger for attacked and not attacked Ss were 2.30 and 1.30, respectively, while corresponding means for insult were 2.75 and 1.37. Neither information nor arousal produced significant effects upon these affective dimensions, nor were there interactions.

In rating of tremor and palpitation, Ss who were told they had taken a stimulant rated themselves higher ($\bar{X} = 1.87$ and 2.00 , respectively) than did those led to believe the capsule they had taken was a vitamin ($\bar{X} = 1.47$ and 1.56). Information was the only factor producing significant effects upon tremor ($F = 5.22$, $df = 1/64$, $p < .05$) or palpitation ($F = 5.54$, $df = 1/64$, $p < .05$). No interactions obtained for either of these latter self-report measures.

Pulse Rate Change

Analysis of pulse rate taken 5 min after S's arrival at the laboratory and before drug administration reveals no significant differences among the experimental conditions, although the overall mean rate, 79.69 bpm, contrasts sharply with the norm of 60-65 for young adult males (Bell, Davidson, & Searborough, 1968, p. 559).

None of the experimental manipulations produced significant differentiation among Ss in heart rate, although Ss across conditions decreased significantly following attack and following opportunity to aggress ($F = 27.49$, $df = 3/192$, $p < .001$; both decreases are significant by Duncan multiple range).

DISCUSSION

The aggressiveness of the attacked Ss constitutes a further (e.g., Geen, 1968; Gentry, 1970) demonstration of the unique potency of attack as an instigator of aggression. An obvious argument against this conclusion is that the larger number of shocks delivered by the attacked Ss was the result of seeing someone else use a similar evaluative scale rather than by the attack per se. Two considerations, however, make it appear that a modeling influence was not the crucial determinant of the attacked Ss'

Table 2
Summary of Analysis of Variance for Mean Number of Shocks

Source	df	MS	F
Arousal (A)	1	6.72	4.67*
Information (B)	1	.50	.35
Attack (C)	1	32.00	22.22**
A by B	1	.06	.04
A by C	1	.89	.62
B by C	1	5.56	3.82†
A by B by C	1	3.55	2.47
Error	64	1.44	

*Significant beyond the .05 level

**Significant beyond the .01 level

†Significant beyond the .07 level

aggressiveness: first, attacked Ss reliably rated themselves higher in insult and anger, emotions not surprising following attack but unusual following observational learning. Also, the S's evaluative mode was intrinsically noxious, but the confederate's was not; therefore, it is unlikely that from merely observing the confederate the Ss learned how much aggression was permissible in the situation (cf. McDaniel, O'Neal, & Fox, 1971).

Why the Dexedrine failed to produce changes in cardiac rate or mood ratings will remain an unanswered question. The Ss' high initial heart rates may have made them less responsive to any manipulation intended to increase heart rate (Wilder, 1957). Perhaps another physiological measure—such as blood pressure—might have been more sensitive to change produced by Dexedrine, since pulse rate responses to Dexedrine are extremely variable (Goodman & Gillman, 1955, p. 520). Or perhaps higher dosage levels of Dexedrine are required before heart rate and mood changes are produced in individuals facing a situation such as that faced by Ss in this experiment.

Nevertheless, the drug added significantly to the aggression delivered whether or not the S had been attacked. This finding agrees with the Geen & O'Neal (1969) results indicating that arousal increases the number of shocks delivered by unprovoked Ss. But it also means that even a very weak arousal agent can add to the aggressiveness of provoked persons as well.

The tendency of provoked Ss to be more aggressive when they were told that they had received a stimulant suggests the possibility of a placebo effect rather than the expected emotional labeling effect. In retrospect, however, this pattern of results is not surprising, since their self-ratings of mood indicate that Ss given Dexedrine were not aware of an increase in arousal and therefore had nothing to "label." All Ss believing

that they had received a stimulant—regardless of which drug they actually ingested—reliably rated themselves higher in palpitation and tremor. Of these Ss, those who were provoked (and angered) may have used the assumed drug effect to justify overt aggression toward their tormenter. ("The pill made me do it!")

Finally, it is appropriate to note that these findings are not incongruent with Berkowitz's influential theory regarding arousal and aggression. According to this position (Berkowitz, 1969), frustration-produced arousal energizes responses to aggressive cues. The present experimental situation was replete with potential "cues"—in the form of the shock apparatus and the electrodes—which might have operated to increase the aggressiveness of attacked and aroused Ss.

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NOTE

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