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The Excitation-Transfer Paradigm:

A Replication

Summary

After the failure of an attempt to enhance the generalizability of ZILLMANN's excitation-transfer paradigm by running an experiment representing a less than usually artificial interaction situation in the laboratory, an exact replication of one of the experiments of ZILLMANN et al. (ZILLMANN, KATCHER & MILAVSKY 1972) was done. Besides a significant increase of sympathetic activation by high vs. low physical exercise no main nor interaction effect of the treatments (low vs. high provocation, low vs. high sympathetic arousal) upon aggressive behavior was obtained. The findings are interpreted as a) being consistent with expectations from the transfer theory of emotion and b) revealing operational deficiencies of the provocation treatment.

## Introduction

During the last years - as observable in numerous other research domains of psychology - the issue of attribution theories has become more and more important for the conceptualization of problems in experimental aggression research (see MUMMENDEY 1978, 1979). Especially concerning the question of the effect of physiological arousal on the occurrence of aggressive behavior and the much discussed problem of the effect of film or TV-violence on aggression ZILLMANN (1971) presented his excitation-transfer paradigm. This paradigm - based on SCHACHTER's two-factor theory of emotion (1964, 1970) - stresses the relevance of the cognitive label attributed to the emotional state (e.g., pleasure or anger) and the relevance of the subject's considerations about the source or cause of his excitation. The function of cognitive processes in selecting more or less aggressive acts as a mediator between the effect of external instigation conditions (TV-film, noise, provocation etc.) and the manifestation of a response is emphasized and qualitatively detailed by the paradigm (for detailed description of the excitation-transfer paradigm see ZILLMANN 1971, MUMMENDEY 1978).

In a number of related experiments done by ZILLMANN and his coworkers the basic propositions of the paradigm could be supported several times; so the paradigm is meanwhile considered as experimentally well founded (see BARON 1977, TANNENBAUM & ZILLMANN 1975).

The different experiments had the same experimental procedure and design in common. In stage A the subject is provoked by a confederate, in stage B unspecific respectively non-aggressive arousal is induced, in stage A' the subject gets the opportunity to retaliate against his tormentor.

According to the propositions implicated in the excitation-transfer paradigm the subject is expected to causally attribute his emotional state corresponding to salient cues provided by his immediate environment. The excitation felt at that time potentially involves residuals from incompletely decayed, unrelated, and antecedent arousal. This state of excitation energizes and intensifies the situation-specifically labeled emotion and - this should be stressed - energizes and intensifies the actions according this specific label of emotion.

Concerning the experimental procedure just described the subject felt arousal based on the provocation by the confederate in stage A. This arousal is labeled as anger against the tormentor. In stage B unspecific additional

arousal is elicited. In stage A' providing the opportunity of retaliation the anger-labeled arousal can be reinstated and intensified by residual parts of the neutral arousal from stage B, this should result in an intensification of the aggressive acts (as dependent variable). If the subject, however, had not been sufficiently provoked in stage A, the excitation from stage B will be correctly attributed to the source of excitation and no intensification of the retaliation behavior will take place.

In the experiments of ZILLMANN and his coworkers the mode of instigating non-specific (or better non-aggressive) excitation in stage B had been operationalized in different ways. So excitation was provoked by presenting an erotic film or by pedaling on a bicycle ergometer as strenuous physical activity. The mode of instigating the anger-arousal in stage A and the aggressive behavior as dependant variable in stage A', however, had been held constant over different experiments. In a BUSS-BERKOWITZ-like procedure in stage A the subject gets a few (low provocation) or many (high provocation) shocks from the confederate which are actually applicated. In stage A' the subject gets the opportunity to take the role of a teacher to administer punishment to the learner (or tormentor) that is to deliver electric shocks to the learner. The results supporting the excitation-transfer paradigm must be considered first of all as very specific concerning the operationalization of anger instigation and aggressive acts in a very special social context, not to talk of the limitation of the narrow population of American undergraduates.

To enhance the validity of the experimental results in relation to the ZILLMANN paradigm, in a first step an experimental series has been started to replicate the results in a less reduced interaction situation by renouncing the use of an aggression-machine. The following procedure was employed: The subjects had to solve a little construction problem (construction of a little vehicle with electric motor) together with the confederate (either as consulting agent or self-acting ). In stage A the subject himself tried to solve the construction task and was consulted by the confederate either in a cooperative (no provocation) or in a non-cooperative, destructive manner, associated with insults and negative evaluations (provocation). Following stage A (according to the procedure of ZILLMANN, KATCHER & MILAVSKY 1972) in stage B the condition of additional excitation had been varied by intensive pedaling on a bicycle ergometer or by only sitting on a chair. In stage A' the subject got the opportunity to retaliate by consulting and evaluating the confederate who now had to do the construction task. Dependent measure was the video-observed verbal and non-verbal behavior of the subject which was rated according to previously established categories (e.g., personal in-

sult, impersonal verbal-aggressive acts, unnecessary interventions, etc.). The experiment was disclosed as a study of problem-solving behavior concerning especially physiological data and knowledge about the development of strategies of problem-solving.

Regrettably after having run a lot of experimental trials it had to be recognized that no subject at all showed any sign of aggressive behavior as defined by the dependent variable. However as the results of the post-experimental interviews indicated all subjects felt being angered by the provocation treatment; they expressed this feeling very clearly by describing their emotional state unequivocally. A modification of the provocation treatment and of the dependent measure - now the subjects had the opportunity to evaluate the construction abilities of their partners by withdrawal of money - didn't change the subjects' explicitly friendly, charming, cooperative, completely prosocial behavior: Independent of their own losses of money they refused to withdraw in reciprocity money from their partners when they took the role of the consulter. After having run 21 male students of the University of Münster except those studying psychology, education or social sciences, the series was stopped.

Finally it had to be concluded that neither the condition of provocation nor the condition of physical excitation, not to talk of an interaction of these conditions, had any effect upon the dependent variable. There was no effect consistent with the paradigm at all. After the provocation treatment however the subjects showed clearly symptoms of anger arousal elicited by the unjustified behavior of the confederate. They were ostensibly not willing to show retaliative aggressive behavior. On the contrary they presented themselves homogeniously cooperative and corresponding to the experimental task in normative adequate and social desirable manner.

This experience raised certain doubts about the external validity of the experimental results especially concerning their generalizability if the usual procedure is exceeded in direction of a less reductive interaction situation in the laboratory. Before continuing experiments to enhance the external validity of the ZILLMANN paradigm by realizing less artificial interaction situations it was decided to replicate one of the original experiments. It should be clarified whether an exact replication of an experiment with subjects of a West-European student population already will show difficulties in supporting the paradigm; further modifications of the experimental procedure would be in vain in this case.

For this purpose a second experimental series was started which represented an exact replication especially concerning the features of the procedure of the experiment of ZILLMANN, KATCHER & MILAVSKY (1972).

### Method

Subjects. 38 male students of the University of Münster, not studying psychology, education, or social sciences served as subjects. This exclusion is well-founded by previous experimentation: During their studying students of psychology acquire a lot of experience with psychological experiments, especially with Milgram-like procedures. The same argument is valid for critical students of social sciences and education; beyond that these students often principally reject the use of the experimental method and rise the risk of invalidation considerably. Ss were paid for their participation in the experiment (DM 15.00).

Ss were randomly assigned to conditions. Before running the experiment, 5 Ss refused to participate on account of the application of electric shock. 9 other Ss had to be excluded afterwards as post-experimental interviews showed that these either recognized the experimental setting (Milgram-type study, no other subject involved) or refused to punish their partner by delivering shock. After one or more discussions with the experimenter, these Ss chose always the lowest intensity.

Contrary to ZILLMANN et al. (1972) all Ss were included whose behavior during the experiment or whose reports in the post-experimental interviews did not show any signs of recognizing the aims of the method. The criterion of exclusion employed by ZILLMANN et al. (low intensity, short duration, minimal response latency) was not used after previous studies proved this criterion consisting of the critical behavior indicators representing the dependent variable as highly imperfect and experimenter-effects promoting.

Design. In a 2x2 independent-measure design (a) degree of initial aggressive instigation (low vs. high, F-/F+) was factorially varied with (b) degree of physiological excitation deriving from physical activity (low vs. high, E-/E+). The degree of aggressive instigation was manipulated by the number of received shocks (3 vs. 9); the manipulation of degree of excitation was validated empirically (systolic and diastolic blood pressure, heart rate). A high degree of excitation was operationalized by a 2.30 minutes pedaling on a bicycle ergometer, a low degree of excitation by a 2.30 minutes sitting on a chair.

Procedure. The procedure to examine the propositions of the excitation-transfer paradigm employed by ZILLMANN (1971, 1972) was replicated as exactly as possible. So the experiment consisted of three stages:

- In stage A - an initial encounter session - the subject is angered by a tormentor who actually is a confederate of the experimenter
- In stage B the S is unspecifically aroused by pedaling on a bicycle ergometer for 2.30 minutes (75-90 w/min). This kind of cognitive neutral excitation is also employed by ZILLMANN et al. (1972) after the use of aggressive and erotic films has shown validity reducing effects. These films elicited additive interfering cognitive and affective reactions
- Finally in stage A' the subject gets the opportunity to retaliate against his tormentor.

These stages were part of a cover story used and described by ZILLMANN et al. (1972). All instructions were given by the experimenter.

The study was introduced as being composed of two independent parts which were put together for reasons of economy. One part was said to investigate the effects of punishment on learning. It would involve another S who was already at work on his task in an adjacent room. Later on the S would have to interact with this S playing the role of a teacher (the other S would have to play the pupil's role). The S was informed the kind of punishment to be employed in the experiment and was given the opportunity to withdraw from the experiment if the use of shock was unacceptable to him. The other part of the experiment was introduced as a test of a hypothesis regarding recent changes in receptivity to nonverbal visual materials. More specifically, S was led to believe that the study concerned the recall of complex visual stimuli which would be perceived under various conditions of distraction. In S's case, the distraction would be in the form of relatively mild or more strenuous motor activity which would be performed while viewing the stimuli presented in a series of slides. Since motor activities were involved, S was told it would be necessary to monitor various physiological indices of his behavior.

Following this instruction the first physiological measures ( $M_1$ ) were taken. A continuous measurement of heart rate was not possible; skin temperature was not used as an indicator for reasons of unreliability. After the first measurement S was accompanied to the aggression machine. The subject was informed that, since the rapport between teacher and learner influences the learning process it would be necessary to take a reliable measure of how much the two Ss "were in tune with one another". This would be done by having the other S express his attitudes on various controversial issues, and by having the other S express his agreement or disagreement. Whereas S would announce his attitudinal positions over an intercom to the other S, the other S would announce his agreement or disagreement via a light signal or through the administration of shock, respectively. After electrodes were attached to S's wrist he first got a test shock of intensity 1. Then the S was given a list of 12 opinion items about which he expressed his attitudes, receiving a signal or a shock in response to each. The number and intensities of the shocks he received were prescheduled and administered by an experimental confederate in the adjacent room, and were thus totally independent of the content of S's expressed opinions.

After S had completed this interaction with the other S, physiological measures were taken a second time ( $M_2$ ) and S was started in his motor task. While S continuously performed the required motor behavior, he was simultaneously exposed to a sequence of colour slides. The slides showed stills only and the stimuli were advanced at 8 sec. intervals. After 2.30 minutes a third measurement of physiological indices was taken ( $M_3$ ). During this stage the experimenter remained in the room in order to supervise S's behavior.

The subject was informed that he would now be completing the first part of the experiment. He was told to provide coded information to the learner whose task would be to identify from it the particular relationship he was supposed to be learning. The learner's response, S was told, would be recorded and would automatically be signaled to S as either correct or erroneous. The subject was instructed that whenever the error signal came in response to his sending of coded information, he had to administer punishment, that is deliver electric shock to the learner. He was informed that he could vary shock intensity from "quite mild" (button 1) through "rather painful" (button 11). It was suggested that he chose the intensity he felt was most adequate in this particular learning situation. The experimenter left S alone during the teaching period in which the other S ostensibly responded erroneously on 12 of 20 items.

After this A' stage of retaliation the physiological measures were taken a last time ( $M_4$ ). Following this measurement S was interviewed concerning his treatment by the other S, his hypotheses about the aims of the investigation,

and his feelings during the instigational stage (see ZILLMANN & SAPOLSKY 1977).

Dependent measures. Measures of aggressive behavior: The main dependent variable was the intensity of shock ostensibly delivered to the other subject. As secondary measures, duration of shock and latency of the response were employed. The latter measure was based on the assumption that the highly instigated S who has his mind set on retaliation and has thus resolved decisional conflicts will exhibit little, if any hesitation in his response selection. Physiological measures. Physiological changes were determined as the difference between S's base level of excitation prior to the differentiating manipulations, and the level of excitation measured at a particular time during the experimental treatment. Blood pressures and heart rate were assessed intermittently corresponding to the procedure employed by ZILLMANN (1971): (a) postinstigation ( $M_2-M_1$ ), (b) postexercise ( $M_3-M_1$ ), and (c) postretaliation ( $M_4-M_1$ ). The direct measures taken were (a) heart rate, (b) systolic blood pressure, and (c) diastolic blood pressure. Based on a, b, and c, a composite measure, sympathetic activation, was computed as

$$SA = HR \left[ BP_{diast.} + \frac{2}{3} (BP_{syst.} - BP_{diast.}) \right].$$

## Results

### Physiological responses

The degree of excitation elicited by provocation during stage A was rather small. The measures of heart rate and blood pressure taken in  $M_2$  did not differ significantly in any way from those taken in  $M_1$ . Even a decrease of excitation was registered in one of the low instigation conditions. The two instigation treatments, low vs. high, failed to produce different changes in physiological responses. All indices of excitation employed yielded differentiations well within chance limits. This finding confirms the results reported by ZILLMANN, KATCHER & MILAVSKY (1972), also realizing an insignificant elevation of physiological measures but no differentiation between the instigational conditions. Apparently the uncertainty or anxiety suffered by the Ss who were confronted with the shock stimulator and who repeatedly anticipated shock produced similar or identical excitation as the instigational treatment.

The physical activation in stage B produced a strong effect on blood pressures and heart rate, dependent on sympathetic activation. The specific differentiation of physiological excitation accomplished with the two motor tasks is shown in Table 1. For reasons of comparison, original data of ZILLMANN et al. (1972, p.254) are presented in Table 1, too.

As with ZILLMANN et al. (1972), the effect of the physical activity consisted in a rise of sympathetic activation ( $p < .05$  t-Test), in total however this increase is much smaller than in the original experiment. This differ-

Table 1:

Differentiation of Means of Physiological Indices of Excitation after Motor Task; Comparison of Our Results with Original Data of ZILLMANN et al.

<u>Variable</u>	<u>Our Data</u>				<u>Data reported by ZILLMANN, KATCHER &amp; MILAVSKY (1972)</u>			
	<u>Treatment Combinations</u>				<u>Treatment Combinations</u>			
	<u>F+/E+</u>	<u>F+/E-</u>	<u>F-/E+</u>	<u>F-/E-</u>	<u>F+/E+</u>	<u>F+/E-</u>	<u>F-/E+</u>	<u>F-/E-</u>
<u>Systolic Blood Pressure</u>	7.50	-7.50	6.66	3.33	52.00	8.50	41.50	5.88
<u>Diastolic Blood Pressure</u>	-5.83	1.66	-3.33	-0.83	-28.75	-2.50	-32.00	-3.38
<u>Heart Rate</u>	18.00	4.66	5.00	-4.66	63.13	-1.38	53.50	4.88
<u>Sympathetic activation</u>	2373.88	146.67	531.09	-295.55	10221.66	212.17	8447.41	792.33

ence has its presumable cause in the easier condition of pedaling on the bicycle ergometer (75-90 w/min vs. 140 w/min).

Aggressive Behavior

Aggressive behavior was operationalized by three indicators: intensity, duration, and latency of shock response. Duration and response latency were not different between the treatment combinations. Concerning the validity of these indicators, the evaluations of ZILLMANN et al. (1972) are corroborated. Duration of shock and latency of response appear to be questionable measures and indicators of aggressiveness (see SCHMIDT & SCHMIDT-MUMMENDEY 1974, BERKOWITZ & LePAGE 1967).

The different treatment combinations failed to produce any effect on the selection of shock intensity; in tendency, however, the results confirm the findings of ZILLMANN et al. (1972). Table 2 and Figure 1 illustrate this result (for reasons of comparison, Fig.1 also shows the respective data reported by ZILLMANN et. al. 1972, p.255).

Shock intensities on the average do not exceed value 4, a small number of Ss only applicated shocks of intensity 1. Higher values in the F+ -condition (high instigation) are caused by extreme values, producing a hypothesis confirming distortion of the data.



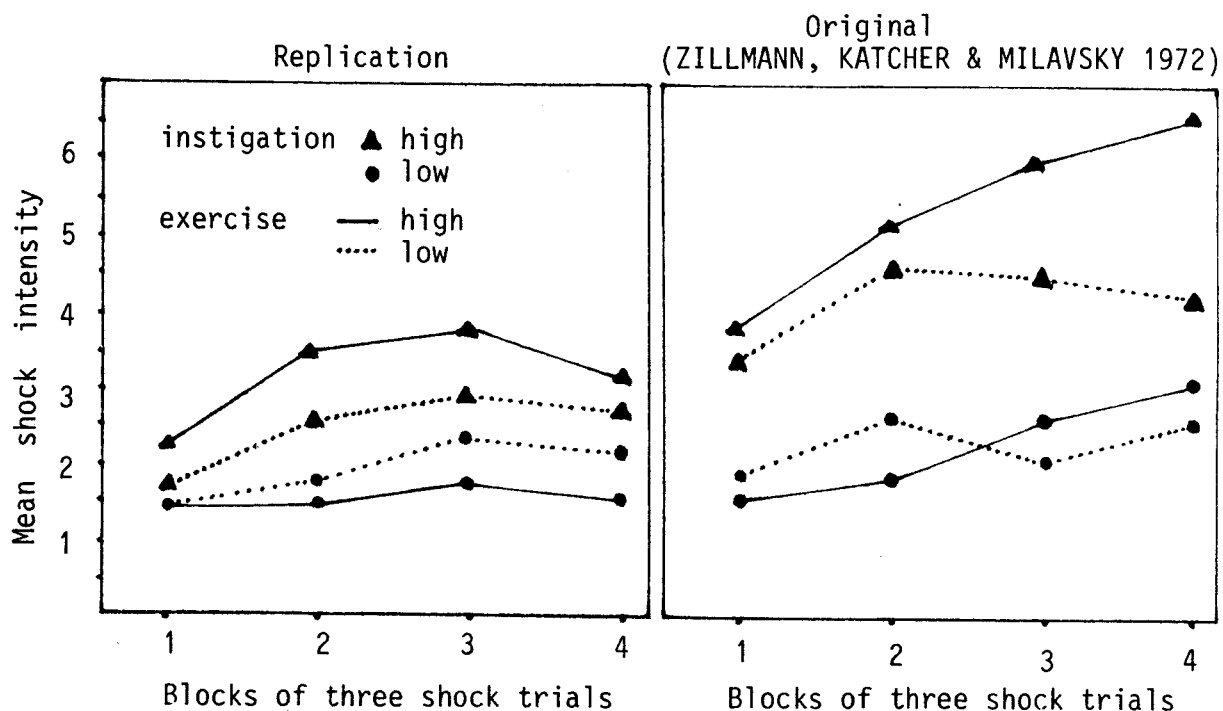
Table 2:

Mean Shock Intensities Employed in a Retaliation Encounter Following Differential Provocation and Differential Exertion (n = 24)

	<u>Treatment Combinations</u>			
	<u>F+/E+</u>	<u>F+/E-</u>	<u>F-/E+</u>	<u>F-/E-</u>
	1.50	2.91	2.33	3.58
	1.00	1.00	1.00	1.41
	1.58	6.33	1.16	2.58
	7.08	1.00	3.00	1.83
	1.75	1.83	1.00	1.00
	6.08	1.00	1.00	1.58
S	18.99	14.07	9.49	11.98
$\bar{x}$	3.16	2.34	1.58	1.99
n	6	6	6	6

Figure 1:

Mean Intensity of Shocks Ostensibly Delivered to the Instigator;  
Comparison of Results of Replication With Original Investigation



As there was no homogeneity of variance an analysis of variance was not performed. Comparing intensities over the treatment conditions, no significant effect appeared. Thus, shock was chosen independently of degree of instigation and degree of excitation. On the one hand this result confirms one basic proposition of the ZILLMANN paradigm. The occurrence of aggressive retaliative behavior depends on recognizing of a provocation and on cognitive guidance of the excitation felt. The procedure of replication did ostensibly not succeed in creating an arousal due to the recognizing of a provocation by a tormentor. Physiological measurements and post-experimental interviews give evidence of this suggestion. Refusing to label the confederate's behavior as aggressive, Ss did not realize any excitation identifiable as anger. On the other hand the findings prove clearly unspecific arousal causally attributable to salient cues of the environment as an insufficient prerequisite eliciting aggressive behavior.

As illustrated by Figure 1, the rank order of the treatment combinations presented by ZILLMANN et al. (1972) is confirmed. Ss who received the provoking treatment (high instigation) in combination with high exercise administered more intense shocks throughout the response sequence, followed by Ss of the F+/E- combination. Ss who received the less provoking treatment preferred to administer mild shocks. Confirming the results of the analysis of variance performed by ZILLMANN et al. (1972), the rank order is in accordance with SCHACHTER's (1970) suggestions and decisively stresses the role of aggressive instigation interpreted as provocation in enacting aggressive behavior.

As is apparent from Figure 1, however, there are a lot of differences between the results of the replication and the original investigation. In the replication Ss of all combinations obviously were not ready to deliver any intense shock to the instigator. Indeed, there are small differences of means as expected by the hypotheses of the paradigm, the variance between and within the groups however being rather great. Two other aspects described by ZILLMANN and his coworkers could not be replicated. The mean intensity of shock in blocks did not increase successively (F+/E+ 2.22 3.50 3.77 3.00; F+/E- 1.66 2.44 2.77 2.61; F-/E+ 1.50 1.50 1.77 1.55; F-/E- 1.50 1.83 2.38 2.11). Chosen intensities were rather held constant throughout the response sequence and generally there was even a small decrease in the last block. Beyond that, no confirmation was found concerning the interaction between physical exercise and shock sequence as described by ZILLMANN et al. (1972).

## Discussion

Although the present experiment did not obtain a replication of the results of ZILLMANN, KATCHER & MILAVSKY (1972) the present findings do fit the expectations derived from excitation-transfer paradigm: An intensification of an aggressive response (in stage A') is just not to be expected if the person had not been provoked sufficiently (in stage A), that means if the person did not label his emotion as anger and thus residual excitation could not receive cognitive guidance into aggressive acts. The person then may attribute correctly the source of his excitation to his physical exertion.

The present results do not show any effect of the "provocation" treatment upon the dependent variable, the subjects seem not to be provoked. Moreover this result is supported by indications from the post-experimental interviews: Nearly no subject did report that he had been really angry about his experimental partner neither after stage A nor during the rest of the procedure. Corresponding to the ZILLMANN paradigm the experimental groups do not show any differences concerning the chosen intensities of electric shock administered; the interaction effect between provocation and excitation, as shown by ZILLMANN et al. (1972), does not occur.

Meanwhile the following question remains: Why does an identical experimental procedure of provocation show success in a number of studies, but not in the present study where the effect is completely zero? It is to assume that the subjects of the present experiment did not feel impressed or touched by receiving three or nine electroshocks which were interpreted as a reply to their political statements, and which did not reveal any meaningful relation to the direction (or content) of their statements. Maybe that meanwhile persons expect a lot of strange things to happen during a psychological experiment and that they accept and bear these stoically - especially if being financially compensated for their participation.

To establish a strong personal involvement of the individual which is seen as an essential characteristic of anger or of a provocation effect which ought to be causally attributed to the confederate - as intended with the procedure just described - the following aspects have to be guaranteed by the cover story: The subject has to interpret unequivocally the confederate's behavior as negative normative deviation. This deviation is to be seen relative to the normative frame of reference established within the experimental situation. If according to the instruction the experimenter has provided the administration and reception of electric shocks, the manipulation of these electric shocks per se must be evaluated by the subject as adequate to the situational relevant

norms. A negative deviation could be recognized if an according to the instruction unnecessarily large, overzealous number of shocks is administered, if the confederate e.g. administers three instead of one shocks per trial or if he still administers shocks when the task is already finished etc. A realization of the provocation treatment as a condition of subjective interpretation of normative deviation is in preparation by some of the authors.

As a further significant divergence between the present results and those reported by ZILLMANN et al. (1972) the extent of the shock-intensities chosen is to be mentioned: While the subjects of ZILLMANN and his coworkers apparently used the whole range of shock intensities at disposition, the subjects of the present experiment chose only shock intensities between 1 and 3. Besides the fact that ZILLMANN et al. dismissed four subjects who administered shocks of intensity 1 because of demand awareness - a decision not at once justified as shown by post-experimental interviews in the present study - there is remarkable difference of chosen shock intensities between the two studies. A reason for this difference could be seen in the establishment of different points of reference concerning the subject's selection of shock intensities by the demonstration of a test shock during instruction. In the present experiment the subject has been shocked for demonstration with shock intensity 1 while ZILLMANN et al. do not report the intensity of the test shock nor the administration of a demonstration shock at all. According to investigations of modeling-effects within the present experimental procedure (see SCHMIDT et al. 1976 a, b) and recently performed pilot studies such an orienting function of a demonstration shock for the subjects may be supposed. Thus it would be preferable not to provide such confounding points of reference by administering a demonstration or test shock.

Altogether the results of the present replication can be seen as a further contribution supporting the excitation-transfer paradigm within the methodological realizations practiced up to now. An extension of its generalizability by varying experimental realizations seems to be worthwhile and necessary because the ZILLMANN paradigm has proved itself - for the present at least - to provide fruitful research perspectives. Since at the same time propositions about simple relations between arousal and aggressive behavior, e.g. about an automatic intensification of aggression or even a cathartic reduction of aggressive acts did not find empirical support additional time should not be especially mentioned.

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