JOURNAL OF EXPERIMENTAL SOCIAL PSYCHOLOGY 26, 289–304 (1990)

Cognitive Dissonance May Enhance Sympathetic Tonus, but Attitudes Are Changed to Reduce Negative Affect Rather than Arousal

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Received June 19, 1989

An experiment was conducted using a novel misattribution source to investigate the motivational state underlying dissonance-induced attitude change. Misattribution sources associated in the past with negative experiences (e.g., a pill) have been criticized as negatively biasing subjects' interpretation of their dissonance arousal. However, prism goggles, which were used in place of an "experimental pill" as the misattribution source in the present research, were found in pilot testing to be novel, affectively neutral, and affectively malleable. Subjects wore prism goggles for 3 min and were informed that the goggles may have the delayed side-effect of making them feel pleasantly excited (positive hedonic state) or tense (negative hedonic state). Subsequently, subjects agreed to write a counterattitudinal essay under conditions of high or low choice. Results revealed that the frequency of nonspecific skin conductance responses was higher for subjects in the high-choice than low-choice conditions only during the critical postdecision period. In addition, dissonance arousal, as indexed by this physiological measure, was equal for subjects in the high-choice/positive-cue and high-choice/negative-cue conditions. The analysis of attitude change revealed the predicted main effect for Choice and and the Cue × Choice interaction: Subjects in the high-

This research was conducted as part of the first author's Ph.D. dissertation and was supported by National Science Foundation Grant No. BNS-8706156 to the second author. Parts of this research were presented at the annual meeting of the Society for Psychophysiological Research, San Francisco, 1988. We thank Louis G. Tassinary, Daniel W. Russell, and Beverly S. Marshall-Goodell for their assistance throughout this research. We express special thanks to Tory Higgins for his helpful comments on an earlier draft of this manuscript. Reprint requests should be addressed to Mary E. Losch, Social Science Institute, 345 Schaeffer Hall, University of Iowa, Iowa City, Iowa 52242.

0022-1031/90 $3.00

choice/positive-cue condition exhibited greater attitude change than subjects in the remaining conditions. These data suggest that although cognitive dissonance may increase sympathetic activity, people in a dissonant state change their attitudes in order to reduce the unpleasant state rather than the "arousal" state induced by cognitive dissonance.

Festinger (1957, p. 2) claimed that when an individual holds cognitions which do not follow from one another (i.e., are inconsistent), the result is a psychologically aversive state which motivates subsequent information processing in a biased fashion to reduce this uncomfortable psychological state. When dissonance results from counterattitudinal behavior, attitude change in the direction of the behavior is one mode for reducing the dissonant state. Prior research has provided support for a variety of attitudinal and behavioral predictions derived from cognitive dissonance theory within certain constraints. For example, the behavior must be perceived as freely chosen, and must be thought to result in negative consequences (see Wicklund & Brehm, 1976). Explorations continue to delineate the antecedents to (Scher & Cooper, 1989) and consequences of (Axsom, 1989) cognitive dissonance. However, the proposal of alternative formulations which rely less on intrapersonal arousal and conflict (e.g., Bem, 1972) spawned considerable theoretical interest in the motivational properties of cognitive dissonance. Among the questions that have been raised about the intrapersonal effects of cognitive dissonance, for instance, are whether nonspecific physiological "arousal" is a component of a dissonant state and whether people in a dissonant state change their attitudes in order to reduce this arousal or to reduce the unpleasant state induced by the dissonance (e.g., Higgins, Rhodewalt, & Zanna, 1979; see reviews by Cialdini, Petty, & Cacioppo, 1981; Cooper & Croyle, 1984; Pittman & Heller, 1987). The present research focuses on these latter questions.

Fazio and Cooper (1983; Cooper & Fazio, 1984) have argued that cognitive dissonance can be characterized as an arousing, affectively neutral state which can be labeled a positive or negative hedonic state depending on situational cues. This position owes its origins to a seminal study by Zanna and Cooper (1974), in which a misattribution paradigm was developed to probe the feelings aroused by dissonant cognitions. On the basis of Schachter and Singer's (1962) theory of emotion, Zanna and Cooper (1974) reasoned that the pressure to change one's attitudes results from an arousal state which is subsequently labeled negatively because of one's apparent responsibility for producing aversive consequences. In the original Zanna and Cooper study, subjects were induced to write counterattitudinal essays under conditions of high or low choice. In addition, subjects were led to believe that a pill they had ingested would cause them to feel tense, relaxed, or have no side effects at all. Zanna and Cooper hypothesized that subjects in the "tense" condition

who had been induced under conditions of high choice to write the essay would misattribute any dissonance aroused by their attitude-discrepant behavior to the pill and, hence, would experience no further motivation to change their attitudes. As expected, subjects in the high choice conditions who were told the pill was relaxing or had no side effects exhibited significant attitude change, whereas subjects who were told the pill might make them feel "tense" did not. On the basis of these results, Zanna and Cooper (1974) concluded that arousal was an important component driving attitude change in cognitive dissonance. Several conceptual replications have followed these early results (e.g., Cooper, Zanna, & Taves, 1978b; Fazio, Zanna, & Cooper, 1977; Gonzalez & Cooper, 1976; Pittman, 1975).

Feelings of "tension" and "relaxation" differ both in terms of felt arousal and in terms of their hedonics. Hence, whether people in a dissonant state change their attitudes to reduce the arousal or the negative affect that was increased by dissonance cannot be determined from the early misattribution studies. To explore this issue, Higgins, Rhodewalt, and Zanna (1979) used the pill paradigm with four separate descriptions of possible side effects of the pill subjects ingested: pleasant excitement (positive/arousal), relaxation (positive/no arousal), tense (negative/arousal), and unpleasant sedation (negative/no arousal). In this way, the side effects of arousal and of negative affect were varied independently to allow an assessment of the importance of each in dissonance-induced attitude change. Results indicated that subjects in the pleasant excitement and relaxation conditions who had freely agreed to write a counterattitudinal essay exhibited more attitude change than subjects in the tense and unpleasantly sedated conditions. Furthermore, subjects in the arousal conditions who had freely agreed to write a counterattitudinal essay changed their attitudes slightly more rather than less than subjects in the nonarousal conditions. On the basis of these findings, Higgins et al. (1979) concluded that attitude change occurs to reduce feelings of unpleasantness rather than feelings of bodily arousal per se. Zanna, Higgins, and Taves (1976) came to a similar conclusion using the pill paradigm.

Since the appearance of the Zanna et al. (1976) and Higgins et al. (1979) studies, Fazio and Cooper (1983) and Cooper and Fazio (1984) have questioned the utility of the pill paradigm in evaluating the feelings induced by dissonant cognitions.

> Do [the Higgins et al., 1979] results imply that one necessarily experiences a specific state of discomfort following induced compliance? We tend to think not . . . subjects may have experienced an immediate state of general, heightened arousal which they subsequently labeled as negative. Recall that subjects believed that they were taking an experimental pill that was still being tested and potentially produced side effects. Concerns about the experimental status of the pill may

> have provided a strong contextual cue for labeling any general arousal as a negative feeling. (Fazio & Cooper, 1983, pp. 130–131)

No data were presented to support this interesting possibility, however. The primary evidence cited as showing that positive as well as negative misattribution sources can eliminate attitude change in high dissonance conditions stems from a study in which subjects rated cartoons under conditions of high or low dissonance either before or after expressing their attitudes (Cooper, Fazio, & Rhodewalt, 1978a). As Higgins et al. (1979) noted, however, the high-choice/cartoon-first versus low-choice/cartoon-first comparison in this study was not reliable. Subjects in the high dissonance condition did not rate the cartoons as being more humorous than did those in the low dissonance condition. Subjects in the high-choice/cartoon-first condition did rate the cartoons as more humorous on the post-test than they did on the pretest, but their pretest was extreme in the other direction so that regression to the mean may have contributed to this effect being statistically significant. These subjects also rated the cartoons as more humorous than subjects in the high-choice/attitude-first condition, but this difference also provides only equivocal evidence for the predicted effect since these latter subjects inexplicably believed the cartoons were especially nonhumorous. Even if there is a reliable effect to be explained, this study does not bear clearly on the question of whether people in dissonant states change their attitudes to reduce "arousal" or an unpleasant state because the results can be explained by either model. For instance, if one assumes that dissonance is phenomenologically aversive and that dissonance-induced attitude change is motivated to reduce this aversive state (e.g., see Higgins et al., 1979; Zanna et al., 1976), then viewing the cartoon in a dissonant state may have produced a contrast effect leading to more positive perceptions of the cartoons. To the extent that viewing the humorous cartoons attenuated the unpleasant state induced by dissonance, attitude change should also be attenuated.

In the present research, a misattribution source was used (wearing prism goggles) that is less open to the criticism previously leveled at the "pill"—that regardless of the supposed side effects from ingesting the pill (positive or negative), just knowing that one will take a pill is inherently negative because of one's unpleasant associations with pills in the past and/or because of the unpleasant prospect of ingesting an experimental pill. In addition, an independent measure was obtained of subjects' sympathetic arousal following their decision to write the counterattitudinal essay.

Pilot testing was conducted to identify a misattribution source with the following characteristics: (a) *stimulus novelty*—subjects had no prior knowledge or strong expectations about the misattribution stimulus; (b)

affective neutrality—exposure to the stimulus in the laboratory was affectively neutral—that is, it did not create pleasant or unpleasant feelings, compared to the feelings of subjects who were not exposed to the stimulus; and (c) *affective plasticity*—descriptions of potentially positive and potentially negative aftereffects of the stimulus were highly and equally credible (Losch, 1988).[1] After rejecting several possible misattribution sources as a result of pilot testing, we found prism goggles could form the basis for the desired misattribution source. Briefly, subjects in pilot testing wore a pair of prism goggles for 3 min while sitting in a recliner in the testing room. No subject reported having ever worn prism goggles or being familiar with prism goggles or their purported effects. Subjects also proved as willing to believe that removal of the goggles might be followed at some later point by sensations of pleasant excitement as they were that removal of the goggles might be followed at some later period by sensations of tension. Hence, the present research was built around the purported perceptual aftereffects of prism goggles.

To assess the presence of increased sympathetic activity during the purported state of cognitive dissonance, the number of nonspecific skin conductance responses (NNSCRs) was measured (e.g., see Croyle & Cooper, 1983). The use of this psychophysiological assessment is important to ensure dissonance arousal was induced by the choice manipulation. In the Croyle and Cooper (1983) and Elkin and Leippe (1986) studies, both of which reported elevated electrodermal activity following attitude discrepant behaviors under conditions of high perceived choice, no misattribution cues were used so that they (i) could not address the possibility that the cue condition might itself differentially influence sympathetic arousal; and (ii) could not examine whether dissonance-induced excitation or unpleasantness was the crucial factor that motivated subjects to change their attitudes. In the Higgins et al. (1979) study, the pill paradigm that has subsequently been challenged by Fazio and Cooper (1983; Cooper & Fazio, 1984) was used to address this question, and no independent evidence was provided regarding arousal levels across conditions.

METHOD

Subjects and Design

Sixty-nine undergraduates were randomly assigned to the cells of a 2 (Choice: low vs high) × 2 (Misattribution Cue: positive vs negative) between-subjects factorial design. All subjects received research credit in their Introductory Psychology courses in return for

[1] It might be noted that the laboratory in which the pilot study and experiment were conducted has minimal cabling or equipment visible to subjects, and previous pilot research in this laboratory has revealed it does not make subjects particularly tense or apprehensive. We nevertheless exposed subjects to the laboratory prior to their participation to further attenuate any possible effect of the room per se.

their participation. All subjects also reported being in good health and none indicated a chronic health problem (e.g., hypertension, diabetes).[2]

Preliminary Session

Approximately 2 weeks prior to the experimental session, subjects were given a brief explanation of the procedures and study. Because subjects were later to be asked to generate arguments favoring the increased use of electric shock in psychology experiments, it was important that subjects not feel as if psychophysiological recordings constituted a threat of electric shock to them. Hence, an overview of psychophysiological recording was provided, and it was explained the bodily recordings that were to be made represented miniscule levels of electrical current and constituted no hazard or danger to them. Any questions subjects had about psychophysiological recording were answered prior to proceeding.

Subjects were told their visual perception would be altered briefly at the beginning of the experimental session, and that involuntary physiological responses to various cognitive tasks would then be assessed. General health information and informed consent were then obtained. Subjects also completed a variety of questionnaires under the guise that the experimenter wanted to gather normative data on the attitudes of undergraduates at the University of Iowa. Among the items embedded in an opinion survey was the following pretest measure: "Electric shock should be used more frequently in the Psychology Department to study psychological phenomena and human behavior" (scored on a 9-point scale where 1 = "strongly disagree" and 9 = "strongly agree"). Subjects believed the surveys were completed anonymously when, in fact, numeric coding was used to allow follow-up measurement while also ensuring confidentiality. Finally, subjects were scheduled for individual experimental sessions.

Apparatus

During the experimental session, subjects were seated in a comfortable recliner in a sound-attenuated testing room adjacent to a control room housing the polygraph and audiovisual equipment. Subjects did not see the physiological instrumentation or audiovisual recording equipment until the completion of the experiment.

Adhesive collars were used to attach Beckman Ag/AgCl electrodes to the thenar and hypothenar eminances of the nonpreferred hand. Prior to the attachment of these electrodes, the recording sites on the skin were washed using a nonabrasive soap, and the electrodes were filled with 0.05 *M* NaCl in a Unibase medium, as specified by Fowles, Christie, Edelberg, Grings, Lykken, and Venables (1981). Skin conductance was then measured using a Wheatstone bridge with a 0.5 V applied voltage and was displayed continuously on a Grass Model 7D polygraph.[3]

[2] Nine subjects in the high-choice condition refused to generate arguments favoring the counterattitudinal advocacy (i.e., the increased use of electric shock in psychology experiments): four from the negative-cue condition and five from the positive-cue condition. These subjects were replaced to achieve a final sample size of 60 participating subjects with 15 subjects per cell. Although it is possible that the remaining subjects in the high-choice conditions had more positive attitudes toward electric shock than did the subjects in the low-choice conditions, it is important to note that approximately half the refusers were in the high-choice/positive-cue condition and half in the high-choice/negative-cue condition. Hence, the omission of data from refusers cannot account for differences between these conditions. Furthermore, neither the initial attitudes nor the number of arguments generated differed significantly across conditions. Finally, of the 60 subjects who participated, 45 were female and 15 were male, and the proportion of female subjects in each the four experimental conditions did not differ significantly.

Procedure

Upon arrival for the experimental session, subjects were reminded that the study was designed to investigate physiological responses to various cognitive tasks following changes in visual perception. The physiological recording procedure was reviewed, and subjects were reminded that the study would begin by their wearing prism goggles for a few minutes. Subjects were also told that after the removal of the goggles they would be asked to perform three cognitive tasks: (i) a memory problem (a filler task), (ii) a campus survey (a filler task), and (iii) an argument-listing task. When satisfactory electrode placements were achieved, subjects were moved to a private, attractively furnished testing room and were seated in a comfortable recliner.

Next, the experimenter assisted the subject in putting on the prism goggles and informed the subject that she would return to remove them in approximately 3 min. The experimenter introduced the misattribution cue upon returning to the subject's room. All subjects were told that approximately 15 min was required for their eyes to readjust to normal vision. Subjects in the *positive cue conditions* were told that people typically report that the return of normal vision is frequently accompanied by a feeling of pleasant excitement and that they too might feel this way. Subjects in the *negative cue conditions* were told that people typically report that the return of normal vision is frequently accompanied by a feeling of unpleasant tension and that they too might feel this way. The experimenter then gave the subjects paper and pencil to complete the filler tasks (which required approximately 10 min to complete) and left the room.[4]

Subjects then performed the filler tasks and, afterwards, a 3-min baseline measure of NNSCRs was obtained. The experimenter then introduced the final task, which involved subjects generating and listing arguments on a particular side of an issue. The experimental instructions, which were audiotaped and were presented through speakers located approximately 1 m behind the recliner, were as follows:

> To assist the Committee on Research Procedures in the psychology department, we have agreed to collect information on a number of issues. One issue presently being investigated is the possibility that painful but not physiologically damaging electric shock be used more frequently as a tool for investigating behavior in psychological studies which are being conducted this semester and next. These experiments typically use introductory and general psychology students as participants. The committee will make a recommendation to the departmental administration soon regarding an immediate change of procedures.

Subjects in the *high choice conditions* then heard the following:

> The committee has asked us to gather arguments on both sides of the issue in order to make the best possible decision. In the past it has been shown that a good way to do this is to ask people to list arguments on only one side of the

[3] Electrodermal data from two subjects were lost due to technical problems. In addition, electrodes for the measurement of facial electromyographic activity were also attached, but difficulties associated with the programming of the laboratory computers resulted in a loss of EMG data for 21 subjects. The results of the EMG measures can be found in Losch (1988) but are not reported here.

[4] Details regarding these filler tasks are available from the first author.

issue. The committee has finished gathering arguments against the use of electric shock and is now ready to gather arguments in favor of the proposal. It is important that you understand that your participation is completely voluntary, but the committee does need strong, forceful arguments in support of using electric shock in human experiments presently being conducted in the psychology department. Please decide whether or not you wish to participate. In a moment, you will see information on the screen pertaining to your decision.

Ten seconds later these subjects saw the following message appear on their screen:

I understand that I will receive credit regardless of whether or not I actually decide to participate in this task. In addition, I understand that I may leave at any time, if I so desire. [Press "1" if you wish to participate in this task. Press "0" if you do not wish to participate in this task.]

Subjects in the *low choice conditions* instead heard the following:

The committee has asked us to gather arguments on both sides of the issue in order to make the best possible decision. In the past it has been shown that a good way of doing this is to instruct people, no matter how they feel personally, to list arguments on only one side of the issue. Therefore, you have been randomly assigned to write strong, forceful arguments in support of increasing the use of electric shock in psychology department experiments. In a moment, you will see information on the screen pertaining to your task.

Ten seconds later, low-choice subjects saw the following message:

I understand that I have been assigned to list arguments in favor of the proposed issue. [Press "0" to continue.]

All subjects were then given 3 min to think of arguments in support of using electric shock in psychology experiments, and it was during this postdecision period that physiological activity was predicted to differ as a function of Choice (i.e., dissonance arousal). This procedure differs slightly from that employed by Croyle and Cooper (1983) and Elkin and Leippe (1986), who followed their choice manipulations within a 3-min essay-writing period. We separated argument generation from argument listing in the present study because (a) electrodermal responding is sensitive to motor responses (Dawson, Schell, & Filion, in press; Edleberg, 1972), and (b) the public commitment to generate arguments for a counterattitudinal position, not the listing of the arguments per se, should be sufficient to produce differential cognitive dissonance in the low-choice and high-choice groups (Wicklund & Brehm, 1976; Cooper & Fazio, 1984).

Subjects were next given 3 min in which to list their arguments (during which time physiological activity was not recorded due to the prevalence

of movement artifacts), 3 min to relax (a final baseline period during which time physiological activity was again recorded for exploratory analyses regarding the time-course of arousal reduction), and as long as they needed to complete a short dependent variable questionnaire, which was presented without further instruction. The critical item in this questionnaire was the following: "Electric shock should be used more frequently in the Psychology Department to study psychological phenomena and human behavior" (scored on a 9-point scale where 1 = "strongly disagree" and 9 = "strongly agree"). Finally, subjects were asked to record the information they were given regarding the possible effects of the prism goggles. Examination of these protocols indicated all subjects correctly recalled the valence of the possible side effects of their having worn the prism goggles. Subjects were then interviewed about their participation, fully debriefed, thanked, and dismissed.

Data Reduction

Due to the evidence of a monotonic relationship between sympathetic activity and the frequency of nonspecific skin conductance responses (NNSCRs) (e.g., see Dawson et al., in press; Edelberg, 1972; Wallin, 1981) and to the fact that this measure has been used as an indication of physiological arousal in previous dissonance research (e.g., Croyle & Cooper, 1983), NNSCRs were used as an index of sympathetic and dissonance "arousal." An NNSCR of 0.1 μs or greater was considered a response (Croyle & Cooper, 1983; Edelberg, 1972). The skin resistance response (GSR) has occasionally been used instead of NNSCRs in dissonance research, but the GSR is an unsuitable measure because (a) *pre*stimulus levels of eccrine gland activity can influence dramatically the size of the GSR attributed to the experimental stimulus; (b) measures of the GSR vary in a nonlinear fashion with actual changes in underlying physiological activity (e.g., the number of active eccrine glands in a region; the rate of secretion of these glands); and (c) measures of GSR are not typically distributed normally (e.g., Lacey & Siegel, 1949; see Dawson et al., in press; Hassett, 1978; Stern, Ray, & Davis, 1980; Venables & Christie, 1980).

The NNSCRs were summed over 1-min epochs for the periods of interest (i.e., the baseline and the postdecision period), and Minute was treated as a repeated measures factor with three levels in the analyses of NNSCRs reported below. Where appropriate, the degrees of freedom of repeated measures analyses were corrected for violations of sphericity.

RESULTS

Preliminary Analyses

A 2 (Choice) × 2 (Misattribution Cue) ANOVA of subjects' pretest attitudes revealed no significant differences among the groups; ^{M}high-

choice/positive-cue = 2.47, σ = 1.36; ^{M}high-choice/negative-cue = 2.87, σ = 1.68; ^{M}low-choice/positive-cue = 2.07, σ = 1.20; and ^{M}low-choice/negative-cue = 2.00, σ = 1.05. In addition, regression slopes did not differ across the groups. Hence, subjects' postdecision attitudes were analyzed using analysis of covariance (ANCOVA) with the pretest attitude rating serving as the covariate. Given a significant Choice × Cue interaction in this ANCOVA, one-tailed simple main effects tests were planned to determine whether, as the model outlined by Higgins et al. (1979) suggests, attitude change is greater in the high-choice/positive-cue condition than in the remaining conditions.

Postdecision Attitudes

The cell means are summarized in Fig. 1. ANCOVAs revealed both a significant main effect for Choice, $F(1, 55) = 13.15$, $p < .01$, and the predicted Choice × Cue interaction, $F(1, 55) = 3.85$, $p < .05$. The main effect for Misattribution Cue was not significant ($F < 1$). A priori ANOVA contrasts further revealed that subjects in the high-choice/positive-cue condition showed significantly greater attitude change than subjects in the low-choice/positive-cue condition, $F(1, 56) = 19.36$, $p < .01$, and that subjects in the high-choice/negative-cue condition showed significantly greater attitude change than subjects in the low-choice/negative condition, $F(1, 56) = 3.24$, $p < .01$.[5]

Electrodermal Activity

A 2 (Choice) × 2 (Misattribution Cue) × 3 (Minute) repeated measures ANOVA was next performed on the measure of NNSCRs for the 3 min of the baseline period and a second was performed for the 3-min period immediately following the dissonance induction. On the basis of previous

[5] Rather than contrasting the attitude change observed in the high-choice/positive-cue (high dissonance) condition with that observed in the low-choice/positive-cue (low dissonance) condition, one could contrast the attitude change observed in the high-choice/positive-cue condition with that found in the high-choice/negative-cue condition, and conduct a parallel contrast within the low-choice conditions. Indeed, given the comparable refusal rates between the high-choice/positive-cue and high-choice/negative-cue conditions and the differential refusal rate under high- and low-choice conditions (see Footnote 2), these contrasts may provide a clearer test of the experimental hypothesis than the a priori contrasts outlined in the text. Consistent with the hypothesis that dissonance-induced attitude change serves to reduce feelings of unpleasantness, the attitude change observed in the high-choice/positive-cue condition was significantly greater than that observed in the high-choice/negative-cue condition, $F(1, 55) = 3.40$, $p < .04$, whereas no difference in attitude change was found in the low-choice/positive-cue and low-choice/negative-cue conditions. Alternatively, one could calculate a contrast predicting that the postdecisional attitudes of subjects in one cell (the high-choice/positive-cue condition) are different from those of subjects in the three remaining cells, and a second contrast predicting no differences among the remaining three cells. As expected, only the first contrast was significant, $F(1, 56) = 11.49$, $p < .01$.

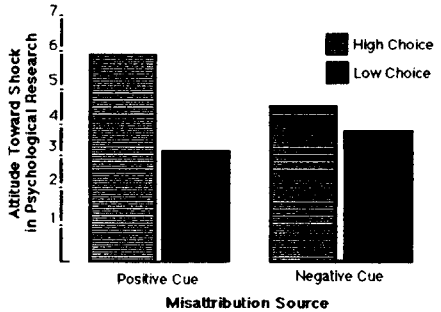

FIG. 1. Adjusted means for the attitude post-test as a function of choice and misattribution cue.

research using the induced compliance paradigm, the NNSCRs was expected to be greater in the high than low choice conditions immediately following the subject's attitude-discrepant decision. No previous investigation has both manipulated the valence of the misattribution cue and measured autonomic activity, but cognitive dissonance theory suggests that dissonance arousal should be equally strong in these high-choice conditions. Hence, the only predicted significant effect in this analysis was the main effect for Choice during the postdecision period. Whether dissonance-induced arousal, as indexed by the NNSCRs, is elevated throughout the 3-min postdecision period or dissipates across this period when subjects have no motor task to perform is unclear from both dissonance theory and prior research. Analyses revealed that (a) the NNSCRs did not differ across groups during the 3-min baseline; and (b) the NNSCRs exhibited by high-choice subjects, relative to low-choice subjects, was greater during the 3-min period immediately following the decision to engage in a counterattitudinal behavior, $F(1, 54) = 7.30$, p

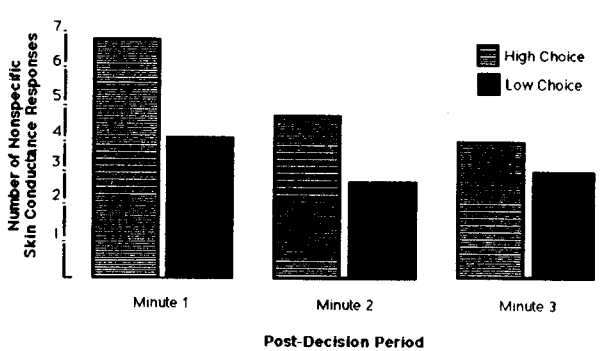

FIG. 2. The frequency of nonspecific skin conductance responses during the postdecision period.

< .01 (see Fig. 2). No other main effect or interaction was significant.[6]

In sum, analyses of EDA activity are consistent with previous findings of increased sympathetic responsivity accompanying dissonance, indicate that dissonance induction was effective, and provide preliminary evidence for the temporal course of dissonance-induced sympathetic activity when subjects are not required to perform motorically immediately following their dissonant decision.

GENERAL DISCUSSION

Recent developments in cognitive dissonance theory have portrayed dissonance as leading to a neutral state of arousal which can be labeled positively or negatively. A major source of evidence for this proposition are studies demonstrating that the subjects in high-choice conditions of an induced compliance paradigm exhibit elevated sympathetic activity (as indexed by electrodermal measures) during the postdecision period, compared to subjects in low-choice conditions. As Higgins et al. (1979) noted, however, elevated sympathetic tonus "may only be a consequence of the unpleasantness produced by cognitive inconsistency, or may simply accompany the unpleasantness, without itself being a factor that stimulates subjects to seek an explanation for their state" (p. 19; see, also, Cooper & Fazio, 1984, p. 257). Consistent with this line of reasoning, we found (1) the frequency of nonspecific skin conductance responses was higher for subjects in the high-choice than low-choice conditions during the post-decision period; (2) subjects in the high-choice/positive-cue condition exhibited greater attitude change than subjects in the low-choice/positive-cue condition; (3) although subjects in the high-choice/negative-cue condition exhibited greater attitude change than subjects in the low-choice/negative-cue condition, the magnitude of this change was significantly smaller than that observed between the

[6] Several exploratory analyses were conducted to further examine the time-course of the differential sympathetic activity observed in the high- and low-dissonance conditions. A significant effect was observed for Choice during the postdecision period at Minute 1, $F(1, 54) = 10.75$, $p < .005$; and at Minute 2, $F(1, 54) = 5.81$, $p < .02$, but not by Minute 3, $F(1, 54) = 1.08$, *n.s.* (see Fig. 2). Comparable minute-by-minute analyses for the baseline period revealed none to be significant. Finally, an exploratory analysis was conducted to assess whether the NNSCRs differed across conditions during the final rest period. No significant difference was found across the 3-min period or at any minute during this final period. Because the dissonance-induced physiological activity dissipated during the period when subjects presumably changed their attitudes, within-cell correlations were calculated between postdecision attitudes and the NNSCRs recorded during the minute immediately following their attitude-discrepant decision. The only correlation to differ significantly was in the high-choice/negative-cue condition, $r = -.65$, $p < .01$. This correlation was high and *negative*, indicating that sympathetic activation within the high-choice/negative-cue condition was associated with *less* attitude change. This result, while tentative, is inconsistent with the notion that attitudes are changed to reduce arousal.

high-choice/positive-cue and the low-choice/positive-cue conditions; and (4) subjects in the high-choice/positive-cue condition exhibited greater attitude change than subjects in the high-choice/negative-cue condition. If individuals in a dissonant state were motivated to bias information processing and to change their attitudes to reduce the arousal that was created by the dissonance, then one would have expected subjects in the high-choice/positive-cue and those in the high-choice/negative-cue conditions to have shown equivalent attitude change, and subjects in both groups to have exhibited greater attitude change than subjects in the low-choice conditions. The present results, therefore, favor the hypothesis that people in a dissonant state change their attitudes to reduce the negative affect rather than arousal.

A case could be made that the prism goggles, like the pill in previous misattribution studies, provide a cue that promotes negative labeling. Hedonic aftereffects emerging 15 min after the removal of the goggles may be a cause for concern, as may *any* aftereffect of noninvasive physiological recording procedure. If negative labels had been primed by these events, then dissonance-induced arousal may be labeled negatively as quickly as it develops. Once labeled negatively, the subject has only negative causes to account for such an effect. If this is the case, then only subjects in the high-choice/positive-cue condition may reject the prism goggles as a possible cause of their negative affect, since they were told explicitly that the goggles would make them feel pleasant rather than unpleasant.

Unlike the experimental "pill," however, the prism goggles were found in pilot testing to be novel and neutral to subjects. In addition, no evidence was found in pilot tests for negative labels or aftereffects being more readily believed than were positive labels or aftereffects—as would have been expected if wearing the prism goggles had primed negative labels. Further, subjects were not led to believe that the goggles were undergoing additional tests or development, but rather that the study concerned temporary physiological and cognitive effects of changes in visual perception.

Could the present results simply reflect the subjects' apprehension about the physiological recording, at least following their decision to write an essay favoring the use of electric shock in psychology experiments? Two lines of evidence argue against this being probable. First, subjects participated in a preliminary session during which time psychophysiological recording principles and procedures were explained to subjects. Among the points emphasized (accurately) were that (i) there is no risk of harm or shock to subjects, and (ii) the level of bioelectrical activity that was of interest is so infinitesimal that subjects would feel nothing as a result of the physiologicl recordings. During the session, subjects were allowed to habituate to the laboratory prior to the intro-

duction of the choice manipulation and were exposed to minimal equipment and visual observation. No subject in pilot testing or during the experiment expressed apprehension about the physiological recordings during the postexperimental interview or debriefing. Hence, efforts to develop a neutral psychophysiological testing environment, like those reported by Elkin and Leippe (1986), appeared successful (cf. Croyle & Cooper, 1983).

Second, Croyle and Cooper (1983) found no differences in attitude change between subjects in the high and low choice conditions even though they found the former subjects exhibited more frequent nonspecific skin conductance responses during the postdecision period. Croyle and Cooper suggested that subjects in their psychophysiological study were apprehensive about the physiological recording equipment and, therefore, misattributed their cognitive dissonance to the recording equipment. This reasoning suggests that if subjects in the high-choice conditions in the present study were apprehensive about the physiological recordings, then they should not have exhibited significant attitude change. That is, if the physiological recordings or attitude topic established a negative context which served as a strong contextual cue for labeling any general arousal as a negative feeling, then subjects in neither high-choice condition should have shown significant attitude change since this cue was present for subjects in both high-choice conditions. In fact, subjects in the two high-choice conditions showed elevated levels of NNSCRs, and subjects in the high-choice positive-cue condition exhibited more positive attitudes toward the advocated position than subjects in the remaining conditions. Perhaps a more parsimonious explanation is that subjects in the high-choice positive-cue condition were unable to find a plausible external source to which to attribute the unpleasant feelings aroused by their perceptions of personal responsibility for a potentially negative consequence. Hence, these subjects may have been left only with the option of attributing their unpleasant feelings to their own actions, and changing their attitudes to eliminate the basis of their aversive state.

In sum, the present experiment replicated and extended previous research on the physiological and phenomenological effects of cognitive dissonance by using physiological measures in a misattribution paradigm. Consistent with prior research, results revealed that the frequency of nonspecific skin conductance responses was higher for subjects in the high-choice than low-choice conditions during the postdecision period. Analyses further indicated that subjects in the high-choice/positive-cue condition exhibited greater attitude change than subjects in the high-choice/negative-cue and low-choice conditions; and that attitude change in the latter three conditions did not differ. Although it is possible that dissonance-induced sympathetic arousal is a necessary component of the motivation to reduce dissonance, the present findings extend prior research in suggesting that people in dissonant states change their attitudes to reduce unpleasantness rather than arousal per se.

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