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THE EFFECTS OF FALSE PHYSIOLOGICAL FEEDBACK AND SUBJECT RELEVANCE UPON BELIEF ACCEPTANCE

KENNETH H. BECK
University of Maryland

CLIVE M. DAVIS
Syracuse University

A conceptual replication and extension of Giesen and Hendrick's (*1974*) *false physiological feedback experiment was performed. Bogus heart rate of different intensities as well as meter feedback indicative of affective types of arousal was presented to smokers and nonsmokers as they viewed an antismoking communication. Consistent with Giesen and Hendrick's intensity hypothesis, intensity feedback facilitated message acceptance while the type of feedback had no effect, but for nonsmokers only. This suggests that false feedback facilitates persuasion only for topics which subjects do not find directly relevant or of personal concern. For smokers, the false feedback appeared to inhibit persuasion, suggesting a resistance effect. The attributional significance of false physiological feedback is discussed.*

The effect of false physiological feedback on attitude change has been tested in several experiments (e.g., Bramel, Bell & Margulis,1965; Harris & Jellison, 1971; Hendrick & Giesen, 1976; Krisher, Darley & Darley, 1973). Generally, it has been found that subjects who are informed that their levels of physiological arousal have increased are more accepting of the message. It is unclear, however, whether this effect is the result of actual physiological arousal, attribution of arousal, or some other effect apart from the emotional significance attached to the false physiological feedback.

False feedback does not consistently correlate with either reported subjective feelings of arousal (Goldstein, Fink, & Mettee, 1972) or actual arousal (Hendrick, Giesen, & Borden, 1975). Furthermore, it is not necessary for the subjects to attribute the feedback to the communication for it to influence attitudes (Giesen & Hendrick, 1974). Additional evidence (Parkinson & Manstead, 1981) indicates that false feedback does not have to reflect autonomic arousal or have to be attributed to one's own reactions in order for it to enhance evaluative responses. All that appears necessary is that subjects attend to it (Stern, Botto, & Herrick, 1972). Thus, the persuasive influence of false physiological feedback may not be due to the fact that it represents information about one's physiological-emotional responses, but rather because it is a salient form of external stimuli which enhances attention to the message that is being presented.

Recent theories (e.g., Leventhal, 1970; Leventhal, Meyer, & Gutman,1980; Rogers, 1975, 1982) have attempted to explain subjective interpretation of emotionally arousing stimuli by dissociating cognitive from emotional labeling of situation cues. The weight of the experimental evidence (e.g., Beck & Lund, 1981; Leventhal, Singer, & Jones, 1965; Jones, 1965; Rogers & Mewborn, 1975) supports the predominance of cognitive factors over emotional labeling in determining message acceptance.

In line with this, Giesen and Hendrick (1974) suggested that false physiological feedback is treated as a direct indication of attitude, with stronger feedback indicating greater message acceptance than weaker forms. These authors used meter feedback to manipulate different degrees (high and low) as well as types (positive and negative) of arousal in response to a persuasive communication. Their results revealed that, regardless of the type of false feedback, subjects were persuaded more under conditions of high arousal feedback than low arousal feedback. They conclude that the type of feedback is unimportant; all that is necessary is that the feedback be sufficiently intense. This is consistent with Bem's (1972) self-perception theory which stresses the importance of salient external information about one's reactions.

A final consideration deals with the subject's susceptibility to the external feedback as a cue for persuasiveness. Goldstein et al. (1972) found that false physiological feedback was most effective at influencing attributions under relatively nonemotional situations, whereas for stronger emotional stimuli, the feedback became ineffective. This suggests that false physiological feedback will be effective at providing persuasion cues for communications which deal with topics for which the subject does not have a strong opinion. In the studies by Hendrick and his colleagues, the topic was the use of pesticides. Giesen and Hendrick (1974) report that the mean interest level in this topic ranged from 4.4 to 4.96 on an 11-point scale, making it likely that their persuasive false feedback effects were due to their use of a relatively unimportant topic of low interest to their subjects. Therefore, these subjects may have been more inclined to rely upon the false physiological feedback, in order to evaluate their attitudes toward the topic, than if they had been exposed to a communication of greater concern and interest.

The purpose of this investigation was to perform a conceptual replication and extension of Giesen and Hendrick's (1974) experiment and to determine if the false feedback intensity effect generalizes to different forms of feedback, across different subject groups. This investigation employed two different forms of feedback, heart rate to manipulate different intensities of feedback, and meter to manipulate the type of feedback. Since the topic of the message was the effects of smoking, smokers as well as nonsmokers were used in order to evaluate the effect of subject relevance upon persuasive susceptibility of false feedback. A previous investigation (Beck, 1979) detailed the influence of these forms of false feedback upon actual physiological arousal and subjective arousal. A subsequent investigation (Beck & Davis, 1980) examined the influence of this subjective arousal upon various indices of persuasion in a correlational fashion. The current investigation examines the relationship between these different forms of feedback and message acceptance, regardless of their subjective arousal effects. The experimental design for this investigation employed different intensities of false heart rate feedback (low, moderate, high, and control) with different types of meter feedback (positive, negative, and control) presented to smokers and nonsmokers in a 4 X 3 X 2 between subjects design. A belief scale was used to determine message acceptance.

METHOD

OVERVIEW

The subjects were told that the experimenter was interested in college students' emotional reactions to a persuasive communication concerning the effects of cigarette smoking, and therefore their actual physiologically based, emotional responses would be measured by a polygraph. The subjects were also informed that they would be able to monitor their own physiological reactions. The persuasive communication advocated an antismoking position and was about five minutes in length. It was composed of a series of photographic slides which contained a variety of belief statements linking cigarette smoking to adverse consequences such as cancer, impaired lung cells, and death, as well as a series of belief statements linking the avoidance of smoking with various positive consequences such as greater longevity and increased

physical health. Interspersed among these statements were picture slides illustrating the various points in the preceding belief statement slide(s). The participants were instructed to read these slides and then monitor their reactions, depending upon experimental condition, through a set of headphones for their heart rate or by a meter which indicated change in their G.S.R.

Subjects were randomly assigned to one of 12 different experimental conditions created by the false physiological feedback. Meter readings were used to manipulate false feedback of different types of arousal (positive, negative, and control). Participants who received meter feedback in conjunction with the persuasive communication were instructed to watch a specially modified voltmeter in which the needle moved in either the "pleasant" or "unpleasant" side of its face. Participants in the positive feedback condition received meter readings in the "pleasant" side of the meter, while those in the negative conditions received readings in the "unpleasant" side. Participants in the control condition did not receive any meter feedback. Bogus heart rate sounds were used to manipulate false feedback of different intensities of arousal (low, moderate, high, and control) - The bogus heart rate feedback ranged from 66 BPM, in the low intensity condition, to as high as 140 BPM in the high intensity condition. The participants in the control condition did not hear any bogus heart rate. The participants monitored their bogus heart rate feedback through a set of headphones, while watching slides. Thus, subjects were either provided or not provided with a set of headphones and/or a meter, depending upon their experimental condition, through which to monitor the false physiological feedback.

Two hundred and forty college undergraduates (120 smokers and 120 nonsmokers) were selected from a poo1 of subjects who were pretested to determine if they were smokers or nonsmokers and were randomly assigned to the various false physiological feedback conditions. Subjects were classified as either a smoker or nonsmoker on the basis of self-report. After exposure to the persuasive communication, with accompanying feedback, the experimenter administered a postexperimental questionnaire. Seven participants expressed suspicions about the validity of the false physiological feedback and their data were not included in any of the data analyses.

APPARATUS

The basic equipment in this experiment, from the participant's perspective, consisted of a slide projector, a table upon which rested a voltmeter, a set of EKG electrodes and wires (attached to the participant's left and right arms), and a pair of headphones (worn by the participant).

A stereo taperecorder was in an adjacent portion of the room (behind a set of bookshelves) unseen by the participant. One track of the stereo tape had on it one of three versions, one for each experimental intensity feedback condition, of a pre-recorded sound resembling a heart beat. These different versions of the bogus heart beats differed only according to the rate or frequency of beats per minute. The bogus heart rate for the low intensity feedback condition started out at 66 BPM and increased, by between 2 and 4 BPM until its maximum of 80 BPM. The same pattern of increases and decreases were recorded for the moderate intensity feedback condition except that the bogus heart rate reached a maximum of 114 BPM. The high intensity feedback condition started out at 75 BPM and reached a maximum of 140 BPM and it also followed the same increase-decrease pattern as the other two arousal conditions. Participants in the control intensity feedback condition did not hear any false heart rate feedback

The other track of the stereo tape had on it the prerecorded meter feedback, in the form of variations in amplitude of a 50 hz tone. These amplitude variations were produced by an audio oscillator with a 20 dB attenuation. A 100 and 1000 M.F.D. capacitors were connected in parallel across the input bridge of the voltmeter. These amplitude variations were coordinated with the bogus heart rate sounds such that increases in heart rate frequency corresponded with increased meter readings toward the "appropriate" part of the meter scale.

The face of the meter was divided into six equal wedge-shaped pieces differing in color. The center two pieces, just left and right of the center line, were light green in color and were labeled "low". The next two pieces, adjacent to and on opposite sides of the centermost pieces, were yellow in color and were labeled "moderate". The last two pieces, on opposite sides and farthest from the center line, were adjacent to the yellow pieces and were labeled "high". They were red in color. Meter readings fluctuated such that the needle started at the center line and moved either left or right depending upon the particular type of feedback condition and the degree of movement depended upon the intensity of feedback condition. In addition to the pie-shaped pieces, the label "unpleasant" was at the extreme left of the meter, while "pleasant" was located at the extreme right of the meter. These meter readings were synchronized with the bogus heart rate feedback and the photographic slides.

The choice of having the meter feedback coordinated with the heart rate feedback (increases in false heart rate were synchronized with readings in the more extreme parts of the meter) was deliberate since it was felt that this would be a more plausible reaction to the subject than high intensity heart rate feedback with no change in the meter's direction. The alternate procedure would have been to present just the meter feedback alone. However, since the participant was required to view the slides as well as the meter, it was not certain that the participant would be able to discern the specific portion ("low", "moderate", and "high") of the meter within which the needle was located. Therefore, it was deemed appropriate to include the false heart rate, via headphones, as an intensity manipulation which would not interfere with the participant's viewing of the persuasive communication. Pilot testing of this procedure revealed that most subjects could perceive the type of meter feedback but not the specific intensity.

In addition, the meter feedback was not constant within experimental condition, throughout the slide sequence. That is, within any condition, the meter feedback fluctuated in a realistic manner in accordance with the type of slide being rejected. If the slide depicted a negative consequence of smoking (e.g., cancer or death) the needle moved toward the "unpleasant" position of the meter. If the slide depicted a positive consequence of not smoking, the needle moved toward the "pleasant" side of the meter. However, within each experimental condition, the majority of readings were in the designated portion of the meter. Likewise, the heart rate feedback did not remain constant and fluctuated with the type of slides, showing greater increases for slides depicting negative consequences in the negative type of feedback conditions and greater increases for positive slides in the positive type of feedback conditions. However, for each intensity condition, the heart rate stayed within the ranges described above.

Participants who received meter feedback without any heart rate feedback (control intensity group) received readings in either the "unpleasant" or "pleasant" portions of the meter. However, in order to control for the intensity of these feedback readings, these participants were subdivided equally into three separate groups which received the exact pattern of readings for each of the low, moderate, and high intensity conditions. This was done to equalize the effect of these different kinds of meter readings within each type of feedback condition. These subgroups were combined for statistical analysis.

PROCEDURE

The experimental participants were tested individually, and seated in front of a table. The experimenter informed them that he had prerecorded a complete description of the experiment on audio tape and would like to play the tape for them now, and, when it ended, answer any questions that they might have. The experimenter then played the recording which gave specific instructions and a description of the experiment to the participant. In the instructions, the participant was told that the experimenter was interested in college students' emotional reactions to a series of slides that might eventually be used to convince people to stop smoking. This, therefore, necessitated measuring the participants' various emotional responses by a polygraph and required

that they be connected to the EKG electrodes and the wires found on the table. Participants were informed that they would be able to hear their actual heart rate through the headphones provided and view their own responses with the meter. Participants in the experimental conditions where they received meter only or heart rate only feedback were told they would be able to monitor just these responses (heart rate or meter). Participants who would receive no feedback were not told that they would receive any feedback concerning their emotional responses. The instructions stressed to the participant that the recording equipment was an extremely accurate, objective and an immediate measure of their physiological pleasantness (unpleasantness) arousal. A distinction was drawn between "objective" and "subjective" arousal, using the instructions of Giesen and Hendrick (1974), in order to minimize any suspicions that may have been caused by a discrepancy between the false feedback and the participant's true feelings. It was explained to the participant that the polygraph measures "objective" physiologically based arousal, and they would be monitoring these responses, but it is possible that their own, "subjective", feelings differ to some extent. Thus, it was stressed that there may be some difference, at various times, between the "objective" arousal provided by the feedback and their "subjective" or felt arousal.

After the instructions ended, the experimenter answered any procedural questions and connected the participant to the EKG electrodes. If the participants were to receive meter feedback, the experimenter told them to read or watch the slide, first, as it was projected on the wall in front, then glance down at the meter in order to view their reaction to it. This way, watching the meter and reading the slide would tend not to interfere with one another. The experimenter then left the room where the participant was seated and entered the adjacent portion of the room where the stereo taperecorder and EKG machine were located. After a two-minute waiting period, the slide sequence, with appropriate feedback, depending upon experimental condition, commenced. At the end of the slide sequence, the experimenter entered and administered a post-experimental questionnaire. The participants were encouraged to provide answers which reflected their true feelings and not what they thought the experimenter wanted.

Upon completion, they were asked if they had any suspicions about the experiment. Seven participants reported doubts about the validity of the false physiological feedback. Any further questions were answered and the participant was dismissed. To safeguard the nature of this experiment, all participants were fully debriefed by mail after completion of the experiment.

BELIEF ACCEPTANCE

A measure of acceptance of the belief statements contained in the persuasive communication was obtained by 10 items which contained belief statements from the communication (e.g., "smoking causes cancer") and each was followed by a 5-point response option ranging from "*very true*" to "*very untrue*". The alpha reliability coefficient for the 10 items was 0.71.

RESULTS

The analysis of the belief scores (see Table 1) revealed a significant three-way interaction, $F(6, 209) = 2.23$, $p < 0.05$. A series of exploratory and post hoc (Fisher's L.S.D. test) analyses were performed to describe this interaction. These results indicated that for the nonsmokers, when no meter feedback was provided, any form of false heart rate feedback facilitated belief acceptance, $F(3, 35) = 5.08$, $p < 0.01$. For the smokers, when no false heart rate feedback was provided the unpleasant meter feedback decreased belief acceptance, $F(2, 27) = 4.71$, $p < 0.05$. When neither form of false feedback was provided, the smokers ($m = 44.30$) were more accepting of the message than were the nonsmokers ($m = 38.80$), $F(1, 18) = 9.14$, $p < 0.01$. However, this difference was reversed when moderate and high heart rate feedback was provided,

TABLE 1:. MEANS AND STANDARD DEVIATIONS OF THE BELIEF ACCEPTANCE SCORES

Heart Feedback	Control	Meter Feedback: Pleasant	Unpleasant	Rate
Nonsmokers	Control	38.80_{b}	42.20	41.70
		(3.99)	(3.35)	(2.35)
	Low	42.45_{a}	43.12	43.50
		(3.53)	(3.55)	(3.56)
	Moderate	4300_{a}^{1}	40.10	41.67
		(2.10)	(2.73)	(3.90)
	High	44.10_{a}^{1}	42.30	44.78
		(2.96)	(5.39)	(1.56)
Smokers	Control	44.30_{a}	44.20_{a}	39.30_{b}
		(4.13)	(2.52)	(5.33)
	Low	39.70	41.30	43.10
		(5.33)	(3.88)	(2.51)
	Moderate	3945^{2}	40.12	40.20
		(4.79)	(4.72)	(5.97)
	High	40.33^{2}	42.63	41.00
		(4.71)	(2.61)	(3.97)

Note: Higher scores reflect greater belief acceptance. Cell sizes ranged from 8 to 11. Within any row or column, means with different superscripts or letters differed significantly at $p < 0.05$.

$F(1, 17) = 4.54$, $p < 0.01$ and $F(1, 18) = 4.56$, $p < 0.01$, respectively. Thus, consistent with Giesen and Hendrick (1974), the intensity of false feedback was more influential than the type of feedback, but for nonsmokers only.

DISCUSSION

As predicted, the intensity (heart rate) feedback was more effective at increasing belief acceptance than was the type (meter) of feedback especially for those who are relatively unconcerned about the topic, or at least not directly involved with it. However, the critical distinction appears to be between any intensity feedback and none at all. Others (e.g., Goldstein et al., 1972) have demonstrated attributional differences between variable heart rate and constant heart feedback conditions, so it appears that it is not the bogus heart rate *per se*, but the change, or increase, which causes the intensity-persuasion effect. Consistent with Bem's (1972) self-perception model, change in feedback suggests to the subjects that they *are* reacting to what is being presented to them. Oliver (1978) explored the extent to which subjects attribute changes in feedback to their own reactions or to an unattached extraneous source. His results did not support Stern et al., (1972), in that attention alone did not affect evaluative ratings: the subjects had to believe that the feedback reflected their own reactions to the presented stimuli.

There was a nonsignificant trend for the smokers which indicates that the heart rate feedback decreased acceptance, under conditions when no meter feedback was provided, while the unpleasant meter feedback alone significantly decreased it. This suggests that the smokers may have been receptive to the information contained in the communication, but active attempts to influence their reaction to this information are met with resistance. For example, the unpleasant meter feedback may have caused the smokers to associate this reaction to their previously negative experiences with attempts to influence their smoking attitudes and behaviors. Undoubtedly they had heard these persuasive attacks before and responded negatively to them (or else they would have quit). The result is that the unpleasant feedback caused them to reject the

message. The pleasant feedback alone presented them with no relevant cues to reject the message, but it did not facilitate its acceptance either.

The results of this investigation extend the findings of Giesen and Hendrick (1974) and reveal that intensity feedback is effective at facilitating message acceptance, but only for subjects likely to find the topic of the communication of less relevance than those who are more directly concerned with the subject matter. This intensity by subject relevance effect suggests that any form of salient external information about one's reactions to a novel or unfamiliar communication will facilitate persuasion. Presumably this effect could generalize to other forms of external information such as the verbal opinions of others about how the subject is reacting, or even statements contained within the communication itself. Hendrick and Giesen (1976) showed that false feedback need not indicate physiological arousal, but could affect persuasion directly by indicating whether the subject believed or disbelieved the message. Thus, the persuasive significance of false physiological feedback appears devoid of any specific emotional context and possesses, an, as yet, undefined cognitive context. Future efforts are needed to define the precise nature of the cognitive representation of false feedback in order to specify more clearly the intervening relationship between these forms of stimuli and persuasive response.

REFERENCES

Beck, K. H. (1979). The effects of positive and negative arousal upon attitudes, belief acceptance, behavioral intention, and behavior. *Journal of Social Psychology,* **107**: 239-51.

Beck, K. H., Davis, C. M. (1980). Predicting smoking intentions and behaviors from attitudes, normative beliefs, and emotional arousal. *Social Behavior and Personality,* **8**(2): 185-92.

Beck, K. H., Lund, A. K. (1981). The effects of health threat seriousness and personal efficacy upon intentions and behavior. *Journal of Applied Social Psychology,* (1981, 11(5): in press.

Bem, D. J. (1972). Self-perception theory. In L. Berkowitz (Ed.), *Advances in Experimental Social Psychology* Vol. 2. Academic Press, New York.

Bramel, D., Bell, J. E., Margulis, S. T. (1965). Attributing danger as a means of explaining one's fear. *Journal of Experimental Social Psychology,* **1**: 267-81.

Giesen, M., Hendrick, C. (1974). Effects of false positive and negative arousal feedback on persuasion. *Journal of Personality and Social Psychology* **30**:449-57.

Goldstein, D., Fink, D., Mettee, D. R. (1972). Cognition of arousal and actual arousal as determinants of emotion. *Journal of Personality and Social Psychology,* **21**: 41-51.

Harris, V. A., Jellison, J. M. (1971). Fear-arousing communications, false physiological feedback, and acceptance of recommendations. *Journal of Experimental Social Psychology,* **7**: 269-79.

Hendrick, C., Giesen, M. (1976). Self attribution of attitude as a function of belief feedback. *Memory and Cognition,* **4**(2): 150-5.

Hendrick, C., Giesen, M., Borden, R. (1975). False physiological feedback and persuasion: Effect of fear arousal vs. fear reduction. *Journal of Personality,* **43**: 196-214.

Krisher, H. P. III, Darley, S. A., Darley, J. M. (1973). Fear-provoking recommendations, intentions to take preventive actions, and actual preventive actions. *Journal of Personality and Social Psychology,* **26**: 301-8.

Leventhal, H. (1970). Findings and theory in the study of fear communications. In L. Berkowitz (Ed.), *Advances in Experimental Social Psychology,* Vol. 5. Academic Press, New York.

Leventhal, H., Meyer, P., Gutmann, M. (1980). The role of theory in the study of compliance to high blood pressure regions. In R. B. Haynes et al. (Eds.), Patient compliance to prescribed anti-hypertensive medication regimens. *U.S. Department of HHS* (*PHS) NIH Publication No. 81-2102*. U.S. Government Printing Office, Washington, D.C.

Leventhal, H., Singer, R. P., Jones, S. (1965). Effects of fear and specificity of recommendations upon attitudes and behavior. *Journal of Personality and Social Psychology*, **2**: 20-9.

Oliver, E. (1978). Attention and causal attributions to false heart rate feedback. *Representative Research in Social Psychology*, **9**: 2-13.

Parkinson, B., Manstead, A. R. S. (1981). An examination of the roles played by meaning of feedback and attention to feedback in the "Valins Effect". *Journal of Personality and Social Psychology*, **40**: 239-45.

Rogers, R. W. (1975). A protection motivation theory of fear appeals and attitude change. *Journal of Psychology*, **91**: 93-114.

Rogers, R. W. (1982). Cognitive and physiological processes in fear appeals and attitude change: A revised theory of protection institution. *In* J. Cacioppo and R. Petty (Eds.), *Social Psychophysiology.* Guilford Press, New York.

Rogers, R. W., Mewborn, C. R. (1976). Fear appeals and attitude change: Effects of a threats noxiousness, probability of occurrence, and the efficacy of coping responses. *Journal of Personality and Social Psychology*, **34**: 54-61.

Stern, R. M., Botto, R. W., Herrick, C. D. (1972). Behavioral and physiological effects of false heart rate feedback: A replication and extension. *Psychophysiology*, **9**: 21-9.

KENNETH H. BECK
Safety Education Center,
Department of Health Education,
University of Maryland,
College Park, MW 20742,
USA.

Reprints of this paper are available from Kenneth H. Beck.