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CONDITIONING OF POSITIVE AND NEGATIVE ATTITUDES

THE CLASSICAL CONDITIONING OF POSITIVE AND NEGATIVE ATTITUDE CHANGE

by

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A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfilment of the requirements for the degree of Doctor of Philosophy.

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Montreal.

October, 1971

Ph.D. PSYCHOLOGY

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A series of studies was presented on the classical conditioning of positive and negative attitudes towards slide photographs of human faces. It was demonstrated that slides which preceded aversive electric shock were subsequently rated unfavourably by subjects while those which predicted a period free of shock were later rated more favourably. Evidence obtained after 15 and 30 days indicated that the experimentally-induced attitudes persisted over time. The negative ratings, in particular, were only slightly reduced in magnitude after 30 days. The present paradigm for the induction of positive attitude change was contrasted with that of aversion relief (cessation conditioning).

Based on the outcome of a control experiment it was inferred that experimental demand characteristics had little effect upon the results in most, if not all of the present studies.

ACKNOWLEDGEMENTS

I would like to thank Dr. E.G. Poser for his many constructive suggestions throughout all phases of this research including, in particular, the preparation of the manuscript.

I am also much indebted to Dr. A. Bregman for valuable discussions and suggestions concerning the design of several studies and for critical reading of the final draft. Dr. J. Macnamara's encouragement and critical reading of the manuscript is gratefully acknowledged.

Two of my colleagues in the Department of Psychology at Sir George Williams University, Dr. D. Gold and Dr. J. Stewart were kind enough to criticize the manuscript. I am especially grateful to Dr. J. Stewart for extensive suggestions which added markedly to whatever clarity in thought and style this thesis may possess.

Appreciation is expressed for the co-operation of Nursing Education at Douglas Hospital, Verdun where this research was conducted and, as well, for the co-operation of the nursing students who served as subjects for minimal recompense.

I would like to convey affectionate thanks to Rosanne for her peaceful and loving presence during the writing of the dissertation.

This research was supported by a grant (MA-2746) from the Medical Research Council of Canada to Dr. E.G. Poser.

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INTRODUCTION

The diverse approaches to the problem of attitude change may be summarized in terms of three general strategies (Bandura, 1969). The information or belief-oriented approach exposes subjects to persuasive communications. The purpose is to alter their beliefs and thereby produce a change in attitude towards some target issue or object. A second approach seeks to produce attitude change by having subjects enact behavior that is inconsistent with some attitude they hold. This procedure is based on a cognitive consistency model which suggests that subjects tend to modify their attitudes in the direction of consistency with the behavior they have performed. A third strategy for inducing attitude change attempts to alter emotional or affective associations in experimental subjects towards specified objects. The procedure involves the presentation of some object (the target of the attitude change) paired with an emotion-provoking stimulus usually in a classical conditioning paradigm. This approach has received the least attention of the three, although interest in it is growing. The studies to be reported in this dissertation were concerned with exploring the effectiveness of affect conditioning in changing attitudes.

Definition of Attitude

Greenwald (Greenwald, Brock & Ostrom, 1968) has pointed out that most current definitions of attitude divide the term into three components--cognitions (beliefs, opinions), behavioral tendencies and affects or emotions. An example definition, that of Krech, Crutchfield and Ballachey (1962), states "...attitudes (are) enduring systems of positive or negative evaluations, emotional feelings, and pro or con action tendencies with respect to social objects."

Kiesler, Collins and Miller (1969) have noted that regardless of how they define attitude, investigators in actual practice rely mainly on pencil and paper measures of attitude. Only occasionally are actual behavioral and physiological changes measured. These authors, in fact, state that all the major theories of attitude change are founded on the empirical data of pencil and paper tests.

Although data from animal research would not ordinarily be considered relevant to a discussion of "attitude," a conditioning approach to attitude change can profitably draw on the animal literature on conditioning. Of particular interest is the work on conditioning of affective responses by the use of aversive stimuli. In the review of studies which follows, several such animal experiments will be discussed in addition to relevant human experimentation in the area of attitude change.

Early Work on Attitude Conditioning

A demonstration of attitude change by means of affect conditioning was conducted by Watson and Rayner (1920). Their experimental subject, a nine-month-old child, was first exposed to a variety of animals and objects to test for emotional reactions. Noting no overt fear responses to these objects they, then, selected a white rat from among these "neutral" stimuli to be the object of the emotional conditioning. A conditioned fear response towards the rat was brought about by pairing it with the emotion arousing or frightening sound of a hammer striking a metal bar. The training required seven trials in all, conducted over two sessions. Tests conducted five days later revealed that the child still showed marked avoidance of the rat and also that his fear had generalized to other similar animals and objects which were previously neutral. It is of interest that Bregman (1934) was unable to replicate these results using stimuli like blocks of wood and curtain material. This suggests that fear and avoidance can be more readily attached to some stimuli than to others.

Contemporary Work on Attitude Conditioning

Lott and Lott (1968) have reported a series of studies on the induction of interpersonal attraction using a learning theory approach. The basic proposition which they tested states that a person who is consistently rewarded in the presence of another will develop a positive attitude towards that other person. In one study, (Lott & Lott, 1960) children were used and success at a game (controlled by the experimenter) was the reward. The results showed that on a sociometric test children who won subsequently chose members of their own play group significantly more often than children who did not win. Play groups were composed of children who had not selected each other on sociometric tests administered prior to the experiment. A similar study (James & Lott, 1964) examined the effect of reward frequency on sociometric choice and ranking of classmates. Compared to children in low frequency reward conditions, significantly more children in the high frequency group chose fellow group members and ranked them more highly than other classmates.

Early (1968) carried out a study on fourth and fifth grade children in which she attempted to induce favourable attitudes towards social isolates. Her conditioning procedure was based on that of Staats and Staats (1958) whose study will be reviewed in detail below. In Early's experiment, isolates' first names served as CSs. UCS words were obtained from a list which was pretested on the subjects and shown to have high evaluative ratings (Osgood & Suci, 1955). Early's subjects were individually exposed to pairs of names and words in a classical conditioning paradigm; the names of experimental isolates were systematically associated with very favourable words (kind, playful) while control isolates' names were associated with neutral words (chair, if). The subjects were told that they were participating in a study on memory. Early was able to show that after conditioning, experimental isolates as compared to control isolates were involved in significantly more social interaction with classmates relative to a pre-experimental baseline. Furthermore, this increased interaction remained evident one week after conditioning. However, the ratings of experimental isolates by peers on sociograms were unchanged at the end of the experiment compared to pre-experimental ratings.

Staats and Staats experimentally induced positive and negative evaluative meaning to nonsense syllables (Staats & Staats, 1957; Staats, Staats, Heard & Nims, 1959), nationalities and male first names (Staats & Staats, 1958). The general procedure followed in these experiments will be described in some detail because it is basic to several additional studies to be reviewed. Stimuli were paired, in a classical conditioning paradigm, with different words having in common a high loading on either positive or negative evaluative meaning (Osgood & Suci, 1955). CS words (e.g., names, nonsense syllables) were presented randomly on a screen following which the investigator pronounced aloud a UCS word (of high positive or negative evaluative meaning depending on the experimental condition to which the CS word was assigned). Subjects repeated aloud the words presented orally by the experimenter in accordance with instructions. The subjects were led to believe that the experiment was concerned with word learning under conditions of simultaneous visual and oral presentation and they were tested for recall of the word lists at the end of the session. The actual experimental data were generated by a single, seven-point semantic differential scale (Osgood, Suci & Tannenbaum, 1957). Subjects filled out the scale for each CS word including several control words which were paired in the experiment with words chosen for their neutrality on the evaluative dimension. A final aspect of the test procedure involved having subjects record their thoughts about the experiment, particularly their ideas about its purpose. Those subjects who indicated an awareness of the pattern in the CS-UCS pairings based on their reply to the inquiry were rejected from the analysis. The interpretation of the results offered by Staats and Staats is that the Cs words acquired the evaluative meaning of the UCS words with which they were paired by a process of classical conditioning in the absence of subject awareness. In addition, Staats and Staats (1959) have shown that the number of learning trials affects the strength of conditioning.

The Staats paradigm and the awareness issue. Subsequent to the original Staats and Staats (1957) experiment, several studies using their paradigm were conducted all of which produced results indicating that awareness played a role in obtaining the conditioned effect. For example, Cohen (1964) repeated Staats and Staats' (1957) procedure in which evaluative words served as UCS. In assessing awareness he modified their method slightly. He rejected any subject rated by at least one of three judges to be aware of the CS-UCS contingency; judgments were based on subject's written response to the request "Would you write down anything you thought about the experiment, especially anything you thought about the purpose of the experiment."

Staats and Staats' original awareness probe included the final phrase "while you were participating in the experiment" (Staats, 1969). Cohen found that most of his subjects were aware of the CS-UCS contingency by his criterion and that awareness was significantly correlated with attitude change. Furthermore, when the data from the remaining unaware subjects were analyzed, no significant attitude conditioning effect was found.

Insko and Oakes (1966), as well, have examined the awareness variable in Staats and Staats' (1957) conditioning procedure. They make a useful distinction between two kinds of awareness which they label awareness of the reinforcement contingency and awareness of the demand characteristics of the experiment (Orne, 1962). Demand awareness refers to the degree to which a subject recognizes, from participation in the experiment, what the experimenter expects him to do or say. Insko and Oakes were interested in two questions related to awareness. Was awareness of the reinforcement contingency necessary for conditioning to occur? Secondly, was the conditioning, using this paradigm, an artifact of the demand characteristics of the experiment? Included in their experimental treatments were a distracting intertrial activity, colour naming, and manipulation of the percentage of reinforcement and the number of extinction trials. Contingency awareness and demand awareness were evaluated by a questionnaire arranged in ascending order of explicitness. Rules for assigning differential numerical scores to the answers were based on the principle that a correct response to a general question indicated greater awareness than one in response to a more explicit question. Several of the findings of this rather complex design are of interest. Insko and Oakes, like Cohen (1964), found significant correlations between awareness and attitude conditioning. Correlations between contingency awareness and attitude were significant both in the presence and absence of a distracting colour naming task ($r = .46$ and $r = .61$ respectively). Demand awareness, on the other hand, correlated significantly with attitude ($r = .29$) only in the absence of colour naming. The distracting intertrial activity of colour naming significantly reduced both types of awareness as well as attitude conditioning. Another important finding was that subjects who were unaware of the reinforcement contingency showed no significant attitude conditioning effect whereas subjects who were unaware of the demand characteristics did show a conditioning effect. Finally, Insko and Oakes reported no extinction of conditioned evaluative responses following either partial or continuous reinforcement over thirty trials. Their data suggest that an awareness of the CS-UCS contingency is necessary for conditioning to occur. Activities which reduce that awareness produce a concomitant decline in conditioning. As for awareness of demand aspects of the experiment, Insko and Oakes' results indicate that this variable is significantly but weakly correlated with attitude conditioning and is not a necessary condition for its demonstration.

Yet another study (Page, 1969) has been done using the Staats and Staats (1957) paradigm. Like Insko and Oakes (1966), Page was interested in the role of contingency and demand awareness in producing attitude change. Comparisons between the results of these two studies may be made if it is remembered that each employed different awareness questionnaires. It will be recalled that Insko and Oakes (1966) following Orne (1962), employed an awareness assessment which moved from general to particular questions. Awareness was conceptualized as a continuous variable. Higher awareness scores were assigned to subjects who gave correct answers to vague questions than to subjects who answered correctly more pointed questions. In contrast, Page (1969) regarded awareness as a dichotomous variable and constructed a questionnaire and scoring procedure on this assumption. Page (1969) argued "A subject either knows it or he doesn't. Also, subjects aren't likely to tell about such things as demand awareness unless specifically and carefully asked (p. 181)." It is likely that Page's questions were more direct than those of Insko and Oakes, raising the possibility that his instrument created the awareness which it was seeking to assess. There is no way at present to resolve the issue of which style of awareness inquiry is more valid. However, the differences between Page's and Insko and Oakes' procedures should be kept in mind when the results are examined. Page, like others, found a strong attitude conditioning effect. Dichotomizing his dependent variables he computed phi coefficients to measure strength of association between them. He found that both contingency and demand awareness were strongly associated with each other and with conditioned attitude ratings; there was a slight tendency for demand awareness to be more closely associated with conditioning than was contingency awareness. By dividing his subjects according to the results of the awareness questionnaire, Page also found that demand awareness was necessary to the demonstration of attitude conditioning whereas contingency awareness was not. These findings are opposite to the results of Insko and

Oakes (1966).

In summary, the foregoing studies have all replicated Staats and Staats' attitude change effect. They have, as well, unequivocally established that contingency awareness is significantly correlated with attitude change. It is interesting to note that this latter finding is consistent with results of autonomic conditioning studies (Fuhrer & Baer, 1965; Dawson & Grings, 1968) which have also shown that recognition of the CS-UCS contingency is essential for conditioning to occur. The findings concerning the relation between demand awareness and attitude conditioning do not permit any firm conclusions.

A number of attitude conditioning studies have employed electric shock as a UCS. For example, Staats, Staats and Crawford (1962) paired CS words with an aversive electric shock (or occasionally a loud sound) and obtained the following results. Subjects for whom the word was associated with an aversive stimulus rated it significantly more negatively on a single semantic differential scale (pleasant-unpleasant) than did control subjects. Other examples of studies employing a shock UCS will be included in the following section.

<u>The problem of conditioning positive attitudes by means of shock termination</u>. Zanna, Kiesler, and Pilkonis (1970) conditioned both positive and negative attitudes to adjectives (light, dark) by associating them either with shock onset or shock offset. The dependent variables employed were responses on five evaluative scales of the semantic differential and the galvanic skin response (GSR). Demand awareness was controlled by an elaborate, misleading story whose effectiveness was verified in a post-experimental inquiry. The adjective-shock contingencies were made explicit for each subject in the preliminary instructions. The authors stress that the positive and negative attitude changes which resulted from the experimental procedure, while somewhat weaker than those of other studies, could not be accounted for in terms of demand characteristics.

An important aspect of this study which bears further description is the experimenters' use of shock termination for inducing positive attitude change. They employed two different shock termination paradigms. One consisted of pairing an adjective designated for positive attitude change with the cessation of pain produced by shock. In the second paradigm the same adjective signalled that shock would not occur. That is, for an individual subject, on one trial the adjective could predict termination of shock; on another trial it could predict the non-occurrance of shock. The former procedure has been referred to as aversion relief (Wolpe & Lazarus, 1966) or cessation conditioning (Razran, 1966). The latter procedure leads to a CS acquiring the status of a safety signal. Zanna et al. (1970) employed both techniques for an adjective undergoing positive conditioning, probably because the literature provided them with little basis for selecting between the two. Recently, however, two reviews of the animal literature appeared on the topic of conditioned positive reinforcement by means of shock termination (LoLordo, 1969; Siegel & Milby, 1969). Their conclusions though not directly applicable to the problem of conditioning positive attitudes in humans, offer valuable clarifications. Both of these review papers present the conclusion that to date no evidence is available which allows one to state unequivocally that stimuli associated with termination of electric shock acquire secondary reinforcing properties. LoLordo's (1969) review, however, describes a series of studies which strongly suggest that a stimulus presented consistently with the non-occurrance of shock acquires the properties of a safety signal. For example, Rescorla and LoLordo (1965), investigating several

Pavlovian inhibitory conditioning procedures found that CSs which had reliably predicted shock-free time intervals later reduced the rate of avoidance behavior (a measure of fear) in dogs trained to hurdle a barrier to avoid unsignalled shock. Their findings led them to suggest that the critical operation in creating a fear inhibitor is that the CS predict the non-occurrance of shock.

Moscovitch and LoLordo (1968) used the same basic experimental design in a series of experiments on backward-conditioning in dogs and reached a similar conclusion. In their first experiment they compared the subsequent fear-reducing properties of a CS from cessation-conditioning trials with a CS from backward-conditioning trials. In the cessation-conditioning procedure a five-second tone CS began in the last second of a variable duration (mean of five seconds) shock stimulus. In the backward-conditioning procedure there was a one-second interval between termination of the five-second (mean) shock and onset of the five-second tone. The intertrial interval varied about a mean of 2.5 minutes. The CSs from each condition were then tested for their capacity to reduce fear as measured by reduction in rate of avoidance responding. The results showed that the group of dogs which had experienced the tone in the cessation-conditioning procedure did not show reduced fear on subsequent testing, in the presence of the tone. The group which experienced the tone in backward-conditioning showed a marked significant drop in fear during its subsequent test presentation. The authors reasoned that the CS in the backward-conditioning procedure acquired fear-reducing properties due to one of two relations which are confounded in backward-conditioning. A backward CS may acquire fear-reducing capability (a) by virtue of its contiguity with shock termination, or (b) because it predicts a shock-free, safety period (the intertrial interval). To isolate which was the key relation, two more backward-conditioning groups were run to compare with the previous backward group (Group 1). For one group (Group 2) the onset of the tone CS occurred 15 seconds after shock termination but did not otherwise differ from the original backward-conditioning experiment (Group 1). For the third group, CS onset followed shock termination by one second as in Group 1. However, in this condition, UCS-CS pairs were programmed to occur randomly. This resulted in variable intertrial intervals ranging from zero to 15 minutes with a mean value set at 2.5 minutes as in the original experiment. The CS in this condition provided no information about the time of occurrence of the next shock.

In summary, compared to the CS in Group 1, the CS for Group 2 had a similar forward but a different backward temporal relationship to the unconditioned stimulus. In Group 3 the CS had a similar backward but a different forward temporal relationship to the unconditioned stimulus. The results were clearcut, showing that presentation of the Group 2 CS led to fear reduction of a magnitude comparable with the Group 1 CS. No significant reduction in fear behavior occurred upon presentation of the Group 3 CS which had been contiguous with shock termination but non-informative about future shocks. It may be concluded from the preceding experiments that a backward CS will become a fear-inhibitor regardless of its temporal relation to shock termination provided that it can predict a shock-free time interval. It is the forward safety signal feature of the CS rather than its backward contiguous relation with shock termination that produces inhibition of fear. LoLordo (1969) believes that this conclusion might apply as well to cessation conditioning when fairly long intertrial intervals are employed. In fact, he ventures the notion that "...all the suggestive evidence for positive conditioned reinforcement based upon shock termination can be reinterpreted as evidence that a stimulus which precedes a long shock-free period against a background of shocks will become a positive conditioned reinforcer" (LoLordo, 1969, p. 201). The clarity of this assertion invites further research in both lower animals and humans. If it is further supported, it reduces cessation-conditioning to a particular instance of the general principle quoted above.

The use of multiple stimuli and contrast effects in the induction of positive and negative attitude change in human subjects has been described by Sutterer and Beck (1970). They studied the effects of single and multiple stimuli (lights) associated with shock onset and termination upon semantic differential ratings and the GSR. Three stimulus conditions were defined in terms of their temporal relations with electric shock. CS1 was of one-second duration and terminated at the onset of a four-second shock UCS. CS2 came on during the last second of the four-second shock UCS and terminated with it, creating an aversion relief or cessation-conditioning paradigm. CS3, likewise of one-second duration appeared six seconds after UCS offset in a backward-conditioning paradigm. Subjects were assigned to one of seven experimental conditions. Three of the conditions were those described above; the others were made up by presenting two of these CSs, in their previously defined temporal relations to a single shock UCS. There were 20 acquisition trials with intertrial intervals varying between 30 and 60 seconds.

In the single stimulus experimental conditions, neither CS2 nor CS3 underwent change when post-acquisition semantic differential scores were compared with pre-acquisition scores. However, CS1 (classical conditioning paradigm) did change in a negative direction (reaching significance on activity and potency factors and approaching significance on the evaluative factor). In the multiple stimulus conditions CS2 (aversion relief) was rated more positively when presented in combination with CS1 (classical conditioning paradigm) but negatively when presented with CS3 (backward paradigm). CS1 underwent the greatest negative change when presented with CS3. Finally CS3 underwent the most positive change in combination with CS1. To summarize the major results: ratings on the semantic differential of a single stimulus which either just preceded or just followed shock termination (CS2 and CS3 respectively) showed little change after conditioning trials whereas a single stimulus which was paired with shock onset (CS1) was rated more aversive after conditioning trials. In the multiple stimulus condition

CS1 underwent the greatest negative change when presented over trials with CS3 while CS3 changed most positively when combined over trials with CS1. CS2 changed positively in combination with CS1, but negatively when combined over trials with CS3. The results based on the GSR were extremely variable leading Sutterer and Beck (1970) to conclude that further work with this measure was necessary before its value for their research could be ascertained. In conclusion, the authors suggest that the findings for the combined presentation of CS1 (occurring prior to UCS onset) and CS3 (occurring six seconds after UCS termination) have general implications for the conduct of aversive conditioning and for generating positive effects. Their results indicate that the aversiveness of the CS in classical aversive conditioning may be enhanced by the additional presentation of a stimulus occurring, in contrast, a few seconds following the UCS. Furthermore, the additional post-UCS stimulus acquires positive value via the contrast with the classical CS.

<u>The present project</u>. It is obvious from the foregoing survey of studies that even within the confines of an affect conditioning approach to attitude change the techniques are numerous. Unconditioned stimuli varied from

success at contrived games through evaluative words to electric shock. A variety of stimuli served as targets of attitude change as well. Generally, the CSs tended to be simple (e.g., coloured light) except when the experimental subjects were children. The choice of a simple CS was understandable because the method was in an early stage of investigation. There is now a considerable body of evidence to support the feasibility of changing attitudes towards simple stimuli by an affect conditioning technique.

A rather intriguing extension of this approach to complex and socially meaningful stimuli is exemplified by the work of Miller, Murphy and Mirsky (1955) and Murphy and Miller (1956). These investigators attempted to alter stable dominance patterns among members of a group of monkeys by conditioning fear and avoidance behavior in the group towards one of its submissive members. Interanimal conditioning was the name given to the technique. It consisted of pairing repeatedly the appearance of the submissive monkey with shock to a more dominant monkey which was viewing the CS animal through a one-way screen. Conditioning trials and dominance tests were conducted in separate and distinct contexts. Significant changes in dominance behavior in the CS monkey were found to have occurred after conditioning of the group members. The authors demonstrated that fear was developed by interanimal avoidance conditioning which transferred and modified social interaction between conditioned animals and the stimulus animal.

Five studies will be reported in subsequent chapters. These studies attempted to extend the application of the affect conditioning model by studying attitude change in adult human subjects to pictures of human faces, as a result of affect conditioning. Electric shock was chosen as the unconditioned stimulus because it could be administered with precision and also because there was a large body of literature on conditioning in which electric shock was used; this literature was of potential value to the present undertaking. It will be recalled from the previous review of the literature that the technique for conditioning positive attitude change by means of shock termination remains somewhat uncertain. Therefore an additional purpose of the present research was to gather data on this topic by attempting to produce positive as well as negative attitude change.

The studies which follow, then, were concerned with the induction of positive and negative evaluative attitudes towards projected colour slides of human faces using affect conditioning techniques.

The group of experiments began with an exploratory investigation. The results of this first study suggested that an aversive classical conditioning paradigm showed promise as a method for inducing negative attitudes towards the CS slides. In addition, a procedure in which CS faces predicted time-out from shock succeeded whereas cessation-conditioning (aversion relief) did not, as a method for inducing positive attitude change. The procedures derived from the first exploratory investigation were evaluated under more controlled conditions in Study II. Study III was designed to investigate the effect of demand characteristics upon the previous results. Studies IV and V were carried out to assess the effects of modifications in the procedure for generating positive and negative attitude change. In Study V the duration of the changes was studied, as well, by retesting subjects 15 and 30 days following termination of conditioning trials.

STUDY I: EVALUATION OF TWO AFFECT CONDITIONING PROCEDURES

INTRODUCTION

This study was undertaken as an exploratory investigation. Two affect-conditioning paradigms were assessed for the induction of negative and positive attitudes towards projected slides of girls' faces. An aversive classical conditioning procedure was tested for inducing negative attitudes. The procedure for generating positive attitudes was derived from Mowrer's (1960) notion that a CS presented just prior to termination of an aversive UCS (cessation-conditioning) would become a secondary reinforcer because it is associated with the termination of an aversive state. Wolpe and Lazarus (1966) have described the use of this technique in the context of clinical behavior modification. Two control conditions were tested, as well. These consisted of the repeated presentation of one face in the absence of any shock contingency and of the presentation of faces in an approximation of a random relation with shock. The inclusion of this latter condition is based on a discussion by Rescorla (1967). He contends that one of the essential elements of classical conditioning is the temporal relation between CS and UCS. Therefore, the appropriate control for the associative factors involved in classical conditioning, he argues, would be a condition explicitly lacking a systematic association between CS and UCS, namely a random relation.

In summary, aversive classical conditioning and cessation conditioning were explored as methods to induce negative and positive evaluative attitudes, respectively, to photographic slides of individual faces. The effects of two different control procedures were also tested in this experiment.

METHOD

Subjects

Twenty-seven female nursing students out of a class of 30 volunteered to serve as subjects upon solicitation by the experimenter. All of the girls were high school graduates; a few had completed first year university. They ranged in age from 18 to 21. None had taken a course in psychology and all were beginning a psychiatric rotation in a large mental hospital. Subjects were paid $5.00 for their participation.

Overview of Procedure

Upon arrival at the laboratory, each subject was falsely informed that she was taking part in an experiment on attention and memory under stress. Subjects underwent 140 conditioning trials distributed over three sessions on consecutive days. Electric shock served as the unconditioned stimulus (UCS). The conditioned stimuli (CSs), towards which subjects' attitudes were to be modified, consisted of five photographic slides, each a close-up of a girl's face unknown to the subjects. The dependent variable in this first study was a set of semantic differential scales administered before and after the experimental treatment. The scales provided a measure of the change in subjects' attitudes to the faces following the conditioning trials. Prior to the posttreatment attitude assessment, subjects were posed questions concerning their recollection of various details of the slides. The purpose of this inquiry was to support the deception presented to them at the outset concerning the purpose of the experiment.

Independent Variables

There were three experimental conditions in each of which the same five stimulus slides were employed. Nine subjects were randomly assigned to each condition.

Subjects in the first condition underwent aversive classical conditioning to the stimulus faces in an attempt to induce negative evaluations of the slides.

In the second condition the faces were paired with the termination of an ongoing shock (Wolpe & Lazarus, 1966). The purpose of this procedure was to create positive feelings to the stimulus faces by associating them with the termination of pain.

In both the conditions mentioned, the same face was arbitrarily selected as a control. The slide of that face appeared as frequently as the other four but in neither experimental condition was it associated with contingent shock or shock termination.

A multiple contingency control procedure was employed as the third condition. Each of the five faces was associated equally with four different shock contingencies. This approximation to a random association between CS and UCS was set up to compare with the other conditions in which there was a systematic relation between CS and UCS.

Dependent Variable

The First Impression Rating Scale (FIRS) which was designed to obtain evaluative ratings of pictures of people (Izard, 1962) served as the dependent variable. It consisted of 15 semantic differential scales (Osgood, Suci & Tannenbaum, 1957) with a positive and negative adjective at either end of the nine-point scales. Two parallel forms exist, one containing bipolar adjectives which are approximately equivalent to the other. Izard and Nunnally (1965) report a reliability coefficient of .85 for the two tests. This may be a conservative estimate because the stimulus pictures used to assess the equivalence of the parallel tests were not identical. That is, subjects filled out FIRS Form I for one set of 12 pictures and FIRS Form II for a different set of 12 pictures. However, this set had been rated previously by judges as approximately equal in attractiveness to the first. Nevertheless, it is likely that the correlation between the parallel test scores was reduced by this test procedure. In the same article, the authors offer empirical support for the construct validity of the FIRS and report a factor analysis of the adjective pairs. A single factor akin to Osgood *et al.*'s (1957) evaluative factor predominates. The loadings on this factor for the various bipolar adjective scales ranged from .64 to .84.

An overall evaluative score for a particular stimulus picture is derived by summing algebraically the positive and negative numerical ratings provided by the subject.

Scores on the FIRS range from a maximum negative rating of -60 through a neutral 0 score to a maximum positive rating of +60. The FIRS Forms I and II are shown in the appendix.

In the present experiment, subjects were asked to complete the FIRS for the five stimulus faces prior to and immediately following conditioning. Half the subjects were given Form I and half Form II in the initial testing and the appropriate parallel form in the posttesting.

Conditioning Procedure and Apparatus

Upon arrival at the laboratory, the subject was seated in a chair with arm rests in an 8' x 11' x 7' room which was shielded from natural light. A three-foot square slide screen mounted on a tripod was situated three feet in front of the subject. Adjoining the subject's room and connected to it by a door was a second small room in which there was a Lafayette 8-bank timer connected with a Kodak Carousel slide projector and an apparatus for delivering electric shock. To begin with, subjects were requested to record on the FIRS how they felt about each of the five faces. For this purpose each face was projected on the screen for 1.5 minutes. Next, the subject was wired to receive electric shock in preparation for his first conditioning session.

Two copper electrodes coated with Sanborn Redux electrode paste (Tursky & Watson, 1964) were affixed to the right wrist, two inches apart, by means of a rubber wrist band. The position of the electrodes on the wrist was approximately similar for each subject. Shock was provided by a Converter powered by a 12-volt battery. The output voltage adjusted by a potentiometer approximated a sine wave with a frequency of 250 Hertz.

An aversive shock level was determined for each subject prior to the onset of the conditioning trials in the following manner. First the subject was informed that the stress aspect of the study required the selection of an intensity of shock which the subject judged to be painful but still bearable. The subject was then told that shock would be introduced at a low level and increased in a gradual, continuous fashion in order to assess her tolerance. She was instructed to tell the experimenter at which point the limit of her tolerance had been reached whereupon the shock was terminated. After noting the level, the experimenter encouraged the subject to try to exceed her previous tolerance in two repetitions of the above procedure. The shock level in the conditioning phase was the highest level reached by the subject in the three tolerance trials.

The stimuli to be conditioned were five close-up 35 mm. colour slides of girls' faces. The photographic subjects were unknown to the experimental subjects and similar to them in age. On each slide in one of the four corners a minute circle, X, or triangle had been drawn. These drawings formed part of the deception concerning the purpose of the experiment.

Following determination of their aversive shock level subjects were told that their job was to study the faces carefully as each appeared on the screen. They were to try to do this despite frequent distracting shocks that would be administered. They were also told that there would be a three-minute rest pause midway through the session. The door to the experimental room was fitted with a one-way screen. It was closed to prevent the sound of the slide projector from reaching the subject. Slides were projected through the one-way mirror into the experimental room.

In the conditioning procedure the five faces were presented in random order in blocks of five. There were 28 conditioning trials per face, 140 in all. The number of conditioning trials was selected on the basis of preliminary pilot work. The three sessions on successive days were divided into 46, 47 and 47 trials respectively.

In the aversive classical conditioning procedure the CS face was presented for two seconds. Shock onset occurred .5 seconds after the onset of the CS and lasted for 1.5 seconds. Thus CS and UCS presentation were simultaneous for 1.5 seconds and coterminated. The control stimulus, like the CS faces, appeared for two seconds but was not associated with shock. The intertrial interval (ITI) was 10 seconds. All stimulus presentations and ITIs were controlled by the Lafayette timers. Elimination of shock during presentation of the control face was manually performed with a cut-off switch.

In cessation-conditioning, the procedural details, apparatus and number of trials were the same as those for the aversive condition. The only difference in procedure lay in the temporal relation between CS and UCS. In this condition a shock of 1.5 seconds was presented but the onset of the two-second presentation of the CS occurred in the final .5 seconds of shock. That is, the appearance of the face overlapped approximately .5 seconds with the shock and remained for 1.5 seconds following its termination. In this way the face served as a cue for the end of the shock. The same face which was unpaired with shock in the aversive condition served, again, as a control in this condition. No shock contingency was related to it.

In the multiple contingency condition four CS-UCS contingencies were associated an equal number of times with the presentation of the five faces. Unlike the previous conditions there was no single control face presented independently of shock. Since there were 28 learning trials per face and four different contingencies, a particular contingency was associated seven times with each face. Three of the four contingencies used in this condition have been described above. These were aversive classical conditioning, aversion relief and the shock-absent condition. The fourth contingency was a backward conditioning paradigm. Here a shock of 1.5 seconds duration was followed by a pause of one second and then by presentation of a face for two seconds. The appropriate CS-UCS relation for each trial was manually initiated by reference to a program. Once initiated the stimulus events were automatically controlled. The ITI under manual control was the usual 10 seconds.

Posttesting was carried out at the conclusion of conditioning trials in the third session. First, the electrodes were removed from the subject. Then, as part of the deception concerning the purpose of the experiment, a bogus inquiry was conducted. Subjects were asked to describe details of the features and hair style of each face. They were also asked to report any symbol that they may have noticed on the slide and its location. All answers were conspicuously noted. After this inquiry the actual experimental data were obtained. A parallel form of the FIRS was introduced as follows. "Your ideas and feelings towards these faces may or may not have changed. I'd like you, now, to fill out these scales for each face to see if the way you feel about these girls had anything to do with what you remembered about them." Each face was then flashed on the screen in random order for two seconds. The FIRS was completed following its removal from the screen. Finally, subjects were asked to describe the shock contingency associated with each face to verify that they had been attending to the experimental events.

RESULTS

The three experimental procedures were evaluated separately. The Wilcoxon matched-pairs signed-ranks test, a nonparametric technique (Siegel, 1956) was used in this analysis (unless otherwise stated) and in the analyses of all subsequent experimental results because the data were ordinal in nature. FIRS scores on the individual faces were summed and averaged for each subject yielding a mean pretreatment and posttreatment score based on all faces. In the aversion and cessation conditions these means were based on a total of four faces (there being one control face presented in each of these conditions). In the multiple contingency condition the mean scores were derived from the five faces.

Conditioning of Negative Attitudes by

Aversive Classical Conditioning

The means and standard deviations of the FIRS evaluations, pretreatment and posttreatment are presented in Table 1. The data show that in the initial testing the treatment faces and the control face on the average elicited a favourable evaluation on the FIRS. Following aversive conditioning, the evaluation of the faces paired with shock shifted markedly towards neutrality. This decline in positive attitude towards the faces paired with shock was significant ($T = 1$; $p < .01$, two-tailed).

The control face in the aversive condition acquired greater positive value for subjects in the course of the aversive conditioning of the other four faces. The increase in the mean FIRS score from before to after treatment

Table 1

Means and Standard Deviations of FIRS Scores* for CS Faces in Aversive, Cessation Conditioning and Multiple Contingency Control Conditions

(N=9 in each group)

	Pretreatment		Posttreatment	
	$\bar{X}$	SD	$\bar{X}$	SD
Aversion	19.89	6.93	4.00	11.54
Control Face (no shock)	16.00	13.08	27.33	9.42
Cessation Conditioning	8.56	7.00	3.67	15.71
Control Face (No association with shock termination)	20.44	16.23	24.11	14.69
Multiple Contingency	9.67	9.59	3.00	4.58

* Higher scores represent more favourable ratings.

for this face was significant ($T = 4$; $p < .05$, two-tailed). It was also of interest to compare the posttreatment mean scores for aversive faces with the posttreatment scores for the control face. This comparison was significant as well ($T = 0$; $p < .01$, two-tailed). This result indicates that following the treatment there was a significant difference in the subjects' evaluations of the aversive and control faces.

Cessation Conditioning of Positive Attitudes

The means and standard deviations of the FIRS evaluations, pretreatment and posttreatment for this condition are also presented in Table 1. These data show that for this group of subjects, the mean pretreatment FIRS evaluation of the experimental faces was a little above neutral whereas the mean pretreatment evaluation of the control face was more positive.

Following the systematic pairing of four faces with shock termination their posttreatment mean evaluation showed a slight decline suggesting that these faces were judged a little less favourably. This change from the pretreatment level, however, was not significant. The control face underwent a slight, insignificant positive change from pre- to posttesting. In order to compare the effects of the treatment with the single control face, difference scores were used because of the discrepant initial FIRS scores. This comparison was not significant.

Multiple Contingency Control Condition

FIRS means and standard deviations pretreatment and posttreatment for the faces in this condition are, once again, presented in Table 1. Beginning with slightly positive ratings, these faces, following treatment lost much of their positive value. This difference from pre- to posttreatment was significant ($T = 5$; $p < .05$, two-tailed). In order to compare the negative changes in evaluation in this condition with those which occurred in the aversive condition described above, the pretest to posttest results for these groups were converted to average difference scores. These scores were compared using the Mann-Whitney U Test (Siegel, 1956). The difference between the negative changes which occurred in these two groups fell just short of significance.

DISCUSSION

This experiment was undertaken as a pilot study to test two affect conditioning procedures for producing positive and negative attitude change and to assess two control methods. One clearcut finding was that an aversive classical conditioning procedure succeeded in producing significant negative attitude change. These results confirm the findings of Sutterer and Beck (1970) who used coloured lights as CSs and Zanna et al. (1970) using adjectives. A control face (non-shocked) presented among the aversive faces and as frequently, underwent significant positive change. This unanticipated result was the only demonstration of positive attitude change to occur in the present study. A comparable result was, in fact, obtained by Sutterer and Beck (1970) whose findings with two stimuli in various temporal relations with a single shock UCS were reviewed earlier. It will be recalled that they found that the optimal configuration for inducing both negative and positive attitude change was a stimulus in classical conditioning relation to shock and as well a contrasting second stimulus occurring after the shock in the ITI. Their paradigm resembles, somewhat, the present one in which the control face regularly appeared in the absence of shock amongst four CS faces which were being paired with shock.

The cessation-conditioning paradigm which was under test as a possible procedure for conditioning positive attitude change was unsuccessful. Actually, the faces paired with termination of shock in this condition became more negatively evaluated at the end of conditioning trials although not significantly so. Sutterer and Beck (1970) likewise failed to generate positive attitudes by cessation conditioning. It would seem, therefore, that the paradigm whereby a CS slightly precedes the termination of a shock of fixed short duration does not produce favourable feeling towards that CS. A study by Egger and Miller (1962) suggests a possible reason. A CS which predicts the imminent termination of a fixed UCS possesses no information value. It is redundant because if a shock is of fixed duration or varies only slightly about a given value its mere onset yields sufficient information concerning its termination. Accordingly, Moscovitch and LoLordo (1968) have suggested that a CS which predicted the termination of a shock which varied widely in duration might be more likely to acquire positive value. Returning to the present results with the cessation-conditioning paradigm it is of interest that the same control face in this condition did not undergo significant favourable change as it did in the aversive condition.

The multiple contingency control condition in this experiment was an approximation of a random association between CS and UCS proposed by Rescorla (1967) as the appropriate control for nonassociative factors in classical conditioning. The subjects seem to have found this condition aversive since the CS faces associated with it underwent significant negative evaluational change. The magnitude of this negative change was not as great as that obtained in the aversive condition but this difference between the two conditions was not significant. A similar finding to the one found with this control procedure was reported by Geer (1968). He measured the effects of tones paired with aversive non-painful stimuli (colour photos of victims of violent death) upon the human GSR. Using classical conditioning, backward conditioning and a condition of random association between CS and UCS he found that the latter paradigm produced the greatest GSR.

In summary, the results of this pilot investigation yielded a promising procedure for conditioning negative evaluative attitudes towards CS faces. The cessation-conditioning technique for inducing positive attitudes, as it was carried out in this experiment, was ineffective. However, a non-shocked control face which appeared in the context of faces undergoing aversive conditioning was rated significantly more positive following conditioning trials.

This result suggested further testing of what was essentially a Pavlovian discriminative conditioning paradigm in which some CS faces are paired with shock while another is presented in the absence of shock. Finally, the CS faces in the multiple contingency condition, failed to receive ratings which were stable from pre- to posttreatment. The significant negative attitude change undergone by subjects to these faces strongly suggested that this condition was, in fact, aversive.

STUDY II: FURTHER EVALUATION OF A PAVLOVIAN DISCRIMINATIVE CONDITIONING PROCEDURE

INTRODUCTION

This study attempted to evaluate further, the effects of the discriminative conditioning procedure used in Study I which generated both significant negative and positive attitude changes. That paradigm involved conditioning trials in which several faces were paired with shock while another was not associated with shock. In Study II, the number of CS faces paired with shock was cut from four to three in order to reduce the number of aversive trials and thereby lighten, somewhat, the subjects' task. Initial ratings on the First Impression Rating Scale (FIRS) were controlled for neutrality by means of pretesting. This step was taken to insure that subjects' initial attitudes to CS faces in each condition would be similarly neutral prior to the experimental treatments. In this study, as well, the slides designated as control faces were rated along with experimental faces prior to conditioning trials and again following conditioning. They were not presented at all in the intervening treatment period. Hence, the ratings of those slides provided information concerning the effects of retesting.

Two additional dependent variables, an adjective check list composed of favourable and unfavourable adjectives and a sorting task were introduced in this experiment. It was felt that a battery of three measures, each varying in format, might be more sensitive than a single measure to changes resulting from the operation of the independent variables. The two new dependent variables will be described in detail below.

METHOD

Subjects

Fifteen experimentally naive nursing students from the same population as in the previous experiment took part. They were paid $5.00 for participation as before.

Independent Variables

As mentioned, the discriminative conditioning procedure from the previous study was repeated in this experiment. Four slides of faces were presented in the conditioning trials. Three were regularly paired with shock in an aversive classical conditioning paradigm and one was associated with the absence of shock.

Dependent Variables

As before, a pre-post experimental testing design was followed. In addition to the First Impression Rating Scale (FIRS) there were two other dependent measures. A picture-sorting task (Pic-sort) was set up which required the subject to sort 21 slides of girls' faces into three categories: "Like," "Dislike," and "Feel neutral towards." Six of the 21 slides werved as CSs in the actual experiment, three in the aversive condition, one in the no-shock condition and two being used as controls. The Pic-sort task was designed to reveal in a simple fashion whether the experimental faces were shifted to predictable categories following particular experimental treatments.

The third measure was adapted from the Adjective Check List (Gough & Heilbrun, 1965). The Adjective Check List consists of 300 adjectives which describe attributes of a person. It originated as a personality assessment instrument. There are 24 scales of which two are of interest for present purposes, Favourable Adjectives and Unfavourable Adjectives. These scales were empirically derived and contain 75 adjectives in each. Test-retest reliability coefficients for the Favourable and Unfavourable scales over a ten-week period were reported as .76 and .84 respectively (Gough & Heilbrun, 1965, p. 12). The check list employed in the present study contained 140 words. Of these, 49 were selected from the Favourable Adjectives scale (e.g., affectionate, humorous, tactful), 49 from the Unfavourable scale (e.g., cruel, intolerant, undependable), and 42 filler adjectives (unscored) from the Nurturant and Aggressive Scales. (The favourable and unfavourable adjectives were chosen to avoid excessive redundancy with the FIRS.) The selected adjective check list (SACL) thus formed was presented in alphabetical order on a single page. Subjects were instructed to read the list of adjectives and check any that they thought applied to the face being assessed. A separate SACL was completed for each stimulus face, the maximum favourable score being 49, the maximum unfavourable sccre being -49. The overal score for a face was computed by algebraically summing all positive adjectives checked (each valued at +1) with all negative adjectives checked (each valued at -1). A copy of the SACL appears in the appendix.

Procedure and Apparatus

The laboratory and apparatus for presenting slides and delivering shock were the same as in the previous study. Upon arrival, the subject was given the same false information concerning the purpose of the study and was seated in the experimental room. Beside her on a small desk, 21 slides of girls' faces whose characteristics were described in the previous study were on view. This was accomplished by means of a slide editor which consisted of an enclosed electric bulb illuminating a translucent plastic screen. The slides were all visible on this screen. Each was marked with a small symbol in accordance with the false account of the study's purpose. The subject was instructed to sort the slides into three categories, those liked, those disliked, and those towards whom she felt neutral. The allocation by the subject of each slide was noted. Next the slides were serially flashed on the screen for a maximum duration of 1.5 minutes while the subject completed an FIRS for each. The FIRS was scored in the adjoining room by the experimenter as they were completed. The subject continued to rate slides of faces on the FIRS until she had given neutral scores (not deviating markedly from 0 on the FIRS) to six stimulus faces. The subject, next, completed the SACL for each of these six faces as they were flashed, serially, on the screen for a maximum duration of 2.5 minutes. The faces were then randomly assigned to aversive (three faces), no shock (one face), and control (two faces) conditions. The procedure for placing the electrodes and for determining an aversive shock level was conducted as described previously. Again, 28 conditioning trials per face were administered over three sessions. Faces were presented in randomized blocks of four. The duration of slide presentation and shock was two seconds, and 1.5 seconds respectively with a CS-UCS delay of .5 seconds. The intertrial interval was 10 seconds. As before, the face associated with no shock appeared an equal number of times as the aversive faces.

Posttesting occurred again at the end of the third conditioning session following removal of the electrodes. First, the bogus inquiry concerning recall of details of the stimulus faces was conducted. Then, the parallel form of the FIRS, the Pic-sort task and SACL were administered in random order for each subject. The order of presentation of the six faces was altered between the administration of the FIRS and the SACL. A Final question called for a description of the shock contingency associated with each face.

RESULTS

As in the previous study, a mean pretreatment and posttreatment score for each subject was calculated in the aversive and control condition based on three faces and two faces respectively. Means and standard deviations of ratings on the FIRS and SACL for the no-shock, aversive, and control conditions before and after treatment are presented in Table 2. It can be seen from this table that the posttreatment ratings of the faces on both measures are in the expected direction. That is, faces paired with shock acquired the most negative ratings, faces associated with absence of shock, the most positive ratings and the control faces obtained ratings in between. It can also be seen that there was considerable variability in subject response in all conditions. Statistically significant changes in ratings were distributed about equally over two of the three dependent variables. Table 3 summarizes the results of the Wilcoxon statistical analyses performed upon the various changes in ratings obtained in this experiment. One-tailed tests were used since the direction of change was predicted. As in the first experiment all subjects were able to describe accurately the shock contingency associated with each face.

No-Shock

<u>FIRS</u>. On this measure the faces paired with the absence of shock received a somewhat more favourable evaluation

Table 2

FIRS and SACL: Means and Standard Deviations of CS Ratings Before and After Experimental Treatment

(N = 15)

	Pre		Post	
	$\bar{X}$	SD	$\bar{X}$	SD
FIRS:				
No-shock	.93	4.13	10.13	23.42
Aversion	1.40	3.31	- 7.53	17.85
Control	2.60	10.08	5.20	16.49
SACL:				
No-shock	5.18	13.48	8.13	16.33
Aversion	-0.02	11.85	- 9.73	14.18
Control	-3.18	11.75	5.00	14.91

Table 3

Results of Wilcoxon Significance Tests

A. Comparison of posttreatment ratings between conditions.

	Aversive	Control
FIRS:		
No-shock	$p < .05$	n.s.
Aversive		n.s.
SACL:		
No-shock	$p < .005$	n.s.
Aversive		$p < .025$

B. Within condition pre- to posttreatment changes in ratings.

	No-Shock	Aversive	Control
FIRS	n.s.	$p < .05$	n.s.
SACL	$p < .025$	n.s.	n.s.

following the experimental treatment. Although the mean change from pre- to posttesting was more than nine points, this difference did not reach significance. Because initial scores were experimentally controlled it was meaningful to compare the posttest scores in this condition with the posttest scores of the aversive and control faces. If the no-shock and aversive conditions were exerting differential effects on subjects' evaluations of the faces one would expect a significant difference between ratings in the two groups which was predictable in direction. When the no-shock condition post scores were compared with aversive post scores this proved to be the case ($T = 27$; $p < .05$). Likewise, one would have expected that ratings of faces in the no-shock condition would have been significantly more positive than in the control condition. Table 2 reflects such a trend but the difference did not reach statistical significance possibly because of the large variances.

SACL. It will be recalled that only FIRS pretest scores were experimentally controlled. Table 2, therefore, shows small differences between mean pretest scores on the SACL for faces in the three conditions. On this measure, unlike the FIRS, the no-shock faces underwent significant positive change from pre- to posttreatment ($T = 10$; $p < .025$). This comparison is based on the scores of eleven subjects rather than fifteen because four of the subjects' SACL pretreatment scores were inadvertently not recorded. Also, the difference between the no-shock condition post scores and the aversive post scores on this measure was significant ($T = 11$; $p < .005$). There was no significant difference between no-shock and control face ratings, posttreatment.

Pic-sort. For this measure values of +1, 0 and -1 were assigned to faces categorized by subjects as "Like," "Feel neutral towards" and "Dislike," respectively. Mean pretest and posttest categorizations were computed for the three aversive and two control faces. For the sake of simplicity, scores were rounded to the nearest whole number. The maximum change a face could undergo on this measure was +2 or -2 depending on whether the face shifted its rating positively or negatively. Although CS faces were not necessarily assigned neutral ratings on the Pic-sort, most were in this category. Table 4 presents the frequency of category placements of faces in each treatment group and the resulting total rating (based on category values of +1, 0 or -1). These are total mean scores in the case of aversive and control conditions. The total scores give a rough indication of the predominant category in which the faces in the three conditions

Table 4

Picture Sorting Task: Evaluations of CS Faces

Pre- and Posttreatment (N = 15)

(Like = 1; Dislike = -1; Neutral = 0)

	Like	Dislike	Neutral	Overall Rating
PRE:				
No-shock	0	5	10	-5
Aversion	0	1	14	-1
Control	3	4	8	-1
POST:				
No-shock	5	6	4	-1
Aversion	1	5	9	-4
Control	6	4	5	2

were placed before and after treatment. There were no significant differences in rating between conditions prior to the experimental treatment although more faces in the no-shock group were negatively rated. Following the experimental treatment it can be seen that the trends in ratings were in the appropriate direction. However, none of these small differences achieved statistical significance.

Aversive Condition

FIRS. The three faces in this condition, following aversive classical conditioning changed from a neutral average rating pretreatment to a more negative average evaluation posttreatment. This change was significant ($T = 28$; $p < .05$). Two other comparisons are of interest, one of which has already been mentioned. The expectation was borne out that faces paired with shock would be rated significantly more negatively on the average than a face associated with the absence of shock. However, when aversively conditioned faces were compared with controls there was no significant difference between their ratings.

SACL. The pre- to posttreatment negative change in rating which was significant on the FIRS did not achieve significance on the SACL. The trend was, nevertheless, in the predicted direction as can be seen from Table 2. As mentioned above, aversively conditioned faces were rated significantly more negatively than the no-shock faces on this measure. Finally, the comparison between posttreatment ratings of aversive and control faces on this variable was significant ($T = 21$; $p < .025$) the aversive faces being rated more negatively.

Pic-sort. No changes achieved statistical significance on this measure although the small changes which did occur (Table 4) were in the expected direction.

Control Condition

The control faces underwent pretreatment and posttreatment evaluation and did not appear during the intervening conditioning trials. The only remaining comparison to discuss in relation to the control faces is the test-retest change which occurred. In general, the control faces underwent a small positive change in rating on all three dependent measures (Tables 2 and 4) but none reached significance.

DISCUSSION

This study was undertaken to evaluate a discriminative conditioning procedure for generating positive and negative attitudes towards faces whose initial neutral valence for each subject had been empirically determined on one measure (FIRS). The previous exploratory investigation (Study I) had not controlled for pretreatment attitudes towards the CS faces. By selecting CS faces having a stimulus value around the neutral point it was possible to evaluate the attitude conditioning procedures in the absence of potentially facilitating or impeding effects of marked pre-experimental attitudes.

Although significant differences across all comparisons and dependent measures were not obtained, the basic findings in the aversive and no-shock condition of the previous exploratory investigation were confirmed. The finding across two of the three dependent variables in this experiment that there were significant differences between post-treatment ratings of faces associated with the absence of shock and those associated with shock reaffirms one of the clearest results of the previous study.

The fact that both the FIRS and the SACL registered an approximately equal number of significant changes suggests that both measures were probably equally sensitive to the effects of treatment variables in this experiment. The Pic-sort task which yields scores on a nominal scale is the grossest measure of the three. Perhaps, for this reason it failed to undergo any significant change.

The results of this study suggest that it is possible to induce in subjects favourable and unfavourable evaluative attitudes towards slides of human faces which had previously been rated neutral. The process seems to involve classical conditioning whereby faces repeatedly associated with aversive electric shock acquire negative connotations. In this aversive context faces paired with the absence of shock are subsequently rated as possessing positive characteristics.

Because subjects are often aware of the experimenter's purpose in classical conditioning studies, there remains the possibility that the foregoing results were obtained partly as a consequence of the demand characteristics inherent in this experimental design. That question was taken up in the following experiment.

STUDY III: THE ROLE OF DEMAND CHARACTERISTICS

INTRODUCTION

Two major hypotheses may be advanced to account for the findings of the previous studies. These may be termed the compliance hypothesis and the affect conditioning hypothesis. The compliance hypothesis is based on two suppositions: that subjects were aware of the investigator's expectations for the experiment (in spite of the misleading cover story) and that they complied with them. The affect conditioning hypothesis holds that the observed attitude changes resulted from the differential association with the stimulus faces of either pain or relief from pain.

In order to test these two competing notions the following experiment was designed. Study II was repeated in every detail except one. Instead of using strongly aversive shock, a level which was only high enough for detection was employed. The experiment was presented to the subjects in identical fashion to the previous one. As in that study, subjects in the present experiment received "shock" (nonpainful in this case) paired with three faces and absence of "shock" with one. The procedure, presumably, created an identical awareness and expectation as in the previous study.

The predictions associated with the two hypotheses were clear. If the mechanism at work was compliance, the results of this study, because of the comparable inherent demands, would be similar to previous results. If, on the other hand the attitude change observed in the previous studies was due, primarily, to affect conditioning, there would be no attitudinal change measured in this study because no affect, positive or negative had actually been generated.

METHOD

Subjects

Twelve experimentally naive nursing students from the same population as in the previous studies were paid $5.00 each for participation in this experiment.

Procedure

As before subjects were oriented by being told that they were taking part in a study of attention and memory under stress. By means of the pretesting procedure described in the last study, six faces with neutral initial scores on the First Impression Rating Scale (FIRS) were selected as CSs. These were randomly assigned to "shock," "no-shock" and control conditions. Pretreatment scores on the picture sorting task

(Pic-sort) and the selected adjective check list (SACL) were also obtained. The electrodes were applied as usual.

The procedure in the previous studies for determining an aversive shock level had to be modified in this experiment. In this case, it was not necessary to determine an aversive shock level at the ceiling of a subject's tolerance but merely the minimum intensity of shock which was reliably detectable. As before, subjects were told that the stress aspect of the study required the administration of a painful electric shock. They were also falsely informed that the level of shock they would receive was one which subjects on the average considered quite painful. The experimenter then instructed subjects to tell him exactly when they experienced a sensation in the wrist so that he might know that the shock was "coming through." After the initial detection level was established, subjects were asked to report the onset of shock in two more trials. The purpose of the additional trials was to verify that the shock was being reliably detected. Occasionally, subjects expressed surprise that the designated shock level could be perceived by anyone as painful. To these comments the reply was, routinely, "Most people find it pretty hot."

Conditioning trials using the nonpainful shock were conducted in three sessions over three days as before with the usual mid-session rest period of three minutes. The post-treatment testing routine was conducted exactly as in the previous experiment including the question about the contingency accompanying each CS face.

RESULTS

All subjects in this experiment accurately described the shock contingency associated with each face.

Subjects' ratings in the aversive and control condition were averaged across CS faces as before. Whereas the direction of change was not predicted in this experiment, Wilcoxon one-tailed tests were, nevertheless, employed. This was done so that the results of the statistical analysis of this experiment could be fairly compared with those of Study II where one-tailed tests were used, as well. Table 5 presents the means and standard deviations of the FIRS and SACL ratings of faces in the various conditions. The Pic-sort ratings appear in Table 6. An examination of Table 5 as a whole reveals that there were no systematic effects, unlike the results of Study II. The findings may be conveniently presented by considering each dependent variable in turn. On the Pic-sort task (Table 6) the faces in each group began with essentially

Table 5

FIRS and SACL: Means and Standard Deviations of CS Ratings Before and After Experimental Treatment

(N = 12)

	Pre		Post	
	$\bar{X}$	SD	$\bar{X}$	SD
FIRS:				
No-shock	-0.67	4.10	1.83	19.54
Aversive	-0.75	4.25	4.58	18.74
Control	-0.08	7.18	2.00	14.12
SACL:				
No-shock	-8.00	15.52	-0.50	18.44
Aversive	6.08	11.57	1.83	12.01
Control	3.58	10.82	2.67	12.46

Table 6

Picture Sorting Task: Evaluations of CS Faces

Pre- and Posttreatment (N = 12)

	Like	Dislike	Neutral	Overall Rating
PRE:				
No-shock	1	2	9	-1
Aversive	1	3	8	-2
Control	3	4	5	-1
POST:				
No-shock	3	4	5	-1
Aversive	0	4	8	-4
Control	1	6	5	-5

equal overall ratings (neutral) and changed little following the treatment.

The FIRS results are equally straightforward. Beginning at about the same neutral point, the ratings of faces in the three conditions changed little after treatment. The small changes which did occur were not orderly. In fact, the "aversive" faces received the most favourable rating while the no-"shock" and control faces were evaluated about equally (neutral). None of the statistical tests performed on the differences between the three groups were significant (Table 7A).

Turning to the SACL, inspection of the posttreatment mean ratings shows little difference between the various conditions. The control faces obtained the most favourable ratings while the no-"shock" faces received the least. Consistent with the findings on the FIRS there were no statistically significant differences on the posttest ratings between the various conditions (Table 7A). However, there were pretreatment to posttreatment changes in the no-"shock" and "aversive" conditions which reached significance, the respective T values being 11 ($p = .025$) and 14 ($p < .05$). These results are difficult to interpret because of the somewhat extreme pretreatment ratings assigned to faces in both conditions on the SACL.

Table 7

Results of Wilcoxon Significance Tests

A. Comparisons of posttreatment ratings between conditions.

	Aversive	Control
FIRS:		
No-shock	n.s.	n.s.
Aversive		n.s.
SACL:		
No-shock	n.s.	n.s.
Aversive		n.s.

B. Within conditions pre- to posttreatment changes in rating.

	No-shock	Aversive	Control
FIRS	n.s.	n.s.	n.s.
SACL	$p = .025$	$p < .05$	n.s.

The SACL is vulnerable to chance fluctuation because initial scores on this test were not controlled for neutrality as they were on the FIRS. It should be noted that the CS faces in these conditions received mean ratings in pretesting which departed from the neutral ratings they received on the other two dependent measures. The significant changes from pre- to posttesting might have been due to recovery of the ratings to a neutral point consistent with the original ratings on the other measures, in the absence of any strong treatment effect. As can be seen from Table 5 the mean ratings, post-treatment, on the SACL in both experimental conditions do not depart from the neutral point.

DISCUSSION

Under the conditions of nonaversive shock which obtained in the present experiment, ratings of the faces in the three conditions were indistinguishable from one another in post-testing (Table 5). This result is in contrast to the previous two experiments where a significant difference was obtained between ratings of faces in the no-shock and aversive conditions. The two significant changes which did occur on the SACL could have been due to a chance fluctuation in the initial

SACL ratings (which unlike the FIRS were uncontrolled for initial neutrality). It is of interest to examine the FIRS changes which paralleled the significant pre- to posttreatment shifts in rating on the SACL. Reference to Table 5 shows that no major positive change in rating occurred in the no-"shock" condition on the FIRS. The scores were hardly changed at posttesting from their initial neutral position. Furthermore, on the FIRS, faces in the "aversive" condition, contrary to the compliance hypothesis, shifted positively in rating from an initial neutral level.

The results of this experiment in their general tenor more than by the absence of significant results, suggest affect conditioning rather than compliance as the variable which accounts for the major portion of the attitude change observed in the previous studies.

A possible objection to the design of this study could be that although the intention in the control experiment was to create identical demand characteristics to those in previous studies, the reduction in shock intensity inevitably altered the experimental demands. This point is amenable to empirical investigation. Other control designs might have been used, as well. For example, one could have observed the effects of varying the number of conditioning trials (using aversive shock) in different groups of subjects. If few conditioning trials produced the same attitude change as many trials, this would have supported a demand characteristics interpretation of the results. However, there are limitations to this approach as well, the most obvious one being that the functional relation between attitude change and learning trials is probably quite complex. Inferences about the operation of demand characteristics from the relation between these two variables would be quite uncertain. No single study could conclusively resolve the question of the influence of demand characteristics upon the previous attitude change findings. The control study which was carried out provided one kind of evidence on the issue.

STUDY IV: MODIFICATION OF THE PROCEDURE FOR POSITIVE ATTITUDE CHANGE

INTRODUCTION

Moscovitch and LoLordo (1968), in their paper reviewed earlier, suggested an effective technique for conditioning positive affect. Their conclusion was that a CS acquired fear-reducing properties to the extent that it predicted a time-period free of shock. The implications for the present study were clear; conditioning of positive affect might be enhanced by not only associating a face with the absence of shock for the brief period during its presentation but also by making it predictive of a lengthy shock-free intertrial interval (ITI). This notion was tested in the following experiment.

METHOD

Subjects

Twelve experimentally naive nursing students from the population already described were asked to participate in the experiment. They did so under the same conditions of remuneration as previous subjects.

Procedure and Apparatus

The procedures used in this study were identical to those used in Study II except for a change in the ITI following the face associated with no shock. In the previous studies a fixed 10-second ITI obtained between conditioning trials. In this experiment the face paired with the absence of shock was regularly followed by a 25-second ITI. (This will be referred to as the time-out from shock condition.) Faces paired with shock were followed by a 10-second ITI as before.

A change was made in the method of shock delivery for this study so that it was no longer necessary to stop the shock manually during presentation of the time-out from shock slide. Timing and duration of shock and slide were the same as in previous studies. The lengthy ITI following a face signalling no shock was easily arranged by placing a sequence of slides containing opaque material in the carriage following the time-out face. The subject thereby experienced an uneventful 25-second period of darkness prior to the onset of the subsequent trial. The projector was in a separate room from the subject so that it could not be heard.

The pretesting and posttesting procedures were identical to previous studies.

RESULTS

All subjects successfully described the shock contingencies associated with each face.

As usual, each subject's pretest and posttest scores represent their average ratings of the faces in the aversive and control conditions. The means and standard deviations of ratings on the FIRS and SACL for faces in each condition are presented in Table 8. Ratings based on the assignment of faces to the categories on the Pic-sort task appear in Table 9. Wilcoxon one-tailed tests are reported (unless stated otherwise) because the direction of change was predicted.

Time-Out From Shock

Inspection of Tables 8 and 9 shows that on all posttreatment measures the ratings of faces in the time-out condition were markedly positive. The difference between ratings from pre- to posttesting on all dependent variables was significant. The pre to post comparison on the FIRS yielded a T of 0 ($p < .005$). On the SACL the same comparison produced a T of 8 ($p < .01$) and on the Pic-sort a T of 5 ($p = .01$). Similarly, when the posttreatment ratings of faces in the time-out condition were compared with those faces in the

Table 8

FIRS and SACL: Means and Standard Deviations of CS Ratings Before and After Experimental Treatment

(N = 12)

	Pre		Post	
	$\bar{X}$	SD	$\bar{X}$	SD
FIRS:				
Time-out from shock	1.50	4.85	17.33	9.03
Aversive	1.17	3.43	8.17	8.23
Control	1.33	5.03	7.75	12.01
SACL:				
Time-out from shock	1.00	13.82	13.58	12.32
Aversive	5.58	7.88	5.08	9.53
Control	2.83	9.19	8.92	14.35

Table 9

Picture Sorting Task: Evaluations of CS Faces

Pre- and Posttreatment (N = 12)

	Like	Dislike	Neutral	Overall Rating
PRE:				
Time-out from shock	0	4	8	-4
Aversive	1	1	10	0
Control	1	4	7	-3
POST:				
Time-out from shock	6	1	5	5
Aversive	1	3	8	-2
Control	3	5	4	-2

aversive condition all comparisons were significant. On the FIRS this T was 11 ($p < .025$). On the SACL the T value was 14 ($p = .025$) and on the Pic-sort the T was 12 ($p < .05$). Finally, when posttreatment ratings in the time-out condition were compared with the control condition on all measures only the FIRS comparison was significant ($T = 17$; $p < .05$). These results are summarized in Table 10.

Aversive Conditioning

Table 8 shows that the ratings of faces under this condition did not conform to the results obtained in previous experiments. In fact, on the FIRS, the ratings changed in a positive instead of the expected negative direction following treatment. This pre- to posttreatment change in the opposite direction was significant ($T = 8.5$; $p < .05$, two-tailed), but isolated, because there was no comparable positive change on the remaining dependent variables. In fact, the ratings on the SACL and Pic-sort remained quite stable from pretest to posttest. Although faces in this condition underwent a significant positive change in rating on the FIRS, it has already been mentioned that the positive change observed under the time-out from shock condition was significantly greater. This was the case across all three measures. Finally, there

Table 10

Results of Wilcoxon Significance Tests

A. Comparison of posttreatment ratings between conditions.

	Aversive	Control
FIRS:		
Time-out from shock	$p < .025$	$p < .05$
Aversive		n.s.
SACL:		
Time-out from shock	$p = .025$	n.s.
Aversive		n.s.
PIC-SORT:		
Time-out from shock	$p < .05$	n.s.
Aversive		n.s.

B. Within conditions pre- to posttreatment changes in rating.

	Time-out from shock	Aversive	Control
FIRS	$p < .005$	$p < .05$ (wrong direction)	n.s.
SACL	$p < .01$	n.s.	n.s.
Pic-sort	$p = .01$	n.s.	n.s.

were no significant differences on any measure between the ratings of aversive and control faces. Table 10 summarizes these results.

Control Condition

Table 8 shows that the evaluation of control faces on both the FIRS and the SACL shifted fairly strongly in a positive direction following treatment. Neither change, however, was significant. The control faces remained stable in rating on the Pic-sort from pre- to posttreatment.

DISCUSSION

This study tested a modification in procedure suggested by Moscovitch and LoLordo (1968) which was intended to strengthen the positive attitude change effect. In this modification, the presentation of a time-out from shock face was not only correlated with the absence of shock but it also reliably predicted a lengthy shock-free ITI. The resulting large and consistent positive changes found on all measures would appear to indicate that the method is an effective one. An interesting and unexpected complication did arise, however; the procedural modification which strengthened the positive attitude change effect destroyed the negative attitude change effect. The ability of the electric shock to produce negative affect seems to have been reduced by the introduction of rest pauses following faces in the time-out from shock condition. The ratings of faces in the aversive condition did not change on two measures (SACL and Pic-sort) following the treatment and on the FIRS, they actually changed significantly in a positive direction. It is interesting to note that the magnitude of the change was approximately equal to the positive change which the control faces underwent on the FIRS. The next experiment attempted to find a method to recover the negative attitudinal change effect while preserving the strong positive effect obtained in the present study.

STUDY V: MODIFICATION OF THE PROCEDURE FOR NEGATIVE ATTITUDE CHANGE

INTRODUCTION

In the previous study the introduction of the 25-second rest period after the time-out from shock face clearly strengthened the positive attitude change effect. However, the same manipulation seems to have reduced the effectiveness of the electric shock in producing negative attitude change. One explanation of this phenomenon is that, somehow, the shock was made less aversive by this procedure modification. The aim of the present experiment, therefore, was to attempt to recover the negative change effect by increasing the aversiveness of the negative paradigm while retaining the strong positive effect obtained in the previous study. Duration of the experimental attitude change was also studied in the experiment to be reported.

A number of experiments (e.g., D'Amato & Gumenik, 1960; Lockhard, 1963) have examined factors affecting the degree of aversiveness of electric shock. One major variable which has emerged is the predictability of the shock. It seems clear that subjects rate unsignalled shock more aversive than signalled shock. This finding suggested that the effectiveness of the negative attitude change paradigm might be increased by making the shock associated with a particular face less predictable. This alteration in the aversive conditioning procedure was tested in the present experiment.

METHOD

Subjects

Sixteen experimentally naive nursing students from the same population as before were paid $5.00 for participation in the study.

Procedure and Apparatus

The paradigm for the induction of positive change using a long ITI after the no-shock face was identical to the previous study. The procedure for conditioning negative feeling was changed as follows. After each two-second presentation of an aversive face, a 20-second interval followed during which the subject received two, three or four shocks (averaging three over all sessions). The mean interval between offset of an aversive face and the occurrence of the first shock was six seconds. Each shock was of 1.5 seconds duration. There were no shocks in the two-second interval prior to the onset of the next face. The reason for this latter restriction was to avoid placing a subsequent time-our from shock face in too close a time-relation with shock. The order of presentation of the faces, the number of shocks and the timing of shock presentation in the 20-second interval following an aversive face were randomized. In this experiment, two faces were paired with shock instead of three as before and the number of conditioning trials was reduced from 28 to 18. Both of these changes were necessary in order to maintain the overall number of shocks at a reasonable value. It will be noted that the present paradigm called for an average of three shocks for each presentation of a CS face as compared to one in the previous experiments. Even with the reduction in the number of faces paired with shock and of trials in this experiment, there were still a total of 108 shocks presented (18 trials x 3 shocks x 2 faces) as compared to a total of 84 in the previous study.

The delivery of shock was again automatically controlled by a switch in the slide projector which was triggered by metal foil tape placed on the frames of specific slides. In this experiment, however, the insertion of opaque slides into the magazine controlled the required time interval following both the aversive and the no-shock faces (20 seconds and 25 seconds, respectively). By foil-taping the appropriate opaque slides which followed an aversive face it was possible to control the timing of the shock presentation during the aversive interval.

The pretesting and posttesting procedures, including the false inquiry, were the same as in previous studies.

Follow-up Testing

In order to measure the duration of the experimental effect half the subjects were retested after 15 days and half after 30 days. Accordingly on the 16th day after the termination of the experiment, eight randomly selected subjects were asked to re-evaluate the slides on the same three measures. The remaining eight subjects were requested to do the same on the 31st day. The follow-up testing was carried out in the physical setting where the experiment, proper, had taken place. There were, of course, no electrodes or shocks introduced on this occasion. Subjects were paid $1.00 for their participation.

RESULTS

The ratings of CS faces in the aversive and control conditions, were averaged over the two faces in each condition. Table 11 presents means and standard deviations of the scores on the FIRS and SACL for faces in the three conditions. Ratings based on categories into which faces in the three conditions were placed on the Pic-sort task appear in Table 12. The results of the follow-up testing are summarized in a separate table (Table 14). Wilcoxon one-tailed tests were used in the analysis of the data collected at the conclusion of conditioning trials. Two-tailed tests were used for the follow-up results because the direction of the change in these data was not predicted.

As before, all subjects correctly described the shock contingencies associated with each face at the posttreatment testing.

Time-out From Shock

The consistently significant positive change effects found under this condition in the previous study were obtained again in the present experiment. Table 11 shows that subjects shifted their ratings of faces in this condition from neutral to markedly positive on both the FIRS and the SACL following the experimental treatment. Data from the Pic-sort task presented in Table 12 indicate a similar effect. Statistical analyses of pre-post changes under this condition yielded significant effects on the FIRS ($T = 3$; $p < .005$), on the SACL ($T = 13$; $p < .005$), and on the Pic-sort

Table 11

FIRS and SACL: Means and Standard Deviations of CS Ratings Before and After Experimental Treatment

(N = 16)

	Pre		Post	
	$\bar{X}$	SD	$\bar{X}$	SD
FIRS:				
Time-out from shock	1.75	5.43	18.63	12.03
Aversive	1.81	4.48	- 4.13	15.65
Control	2.13	5.26	8.19	10.66
SACL:				
Time-out from shock	4.13	18.76	18.00	13.07
Aversive	1.06	9.95	- 5.81	12.36
Control	0.25	14.00	4.75	11.64

Table 12

Picture-Sorting Task: Evaluations of CS Faces

Pre- and Posttreatment (N = 16)

	Like	Dislike	Neutral	Overall Rating
PRE:				
Time-out from shock	1	3	12	-2
Aversive	2	0	14	2
Control	0	1	15	-1
POST:				
Time-out from shock	10	1	5	9
Aversive	2	12	2	-10
Control	2	5	9	- 3

task ($T = 5$; $p = .005$) (Table 13B). Table 11 shows a large difference between posttreatment ratings of faces in the time-out from shock and aversive conditions which was significant on the FIRS ($T = 9$; $p < .005$) and on the SACL ($T = 7.5$; $p < .005$); this difference on the Pic-sort task (Table 12) was significant as well ($T = 8$; $p < .005$). Finally, when posttest ratings of faces in the time-out condition were compared with control condition posttest ratings the time-out results were significantly more positive on the FIRS ($T = 17$; $p < .005$), on the SACL ($T = 17.5$; $p < .005$) and on the Pic-sort task ($T = 12$; $p < .01$). It is of interest to note that these comparisons were significant in the expected direction in spite of a competing positive change trend which control faces were undergoing on the FIRS and SACL measures. Table 13 summarizes the results of the statistical analyses presented above.

Aversive Condition

Tables 11 and 12 show that a negative attitude change effect was obtained in this experiment. There was a negative change in rating on the FIRS, the SACL, and the Pic-sort task following the experimental treatment. The pre- to posttreatment changes in rating were significant on all

Table 13

Results of Wilcoxon Significance Tests

A. Comparison of posttreatment ratings between conditions.

	Aversive	Control
FIRS:		
Time-out	$p < .005$	$p < .005$
Aversive		$p < .01$
SACL:		
Time-out	$p < .005$	$p < .005$
Aversive		$p < .025$
PIC-SORT:		
Time-out	$p < .005$	$p < .01$
Aversive		n.s.

B. Within conditions pre- to posttreatment changes in rating.

	Time-out	Aversive	Control
FIRS	$p < .005$	$p < .05$	$p < .02$*
SACL	$p < .005$	$p < .025$	$p < .02$*
Pic-sort	$p = .005$	$p < .005$	n.s.

* Two-tailed.

measures. On the FIRS the T value was 36 ($p < .05$), on the SACL, the T was 29 ($p < .025$) and on the Pic-sort task the T was 6.5 ($p < .005$). Comparison of posttreatment ratings in the aversive and time-out condition were already reported above. When posttreatment ratings in the aversive condition were compared with control face ratings, the aversive results were found to be significantly more negative on the FIRS ($T = 17$; $p < .01$) and on the SACL ($T = 25$; $p < .025$). On the Pic-sort task the T fell just short of statistical significance.

The aversive conditioning procedure was competing with a countertrend leading subjects to rate faces favourably on the FIRS and SACL as indicated by the positive change noted in the ratings of control faces. Nevertheless as can be seen from Table 13 all statistical comparisons involving the aversive condition results were significant except one and it, too, was in the predicted direction.

Control Condition

It was already mentioned that the ratings of faces in this condition underwent positive change from pre- to post-testing on the FIRS and SACL. These changes were significant (FIRS: $T = 21.5$; $p < .02$, two-tailed; SACL: $T = 23$;

$p < .02$, two-tailed) reflecting a tendency of subjects in this experiment to rate the CS faces more positively upon retesting in the absence of any systematic experimental influence. This trend did not extend to the Pic-sort task where there was a slight, nonsignificant negative change on posttesting.

FOLLOW-UP TESTING

Table 14 presents results of the second rating of the CS faces performed by eight subjects after 15 days and by the remaining eight subjects after 30 days. The means and standard deviations of the pretreatment and posttreatment ratings of faces by the 15-day and 30-day follow-up groups on the three measures are also presented. Thus, by inspecting the columns of Table 14 it is possible to discern the trend of the experimental attitude change from pretesting to posttesting and then to the 15- or 30-day follow-up for each treatment condition on each measure. Following the testing, subjects were asked if they recalled the contingencies associated with each face. Only two subjects in the 15-day group and one in the 30-day group made errors. In each case the error was confined to a single face.

Table 14

Means and Standard Deviations of CS Ratings Pretreatment, Posttreatment and at Follow-up (15 and 30 days)*

	Time-out from Shock				Aversive				Controls			
	15 days		30 days		15 days		30 days		15 days		30 days	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
FIRS:												
Pre	2.50	4.99	1.00	6.09	1.87	4.09	1.75	5.12	3.00	6.89	1.25	3.20
Post	12.75	11.50	24.50	9.96	0.75	16.56	-9.00	14.02	4.25	13.22	12.13	5.77
F-up	20.00	16.80	13.38	10.31	5.63	13.11	-6.63	13.68	7.63	13.95	10.63	9.76
SACL:												
Pre	2.88	21.32	5.38	17.21	0.25	11.35	1.88	9.05	-6.50	16.72	7.01	6.00
Post	14.00	12.08	22.00	13.55	-2.50	15.66	-9.13	7.55	0.75	15.37	8.75	4.17
F-up	17.25	17.93	13.13	13.80	3.50	16.74	-7.13	14.75	-2.88	22.54	14.38	10.03

	15 days	30 days	15 days	30 days	15 days	30 days
Pic-sort:**						
Pre	0	2	2	0	-1	0
Post	3	6	-4	-6	-2	-2
F-up	4	3	-2	-8	-1	-2

* Fifteen and thirty day follow-up groups contain eight subjects each.
** Overall ratings.

Time-out From Shock

Table 14 suggests that subjects' ratings on the FIRS of faces in this condition were more favourable 15 days after termination of the experiment than immediately following conditioning. This difference, however, was not significant. Nevertheless, this second set of ratings, obtained after 15 days, was still significantly different ($T = 2$; $p = .02$, two-tailed) from the initial pretreatment ratings of the same faces. Similar results obtained on the SACL where the ratings of faces after 15 days were also significantly more positive ($T = 2.5$; $p < .05$, two-tailed) than the initial pretreatment ratings. On the Pic-sort task, subjects' ratings after 15 days were essentially comparable in magnitude to their posttreatment evaluations. The magnitude of the positive ratings of the time-out from shock faces, particularly on the FIRS and the SACL suggests that subjects continued to perceive these latter faces more favourably.

Subjects in the 30-day retest group rated faces in the time-out condition less favourably than they did immediately following conditioning. This was the case on all measures. On the FIRS and SACL the ratings declined to values comparable to those assigned control faces after 30 days.

Aversive Condition

The 15- and 30-day follow-up groups, unfortunately, were not matched on ratings derived from the first posttest (following termination of conditioning). It can be seen from Table 14 that the 15-day subgroup, in fact, showed very little negative attitude change at the posttreatment evaluation stage. By contrast the group selected for re-testing after 30 days happened to be composed of subjects who had undergone fairly strong negative attitude change as indicated by their posttreatment ratings of faces in that condition. The 15-day group re-ratings of the aversive faces showed the same mild tendency to become more positive relative to posttreatment ratings as shown in general by the control faces.

The picture was rather different for subjects rating faces in the aversive condition after 30 days. Only a small decrease in posttreatment negative rating was registered on the FIRS and the SACL after 30 days. There was, in fact, a small increase in negative rating after 30 days on the Pic-sort task. An examination of the magnitude of subjects' ratings of faces in the three experimental conditions after 30 days shows that faces in the aversive condition received markedly more negative scores on all three measures compared to faces in the time-out from shock and control conditions. The 30-day follow-up ratings of aversive faces were significantly more negative than the ratings after 30 days of time-out from shock faces ($T = 3$; $p < .05$, two-tailed) and those of control faces ($T = 1$; $p < .02$, two-tailed) on the FIRS. Ratings of aversive faces were also significantly more negative than those of controls ($T = 0$; $p < .01$, two-tailed) on the SACL. Further corroboration of these results occurs on the Pic-sort task where aversive faces were rated significantly more negatively than time-out faces ($T = 0$; $p = .02$, two-tailed) and control faces ($T = 0$; $p = .05$, two-tailed) after 30 days.

Control Condition

Many references to the results of the 15- and 30-day follow-up evaluations of faces in the control condition have already been made in the previous sections. Perhaps it need only be added that there were no very orderly trends to be discerned. Ratings of control faces on both the FIRS and the SACL at both follow-up intervals were more favourable than their initial pretreatment evaluations but not necessarily more than their posttreatment evaluations. None of these differences reached statistical significance. As for the Pic-sort task the ratings at both follow-up intervals closely followed the posttreatment scores reflecting high test-retest stability.

DISCUSSION

This study undertook to find a method to recover the negative attitude change effect, lost in the previous study, while maintaining the strong positive change effect obtained in that study. Both aims were realized at acceptable levels of statistical significance. The negative attitudinal effect was attained by a procedural modification tested in this study. The resultant change was of small magnitude on the FIRS and SACL but large on the Pic-sort task. Despite this variation in size, the negative effect proved to be consistently significant on almost all comparisons and across the three dependent measures.

The follow-up testing which was carried out provided information concerning the duration of the two experimental effects. After 15 days the positive ratings had increased in magnitude on two out of the three measures compared to their level at posttreatment testing, although these changes were not significant. After 30 days, the ratings tended to subside to a level comparable to those assigned the control faces. Only the 30-day retest subjects provided meaningful results about the durability of the negative attitude change effect. Their ratings on two measures, of faces in the aversive treatment condition, were only slightly less negative after 30 days than at the posttreatment testing. On the third measure (Pic-sort) the ratings were slightly more negative (nonsignificantly). In short, after 30 days, these faces continued to be perceived in a markedly negative fashion. It has been mentioned that these follow-up results were provided by subjects who, by and large, were able to recall the contingency associated with each CS face. Whether subjects who had forgotten these contingencies would have provided similar follow-up data is a question for subsequent investigation.

This study thus provides a combination of two contrasting affect conditioning procedures for the induction of reliable positive and negative evaluative attitudes towards CS slides of faces. As well, evidence presented in this study suggests that these attitudinal changes are durable over time.

SUMMARY, EVALUATION, AND QUESTIONS FOR FUTURE RESEARCH

INTRODUCTION

A series of five experiments was presented on the classical conditioning of positive and negative attitudes toward photographic slides of human faces. The first study provided evidence that these attitudes might be effectively induced by a Pavlovian discriminative conditioning procedure. Three subsequent studies were done to determine the sufficient conditions for producing reliable attitude change and to test the duration of these effects. A control experiment was also carried out to investigate the role demand characteristics may have had in producing the present results. This final chapter reviews the contributions and limitations of these studies and suggests further related experiments.

CONDITIONING NEGATIVE ATTITUDE CHANGE

There has been no disagreement concerning the method for generating negative attitude change based on an affect conditioning model. Since the early work of Watson and Rayner (1920) a classical aversive conditioning procedure has proven to be effective in a variety of studies reviewed in the introductory chapter. This has been the case in the present work, as well, where the use of aversive electric shock in a classical paradigm produced significant negative attitude change towards complex stimuli (human faces) in three out of four studies. Furthermore, follow-up testing revealed that the negative attitudes created in subjects persisted at almost equal strength 30 days after the conclusion of conditioning trials.

It is of interest to consider the single study (Study IV) in which classical conditioning using high levels of shock failed to generate negative attitudes toward the CS slides. Unlike previous studies, the ITI in that experiment varied as a function of the preceding trials, aversive CS faces being followed by the usual 10-second ITI while time-out from shock CS faces were followed by a 25-second ITI. This procedural change had asymmetrical effects upon outcome. That is, it strengthened the positive effect as was anticipated but it also unexpectedly erased the negative attitude effect which previously had resulted from aversive classical conditioning of particular CS slides. The change in procedure seems to have reduced the aversiveness of the shock below the level necessary to generate negative associations to the CS slides. Yet the shock was sufficiently aversive that the time-out from shock slides acquired strong positive value. These findings unlike those of previous studies in this series indicate that the positive and negative attitudinal effects may be independent so that one may actually occur in the absence of the other.

In the experiment described above and previous ones, CS slides designated for aversive conditioning were paired with a shock of 1.5 seconds duration in a paradigm where the CS-UCS interval was .5 seconds. The subsequent study attempted to generate negative attitude change more effectively by decreasing the predictability of the shock associated with the CS slides and thereby increasing its aversiveness. This was accomplished by varying the CS-UCS interval, the number of shocks associated with the CS slide on any given trial and the timing of their presentation. In this new paradigm the presentation of CS faces in the aversive condition was reliably followed by shock but these shocks were otherwise unsignalled and variable in number. Under these modified conditions the resulting negative attitude change was consistently significant across the three dependent measures. These findings suggest that reliable negative attitude change might best be achieved by an aversive classical conditioning procedure which minimizes the predictability of occurrence of the electric shock.

CONDITIONING POSITIVE ATTITUDE CHANGE

One of the aims of the present series of studies was to develop an affect conditioning paradigm for the reliable induction of strong positive attitudes. Based on the results of the first pilot study, the method of associating a stimulus with time-out from shock was selected and developed because it seemed to be much more effective than an aversion relief or cessation-conditioning procedure. Subsequent to this decision, a number of studies and reviews appeared (LoLordo, 1969; Moscovitch & LoLordo, 1968; Rescorla, 1969; Sutterer & Beck, 1970) which corroborated the results of the pilot study and the paradigm choice. The general finding seems to be that a stimulus acquires positive value (inhibits fear) when it is predictive of (associated with) time-out from shock in a context where aversive shock is being administered. The foregoing general principle was supported by the results of the final two studies in the present series. Furthermore, the attitudes generated towards slides of faces were shown to persist for at least 15 days following termination of conditioning trials.

The cessation conditioning (aversion relief) procedure merits discussion in this context. This is a fairly common technique in clinical behavior modification (Wolpe & Lazarus, 1966). Moscovitch and LoLordo (1968) have shown that the presentation of a CS which predicted a shock-free period, lead to greater inhibition of fear than the presentation of a CS paired with shock termination (cessation CS). They also showed that a cessation CS does not acquire fear inhibiting properties through contiguous pairing with shock termination and relief from pain, but rather by the extent to which the CS has signalled or predicted a subsequent shock-free period. Based on this analysis, they have made two proposals for strengthening the cessation conditioning procedure. First, the cessation CS should be made to predict the termination of shocks varying widely in duration so that it becomes truly informative and predictive of a period of safety. Second, they suggest that the ITI be fairly long so that the CS predicts a safety period of sufficient duration to be rewarding. Evidence from the first pilot study in this series and from Sutterer and Beck (1970) suggest that cessation conditioning paradigms which employ shock of fixed duration or shock varying slightly about a mean value do not generate positive feeling towards associated stimuli. This evidence, based on human subjects is consistent with Moscovitch and LoLordo's (1968) first proposal. A useful future attitude study might be one which compared the cessation-conditioning procedure proposed by Moscovitch and LoLordo (1968) with a paradigm in which a CS simply predicts long shock-free periods against a background of frequent shocks (as was employed in the last two studies of the present series).

DEMAND CHARACTERISTICS

In the present group of studies, two safeguards were employed in order to minimize the influence of experimental demand characteristics. First, subjects were told at the outset that they were taking part in an experiment on attention and memory under stress (electric shock). In support of this cover story, at the conclusion of the conditioning trials and prior to the posttreatment rating of the slides, a bogus inquiry was conducted. Subjects were asked to recollect as many details as they could, concerning the features and grooming of each stimulus picture. In addition, they were asked to identify and locate from memory a small symbol placed in one of the four corners of each slide (a circle, X, or triangle had previously been drawn on each slide as part of the deception procedure). The second countermeasure consisted of the wording of the instructions prior to the re-rating of the photographs at the conclusion of conditioning trials. The initial remark introducing the posttreatment testing that "your ideas and feelings towards these faces may or may not have changed" was intended to release subjects from any perceived demands, arising from the experiments.

The control experiment (Study III) was designed to permit inferences concerning the role of compliance with perceived demand characteristics in the results of this group of experiments. The approach in the control experiment was based on the notion that, essentially, it was the CS-UCS contingencies experienced by the subjects combined with the pre-post testing procedure which generated whatever demand characteristics were present. Accordingly, the control experiment preserved the shock and non-shock contingencies, the pre-post testing design and all other procedural details which defined the forthcoming shock as stressful. However, non-aversive shock was substituted for the usual painful shock. Under the conditions of this experiment, only two significant attitude shifts, pretreatment to posttreatment, were observed. These occurred on the SACL only. In the discussion of these findings in Study III it was reasoned that they were probably not due to any systematic factor such as compliance with demand features. An alternative hypothesis would be that, of the three measures, the SACL only, is mildly susceptible to demand characteristics. It would suggest, further, that conclusions based on SACL results, alone, be regarded with some caution. This view can be adopted without weakening the interpretations of subsequent results obtained in Studies IV and V. The significant changes in these experiments appeared consistently on all three dependent variables so that the SACL results confirmed but were not essential to conclusions drawn from the other two measures.

The other possibility one might consider is that the significant changes in Study III were due to chance fluctuations in the SACL pretreatment scores. It might, then, be concluded more firmly that the absence of any consistently significant attitude change in the control study points to the critical role of affect conditioning based on aversive electric shock.

In their study, Insko and Oakes (1966) differentiated between demand awareness and contingency awareness. Their findings showed that awareness of the CS-UCS contingency was a necessary prerequisite to the demonstration of conditioning effects. They also provided evidence that awareness of the demand aspects was weakly correlated with attitude conditioning but it was not a necessary condition for its demonstration. Similarly, Zanna et al. (1970) succeeded in conditioning positive and negative attitudes in subjects who were deliberately informed about the reinforcement contingencies but who were carefully shielded from the influence of demand characteristics. All subjects in the present research like those in the studies cited above indicated awareness of the reinforcement contingencies.

It is recognized that the results of the present control study may not fully reflect the part played by demand characteristics, particularly in Studies IV and V which resemble it less closely than do Studies I and II. The precise assessment of the influence of demand characteristics on the results of Studies IV and V is a matter for future research.

QUESTIONS FOR FUTURE RESEARCH

In this series of studies the affect conditioning model of attitude change was extended to complex stimuli using adult human subjects. In addition, a method of positive attitude induction derived from animal studies of Pavlovian principles for conditioning inhibition of fear was shown to be both feasible and effective. A number of limitations were associated with the accomplishment of these aims. For instance, the photographic slides of faces used in this experiment were preselected to yield neutral ratings on one of the measures (FIRS) prior to treatment. It remains to be determined whether the present attitude conditioning procedures would be effective with faces towards whom subjects held strong pre-experimental attitudes. Concerning the practical utility of these procedures one would, of course, want to know whether induced attitudes toward photographically presented stimuli would generalize to persons encountered in real life.

Another important limitation concerns the nature of the dependent variables used in these experiments. The paper-and-pencil tests of attitude and the sorting task by which the effects of the experimental treatment were measured were informative and convenient. However, the paradigms which have been developed on the basis of these measures now must be tested for their effects upon more significant social behaviors. Although promising relationships have been demonstrated between attitudes and behavior (De Fleur & Westie, 1958) the factors governing the association between these two response classes are complex (Kiesler *et al.*, 1969). Extension of the present project as suggested above would be of theoretical interest and would also have useful applications in the area of therapeutic behavior change.

Finally, it bears repeating that the foregoing studies converged on an optimal combination of conditions which are sufficient for producing positive and negative attitude change. However, except for the role of aversive electric shock, they have not provided information concerning the specific contribution of each variable to the observed results. For instance, the optimal number of trials and CS faces in each treatment condition needs to be determined. Likewise, the most effective ITI length for each of the two conditions requires study. Furthermore, the desirability of simultaneously conditioning positive and negative attitudes towards different persons must be evaluated. For example, it might be more effective to condition only positive feeling towards a person (or persons). This could be attempted by making the appearance (live or photograph) of a person predictive of a lengthy stress-free period for a subject who has been receiving aversive electric shock on a random schedule. Many similar issues of equal importance to the development of this new research area remain to be explored.

SUMMARY

A series of five experiments was reported on the classical conditioning of positive and negative attitude change towards slide photographs of human faces. The optimal conditions for the induction of unfavourable attitudes involved a paradigm in which the presentation of CS slides preceded a period of shocks, unpredictable as to frequency and distribution. Favourable attitudes were most effectively induced by CS slides reliably predicting a long, shock-free intertrial interval. The durability of the experimentally induced attitude change was tested after 15 and 30 days. It was found that negative attitudes were still present 30 days after conditioning. Favourable attitudes remained significantly different from pretreatment levels 15 days following the experiment. These later diminished in intensity until after 30 days they were comparable to ratings of the control faces.

The demand characteristics of the experimental procedure employed in some of the studies reported, were assessed in a control experiment. The results indicated that demand characteristics were exerting little or no influence on the attitude changes which had been produced.

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APPENDIX

PRETREATMENT TEST INSTRUCTIONS

Picture Sorting Task

Please examine the slides you see in front of you on the editor. I'd like you to form an impression of each of them and the kind of people they seem to be. Then, I'd like you to sort them, one at a time, into three groups, those you like, those you dislike, and those you don't feel strongly towards, that is, those towards whom you feel neutral.

FIRS

I'm going to project a series of faces on the screen, one at a time, each for one and a half minutes. I'd like to know how they impress you--what you think and feel about them. On the rating scale, +4 indicates that the person on the screen has a very high degree of the characteristic described by the adjective on the left (right); a -4 indicates a high degree of the opposite characteristic described by the term on the right (left). The numbers in between indicate varying degrees of the characteristic. Please circle one of the numbers which corresponds to your rating.

SACL

I'm going to project some of these faces on the screen again, each for two and a half minutes. Your job, this time, is to place a check beside any adjective on this page that you think describes the person you are rating on the screen.

POSTTREATMENT INSTRUCTIONS

Your ideas and feelings about these faces may or may not have changed. I'd like you, now, to rate the faces again to see if the way you feel about these girls had anything to do with what you remember about them. We'll begin with this (either Pic-sort, SACL or FIRS). Do you remember how to do this? (If necessary, parts of the relevant pretreatment instructions were repeated at this point.)

Contingency Awareness Inquiry

Were there any particular events connected with the appearance of this face on the screen?

Follow-up Instructions

I'd like you to evaluate these faces, again, today. Do you remember how to fill this out? (FIRS, SACL and Pic-sort were presented in random order for each subject.)

First Impression Rating Scale--Form I (Subjects' forms were untitled)

1.	Understanding	+4	+3	+2	+1	0	-1	-2	-3	-4	Socially insensitive	1.
2.	Creative	+4	+3	+2	+1	0	-1	-2	-3	-4	Destructive	2.
3.	Good sense of humor	+4	+3	+2	+1	0	-1	-2	-3	-4	Kill joy	3.
4.	Imaginative	+4	+3	+2	+1	0	-1	-2	-3	-4	Unimaginative	4.
5.	Physically attractive	+4	+3	+2	+1	0	-1	-2	-3	-4	Physically repulsive	5.
6.	Considerate	+4	+3	+2	+1	0	-1	-2	-3	-4	Inconsiderate	6.
7.	Intelligent	+4	+3	+2	+1	0	-1	-2	-3	-4	Stupid	7.
8.	Colorful	+4	+3	+2	+1	0	-1	-2	-3	-4	Colorless	8.
9.	Deep	+4	+3	+2	+1	0	-1	-2	-3	-4	Shallow	9.
10.	Good	+4	+3	+2	+1	0	-1	-2	-3	-4	Bad	10.
11.	Courageous	+4	+3	+2	+1	0	-1	-2	-3	-4	Cowardly	11.
12.	Affectionate	+4	+3	+2	+1	0	-1	-2	-3	-4	Hostile	12.
13.	Likeable	+4	+3	+2	+1	0	-1	-2	-3	-4	Despicable	13.
14.	Generous	+4	+3	+2	+1	0	-1	-2	-3	-4	Miserly	14.
15.	Energetic	+4	+3	+2	+1	0	-1	-2	-3	-4	Lazy	15.

First Impression Rating Scale--Form II (Subjects' forms were untitled)

1.	Rejecting	-4	-3	-2	-1	0	+1	+2	+3	+4	Accepting	1.
2.	Unproductive	-4	-3	-2	-1	0	+1	+2	+3	+4	Productive	2.
3.	Boring	-4	-3	-2	-1	0	+1	+2	+3	+4	Entertaining	3.
4.	No originality	-4	-3	-2	-1	0	+1	+2	+3	+4	Original	4.
5.	Ugly	-4	-3	-2	-1	0	+1	+2	+3	+4	Good looking	5.
6.	Self-centered	-4	-3	-2	-1	0	+1	+2	+3	+4	Cares for others	6.
7.	Sluggish	-4	-3	-2	-1	0	+1	+2	+3	+4	Alert	7.
8.	Over-critical	-4	-3	-2	-1	0	+1	+2	+3	+4	Enthusiastic	8.
9.	Foolish	-4	-3	-2	-1	0	+1	+2	+3	+4	Wise	9.
10.	Cruel	-4	-3	-2	-1	0	+1	+2	+3	+4	Kind	10.
11.	Dependent	-4	-3	-2	-1	0	+1	+2	+3	+4	Self-reliant	11.
12.	Cold	-4	-3	-2	-1	0	+1	+2	+3	+4	Warm	12.
13.	Disturbing	-4	-3	-2	-1	0	+1	+2	+3	+4	Pleasing	13.
14.	Vengeful	-4	-3	-2	-1	0	+1	+2	+3	+4	Forgiving	14.
15.	Slow-moving	-4	-3	-2	-1	0	+1	+2	+3	+4	Vigorous	15.

Selected Adjective Check List

ADAPTABLE
AFFECTED
AFFECTIONATE
AGGRESSIVE
ALERT
ALOOF
APATHETIC
APPRECIATIVE
ARGUMENTATIVE
ARROGANT
ARTISTIC
ASSERTIVE
ATTRACTIVE
AUTOCRATIC
BITTER
BLUSTERY
BOSSY
CALM
CAUTIOUS
CHARMING
CHEERFUL
CLEVER
COARSE
COLD
COMPLAINING
CONSCIENTIOUS
CONSIDERATE
COOL
COOPERATIVE
CRUEL
CYNICAL
DECEITFUL
DEFENSIVE
DEPENDABLE
DEPENDENT
DISORDERLY
DISSATISFIED
DISTRUSTFUL
DOMINANT
EASY GOING
EGOTISTICAL
ENTHUSIASTIC
FOOLISH
FORCEFUL
FORGIVING
FRIENDLY
FRIVOLOUS
GENEROUS
GENTLE
GOOD LOOKING
GOOD NATURED
GREEDY
HARD HEARTED
HEADSTRONG
HEALTHY
HELPFUL
HOSTILE
HUMOROUS
IMPATIENT
INHIBITED
INSIGHTFUL
INTELLIGENT
NARROW INTERESTS
WIDE INTERESTS
INTOLERANT
IRRESPONSIBLE
IRRITABLE
KIND
LOYAL
MANNERLY
MILD
NAGGING
NATURAL
OBLIGING
OPINIONATED
OPTIMISTIC
ORIGINAL
OUTGOING
OUTSPOKEN
PATIENT
PEACEABLE
PLEASANT
POISED
PRAISING
RELIABLE
RESENTFUL
RESERVED
RESPONSIBLE
RETIRING
RUDE
SARCASTIC
SELF CENTERED
SELF CONTROLLED
SELF PITYING
SELF SEEKING
SELFISH
SENSITIVE
SENTIMENTAL
SHOW OFF
SHY
SILENT
SINCERE
SNOBBISH
SOCIABLE
SOFT HEARTED
STABLE
STINGY
SUBMISSIVE
SULKY
SUSPICIOUS
SYMPATHETIC
TACTFUL
TACTLESS
THOUGHTFUL
TIMID
TOLERANT
TOUCHY
TRUSTING
UNDEPENDABLE
UNDERSTANDING
UNEMOTIONAL
UNFRIENDLY
UNINTELLIGENT
UNKIND
UNSELFISH
VINDICTIVE

Selected Adjective Check List (Continued)

EVASIVE
EXCITABLE
FAIR MINDED
FAULT FINDING
FICKLE

QUARRELSOME
QUIET
REASONABLE
REBELLIOUS
RELAXED

WARM
WHINY
WISE
WITHDRAWN