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Recent Developments in Classical Conditioning*

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The present paper examines the implications of recent developments in classical conditioning for consumer research. It discusses the finding that the conditioned response need not resemble the unconditioned response, and that the conditioned stimulus must predict but not necessarily precede the unconditioned stimulus for conditioning to occur. The paper also considers the implications of several situations in which classical conditioning may unexpectedly fail to occur, several of the characteristics of classically conditioned behavior, and the role of awareness in conditioning.

Nord and Peter (1980) reviewed the implications for marketing of two basic principles of learning: operant and classical conditioning. Many other papers have also focused on the implications of operant conditioning for consumer research (e.g., Markin and Narayana 1976; Peter and Nord 1982; Rothschild and Gaidis 1981). In operant conditioning, a response which is followed by a reinforcer increases in frequency (Skinner 1938).

Much less attention has focused on the principle of classical conditioning (Pavlov 1927). Classical conditioning is usually described by saying that Pavlov presented an arbitrary stimulus (a metronome), now called the conditioned stimulus or CS, to a hungry dog. The CS was followed by another stimulus, now called the unconditioned stimulus or US (food). The US automatically evoked a response, called the unconditioned response or UR (salivation). As a result of this pairing, the CS came to elicit a part of the unconditioned response even when it was presented alone. The response emitted to the CS was called the conditioned response or CR (salivation).

The present paper focuses on the implications of classical conditioning for consumer behavior and research because two lines of evidence suggest that it may be relevant. First, as Nord and Peter (1980) have pointed out, many advertisements appear to be structured so that classical conditioning will occur. To use one of their examples, advertisements may use famous sportscasters whose voices have been paired with exciting sports events for years. The excitement (the UR) evoked by the voices (the US) may become associated with the advertised product (the CS) through classical conditioning when the two are paired in an advertisement.

A cursory glance at current advertising supports Nord and Peter's point. The products of fast food chains are often marketed by associating their names with the sight and sound of a sizzling hamburger, soft drinks are associated with catchy jingles, breakfast cereals are associated with famous sports personalities, and so on. Supermarkets play music for their customers while they shop (Milliman 1982). All of this is done in the hope of altering consumer behavior.

There is also some laboratory evidence that classical conditioning can alter consumer behavior. Although classical conditioning has been known to occur in humans virtually from the time of Pavlov (e.g., Hilgard 1931), it is only recently that behaviors of interest to consumer research have been studied. For example, Gorn (1982) tried to arrange a classical conditioning situation by showing students slides of either beige or blue pens (the CSs) while they listened to liked or disliked music (the USs). When the students were given a choice of taking a beige or blue pen, more students indicated their preference (the CR) for the pen associated with the liked music.

The present paper describes the details of classical conditioning as they are currently understood. We argue that changes have been made recently in the idea that the conditioned response must resemble the unconditioned response, that the CS must precede the US for conditioning to occur, and that conditioning will occur whenever the CS precedes the US. We also discuss some of the characteristics of conditioned responses and the role of awareness in conditioning. The potential implications of all of these changes in our understanding of classical

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conditioning for consumer research are discussed throughout the paper.

We do not argue that classical conditioning necessarily plays an important role in consumer behavior, or that the specific implications discussed here are necessarily correct. The role of classical conditioning in consumer behavior and the accuracy of specific implications need to be established by careful experiments. However, initial experiments are promising (e.g., Gorn 1982), and more conclusive experiments cannot be conducted without a thorough understanding of classical conditioning procedures. This paper tries to provide such an understanding in the hope that future experiments will be able to establish the role of classical conditioning in consumer research in greater detail.

THE FORM OF THE CONDITIONED RESPONSE

The traditional view of classical conditioning assumes that the conditioned response resembles the unconditioned response. If the US is food and it evokes salivation (the UR), then the animal will also salivate (the CR) to a stimulus (the CS) that precedes the food. Some authors have also argued that only responses controlled by the autonomic nervous system can be classically conditioned (e.g., Skinner 1938). Basically, autonomic responses are those which are involuntary, such as salivation or blinking of the eyes. According to this view, voluntary responses controlled by the skeletal nervous system, such as walking or talking, cannot be classically conditioned. More recent research has questioned both of these assumptions about the form of the conditioned response.

Skeletal Responses Can Be Classically Conditioned

Recent experiments have found that voluntary, skeletal responses can be modified by a classical conditioning procedure. For example, Brown and Jenkins (1968) exposed hungry pigeons to a light (the CS) which appeared periodically on a Plexiglas panel. When the light went out, the pigeons were given brief access to food (the US), which evoked pecking (the UR). After several exposures to this procedure, all subjects pecked the panel that was lit (the CR).

The Brown and Jenkins experiment surprised psychologists when it appeared. Up to that point, psychologists had believed that key pecking, like other skeletal responses, was controlled by operant conditioning. In operant conditioning, a response is followed by a reinforcer, and the response increases in frequency. A reinforcer is technically defined as anything which increases the frequency of a response that it follows. Less technically, a reinforcer is a reward or something which the animal will work to receive. Many reinforcers, such as food, can also serve as USs in classical conditioning procedures. However, operant conditioning differs from classical conditioning. In operant conditioning, it is the relation between the animal's behavior and the reinforcer or US that changes the animal's future behavior. In classical conditioning, it is the relation between some arbitrary stimulus (the CS) and the US or reinforcer which changes behavior.

Many experiments had already shown that key pecking could be operantly conditioned (i.e., that pecking would increase in frequency when it was followed by a reinforcer). However, the key pecks observed by Brown and Jenkins could not be attributed to operant conditioning. Not only had Brown and Jenkins failed to arrange the relation between the pecking response and its reinforcer, which is necessary for operant conditioning, but also, later experiments showed that the key peck would still occur during a Brown and Jenkins procedure even when the procedure was modified so that the key peck actually cancelled the presentation of food (e.g., Williams and Williams 1969). In that procedure, it was impossible to argue that the pecking occurred because pecks were occasionally accidentally followed by food. Pecking in that experiment was the one response that was never reinforced by food.

Further consideration revealed that the Brown and Jenkins experiment had arranged a classical conditioning procedure. A light (the CS) was followed by food (the US), and a pecking response which was evoked by the food (the UR) came to be emitted to the light (the CR). However, in order to accept that these key pecks were classically conditioned, psychologists had to admit that responses controlled by the skeletal nervous system, such as pecking, could be modified by classical conditioning procedures.

Many psychologists since that time have presented explanations for the results of the Brown and Jenkins experiment that do not assume that the pecking was a classically conditioned response (e.g., Ettinger, Finch, and McSweeney 1978; Steinhauer, Davol, and Lee 1976). However, these explanations are typically complicated, and the current weight of opinion favors the idea that Brown and Jenkins demonstrated the classical conditioning of a skeletal response.

The CR Need Not Resemble the UR

Recent experiments have also shown that the conditioned response need not resemble the unconditioned response. Evidence about the form of the CR comes from three sources. First, Siegel and his associates conducted a series of experiments in which various drugs served as the US (Poulos, Hinson, and Siegel 1981; Siegel 1977). They found that the CR took a form opposite to that evoked by the drugs themselves (the URs). For example, if Siegel and his associates presented a CS to a rat and followed it by a morphine injection (the US), the CS came to evoke a physiological reaction (the CR) that was opposite in form to that evoked by the morphine alone (the UR). If the morphine injections increased the animals'

tolerance for pain, a tone which preceded morphine made them less tolerant of pain (but see also Eikelboom and Stewart 1982 for a different point of view).

Second, Holland (1980) conducted a series of experiments with long-duration CSs in which he found several CRs occurring during different parts of the CS. Although these responses took many forms that were difficult to describe, Holland argued that responses which occurred in the early part of a long CS took a form that was determined by the CS, and that those which occured later in the CS took a form determined by the US. For example, if the CS was localizable (e.g., a light), the animal usually physically approached and contacted the stimulus during the early part of its presentation. If the US was food, then the animal usually bit, chewed, or salivated during the later part of the CS. Holland's results have been interpreted to mean that more than one conditioned response may occur and that they need not all resemble the UR.

The CR May Include Sign-Tracking. In an influential paper, Hearst and Jenkins (1974) suggested that the conditioned response always includes physical approaches to and contact of the CS. In fact, they formulated a general principle of behavior called sign-tracking, which states that animals approach and contact the best predictors of reinforcers in their environment. Sign-tracking also states that animals withdraw from stimuli that predict the absence of reinforcers. According to Hearst and Jenkins, the classical conditioning procedure arranges a situation in which sign-tracking will occur: the CS is the best predictor of the presentation of the US. Because many USs are also reinforcers, sign-tracking should occur—i.e., the animals should physically approach and contact the CS as part of the conditioned response.

Hearst and Jenkins present many examples to illustrate the role of sign-tracking in classical conditioning. One of these examples is the Brown and Jenkins (1968) experiment just discussed. In that experiment the pigeons pecked (i.e., approached and contacted the CR) the light (the CS) that signaled food (the US or reinforcer). Although the sign-tracking principle has been criticized as a general description of classically conditioned responding (e.g., Jenkins et al. 1978), most people concede that approach and contact responses may occur when classical conditioning procedures are used.

Implications. All of this evidence has helped to broaden current ideas about the form of the CR. In many cases, the CR still does resemble the UR, but in other cases it does not. Although some authors have tried to describe when the CR will resemble the UR and when it will not (e.g., Eikelboom and Stewart 1982), such descriptions are not generally accepted yet. They are also beyond the scope of this paper. However, the implications of the change in the form of the CR for consumer research can be discussed without such an understanding. It is enough to recognize that classical conditioning may control skeletal responses as well as autonomic responses, and that the form of the CR need not resemble the form of the UR.

One implication of these changes for consumer research is that if skeletal responses can be classically conditioned, then classical conditioning can do more for a product than make people feel good about it or make them salivate in its presence. If Hearst and Jenkins are correct, then people will approach a product which is followed by a US that is also a reinforcer. To use Gorn's example, presenting a pen to a person followed by pleasant music may produce more approaches to the pen in the store, as well as a greater consumer preference for the pen. Inducing approach to a product may have several benefits. People may be more likely to buy a product that they approach, and they may be more susceptible to other forms of advertising or incentives that may also accompany the product.

A second implication of the revised view of the CR is that a US that evokes the particular response to be conditioned need not be found before classical conditioning can be used. If the CR always resembles the UR, then a US that evokes a response must be found before that response can be conditioned. This is not necessary if the CR does not resemble the UR. Getting back to our approach example, a US that evokes approach need not be found before classical conditioning can be used to move people closer to displays in supermarkets. Any reinforcer may be used as the US to condition this behavior.

Third, the revised view of the CR implies that any attempt to use classical conditioning to alter consumer behavior must be carefully pretested before it is used. It cannot be assumed that the response that will be conditioned will necessarily be similar to the response evoked by the US. For example, it cannot be assumed that because people say that they like (UR) particular music (US), that they will also like (CR) a product (CS) that is followed by this music. The conditioned response to the product may be very different, and we currently have no rules to predict this response. Only pretesting of the advertisement will reveal the response that will be conditioned.

Changes in our ideas about the form of the CR have both favorable and unfavorable implications for the use of classical conditioning to alter consumer behavior. On the one hand, these changes have increased the number and type of responses that can be modified by classical conditioning. On the other hand, the changes have made it less possible to predict in advance the change in behavior that a particular procedure will produce. Attempts to alter consumer behavior should be pretested if classical conditioning is to be used.

PREDICTIVENESS VS. TEMPORAL PRIORITY

Temporal Priority

According to the traditional view of classical conditioning, a CS must temporally precede a US for classical

conditioning to occur. This statement is almost correct and it can be used to correctly identify some situations in which classical conditioning will not occur. For example, classical conditioning will not occur if the US precedes the CS. This is called backward conditioning. Although a few laboratory studies do report some backward conditioning (e.g., Shurtleff and Ayres 1981), backward procedures (US before CS) usually do not work and they are generally less effective than equivalent forward procedures (CS before US). Because backward conditioning is usually ineffective, playing a jingle (US) and then displaying a soft drink (CS) should produce little change in preference (CR) for the soft drink.

The temporal priority view of classical conditioning also predicts little conditioning when the CS and US are presented simultaneously. Although this procedure has been used in some past studies of classical conditioning in marketing (e.g., Gorn 1982), laboratory research indicates that it does not produce optimal conditioning (e.g., Bitterman 1964; Smith, Coleman, and Gormezano 1969). The failure of simultaneous conditioning implies that classical conditioning may not alter consumer behavior when it is used in static situations such as magazine or newspaper advertisements. In these situations, the product cannot be reliably displayed before the US. The failure of simultaneous conditioning also implies that presenting the product (e.g., a soft drink) and then introducing the US (a catchy jingle) should be more effective in conditioning a preference for the soft drink than presenting the drink during the jingle.

The Predictiveness View

Although the implications of the temporal priority view for backward and simultaneous conditioning appear to be correct, more recent studies have characterized classical conditioning differently. It has been argued that the CS must predict, but not necessarily precede, the US for conditioning to occur (Rescorla 1967).

A three-part experiment by Rescorla (1968) may illustrate the difference between the older temporal priority view and the newer predictiveness view of classical conditioning. In the first part of his experiment, Rescorla showed that the amount of conditioning displayed by rats increased with increases in the probability that a footshock (the US) would follow a tone (the CS). The results of this part of the experiment were compatible with the temporal priority view, because it could also be said that the amount of conditioning had increased with increases in the probability that the US "followed" the CS.

The second and third parts of the experiment were incompatible with the temporal priority view, however. In the second part, Rescorla showed that the amount of conditioning also decreased with increases in the probability that a US would occur in the absence of a CS. This finding is incompatible with the temporal priority view, which says nothing about the effect of USs that occur in the absence of the CS. In the third part, Rescorla showed that no conditioning occurred when the probability that a US would occur was equal in the presence and absence of the CS. This finding is also incompatible with the temporal priority view, which predicts—incorrectly—that conditioning should occur. The temporal priority view predicts conditioning if the US occasionally occurs after a CS, regardless of what happens in the absence of the CS.

Rescorla summarized his findings by saying that classical conditioning occurs when a CS predicts rather than precedes a US. He also argued that a CS predicts a US when the conditional probability of the US is higher in the presence of the CS than in its absence (Rescorla 1967). Many additional experiments have supported his predictiveness view over the traditional temporal priority view of conditioning (e.g., Thomas and Wagner 1964; Wagner et al. 1964), but his definition of predictiveness has not gone unchallenged. Unfortunately, no formal statements describe exactly how the probabilities are calculated or how the presence or absence of the CS is defined and measured.

In the absence of a completely acceptable formal definition, psychologists have agreed on a procedure that arranges a predictive relation between a CS and a US. It is now generally accepted that this procedure must be followed to show that a response is classically conditioned (e.g., Rescorla 1967). This procedure requires two groups of subjects. The CS–US paired group is exposed to the CS followed by the US—for example, the name of the fast-food chain followed by a sizzling hamburger. The random control group is exposed to the same number of CSs and the same number of USs as the first group, but these CSs and USs are presented randomly with respect to each other. The subjects see the name of the fast-food chain and the sizzling hamburger, but the presentation of each stimulus is controlled by a timer which runs independently of the one controlling the other stimulus. Classical conditioning is said to occur if a particular response (e.g., salivation to the name of the fast-food chain) develops in the first group but not in the second.

This procedure is said to represent the predictiveness notion of classical conditioning because the two groups differ only in the degree to which the CS predicts the US. The two groups have the same number of CS and US presentations. Therefore, differences in behavior between the groups cannot be attributed to differences in familiarity with the CS or US, or to any interaction between them. Differences between the groups can be attributed only to differences in predictiveness. If classical conditioning occurs only when a CS predicts a US, then a conditioned response should occur in the first group but not in the second.

Implications of the Predictiveness View

The predictiveness view of classical conditioning has obvious implications for consumer research. To show that a behavior really has been established by classical

conditioning, it is now necessary to use the two-group experimental design. Otherwise, true classical conditioning may be confused with changes in behavior resulting from CS or US familiarity, or from an interaction between the two.

The predictiveness view also has some practical implications for altering consumer behavior. These implications should be tested experimentally. For example, the temporal priority view may imply that a preference for a soft drink could be conditioned by presenting the drink constantly with a jingle played occasionally. Sight of the drink would occasionally precede the music. However, experiments on classical conditioning have shown that presenting the CS constantly and introducing the US intermittently does not produce a conditioned response (Brown and Jenkins 1968). These experiments are consistent with the predictiveness view of conditioning. In this situation, the presence of the CS does not predict whether the US will occur. The CS is always present and the US occurs only occasionally. This implies that commercials which are arranged so that the onset of the product precedes the US will be more effective in altering consumer behavior than those which present the product and introduce the US occasionally.

The predictiveness view of conditioning also implies that the number of extra exposures to the CS (the product) outside of the advertisement should be minimized. As the number of times the CS occurs without the US increases, the predictiveness of the CS—and therefore the conditioning to that CS—decreases (Rescorla 1968). This has at least two implications for consumer research.

First, classical conditioning may not be as effective in altering consumer behavior towards products which are frequently encountered as it is for products which are infrequently encountered. For example, classical conditioning might not work well in advertising Chevrolets because they will be frequently seen in everyday life. The effectiveness of the conditioning will decrease when the product is encountered without the US. Classical conditioning might work very well for a new line of cars because they will rarely be seen outside of the advertisement. Cutting across product lines, classical conditioning might be more effective when it is used for something such as a laundry detergent that is not encountered frequently, than when it is used for a popular line of shirts that would frequently occur without the US.

Second, the decrease in conditioning which occurs when the CS is encountered without the US may also imply that people who wish to use classical conditioning to alter consumer behavior should not use several types of advertising. To use Gorn's example of increasing the preference for a pen by following it with music, people will occasionally see the pen without hearing the music and this will decrease the effectiveness of classical conditioning. Its effectiveness should not be decreased still further by presenting extra, unpredictive CSs, as it might if the pen were also advertised in newspapers or magazines where it would be seen without the music.

A final implication of the predictiveness view is that the number of exposures to the US in the absence of the CS should be minimized. To condition preferences using music, a novel tune should be used. If a familiar song is used, then the US may frequently occur when it has not been predicted by the CS, decreasing the effectiveness of conditioning.

To summarize, the CS must predict the US for classical conditioning to be effective. The better the CS predicts the US, the better the conditioning will be. The CS will not predict the US if the CS and US are presented simultaneously or if the CS is presented constantly with the US introduced only occasionally. The predictiveness of the CS will also be reduced if the CS is encountered frequently in the absence of the US or if the US is encountered frequently in the absence of the CS.

SITUATIONS IN WHICH CLASSICAL CONDITIONING FAILS TO OCCUR

The traditional view of classical conditioning argues that conditioning will occur whenever a CS is followed by a US. More recently, situations have been found in which conditioning does not occur even when the CS is followed by, and predicts, the US. These failures of conditioning must be avoided if classical conditioning is to be effective. Currently, five situations are known to prevent conditioning even though the CS precedes and predicts the US. These are summarized in Table 1.

Overshadowing

First, classical conditioning will not occur if overshadowing occurs (Pavlov 1927). In an overshadowing procedure, two CSs are presented at the same time and both precede the US. If the CSs differ in salience (e.g., a loud noise and a dim light), then conditioning may occur to the more salient stimulus (the loud noise), but not to the less salient stimulus (the dim light). For example, the sound of a particular sportscaster's voice (CS_1) and a particular time on Saturday afternoon in the fall (CS_2) may both predict an enjoyable football game (US), but little classical conditioning may occur to the time because it is "overshadowed" by the more noticeable voice. Overshadowing implies that other salient stimuli should be removed from commercials which attempt to change consumers' preferences for a product. For example, if the product is accompanied by an attractive person, the person may overshadow the product and leave preferences for the product unchanged.

Blocking

Classical conditioning will not occur if blocking occurs (Kamin 1969). In a blocking procedure, the subject is given previous experience that one CS (CS_1) forecasts a US. Later, that CS and a new CS (CS_2) are presented together and are followed by the same US. No condi-

TABLE 1

SITUATIONS IN WHICH CLASSICAL CONDITIONING MAY NOT OCCUR

Type	Procedure	Results	Implications
Overshadowing	CS_1, CS_2 → US	CR develops to CS_1 but not CS_2 because CS_1 is more salient.	Remove other salient stimuli which coincide with the CS from the advertisement.
Blocking	CS_1 → US, then CS_1, CS_2 → US	CR develops to CS_1, but not CS_2, because of the past experience that CS_1 forecasts the US.	Do not use something familiar as a US.
US pre-exposure effect	US only, then CS → US	CR fails to develop to CS because US loses its effectiveness through prior presentation alone.	Do not use something familiar as a US.
Latent inhibition	CS only, then CS → US	CR fails to develop to the CS because the CS loses its effectiveness through prior presentation alone.	Use classical conditioning to change preferences for new products rather than old ones.
Garcia effect	CS_1 → US_1 CS_2 → US_1 CS_1 → US_2 CS_2 → US_2	CR develops to CS_1 when followed by US_1 but not when followed by US_2. CR develops to CS_2 followed by US_2 but not when followed by US_1.	Pretest your choices of CS and US to make sure conditioning will occur for these choices.

tioning occurs to the new CS (CS_2) even though it precedes and predicts the US. It is as if prior experience with the old CS (CS_1) "blocked" conditioning to the new CS (CS_2). For example, suppose that over many years you have learned that clouds forecast rain. Now you acquire a barometer so that you can potentially forecast rain on the basis of either clouds or barometric pressure. If blocking occurs you will not acquire a classically conditioned response (e.g., a disliking) to low barometric pressure even though it is now a good and salient predictor of rain. In a sense, your past experience that clouds are a valid predictor of rain prevents you from learning a conditioned response to the barometric pressure. There is no need to condition to the barometric pressure because it provides little new information about the US (the chance of rain).

Blocking suggests that familiar USs should not be used if a product is to be presented with stimuli that have predicted that US in the past. For example, people may learn that listening to a particular radio station predicts that a particular popular song may be played. If a product (CS_2) is advertised on that station (CS_1) using that particular song as a US, previous experience may block conditioning to the product. That is, people may show an increased preference for that radio station, but not for the product, even though the product also predicted the song.

US Pre-Exposure Effect

Classical conditioning will not occur if subjects are given prior exposure to the US presented alone (Mis and Moore 1973; Rescorla 1973). Although familarity with a stimulus is frequently reported to produce greater liking for that stimulus (Zajonc 1968), familiarity also decreases the effectiveness of that stimulus as a US. The US pre-exposure effect is similar to blocking, but the US is presented alone instead of predicted by a CS, as it is in blocking experiments. The US pre-exposure effect also suggests that a familiar stimulus (e.g., a familiar song) should not be used as a US. Familiarity with the US will decrease the effectiveness of a classical conditioning procedure in altering consumer behavior.

Latent Inhibition

Classical conditioning will not occur if latent inhibition occurs (Lubow 1973; Lubow and Moore 1959). In a latent inhibition procedure, the CS is presented several times without the US. When the CS is later followed by the US, little conditioning occurs. Latent inhibition implies that it will be easier to classically condition behaviors to new products (CSs) than to products with which people have had previous experience.

Garcia Effect

Classical conditioning does not occur in some cases because of improper choice of the CS that is paired with the US. Garcia's experiments on poison-based avoidance conditioning provide the classic demonstrations of this failure of conditioning (Garcia and Koelling 1966). Basically, Garcia found that an aversion (CR) was easily conditioned to a flavor (CS_1) when that flavor was followed by sickness (US_1), but an aversion (CR) did not develop to the same flavor (CS_1) when it was followed by shock (US_2). Likewise, an aversion (CR) did develop to a light and a noise (CS_2) that were followed by shock (US_2), but it did not develop to the same light and noise (CS_2) when they were followed by sickness (US_1).

No one has yet provided a list of rules that would predict which choices of CSs and USs will produce conditioning when they are paired. One popular speculation is that stimuli that "biologically" belong together, such as tastes and sickness, lead to the best conditioning. Stim-

TABLE 2

CHARACTERISTICS OF CLASSICAL CONDITIONING

Type	Procedure	Results	Implications
Acquisition	CS → US	Strength of CR increases gradually with increases in the number of pairing of the CS with the US.	Use a salient CS and a strong US. Space commercials well in time. Do not expect a change in preference until several commercials have been given. Present the commercial only rarely after full conditioning has been achieved.
Extinction	CS → US, then CS alone or CS and US presented randomly	Strength of CR progressively decreases.	Do not expect the change in preference to last forever if advertisements are completely discontinued.
Higher order conditioning	CS_1 → US, then CS_2 → CS_1	CR develops to CS_2 because CS_1 has acquired the ability to act as a US.	You may use people and objects associated with pleasant events as USs.
Discrimination	CS_1 → US and CS_2 presented alone or randomly with respect to the US	CR develops to CS_1, not to CS_2.	Present rival products without the US, as well as your own products with it.
Generalization	CS_1 → US	CR occurs to other CSs to the extent that they resemble CS_1. The CR will extinguish to the other CSs if they are presented repeatedly without a US.	Restrict the benefits of your advertising to your product by making it as distinctive as possible. Take advantage of other's advertising by making your product similar to theirs. Make your advertisements as similar as possible to the situation in which the customer will encounter the product.
Inhibition a. Discrimination	CS_1 → US and CS_2 presented alone or randomly with respect to the US	CS_2 evokes a response opposite to that which occurs to CS_1.	You may be able to decrease preference for a rival's product if it is presented by itself in a commercial in which your product predicts the US.
b. Conditioned inhibition	CS_1 → US and CS_1, CS_2 → no US	CS_2 evokes a response opposite to that evoked by CS_1.	You may be able to decrease preference for a rival's product, if your product predicts a pleasant US when presented alone but not when presented at the same time as the rival product.
c. Inhibition of delay	long CS_1 → US	Responses occur in the early part of the CS which are opposite in form to those which occur later.	Don't present your product for too long before the US. People may dislike your product during the first part of its presentation.

uli which are not "biologically" linked, such as tastes and shocks, produce the worst conditioning. However, this rule is too vague to use in practice, and the implications of the Garcia effect for altering consumer behavior are clear without such a rule. The Garcia effect implies that it cannot be assumed that any stimulus can be used as a CS and any other stimulus can be used as a US. Instead, once a CS and US have been chosen, they must be pretested to make sure that conditioning does occur when they are paired.

Summary

Taken together, these situations in which conditioning fails to occur imply that careful attention must be paid to the procedure used if classical conditioning is to occur. For example, commercials cannot be put together solely on the basis of intuition or artistic preference. Instead, they should be arranged very carefully to avoid situations in which conditioning fails to occur.

CHARACTERISTICS OF CLASSICALLY CONDITIONED BEHAVIOR

Although many of the characteristics of classically conditioned behavior have been known for many years, we discuss them here because they have obvious implications for consumer research. These characteristics are summarized in Table 2.

Acquisition

One characteristic of conditioning is that classically conditioned responses do not appear full blown the first time the CS is followed by the US. Instead, the strength of the conditioned response increases as a negatively accelerated function of the number of pairings of the CS with the US (Anrep 1920). This means that the strength of the CR increases greatly the first time the CS and US are paired. The next pairing produces a slightly smaller increase, the third pairing a still smaller increase, and so

on. Eventually, the strength of the CR reaches an asymptote. That is, it does not meaningfully increase with further pairings with the US.

The speed of acquisition of CRs can range from one to many trials, and it is influenced by many factors. For example, the more salient the CS, the faster the conditioning will be and the stronger the CR will be (Kamin and Brimer 1963; Rescorla 1972). Conditioning will also be better for stronger USs (Pavlov 1927; Wagner et al. 1964) and for longer intertrial intervals (Terrace et al. 1975). The intertrial interval is the time between succesSsive CS–US pairings. Although no precise definition of CS salience can be given, CSs that are more intense physically (e.g., brighter lights) are generally more salient than less intense stimuli, and stimuli that have acquired some psychological importance (e.g., your name) are more salient than those that have not. USs that are more intense physically (e.g., more severe footshocks) are generally stronger than less intense stimuli.

The characteristics of acquisition have several implications for consumer research. First, the finding that conditioning develops only with several CS–US pairings implies that presenting a commercial once will not be enough to substantially alter consumer preferences. Instead, an advertisement containing a soft drink and jingle must be presented several times to insure that a change in preference occurs.

Second, commercials which use a salient CS and a strong US will be most effective. To use Gorn's pen and music example, the salience of the pen could be increased by making sure it does not blend into the background and by removing other distractions from the setting in which it is shown. The strength of the US could be increased by pretesting several types of music to find the most preferred, and by making sure that it is clearly audible when it is presented.

Third, commercials which are well-spaced in time should be more effective than those which are not. The intertrial interval refers to the time between successive pairings of the CS and the US. In our fast-food chain example, this is the time between commercials which pair the name of the chain and a sizzling hamburger. As this time increases, the strength of conditioning achieved by a fixed number of CS–US pairings increases up to a point. No exact numbers can be assigned to the intertrial interval which will produce optimal conditioning in any one case. Currently, the only way to determine the optimal intertrial interval is empirically—by presenting the commercials to test groups, using a different intertrial interval for each group. Such pretesting might reveal, for example, that it is better to buy a small number of commercials on several shows than to buy many commericals on only one show.

Fourth, the fact that conditioning reaches an asymptote after some number of trials implies that there will be some optimal number of presentations beyond which further presentations will not measurably change consumer behavior. There are no fixed rules about how quickly responses reach an asymptote other than the vague suggestion already offered to use salient CSs, strong USs, and longer intertrial intervals to increase the speed of conditioning. Again, the only way to determine exactly how quickly conditioning will occur is by pretesting the commercial using test groups.

Extinction

A second characteristic of classically conditioned behavior is that it will disappear if the predictive relation between the CS and the US is broken (Pavlov 1927). This is called extinction, and the CS–US relation may be broken in either of two ways. First, the US may be omitted entirely; second, the CS and US may both be presented randomly with respect to each other. For example, suppose a preference for a soft drink has been conditioned by following that drink (CS) by a jingle (US). That conditioned preference will disappear if the soft drink is presented several times without the music, or if the soft drink and the music are presented randomly in time.

It should be clear from this example that extinction is not the same as forgetting. Forgetting refers to the disappearance of any behavior over time. Extinction refers to the disappearance of a conditioned behavior when the CS no longer predicts the US. The evidence to date suggests that very little forgetting occurs in conditioning (e.g., Hoffman, Fleshler, and Jensen 1963; Gleitman and Holmes 1967). A classically conditioned response will not simply disappear with the passage of time. It will disappear however, if the CS–US relation is broken.

Extinction implies that the predictive relation between the CS and the US must be maintained for as long as the conditioned response is to occur. As soon as this relation is broken, the conditioned response will begin to disappear. Some presentations of the CS without the US will occur naturally and cannot be controlled. For example, people may pass the name of a fast-food chain without seeing a hamburger. If the commercial which pairs the name of the fast-food chain with the hamburger is discontinued, then the conditioned response will disappear because it undergoes extinction. The conditioned response will be maintained only as long as the commercial is presented occasionally.

Extinction has implications for consumer research which are derived from the fact that the predictive relation between the CS and the US must be maintained in order to prevent extinction. Like the predictiveness view of conditioning, extinction implies that conditioning will be most effective for products that are rarely seen outside of the commercials (e.g., a new type of car or a laundry detergent). If the product is frequently seen, the CS will often occur without the US, and extinction of the conditioned response will occur rapidly once the commercial is discontinued.

Like the predictiveness view of conditioning, extinction also implies that a novel US should be used in commercials that use conditioning. If the US occurs frequently without the CS, the predictive relation between the CS

and US will be broken and extinction will occur rapidly when the commercial is discontinued. Using novel USs in commercials which employ conditioning will avoid this problem and prolong the life of the conditioned response even after the commercials are discontinued.

Higher Order Conditioning

A third characteristic of classical conditioning is higher order conditioning. In higher order conditioning, one CS (CS_1) is followed by a US until a response is conditioned. Then a new CS (CS_2) is followed by the old CS (CS_1). A response becomes conditioned to the new CS (CS_2) even though that CS has never been followed by the US itself (Pavlov 1927). The old CS (CS_1) has acquired the ability to act as a "higher order" US. Although higher order conditioning was once thought to be a fragile phenomenon which might not occur outside of the laboratory, recent evidence indicates that higher order conditioning is a robust phenomenon (Rescorla and Holland 1982), suggesting that it may have important implications for everyday life.

From the standpoint of consumer research, higher order conditioning implies that a standard US need not be employed to achieve classical conditioning. For example, people or symbols which are typically associated with pleasant experiences can serve as higher order USs. As suggested by Nord and Peter (1980), a sports personality whose presence predicts an exciting game may serve as a US in classical conditioning just as could the exciting game itself.

Discrimination

Discrimination is another characteristic of classically conditioned behavior. Discrimination occurs when one CS is followed by a US and another CS is not followed by the US. The conditioned response will occur to the CS that is followed by the US and not to the other CS (Pavlov 1927). From a consumer research point of view, presenting music after a product and explicitly presenting a rival product not followed by music may successfully develop a preference for the first product and prevent a preference from developing for the rival product.

Generalization

Generalization refers to a conditioned response that occurs to a novel CS when the novel CS resembles the CS to which the response has previously been conditioned (Pavlov 1927; Siegel et al. 1968). The conditioned response is said to "generalize" from the CS to which it was actually conditioned to other new CSs which resemble the old one. The extent to which the CR occurs to the new CS depends directly on how closely the new CS resembles the old one. For example, if a preference for a breakfast cereal is developed by pairing it with famous athletes, smaller increases in preferences will also be observed for other breakfast cereals which resemble the one actually used.

In practical situations, generalization may be a two-edged sword. On the one hand, a product can be made as distinctive as possible in order to decrease generalization and to restrict the benefits of advertising to that particular product, but at the same time, that product will not benefit from the advertising of other products. On the other hand, a product can be made as similar as possible to other products in order to increase generalization and the benefits from other products' advertising, but at the same time, the other products will also benefit from the advertising of the first product. Decisions regarding which approach to take may depend on whether a company or its competitors are doing more advertising. If other companies are doing more advertising, then a company may wish to increase generalization by making its product more similar to the more heavily advertised products. If a particular company is doing more advertising than its competitors, it may decrease generalization by making its product as distinctive as possible.

A second implication of generalization for consumer research is that effective advertisements will be as similar as possible to the situation in which the person will actually encounter the advertised product. The CS which becomes conditioned may include the entire setting of a commercial as well as the product itself. If this setting (e.g., an exotic resort) is very different from the one in which the person encounters the product (e.g., the supermarket), then very little generalization (very little preference) may carry over from the advertisement to the situation in which the product is actually sold.

Inhibition

A final characteristic of classical conditioning is inhibition. Inhibition refers to the fact that in some situations a response may be conditioned which opposes the response that will occur when the CS predicts the US. The response which occurs to the CS when it predicts the US is called the excitatory conditioned response. The opposing response is called an inhibitory conditioned response. In Gorn's example, the excitatory response that occurred when the pen predicted the music was an increase in preference for the pen. The inhibitory response would then be a decrease in preference for the pen. To avoid accidentally conditioning a decrease in preference for a product, it is worth considering the situations in which inhibition occurs.

Discrimination. Inhibition occurs in several situations which might be characterized by saying that the CS predicts a decrease in the probability of a US (Mackintosh 1974). One situation in which this occurs is the discrimination situation already mentioned. In a discrimination situation, one CS predicts the US, another CS does not. The CS which does not predict the US becomes inhibitory (Rescorla and LoLordo 1965). That is, with experience,

it will evoke a response which is opposite to that evoked by the CS that does predict the US. A commercial in which a product is followed by music and a rival's product is not should not only increase preference for the first product, it should also decrease preference for the rival's product.

Conditioned Inhibition. The conditioned inhibition procedure is another situation in which inhibition occurs (Pavlov 1927). In a conditioned inhibition procedure, one stimulus is presented alone and then followed by a US. The same stimulus is not followed by the US when it is accompanied by another stimulus. The second stimulus becomes inhibitory. To use our example, a commercial in which a pen is followed by music when it is presented alone and is not followed by music when it is presented with a rival pen should condition inhibition to the rival pen. That is, not only will preference increase for the first product, but it should also decrease for the rival product.

Inhibition of Delay. A final situation in which inhibition occurs is called inhibition of delay (Pavlov 1927). In this situation, the initial part of a long CS becomes inhibitory, the latter part becomes excitatory. No absolute time period can be assigned to the duration of CS that is needed before inhibition will occur. This can only be determined in practice. But in general, if a picture of a pen is presented for too long before the music comes on, people may develop a dislike of the pen when they initially see it. This disliking would eventually turn to a preference for the pen if the person looked at it long enough for the excitatory CR to develop. The problem is that few people would attend to the CS long enough for the excitatory response (the preference) to appear.

Again, these characteristics of conditioning may imply that commercials which use conditioning must be carefully arranged to make sure that conditioning will occur. Only careful attention to detail will prevent serious errors.

CONDITIONING AND AWARENESS

We have been concerned with classical conditioning as a procedure which has a specific effect on behavior. If a CS predicts a US, then a conditioned response will develop. We have not taken a position regarding why classical conditioning occurs. For example, we have not addressed the question of whether conditioning occurs because of some mechanical stamping in of a connection between a CS and US or whether it requires some higher cognitive processing on the part of the subject. This is an interesting question and a theory that answers such a question would vastly increase our knowledge of conditioning. However, this question has not been discussed here because it is not answerable as it is currently phrased and because the implications of conditioning for consumer research are clear without such an answer.

The question of whether awareness is necessary for conditioning is too vague to be answered experimentally at the present time. For example, at first glance, it might seem that the question of whether awareness is needed for conditioning could be easily answered by conducting a conditioning experiment and then asking subjects to decribe what happened. The role of awareness would be demonstrated if the subjects who described the CS–US relation showed conditioning and those who did not describe the relation showed no conditioning. However, such an experiment would actually establish very little. First, the results could be used to support almost any interpretation. Suppose, for example, that conditioning was found in subjects who could not report the CS–US relation. Then the proponents of the view that awareness is necessary for conditioning could argue that some "aware" subjects were actually classified as "unaware." According to this argument, more careful questioning would have revealed this rudimentary awareness.

This example should illustrate the fact that the role of awareness in conditioning cannot be clearly established until some generally agreed upon measure of awareness is developed. Until that time, authors can always reinterpret the results of experiments by arguing that unaware subjects were actually aware, and vice versa. Even if such an experiment conclusively showed that conditioning occurred only in aware subjects, the results would demonstrate only a correlation between awareness and conditioning. They would not show that the awareness produced conditioning. It would be equally plausible that conditioning produced awareness or that both were produced by a third variable.

Other authors have taken a more sophisticated approach to the role of awareness in conditioning. For instance, Brewer (1974) argued that "higher mental processes," such as awareness, must be responsible for conditioning in humans because the occurrence of conditioning can be manipulated by manipulating these higher mental processes. To give an example, Brewer argued that giving subjects the instructions that a CS will be followed by a US, or even the instructions to make a particular response, produced a conditioned response—just as exposing the person to the CS followed by the US did. This evidence is more sophisticated because it is experimental rather than correlational. Brewer cited experiments which manipulated a "higher mental process" (e.g., gave instructions) and observed a change in conditioning. Therefore, he could legitimately conclude that, if the experiments were properly designed, the "higher mental process" caused the conditioning.

Brewer reviewed the literature extensively and clearly demonstrated several manipulations which alter conditioning. However, to summarize these manipulations by saying that "higher mental processes" are necessary for—or cause—conditioning seems misleading and problematic to us.

First, arguing that "higher mental processes" cause conditioning when human subjects are used puts Brewer in the uncomfortable position of arguing that classical conditioning occurs for different reasons in different spe-

cies. Classical conditioning has been observed in many nonhuman species (see Thorpe 1963 for a review). It is hard to argue that the CR is produced by the contemplation of the CS–US relation when rats or rabbits serve as subjects. Therefore, if one argues that conditioning occurs in people because of "higher mental processes," one must also argue that classical conditioning occurs for qualitatively different reasons at different points on the evolutionary scale. Such a claim should be avoided unless the case for the role of "higher mental processes" in humans is overwhelming, and it is not.

The weakness of the case for "higher mental processes" in human conditioning becomes more apparent when one realizes that analogues of many of the experiments cited by Brewer have been conducted, using nonhuman animals, with similar results. For example, Brewer showed that instructing human subjects that a CS will be followed by a US produced a CR. But a similar phenomenon can be shown in rats. For example, Revusky, Coombes, and Pohl (1982) showed that exposing a rat to a flavored liquid in the presence of a poisoned rat established a classically conditioned aversion to that liquid in the first rat. It was as if the sight of the sick rat "instructed" the first rat that ingesting the liquid (the CS) would be followed by sickness (the US).

There is certainly much to explain here. Brewer and others have uncovered some important manipulations that produce conditioning and that need to be explained. But arguing that "higher mental processes" are necessary for conditioning is only one possible summary of these manipulations, and it is one which leads to conclusions that are both intuitively unappealing and untestable. It is not intuitively appealing to argue that the rat contemplates the meaning of the poisoned conspecific and draws implications for its own behavior. It is also untestable, because we currently have no independent way of measuring the rat's "higher mental processes" to make sure that they are necessary for conditioning.

We believe that a better way to approach Brewer's findings is to use them to formulate a hypothesis which is currently testable, and then to test the hypothesis. For example, one might conclude that Brewer's data and the data from studies using rats suggest that conditioning can occur when a CS predicts a US even when the subject does not emit the CR. This is a testable hypothesis because an animal's ability to emit a CR—unlike an animal's "higher mental processes"—can be manipulated today using specific drugs. As a result, this hypothesis could be tested in a variety of circumstances and either accepted or rejected. The exact nature of the CS–US relation that is necessary to produce the conditioning without a CR (ie., the nature of the instructions) could then be explored in detail. It seems to us that this approach is more likely to yield information about conditioning than arguments about whether "higher mental processes" produce conditioning.

We should repeat that we are not arguing that Brewer is necessarily incorrect. He may be correct that "higher mental processes" are necessary for conditioning when people serve as subjects. But we are arguing that the role of higher mental processes in conditioning cannot be conclusively established by current techniques. Focusing on this question now may divert attention from questions which can be answered, to the detriment of research on conditioning.

CONCLUDING COMMENTS

This paper has presented some of our current knowledge about classical conditioning and its potential implications for consumer research. Some words of caution are needed before concluding.

First, we are not arguing that classical conditioning necessarily plays an important role in consumer behavior. Most of our information about classical conditioning comes from carefully controlled laboratory studies. These principles may not hold in the more complicated "real world" settings in which consumer behavior takes place. Studies should be conducted to determine exactly what role classical conditioning does play in these settings. Initial results are promising—they have indicated that classical conditioning may play some role (e.g., Gorn 1982). But these studies are few and even they have indicated that classical conditioning may play a more important role in some situations than in others. It remains for future studies to systematically establish the role of conditioning in consumer behavior.

Second, we are not arguing that the implications of classical conditioning for consumer research are always completely clear. Again, the principles of conditioning were developed in the laboratory, and it may be difficult to translate laboratory situations into their "real world" equivalents. For example, you may have noticed that the blocking and overshadowing principles and the higher order conditioning principle seem to make different predictions about whether famous people should be used in advertising. From the higher order conditioning point of view, the presence of a celebrity after a product may act as a higher order US that would aid in establishing those preferences. From the point of view of overshadowing or blocking, the presence of celebrities along with the product might interfere with the formation of preferences for the product, either by being more salient than the product or by blocking conditioning of preferences to the product.

Only very careful studies can reveal when the presence of celebrities improves and when it interferes with the formations of preferences in advertising; and only careful studies can determine whether the time at which the celebrity is presented makes a difference as implied by a rigorous translation of classical conditioning principles. Many careful studies will be required before accurate translations can be made from laboratory classical conditioning situations to the "real world" of consumer behavior.

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