Evaluative Conditioning 2.0: Referential versus Intrinsic Learning of Affective Value

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Abstract	Evaluative conditioning is an important determinant of consumers' likes and dislikes. Three experiments show that it can result from two types of learning. First, stimulus-stimulus (S – S) or referential learning allows a conditioned stimulus (e.g., a brand) to acquire valence by triggering (unconscious) recollections of the unconditioned stimulus (e.g., a pleasant image). Second, stimulus-response (S – R) or intrinsic learning allows a conditioned stimulus to bind directly with the affective response that was previously generated by the unconditioned stimulus. We show when each type of learning occurs and demonstrate the consequences for the robustness of conditioned brand attitudes.
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Evaluative Conditioning 2.0:

Referential versus Intrinsic Learning of Affective Value

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Evaluative conditioning is an important determinant of consumers' likes and dislikes. Three experiments show that it can result from two types of learning. First, stimulus-stimulus (S – S) or *referential* learning allows a conditioned stimulus (e.g., a brand) to acquire valence by triggering (unconscious) recollections of the unconditioned stimulus (e.g., a pleasant image). Second, stimulus-response (S – R) or *intrinsic* learning allows a conditioned stimulus to bind directly with the affective response that was previously generated by the unconditioned stimulus. We show when each type of learning occurs and demonstrate the consequences for the robustness of conditioned brand attitudes.

There is a long history of consumer research on the attitudinal changes that occur as a consequence of pairing initially neutral stimuli (e.g., brands) with valenced stimuli (e.g., celebrity endorsers, pleasant images, popular music) (Allen and Janiszewski 1989; Bierley, McSweeney, and Vannieuwkerk 1985; Gibson, 2008; Gorn 1982; Kim, Allen, and Kardes 1996; Shimp, Stuart, and Engle 1991; Stuart, Shimp, and Engle 1987). This research has been described using various terms including affective conditioning, attitudinal conditioning, and the classical conditioning of attitudes. More recently, the label evaluative conditioning has been proposed as an umbrella term to describe this type of learning (see De Houwer, Thomas, and Baeyens 2001 for a review).

Two processes have been proposed as the source of evaluative conditioning effects. First, evaluative conditioning has been attributed to the creation of an association between an initially neutral conditioned stimulus (CS) and a valenced unconditioned stimulus (US) (Baeyens et al. 1992b; Baeyens, Hermans, and Eelen 1993; De Houwer et al. 2001). After a sufficient number of pairings between the CS and US, the CS (e.g., a brand) evokes conscious or unconscious thoughts of the US (e.g., an adored athlete), which in turn arouse the positive feelings associated with the US. Thus, the change in the affect experienced when later encountering the CS is mediated by associations with the US. We refer to these associations as S – S (stimulus – stimulus) associations. Second, evaluative conditioning has been attributed to the creation of an association between an initially neutral conditioned stimulus (CS) and the affective reaction triggered by the US (Gorn 1982; A. Staats and C. Staats 1958; Stuart et al. 1987). CS and US pairings allow the affect originally associated with the US to become an intrinsic part of the initially neutral CS, independent of its association with the US. We refer to these associations as S – R (stimulus-response) associations.

Although many authors have made explicit or implicit assumptions about the type of associations that underlies evaluative conditioning, empirical research into the conditions under which one or both of these processes are active has been extremely limited. The few studies that did address this issue led to the, in our view premature, conclusion that evaluative conditioning relies only on S – S associations (De Houwer et al. 2001). The paucity of research on different sources of evaluative conditioning effects is particularly troubling given its potential to exert an influence in advertising environments. For example, consider the desire to have sustainable advertising effects that rely on evaluative conditioning. It is well established that associations between stimuli are susceptible to interference, whereas affective responses to stimuli persist (Brown, Neath, and Chater, 2007; Grossman and Till, 1998; Rubin and Wenzel, 1996; Sahakyan and Goodmon, 2007; Vansteenwegen et al. 2006). The implication for evaluative conditioning is that S – R learning should be less susceptible to interference than S – S learning. In addition, consider the millions of dollars that are spent annually to associate brands with celebrity endorsers. When an endorser behaves badly (e.g., the Michael Vick scenario), affective associations of the endorser can become negative. If evaluative conditioning relies on S – S associations between the brand and the celebrity, (un)conscious recollection of the now negatively-evaluated celebrity leads to a more negative evaluation of the brand. However, if what was learned is the direct association between the brand and positive affect, later changes to the affect tied to the celebrity are immaterial. The implication for evaluative conditioning is that S – R learning may better protect a brand from unexpected negative publicity about an endorser. Each of these examples suggests S – R learning may be more effective than S – S learning.

In this article, we will show that evaluative conditioning can involve the learning of S – S and S – R associations. More importantly, we will investigate the conditions under which S – S or S – R associations are more likely to develop and be strengthened. Finally, we will show the advantages of having S – R associations. These findings are particularly important because advertisers can structure conditioning procedures to encourage the learning of S – S or S – R associations.

CONCEPTUAL DEVELOPMENT

Evaluative Conditioning

Evaluative conditioning is an affective response to a neutral conditioned stimulus subsequent to its pairing with a valenced unconditioned stimulus (Levey and Martin 1975). Evaluative conditioning has been shown to influence affect for words (C. Staats and A. Staats 1957), political slogans (Razran 1954), art (Levey and Martin 1975), brand names (Stuart et al. 1987), beverages (Zellner et al. 1983), products (Gorn 1982), and everyday objects (Hammerl and Grabitz (2000).

Evaluative conditioning is a class of associative learning, but it does not exhibit the characteristics of other classes of associative learning (e.g., predictive or signal learning; see van Osselaer 2008 for a discussion of the distinction). First, attempts to obtain cue interaction effects (e.g., blocking) in evaluative conditioning procedures have failed (Baeyens et al. 1996). Second, evaluative conditioning will manifest itself in contexts other than the learning environment (Baeyens et al. 1996). Third, evaluative conditioning is not subject to extinction. That is, after successful evaluative conditioning, a CS retains its valence despite unreinforced occurrences of the CS or the passage of time (e.g., Baeyens et al. 1988; Diaz, Ruiz, and Baeyens 2005; Grossman and Till 1998; Olson and Fazio 2006; Stevenson, Boakes, and Wilson 2000; Vansteenwegen et al. 2006; Walther 2002). Finally, several studies indicate that evaluative conditioning does not depend on the awareness of the contingency between the CS and US (Baeyens et al. 1992a; Niedenthal 1990; Olson and Fazio 2001, 2002, 2006; Walther 2002; Walther and Nagengast 2006; but see Dawson et al. 2007; Pleyers et al. 2007). In fact, there is even evidence that evaluative conditioning can be established with subliminal presentations of the US (Dijksterhuis 2004; Krosnick et al. 1992).

The Content of Associations Formed in Evaluative Conditioning

There are two possible sources of evaluative conditioning (see figure 1). First, a conditioning procedure can lead to the establishment of an association between the CS and the US. CS-US learning is referred to as S – S (stimulus-stimulus) learning (e.g., Wickens 1959) or, especially in the evaluative conditioning literature, as referential learning (e.g., Baeyens et al. 1992b). The repeated pairings of a CS and a US create an association between the two stimuli such that when the CS is subsequently presented on its own, it evokes conscious or unconscious thoughts of the US (but without the accompanying expectancy that the unconditioned stimulus is actually going to occur – as in predictive learning). Thus, the affective response to a CS is determined by referencing the unconditioned stimulus with which it was previously paired (De Houwer et al. 2001).

Insert figure 1 about here

Second, a conditioning procedure can lead to the establishment of an association between the CS and the unconditioned affective response (UR) to the US. CS – UR learning is referred to as S – R learning (e.g., Wickens 1959) or, especially in the evaluative conditioning literature, as intrinsic learning (e.g., Baeyens et al. 1992b). S – R learning differs from S – S learning in that the affect triggered by the US becomes an intrinsic part of the CS. That is, the affect is tied directly to the CS and is no longer dependent on the retrieval of the US.

In their review of the available evidence, De Houwer et al. (2001) concluded that evaluative conditioning is referential, thus arguing that S – S associations are learned rather than S – R associations. The most important piece of evidence leading to this conclusion is a study showing that evaluative conditioning is sensitive to so-called *US revaluation* (Baeyens et al. 1992b). US revaluation occurs when a post-conditioning change in the valence of the US results in a corresponding change in the valence of the associated CS (e.g., Nike loses brand equity when Michael Vick is accused of cruelty toward animals). Indeed, if evaluative conditioning is a consequence of S – S associations, US revaluation must be observed. Yet, the Baeyens et al. (1992b) findings need not be interpreted as evidence against S – R learning. It could be that S – R learning also occurs, but that S – S learning was promoted by the Baeyens et al. (1992b) procedure. This possibility suggests a closer consideration of the types of procedures that have produced evaluative conditioning effects. A careful study of procedural differences might offer insight into situations in which S – S learning or S – R learning are more likely to be occur.

Determinants of S – S and S – R Learning

CS-US Scheduling. CS-US scheduling refers to the timing of the presentations of the CS and the US. CS-US scheduling has received considerable research attention because changes in the CS-US presentation schedule impact the strength of associative learning. For example, there is considerable evidence that a *sequential conditioning* procedure (i.e., the CS is presented first, followed by a time gap, followed by the US) is more effective than a *simultaneous conditioning* procedure (i.e., the CS and US are presented simultaneously) (e.g., Bitterman 1964; Smith, Coleman, and Gormezano 1969). In fact, the consensus about the scheduling of CS-US presentations is so strong that the sequential conditioning procedure has been long-recognized as the optimal conditioning procedure (McSweeney and Bierley 1984; Rescorla and Wagner 1972; Stuart et al. 1987).

There are two findings that lead us to question whether sequential conditioning procedures are always optimal, especially in the domain of evaluative conditioning. First, as mentioned earlier, evaluative conditioning does not have the same characteristics as other forms of associative learning. If evaluative conditioning does not conform to findings on cue interaction effects, context-specific learning, extinction, and contingency awareness, then it may not conform to recommendations about CS-US scheduling. Second, there are demonstrations of successful evaluative conditioning with sequential conditioning procedures (e.g., Baeyens et al. 1992a, 1992b, 1993; Field and Moore 2005; Levey and Martin 1975; Walther 2002; Walther and Nagengast 2006) and with simultaneous conditioning procedures (e.g., Gibson 2008; Olson and Fazio 2001; Pleyers et al. 2007; Zellner at al 1983).

We propose that CS-US presentation schedule may be one factor that influences whether a person is more likely to learn an S – S association or an S – R association during an evaluative conditioning procedure. First, simultaneous conditioning procedures should allow for S – S or S – R learning. S – S learning can occur because simultaneous presentation of the CS and US allows a person to learn the relationship between the stimuli, although inferences about the predictive relationship between the stimuli may be less likely than with a sequential presentation procedure. S – R learning can occur because simultaneous presentation of the CS and US allows the affect associated with the US to attach to the CS. Valenced stimuli generate a fast, non-specific affective response that is not tied to an attitude object (Ferguson 2007; Murphy, Monahan, and Zajonc 1995; Murphy and Zajonc 1993). This type of diffuse affect, much like a liquid, can “disperse, scatter, permeate, combine, fuse, blend, spill over, and become attached to totally unrelated stimuli” (Murphy et al. 1995, 590), especially in the earliest stage of the perception (Ruys and Stapel 2008; Stapel, Koomen, and Ruys 2002). The idea that S – R learning can occur in simultaneous conditioning is consistent with findings from Gestalt psychology indicating that stimuli that are presented together are experienced as connected (Heider 1958; Schwarz and Clore 2007).

Second, sequential conditioning procedures should allow for S – S learning, but not S – R learning. Sequential presentation of the CS and US promotes referential learning, as a person learns that a CS predicts a US and so starts retrieving conscious or unconscious memories of the US when viewing the CS (De Houwer et al. 2001). Sequential presentation of the CS and US should not promote S – R learning because non-specific affective responses to the US are not available during the presentation of the CS. Non-specific affective responses to the US should best attach to the CS during the perceptual (initial) stage of US processing. In sequential conditioning, the only experimental stimulus present during the brief period in which diffuse affect can bind to stimuli is the US that generated the affect. Thus, the diffuse affect will be tied (almost) exclusively to the US and no direct connection will be formed between the affect and the CS.

Unconditioned Stimulus Heterogeneity. US heterogeneity refers to the consistency of the US stimulus across repeated CS-US pairings. Although we have found no recommendations on US heterogeneity in the literature, the vast majority of associative learning procedures use a constant (i.e., homogeneous) US. The use of a constant US is consistent with the S – S learning interpretation of associative learning that has been dominant over the past 50 years (e.g., Baeyens et al. 1988, 1990, 1992a, 1992b, 1993, 1996, 1998; Dawson et al. 2007; De Houwer et al. 2000; Field and Moore 2005; Gorn 1982; Kim, Lim, and Bhargava 1998; Levey and Martin 1975; Pleyers et al. 2007). However there are numerous exceptions to the use of homogeneous US presentations such as the work on meaning conditioning (A. Staats and C. Staats 1958, 1959; C. Staats and A. Staats 1957; A. Staats, C. Staats, and Biggs 1958) and other work on evaluative conditioning (Gibson 2008; Olson and Fazio 2001, 2002; Shimp et al. 1991; Stuart et al. 1987). With respect to meaning conditioning, C. Staats and A. Staats (1957) paired nonsense syllables with different positive or negative words (experiment 1), active or passive words (experiment 2), or strong or weak words (experiment 3) across the 18 trials. Participants were asked to view the nonsense syllables while repeating the US aloud in ostensibly unrelated tasks. Staats and Staats (1958) observed conditioned meaning in all three studies (see Page 1969, 1974 for a critique). It is important to note that the procedure used in all of the Staats and Staats' research incorporated simultaneous presentation of the CS and US.

In the domain of evaluative conditioning, both heterogeneous and homogeneous US presentations have been used effectively. Stuart et al. (1987) used brand name CSs and heterogeneous, affective USs (e.g., valenced pictures) to influence attitudes toward the brands. Levey and Martin (1975) used neutral picture CSs and homogeneous, affective USs (e.g., valenced pictures) to influence attitudes toward the CS pictures, an effect that has been replicated often (see De Houwer et al. 2001 for review). Olson and Fazio (2001) demonstrated successful evaluative conditioning of cartoon character CSs and heterogeneous, affective USs (e.g., valenced words and pictures), but with five repetitions of each CS-US pair (thus creating homogeneity). Baeyens et al. (1990) used different colors and odors as CS with positive and negative flavors (e.g., sweetness and bitterness) as US to influence attitudes towards soft drinks. It can be concluded that both homogeneous and heterogeneous US procedures have been successfully used to establish evaluative conditioning. However, we note that heterogeneous US presentations only occur in the literature when CS and US were presented simultaneously. No case was identified in which a heterogeneous US manipulation occurred when there was a time gap between the presentation of CS and US (sequential presentation).

We argue that heterogeneous and homogeneous presentation schedules may promote different types of learning. When each CS presentation is paired with a different US on repeated occasions (heterogeneous US conditioning), S – R learning should be promoted and S – S learning should be impaired. In S – S learning, a person learns the relationship between a specific CS and a specific US. Learning this relationship should become more difficult if the US is different on each pairing, even if the valence of the US is the same. S – R learning should not be impaired by US heterogeneity because the affective response generated by the US remains constant. When a CS is paired with the same US on repeated occasions (homogeneous US conditioning), there should be an opportunity for S – S and S – R learning. The same US (supporting S – S learning) creates the same response (supporting S – R learning) during each learning trial.

Implications for Conditioning Effectiveness

Our discussion of the literature treats CS-US scheduling and US heterogeneity as two independent events. In reality, both of these factors are often set to a specific level in an evaluative conditioning procedure. As such, there are opportunities for CS-US scheduling and US heterogeneity to combine in ways that do or do not promote each type of learning. Table 1 summarizes these relationships. First, sequential presentation of the CS and US should encourage S – S learning, but not S – R learning. Second, simultaneous presentation of the CS and US should encourage S – S and S – R learning. Third, homogeneous US presentation should encourage S – S and S – R learning. Fourth, heterogeneous US presentation should encourage S – R learning, but not S – S learning. Combining these conditions allows us to anticipate the learning process that underlies evaluative conditioning for each combination of CS-US scheduling and US heterogeneity. For sequential CS-US scheduling and a homogeneous US, S – S learning should be possible. For sequential CS-US scheduling and a heterogeneous US, S – S learning and S – R learning should both be inhibited. For simultaneous CS-US scheduling and a homogeneous US, S – S and S – R learning are possible. For simultaneous CS-US scheduling and a heterogeneous US, S – R learning should be possible.

Insert table 1 about here

The evaluative conditioning effects reported in the literature are consistent with the predictions of table 1. First, there is evidence for evaluative conditioning with a homogenous US using sequential (Baeyens et al. 1988, 1992a, 1992b, 1993; Field and Moore 2005; Levey and Martin 1975; Walther 2002; Walther and Nagengast 2006) and simultaneous (Pleyers et al. 2007; Zellner et al. 1983) presentation schedules. Second, there is evidence for evaluative conditioning with a heterogeneous US using simultaneous presentation schedules (Gibson 2008; Olson and Fazio 2001, 2002; Stuart et al. 1987; Shimp et al. 1991; C. Staats and A. Staats 1957; Staats et al. 1958), but not sequential presentation schedules. Despite this evidence, it is difficult to anticipate (1) the relative size of an S – S evaluative conditioning effect relative to an S – R evaluative conditioning effect and (2) the manner in which S – S learning and S – R learning might combine or conflict when both are possible. For these reasons, we anticipate that evaluative conditioning will be weaker in the sequential CS-US scheduling with a heterogeneous US condition than in the remaining three conditions. This expectation can be formalized in two hypotheses:

H1: Evaluative conditioning should be weaker in a sequential CS-US / heterogeneous US conditioning procedure than in a sequential CS-US / homogeneous US or a simultaneous CS-US conditioning procedure.

H2: Evaluative conditioning should be a consequence of

a. S – S learning in a sequential CS-US / homogeneous US conditioning procedure.

b. S – S learning or S – R learning in a simultaneous CS-US / homogeneous US conditioning procedure.

c. S – R learning in a simultaneous CS-US / heterogeneous US conditioning procedure.

We test the first hypothesis in experiment 1 and the second hypothesis in experiment 2. In experiment 3 we demonstrate the consequences of S – S versus S – R conditioning for the robustness of the learned attitudes in a dynamic learning environment.

EXPERIMENT 1: CONDITIONING EFFECTIVENESS

In experiment 1, we manipulated CS-US scheduling and the heterogeneity of the USs to test hypothesis 1. The learning context involved the presentation of unfamiliar beer brands (CSs) and images of people that could consume the beer (USs). We predicted that evaluative conditioning would be weakest when the presentation schedule was sequential and the USs were heterogeneous.

Method

Participants and Design. Fifty-seven undergraduate business students (35 female, 22 male) at a large Southeastern university participated in the experiment in exchange for extra credit. The experiment employed a two (CS-US scheduling: sequential, simultaneous) x two (US heterogeneity: homogeneous, heterogeneous) x two (US valence: neutral, positive) mixed design with the first two factors manipulated between-subjects and the latter factor manipulated within-subjects.

Conditioned Stimuli. Belgian beers were chosen to serve as CSs. To avoid contamination by existing attitudes towards brand names, labels, bottles, etc., we ran a pretest using 74 participants from the same participant population. The pretest measured participant attitudes towards 43 Belgian beers. The eight beers with the most neutral (i.e., closest to the midpoint of the scale) and most normally distributed attitudes were selected to serve as CSs.

Unconditioned Stimuli. Eight positively valenced and eight neutrally valenced images from the International Affective Picture System (IAPS: Lang, Bradley, and Cuthbert 2005), were selected. Positive images depicted adults having fun in various ways, such as cuddling, waterskiing, or sailing. Neutral images depicted adults with neutral expressions and engaged in such everyday activities as reading a newspaper on a bench or napping on the subway. Pictures were selected that had relatively small standard deviations in their affective ratings. On the IAPS's nine-point affective rating scale, all neutral images scored between 4.5 and 5.5 for both male and female raters, whereas the positive images all scored above 7.0 for both genders. The positive IAPS pictures selected were numbers 4599, 4641, 8080, 8185, 8200, 8210, 8461 and 8540. The neutral IAPS pictures selected were numbers 2102, 2190, 2200, 2215, 2397, 2440, 2493 and 2570. Examples of the conditioned and unconditioned stimuli are presented in the appendix.

Procedure. The experiment was administered on computers in a behavioral lab. The cover story explained that the study was about assessing college students' spontaneous attitudes towards Belgian beers that could potentially enter the US market. Participants were told that it was unlikely that they had ever seen these brands before, so a slideshow would be used to familiarize them with the brands. Participants were also told that the slideshow included pictures of people engaged in various activities in an effort to make it more interesting.

Learning Phase. In the first part of the experiment, four of the eight CS beers were randomly assigned to be paired with positive images (i.e., the four positively conditioned CSs). The remaining four beers were paired with neutral images (i.e., the four neutrally conditioned CSs). The assignment of CSs to a US valence condition was random by participant.

The learning procedure consisted of 64 CS-US pairings. For participants in the *homogeneous US* conditions, the four positive and four neutral USs were randomly selected and matched with CSs. Participants saw one set of four CS – US positive pairings and four CS – US neutral pairings in block one. This same set of eight pairings was presented in the remaining seven blocks. For participants in the *heterogeneous US* condition, each “positive” CS was paired with one of the eight positive US images and each “neutral” CS was paired with one of the eight neutral US images. Over the course of the eight blocks of the slideshow, every positive CS was paired once with each of the eight positive US images and each neutral CS was paired once with each of the eight neutral US images. The order of presentation of CS–US combinations within every round was randomized, but a round had to be completed (i.e., every CS–US combination must have occurred) before the next round of pairings would begin.

In the *simultaneous conditioning* procedures, the picture of the US (which covered the entire screen) was shown with the CS superimposed on the bottom, center of the US for three seconds. Next, there was a two second intertrial interval consisting of a white screen and an animated Microsoft Windows® icon indicating that image files were being downloaded from the network. In the *sequential conditioning* procedure, the CS was presented in the center of the screen for 1.5s, followed by an interstimulus interval of 0.5s (blank screen), followed by the US presented for 1.5s. The intertrail interval was 1.5s, showing the same Windows® icon. Note that this procedure guarantees equal slideshow duration as well as equal total presentation duration of CS plus US across conditions. Two illustrative conditioning rounds are presented for each of the four procedures in figure 2.

Insert figure 2 about here

Attitude Assessment. After the learning phase was complete, participants' attitudes towards all CSs were assessed. For every CS, participants were asked to provide their global attitude towards the beer on a nine-point scale (scale endpoints "extremely negative", "extremely positive"). Next, participants indicated how appealing they found the beer (scale endpoints "totally unappealing", "very appealing") and their likelihood of buying the beer if it were available at a reasonable price (scale endpoints "extremely unlikely", "extremely likely") using seven-point scales.

Finally, we included a question to detect participants who had not taken the task seriously. This question asked participants to indicate all factors that had significantly contributed to their attitude ratings. One of the eight answer categories was "Random: You rated most beers by just picking a rating randomly". Other answer categories included "affected by the brand names", "feelings of familiarity", or "trusted my gut feelings".

Results

Four participants indicated they had provided their affective ratings in a random fashion and were removed from the data, leaving 53 participants for analysis (32 female, 21 male). The answers on the global attitude questions were analyzed with a full-factorial repeated measures ANOVA with the CS-US scheduling and US heterogeneity as between-subjects factors and US valence as within-subject factor. The means and standard errors are represented in figure 3.

There was a main effect of US valence indicating evaluative conditioning ($F(1, 49) = 64.42$, $p < .001$). The predicted three-way interaction between CS-US scheduling, US heterogeneity, and US valence was significant ($F(1, 49) = 6.76$, $p = .01$). Follow-up two-way interaction tests showed a significant interaction between US heterogeneity and US valence in the sequential CS-US scheduling condition ($M_{\text{Homogeneous Neutral}} = 4.35$, $M_{\text{Homogeneous Positive}} = 6.48$, $M_{\text{Difference}} = 2.14$; $M_{\text{Heterogeneous Neutral}} = 4.77$, $M_{\text{Heterogeneous Positive}} = 5.54$, $M_{\text{Difference}} = 0.77$), ($F(1, 49) = 4.77$, $p < .05$). In the simultaneous condition, we found only a main effect of US valence ($F(1, 49) = 45.21$, $p < .001$) that was not qualified by a statistically significant interaction with US heterogeneity ($M_{\text{Homogeneous Neutral}} = 4.88$, $M_{\text{Homogeneous Positive}} = 6.48$, $M_{\text{Difference}} = 1.61$; $M_{\text{Heterogeneous Neutral}} = 3.88$, $M_{\text{Heterogeneous Positive}} = 6.40$, $M_{\text{Difference}} = 2.52$), ($F(1, 49) = 2.21$, $p > .10$).

Insert figure 3 about here

Simple effect tests showed the difference between the rating of the CSs paired with the neutral USs and positive USs was significant in the sequential homogeneous ($M_{\text{Difference}} = 2.13$), ($F(1, 49) = 23.33$, $p < .001$), simultaneous homogeneous ($M_{\text{Difference}} = 1.61$), ($F(1, 49) = 14.23$, $p < .001$), and simultaneous heterogeneous ($M_{\text{Difference}} = 2.52$), ($F(1, 49) = 32.48$, $p < .001$) conditions, but not in the sequential heterogeneous condition ($M_{\text{Difference}} = 0.77$), ($F(1, 49) = 3.03$, $p > .08$). Finally, a specifically designed contrast proved that the evaluative conditioning effect was on average smaller in the sequential heterogeneous condition than in the other conditions ($F(1, 49) = 6.71$, $p = .01$). Alternative analyses including the deleted participants or using the average of the global attitude questions (transformed to a seven-point scale), the appealingness ratings, and the likelihood to buy estimates (Cronbach alpha's for all CSs > .89), yielded analogous results with similar levels of significance.

Discussion

Confirming our prediction, evaluative conditioning was least pronounced when heterogeneous USs were used in a sequential conditioning procedure. This is consistent with our hypothesis that sequential CS-US presentation schedules do not promote S – R learning and heterogeneous USs do not promote S – S learning. S – S or S – R learning was possible in the other three conditions, so a stronger evaluative conditioning effect was observed. Yet, we readily acknowledge that our predictions depend on the claim that different types of learning are occurring under different conditioning procedures. In experiment 2, we provide more direct evidence for each type of learning. Moreover, we use a procedure that allows determining whether S – S or S – R learning is more active in the simultaneous CS-US schedule with a homogeneous US.

EXPERIMENT 2: CONSEQUENCES OF US REVALUATION

The goal of experiment 2 was to disambiguate S – R learning from S – S learning, thus providing support for hypothesis 2. One possible approach to disambiguating learning processes is the US revaluation procedure (Mackintosh 1983; Rescorla 1988). In a US revaluation procedure, a US's valence is changed after the initial conditioning phase. Typically, a positively valenced US from the conditioning phase is associated with negative information in a post-conditioning revaluation phase, thus altering the valence associated with the US. If the affective response to the CS decreases after the US revaluation, then the learning process is S – S. If the

CS retains its conditioned valence after the US revaluation, then the learning process is S – R. In the latter case, the conditioned attitude towards the CS does not depend on intermediating (un)conscious memories of the US and is thus immune to a revaluation of the US.

Method

Participants and Design. Ninety-seven undergraduate business students (52 female, 45 male) at a large Southeastern university participated in the experiment in exchange for extra credit. The experiment employed a two (CS-US scheduling: sequential, simultaneous) x two (US heterogeneity: homogeneous, heterogeneous) x three (US valence: neutral, positive, positive with revaluation) mixed design with the first two factors manipulated between-subjects and the latter factor manipulated within-subjects.

Stimuli and Procedure. The stimuli and procedure were similar to experiment 1. Modifications to the number of stimuli were necessary because there were three evaluative conditioning groups in experiment 2 (i.e., neutral US, positive US, positive US with revaluation), whereas there were only two evaluative conditioning groups in experiment 1 (e.g., neutral US vs. positive US). Thus, the following changes were made. First, the number of CSs was increased to from eight to nine. This allowed us to randomly assign three CSs to each of the three US valence conditions. Second, the number of positive USs was increased from eight to 10 and the number of neutral USs was decreased from eight to five. This allowed us to pair each CS once with five unique USs for every level of the US valence factor in the heterogeneous US conditions. We note that the five learning trials for each CS were less than the eight learning trials in experiment 1.

The experimental procedure mimicked experiment 1 through the evaluative conditioning phase. Immediately after the evaluative conditioning phase, participants read the following:

> "You've just seen pictures of different people you've probably never met. Illustrating the conventional wisdom that looks can deceive, it's informative to see the felonies that some of the men in these pictures have been convicted for. Therefore we will again show you the people from the previous slideshow. Only this time, criminal records (if applicable) will be provided as well."

In this second phase, all USs were shown three more times. Felonies were displayed at the bottom of the USs assigned to the positive-US-with-revaluation condition. For the three revaluated USs in the homogeneous condition, these felonies were "murdered his ex", "committed bestiality", and "raped a teenager". In the heterogeneous condition, the two additional USs were paired with "arsonist" and "drove while intoxicated and killed a child". The USs in the neutral US and positive US conditions were also shown thrice, but without accompanying felony information.

Next, we asked participants to evaluate the CSs (the beers) in an identical fashion to study 1. Then, as a manipulation check of the US revaluation manipulation, we assessed participants' global attitudes towards each of the USs (the neutral and pleasant pictures) using a nine-point scale with endpoints labeled "extremely negative" and "extremely positive". Finally, after responding to demographic questions, the participants were informed about the purpose of the study and debriefed.

Results

Manipulation Check. Using a mixed design, we analyzed the attitudes towards the positive revaluated USs and towards the normal positive USs as a function of the CS-US scheduling and the US heterogeneity factors. The within-subject effect of US valence (normal positive vs. positive revaluated) on the evaluation of the US was significant ($F(1, 93) = 34.01$, p

< .001), indicating that participants liked the normal positive USs better ($M = 6.94$) than the positive revaluated USs ($M = 5.97$). The main effect of US valence was not moderated by any of the between-subjects factors (all *p*s > .10).

We also analyzed the attitudes towards the neutral USs and the positive revaluated USs and found that the difference between the positive revaluated USs ($M = 5.97$) and the neutral USs ($M = 4.14$) remained significant ($F(1, 93) = 52.52$, $p < .001$). Attitudes towards the revaluated USs remain positive despite the revaluation because participants were asked to state their global attitudes towards the pictures (which always were positive in nature; e.g., a cuddling couple), not towards the male protagonist depicted in the picture (who was incriminated).

Testing Hypothesis 1. The global attitudes towards the CSs are shown in figure 4. To test the first hypothesis, we analyzed the attitudes towards the CS as a function of US valence (normal positive vs. neutral), the CS-US scheduling and the US heterogeneity factors using a mixed design with the first factor manipulated within subjects and the latter two between. First, there was a main effect of evaluative conditioning ($F(1, 93) = 17.38$, $p < .001$). Second, the predicted three-way interaction between US valence, CS-US scheduling and US heterogeneity was marginally significant ($F(1, 93) = 3.10$, $p = .08$). Follow-up two-way tests showed a significant interaction between US heterogeneity and US valence in the sequential CS-US scheduling condition ($M_{\text{Homogeneous Neutral}} = 5.13$, $M_{\text{Homogeneous Positive}} = 5.94$, $M_{\text{Difference}} = 0.82$; $M_{\text{Heterogeneous Neutral}} = 5.31$, $M_{\text{Heterogeneous Positive}} = 5.15$, $M_{\text{Difference}} = -0.16$), ($F(1, 93) = 4.57$, $p < .05$), but not in the simultaneous condition ($M_{\text{Homogeneous Neutral}} = 5.13$, $M_{\text{Homogeneous Positive}} = 6.07$, $M_{\text{Difference}} = 0.94$; $M_{\text{Heterogeneous Neutral}} = 4.69$, $M_{\text{Heterogeneous Positive}} = 5.81$, $M_{\text{Difference}} = 1.12$), ($F(1, 93) = 0.13$, $p > .10$). Only the main effect of US valence was significant in the simultaneous condition ($F(1, 93) = 19.73$, $p < .001$).

Simple effect tests showed the difference between the rating of the CSs paired with the neutral USs and positive USs was significant in the sequential homogeneous ($M_{\text{Difference}} = 0.82$; $F(1, 93) = 6.27$, $p = .01$), simultaneous homogeneous ($M_{\text{Difference}} = 0.94$; $F(1, 93) = 8.33$, $p < .01$), and simultaneous heterogeneous ($M_{\text{Difference}} = 1.12$; $F(1, 93) = 11.53$, $p = .001$) conditions, but not in the sequential heterogeneous condition ($M_{\text{Difference}} = -0.16$; $F(1, 93) = 0.25$, $p > .10$). Finally, a specific contrast confirmed that the evaluative conditioning effect was on average smaller in the sequential heterogeneous condition than in the other conditions ($F(1, 93) = 9.03$, $p < .01$).

Insert figure 4 about here

Testing Hypothesis 2. Hypothesis 2 predicts that there is S – S learning in the sequential-homogeneous condition, no learning in the sequential heterogeneous condition, the potential for S – S learning, S – R learning, or both in the simultaneous homogeneous condition, and S – R learning in the simultaneous heterogeneous condition. Thus, US revaluation should reduce evaluations of the positively conditioned CSs in the sequential homogeneous condition, have no influence in the simultaneous heterogeneous condition, and be diagnostic of the type of learning in the simultaneous homogeneous condition.

We analyzed the attitudes towards the CS as a function of US valence (normal positive vs. revaluated positive vs. neutral), the CS-US scheduling and the US heterogeneity factors using a mixed design with the first factor manipulated within subjects and the latter two between. The three-way interaction between US valence, CS-US scheduling and US heterogeneity was marginally significant ($F(2, 186) = 2.35$, $p < .10$). There was a significant main effect difference between the normal positive US and revaluated positive US conditions ($F(1, 93) = 13.54$, $p <$

.001). Confirming hypothesis 2, this main effect was qualified by a significant interaction between stimulus heterogeneity and US valence ($F(1, 93) = 18.96$, $p < .001$). Further simple contrasts between the normal positive US condition and revaluated positive US condition were conducted to test the revaluation effect for each of the conditioning procedures separately. As expected, US revaluation reduced evaluations of the positively conditioned CSs in the sequential homogeneous condition ($M_{\text{Positive}} = 5.94$, $M_{\text{Positive Revaluated}} = 4.92$, $M_{\text{Difference}} = -1.04$; $F(1, 93) = 13.50$, $p < .001$), indicating S – S learning. As expected, US revaluation had no influence in the simultaneous heterogeneous condition ($M_{\text{Positive}} = 5.81$, $M_{\text{Positive Revaluated}} = 5.83$, $M_{\text{Difference}} = 0.02$; $F(1, 93) = 0.01$, $p > .10$), showing S – R learning. A significant US revaluation effect indicated S – S learning in the simultaneous homogeneous condition ($M_{\text{Positive}} = 6.07$, $M_{\text{Positive Revaluated}} = 4.86$, $M_{\text{Difference}} = -1.19$; $F(1, 93) = 18.66$, $p < .001$). Corroborating the above findings, we found that a significant evaluative conditioning effect (as measured by the difference between positive revaluated and neutral US conditions) remained only in the simultaneous heterogeneous condition ($M_{\text{Neutral}} = 4.69$, $M_{\text{Positive Revaluated}} = 5.83$, $M_{\text{Difference}} = 1.14$; $F(1, 93) = 11.84$, $p < .001$; all other conditions $p > .10$).

Discussion

The results of experiment 2 unambiguously distinguish between the types of associations formed under different types of learning procedures. Homogeneous learning procedures result in S – S learning, regardless of whether the CS-US presentation procedure is sequential or simultaneous. The significant negative effect of US revaluation on evaluations of positively conditioned CSs and the fact that the evaluative conditioning effect was no longer statistically significant support this claim. US revaluation should only influence S – S learning. Simultaneous heterogeneous presentation procedures generated S – R learning. The significant evaluative conditioning effects in the positive US condition and the US revaluation condition, as well as the lack of a significant effect of US revaluation for positively conditioned CSs, support this claim. US revaluation should not influence S – R learning. As in experiment 1, there was no significant learning in the sequential heterogeneous condition. Heterogeneous USs made it difficult to learn an S – S association and sequential presentation made it difficult to learn an S – R association.

In the next experiment, we show further consequences of S – S versus S – R learning for the robustness of the conditioned attitude. Specifically, we show that S – S learning is more susceptible to interference by new learning in a demanding learning environment.

EXPERIMENT 3: CONSEQUENCES OF NEW LEARNING AFTER CONDITIONING

The ability to forget is an indispensable feature of human memory for proper mental functioning (James 1890; Sahakyan and Goodmon, 2007; Schooler and Hertwig 2005). The inhibition of previously learned material has obvious costs, as fewer information can be retrieved, but also benefits, in that it allows better encoding and recall of newly learned material. Therefore, when learning two lists of information, it is beneficial to forget the information from the first list when the goal is to maximize performance on the second list (Bjork, Bjork, and Anderson 1998; Bjork, Laberge, and Legrand 1968; Bjork and Woodward 1973).

On the one hand, when conditioned attitudes result from the S – S (referential) learning process, they are contingent on the successful retrieval of the US that has been associated with the CS. Analogous to the learning of lists containing different words, S – S learning may suffer retroactive inhibition when the initial evaluative conditioning procedure is followed by a second learning phase in which participants learn a new set of materials. On the other hand, when conditioned attitudes result from the S – R (intrinsic) learning process, the attitude change towards the CS is authentic in that it no longer depends on memories to the US. No specific stimuli have to be recollected whose memories can be interfered with by stimuli from a second learning phase. The positively conditioned CS has become inherently positive, without reference to any (unconditioned) stimulus in memory. Thus, when the evaluative conditioning procedure is followed by a second learning phase in which participants have the goal to learn a new set of materials, this will result in a reduction of the conditioned attitudes in case learning was S – S (referential), but not when it was S – R (intrinsic). Or, more formally:

H3: Learning a second set of materials has an extinguishing effect on conditioned attitudes when evaluative conditioning is S – S (referential), but not when it is S – R (intrinsic).

In the current experiment we test this hypothesis using the two most prototypical conditioning procedures in our framework: a sequential homogeneous procedure to generate S – S learning and a simultaneous heterogeneous procedure to generate S – R learning. For half of the participants, the conditioning phase is followed by a new learning task in which participants have the goal to learn factual information in the same product category (e.g., Belgian beers).

Method

Participants and Design. 40 undergraduate business students (13 female, 27 male) at a large Dutch university participated in the experiment in exchange for extra credit. The experiment employed a two (conditioning procedure: sequential homogeneous, simultaneous heterogeneous) x two (secondary learning: no, yes) x two (US valence: neutral, positive) mixed design with the first two factors manipulated between-subjects and the latter factor manipulated within-subjects.

Stimuli and Procedure. The stimuli and procedure were analogous to the corresponding conditions (sequential homogeneous and simultaneous heterogeneous) of experiment 1 except that we employed only five rounds of pairings, as in experiment 2. Eight Belgian beers served as CS, with four to be positively conditioned and four to be neutrally conditioned. A subset of five positive and five neutral pictures was selected from the USs in experiment 1. In the sequential homogeneous condition, four of these five were randomly chosen to be consistently paired with a CS assigned to that US valence category. In the simultaneous heterogeneous condition, all five USs were paired once with each CS that was assigned to their respective valence category. Presentation style and duration of the stimuli was analogous to the previous experiments.

After the conditioning phase, there was a second learning phase in which participants were asked to learn the brewers of a new set of eight Belgian beers. There were four Belgian breweries (e.g., “Van Honsebrouck” or “Brasserie Union”) that each brewed two of the new beers. The learning phase consisted of three presentation rounds, during which a picture of every beer was presented with a brewery name (underneath) for three seconds, with one second between the pairs. After three presentation rounds, participants were asked to indicate the brewery that produced each beer. Participants who correctly identified the brewer in 6 or more instances moved on to the attitude assessment phase, whereas the others were presented with two additional pairings of the beer-brewery information (this was the case for 65% of the subjects who were in the secondary learning condition). Afterwards, these participants were tested again. Regardless of the result, these participants moved on to the attitude assessment phase. The assessment phase was analogous to experiment 2. Only attitudes towards the beers that served as

CS in the conditioning phase were assessed. Beers from the second learning phase were not shown again.

Results

We used a mixed design to analyze the attitudes towards the CS as a function of US valence, the conditioning procedure, and the presence of a second learning phase. The significant main effect of US valence ($F(1, 36) = 29.96$, $p < .001$) was moderated by the predicted three-way interaction between US valence, conditioning procedure and presence of a second learning phase ($F(1, 36) = 7.76$, $p < .01$). Means and standard errors are presented in figure 5.

Insert figure 5 about here

In the sequential homogeneous condition, there was a US valence by presence of a second learning phase interaction ($F(1, 36) = 17.88$, $p < .001$). Analyses of the simple effects revealed successful evaluative conditioning in the sequential homogeneous condition without a second learning phase ($M_{\text{Neutral}} = 3.89$, $M_{\text{Positive}} = 6.02$, $M_{\text{Difference}} = 2.14$; $F(1, 36) = 31.39$, $p < .001$), but not in the sequential homogeneous condition with a second learning phase ($M_{\text{Neutral}} = 5.28$, $M_{\text{Positive}} = 5.08$, $M_{\text{Difference}} = -0.20$; $F(1, 36) = 0.25$, $p > .10$). In the simultaneous heterogeneous conditioning procedure, there was a significant main effect of US valence ($F(1, 36) = 17.82$, $p < .001$) which was not moderated by the presence of a second learning phase ($F(1, 36) = 0.03$, $p > .10$). Analyses of the simple effects revealed successful evaluative conditioning in the simultaneous heterogeneous condition both without a second learning phase ($M_{\text{Neutral}} = 4.28$, $M_{\text{Positive}} = 5.56$, $M_{\text{Difference}} = 1.28$; $F(1, 36) = 9.19$, $p < .01$), as well as with a second learning phase ($M_{\text{Neutral}} = 4.38$, $M_{\text{Positive}} = 5.55$, $M_{\text{Difference}} = 1.17$; $F(1, 36) = 8.63$, $p < .01$).

Discussion

The results of experiment 3 show how evaluative conditioning based on S – S learning is vulnerable to new learning after the conditioning phase, whereas this is not the case when evaluative conditioning resulted in the establishment of S – R associations. These results are of significant importance to qualify claims about evaluative conditioning's resistance to extinction. Extinction refers to the disappearance of the conditioned response when the contingency between CS and US is broken after the learning phase (Pavlov 1927). In a typical extinction manipulation, the CS is presented repeatedly without reinforcement (i.e., without the US) after the conditioning phase. Multiple studies have shown that evaluative conditioning effects – even those resulting from sequential homogeneous procedures – are not reduced by such CS-only presentations and are robust with regard to the passage of time (e.g., Baeyens et al. 1988; Grossman and Till 1998; Vansteenwegen et al. 2006). In fact, this is one of the key differences between predictive or signal learning – in which one learns to actively expect the physical occurrence of the US when the CS is presented – and the referential learning process in evaluative conditioning – in which the CS merely makes one think of the US without the accompanying expectancy that the US is really going to occur (De Houwer et al. 2001).

In experiment 3 we put these findings into perspective. Although S – S (referential) learning effects might be resistant to CS-only presentations and the mere passage of time, they are highly susceptible to retroactive suppression by active new learning right after the conditioning phase – even if this learning does not involve the CSs themselves. S – R (intrinsic) evaluative learning on the other hand is not susceptible to the learning of new material because affect has transferred directly to the CS and thus no memories to the US have to be retrieved.

GENERAL DISCUSSION

Evaluative conditioning is an important determinant of consumers' likes and dislikes and has recently garnered much attention as the main source of implicitly learned attitudes (Gawronski and Bodenhausen 2006). Despite its importance, not much is known about the types of associations involved in evaluative conditioning. The currently leading theory (De Houwer et al. 2001) holds that evaluative conditioning is a stimulus – stimulus (S – S, referential) learning process in which conditioned stimuli (e.g., brands) acquire valence by (un)consciously activating memories of specific unconditioned stimuli (e.g., pleasant pictures or celebrity endorsers). In this article, we introduce a new theory and show that in addition to S – S (referential) learning, evaluative conditioning can also involve stimulus – response (S – R, intrinsic) learning. In S – R learning, the positive affect from the unconditioned stimuli becomes directly attached to the conditioned stimuli.

More importantly, we show when which type of evaluative conditioning takes place. We find S – S learning when conditioned stimuli (e.g., brands) and unconditioned stimuli (e.g., pleasant pictures) are separated by a delay during learning and each conditioned stimulus is consistently paired with the same unconditioned stimulus. We find S – R learning when conditioned and unconditioned stimuli are presented simultaneously and each conditioned stimulus is paired with a number of different unconditioned stimuli. We find very little learning at all when conditioned and unconditioned stimuli are separated by an interstimulus interval and each conditioned stimulus is paired with a number of different unconditioned stimuli.

Our results also suggest that S – R evaluative conditioning is much more robust than S – S evaluative conditioning. For example, our results suggest that whereas S – S evaluative conditioning is extremely vulnerable to post-learning devaluation of the unconditioned stimulus, S – R evaluative conditioning is not. In addition, we show that S – R evaluative conditioning is much more robust to retroactive interference from information that is learned about later. These findings have important implications for consumer behavior. S – R learning should be much less vulnerable to unconditioned stimuli such as endorsers losing their luster and should be much less vulnerable to advertising clutter. S – R learning entails an authentic value transfer from positive stimuli (e.g., pleasant pictures, celebrities) to the brand itself. Thus, the positiveness of the original positive stimuli is not lent to the brand; it is acquired by the brand. There is a "transfer of title" of the positive affect to the brand without the necessity for remaining ties to the original positive stimuli. Finally, our results provide clear recommendations for the pairing of conditioned and unconditioned stimuli in advertising. To achieve any type of evaluative conditioning, sequential presentation of a brand with a multiple positive stimuli should be avoided. To achieve the robust, S – R type of evaluative conditioning, brands should be presented simultaneously with positive stimuli and each brand should be paired with multiple positive stimuli.

Directions for Future Research

Our theory of evaluative conditioning suggests many interesting areas for further research. For example, it might be worthwhile to investigate the influence of cognitive load on each type of evaluative learning. Traditionally, evaluative conditioning has been framed as an incidental learning process that relies on limited cognitive resources (Gawronski and Bodenhausen 2006). However, it is possible that the encoding and recollection of associations between conditioned stimuli and specific unconditioned stimuli in S – S learning requires more cognitive resources than the less specific transfer of affective value in S – R evaluative conditioning.

Another pertinent matter for further research concerns the associative learning process underlying S – S and S – R association formation. In this paper, we have not investigated whether there are functional differences in the required number of presentations, differential sensitivity to classic extinction manipulations, generalization of evaluations to stimuli similar to but different from the CS, and context-specificity of the conditioned attitude. In fact, most of the established properties of evaluative conditioning have been investigated with paradigms favoring the learning of S – S associations, ultimately leading to the referential learning model of evaluative conditioning (De Houwer et al. 2001). It remains to be seen to what extent the presumed characteristics of evaluative conditioning hold when learning is intrinsic (S – R). Some of them may very well be characteristics that are specific to referential evaluative conditioning instead of being characteristics of evaluative conditioning *per se*.

In addition, a seminal paper by Kim et al. (1996) has shown that in conditioning procedures similar to ours, other elements of meaning beyond affect can be conditioned. For example, pairing a pizza delivery service with pictures of a race car increased the perceived speed of the pizza delivery service. It is unclear if this type of learning can be intrinsic (S – R) or is necessarily referential (S – S) which would have implications for the robustness of this type of learning.

Furthermore, a more careful investigation into the content of the learned associations can help to shed light as well on one of the raging debates in evaluative conditioning, namely its dependency on contingency awareness (Dawson et al. 2007; Pleyers et al. 2007; Walther and Nagengast 2006), for which conflicting findings keep emerging.

Finally, taking a broader perspective and abstracting away from the terminology of evaluative conditioning, our findings raise interesting questions about the nature of consumer attitudes. They suggest that brands can be evaluated positively for different reasons. Brands can be evaluated positively because they trigger the recollection of positive stimuli but may also become intrinsically positive, independent of the stimuli that created the positive attitude. These two types of brand attitudes might have very different implications for consumer behavior. Intrinsic attitudes may be more robust, rely less on situation-specific memory cues, and have more automatic behavioral implications than referential attitudes. For example, when consumers in a buying situation are under mental load, the recollection required for referential attitudes may be impaired while intrinsic attitudes remain unaffected.

APPENDIX

EXAMPLES OF THE CONDITIONED STIMULI (BEER BRANDS)

EXAMPLES OF POSITIVE UNCONDITIONED STIMULI

EXAMPLES OF NEUTRAL UNCONDITIONED STIMULI

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TABLE 1

S – S VERSUS S – R LEARNING
AS A FUNCTION OF THE CONDITIONING PROCEDURE

	Sequential CS-US (S-S Learning)		Simultaneous CS-US (S-S and S-R Learning)	
	Homogeneous US (S-S and S-R)	**Heterogeneous US** (S-R)	**Homogeneous US** (S-S and S-R)	**Heterogeneous US** (S-R)
S-S	Possible		Possible	
S-R			Possible	Possible

FIGURE 1

DURING EVALUATIVE CONDITIONING, ASSOCIATIONS CAN BE FORMED BETWEEN STIMULI (S–S LEARNING AKA REFERENTIAL LEARNING) OR BETWEEN A STIMULUS AND AN AFFECTIVE RESPONSE (S–R LEARNING AKA INTRINSIC LEARNING).

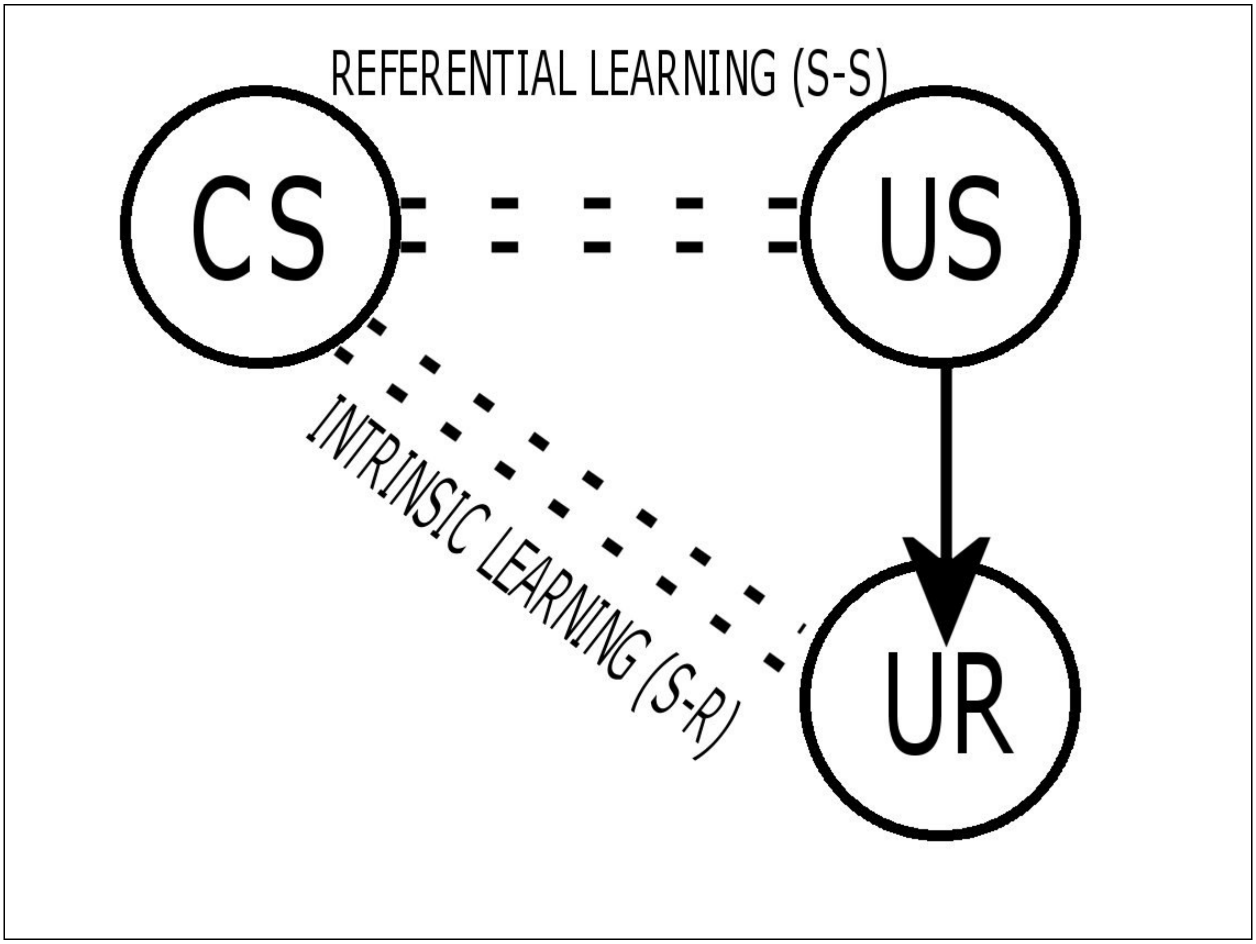


FIGURE 2

EXAMPLES OF 2 ROUNDS OF CONDITIONING IN EACH OF THE FOUR PROCEDURES IN EXPERIMENT 1

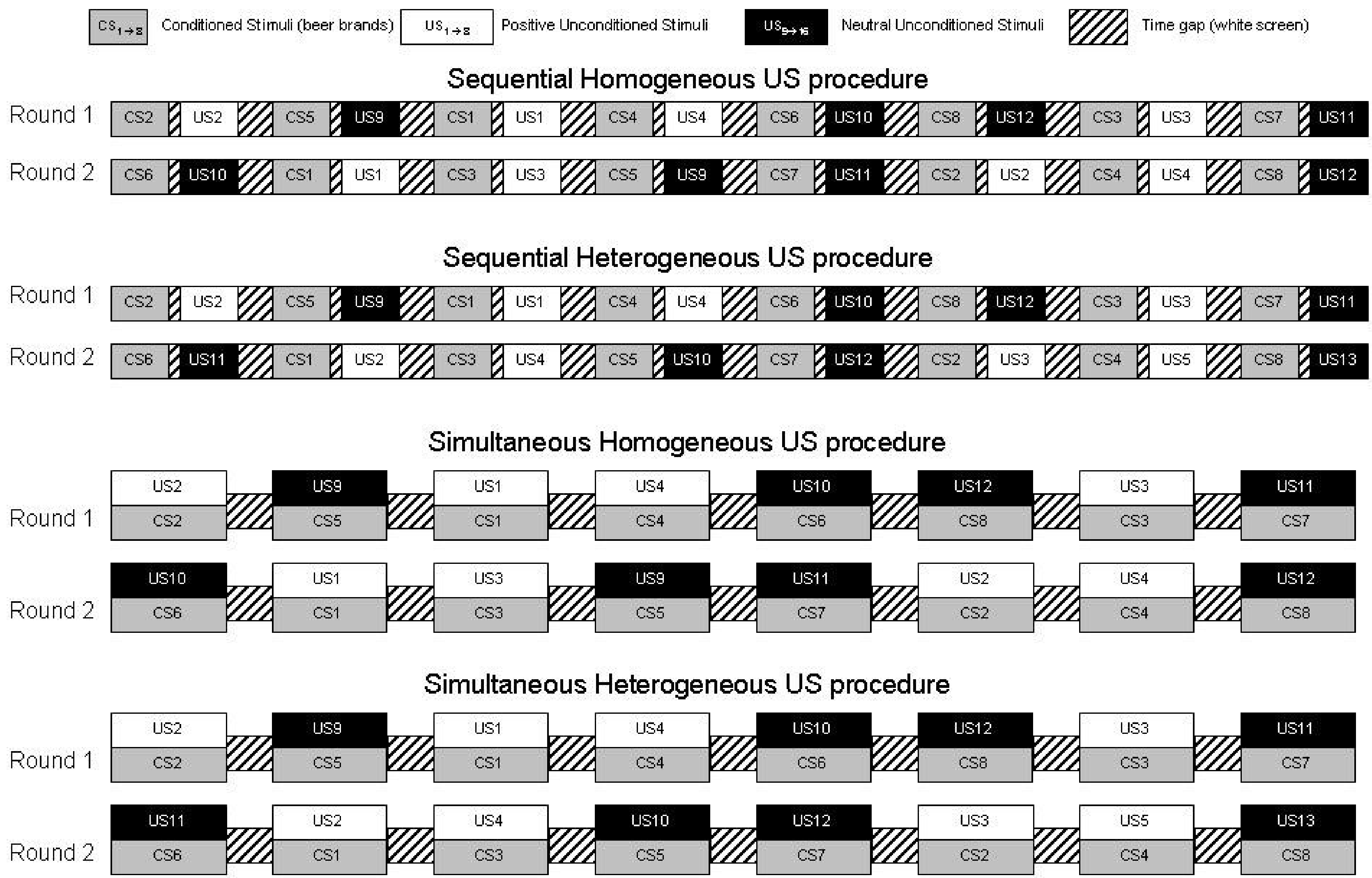


FIGURE 3

GLOBAL ATTITUDES TOWARDS POSITIVELY VERSUS NEUTRALLY CONDITIONED STIMULI AS A FUNCTION OF CONDITIONING PROCEDURE IN EXPERIMENT 1

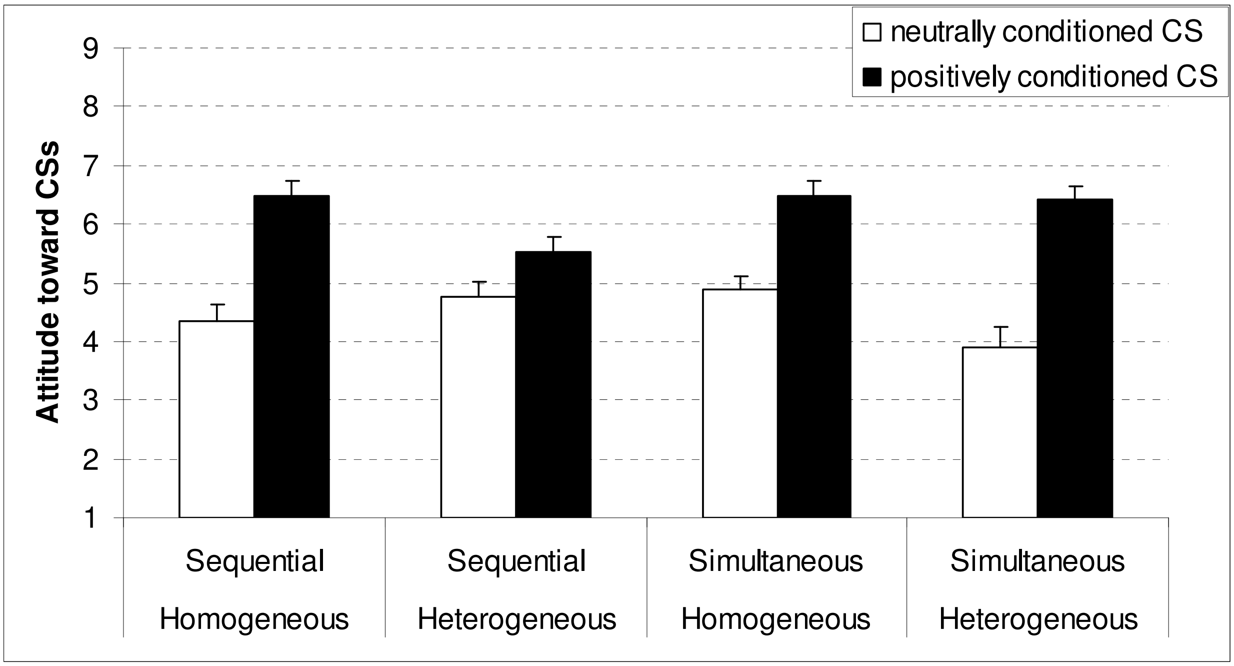


FIGURE 4

ATTITUDES TOWARDS THE CS AS A FUNCTION OF US VALENCE AND CONDITIONING PROCEDURE IN EXPERIMENT 2. THE EFFECTS OF US-REVALUATION REVEAL WHERE EVALUAITIVE CONDITIONING IS S – R (NO REVALUATION EFFECT) VERSUS S – S (REVALUATION EFFECT PRESENT)

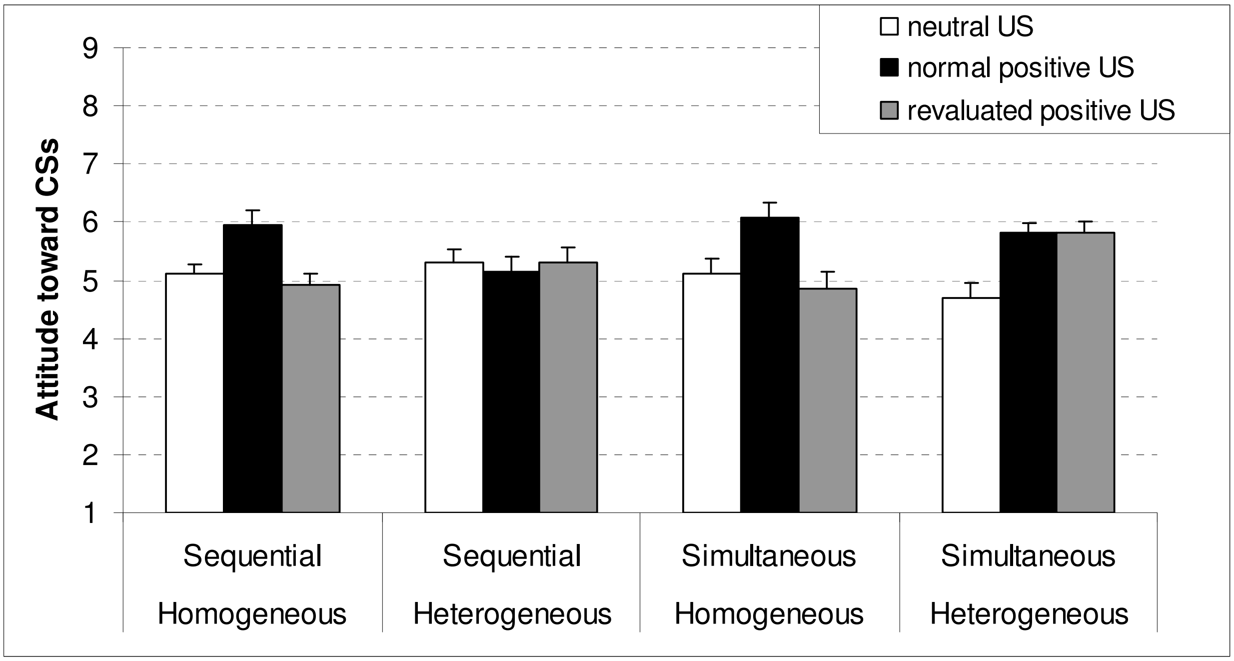
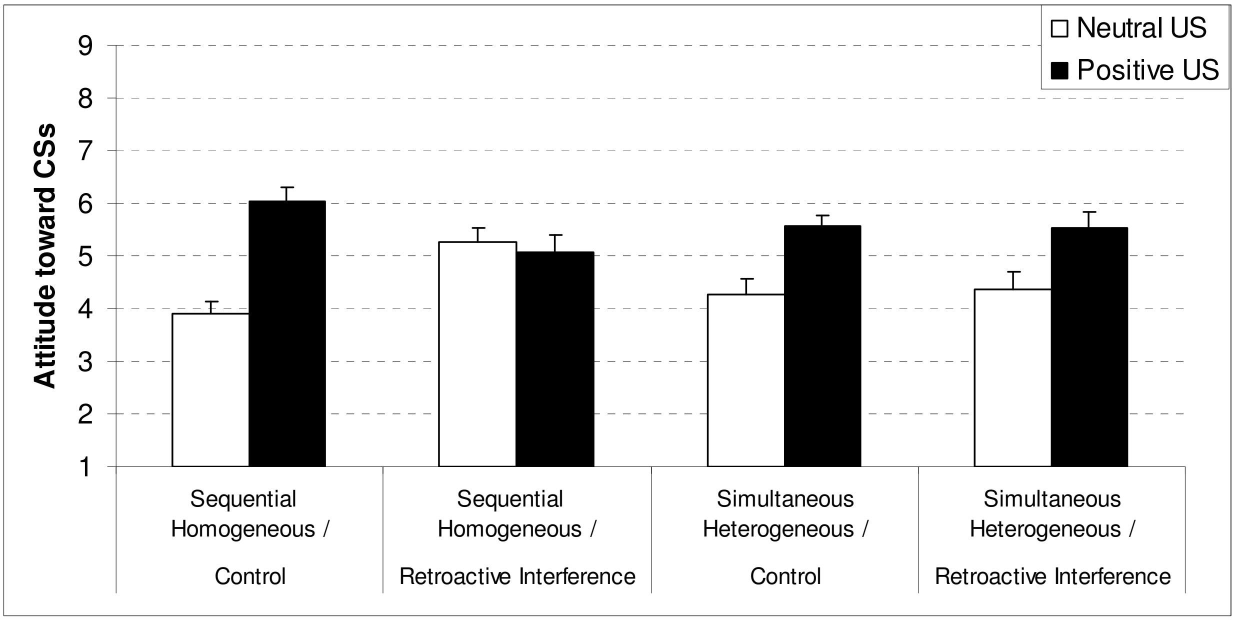


FIGURE 5

CS ATTITUDES AS A FUNCTION OF THE CONDITIONING PROCEDURE AND THE PRESENCE OF A SECOND LEARNING PHASE AFTER CONDITIONING IN EXPERIMENT 3



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