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Can the Formation of Conditioned Attitudes Be Intentionally Controlled?

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Abstract

Evaluative conditioning (EC) is defined as the change in the evaluation of a conditioned stimulus (CS) due to its pairing with a valenced unconditioned stimulus (US). Counter to views that EC is the product of automatic learning processes, recent research has revealed various characteristics of nonautomatic processing in EC. The current research investigated whether the formation of conditioned attitudes can be intentionally controlled. Whereas EC effects on self-reported evaluations were reduced (enhanced) when participants were instructed to prevent (promote) the influence of CS-US pairings, EC effects on an evaluative priming measure remained unaffected by control instructions. Moreover, although EC effects on self-reported evaluations varied as a function of evaluative priming effects and recollective memory for CS-US pairings, motivation to control the influence of CS-US pairings qualified only the predictive relation of recollective memory. The results highlight functionally distinct contributions of uncontrollable encoding-related processes and controllable expression-related processes to EC effects.

Keywords

attitude formation, automaticity, cognitive control, evaluative conditioning

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A common theme in theories of attitude formation and change is that attitudes can be acquired via two different routes: a more deliberate route that involves the scrutiny of descriptive information about an attitude object and a less deliberate route in which the attitude object is automatically associated with positive or negative features of the context in which it is encountered (e.g., Chen & Chaiken, 1999; Gawronski & Bodenhausen, 2006; Petty & Wegener, 1999). A commercial ad, for example, may influence attitudes toward the advertised product by means of arguments that emphasize its quality. Alternatively, attitudes may be influenced by the pairing of the consumer product with a pleasant stimulus (e.g., liked celebrity), although the pairing itself may not involve any meaningful information about the product.

The idea that attitudes can be influenced by repeated co-occurrences of an attitude object and a valenced stimulus is most prominently reflected in research on evaluative conditioning (EC), showing that pairings of a conditioned stimulus (CS) with a positive or negative unconditioned stimulus (US) lead to corresponding changes in the evaluation of the CS (for a meta-analysis, see Hofmann, De Houwer, Perugini, Baeyens, & Crombez, 2010). EC effects are often explained in terms of a process of automatic link formation, in which the mental representation of the CS becomes automatically associated with the representation of the US (e.g., Walther, Gawronski, Blank, & Langer, 2009) or the evaluative response elicited by the US (e.g., Sweldens, Van Osselaer, & Janiszewski, 2010). However, counter to the widespread view that EC effects are the product of automatic learning processes, recent research suggests that EC depends on the availability of cognitive resources (e.g., Davies, El-Deredy, Zandstra, & Blanchette, 2012; Pleyers, Corneille, Yzerbyt, & Luminet, 2009), momentary processing goals (e.g., Corneille, Yzerbyt, Pleyers, & Mussweiler, 2009; Gast & Rothermund, 2011), and higher-order construals of CS-US relations (e.g., Fiedler & Unkelbach, 2011; Förderer & Unkelbach, 2012) during the encoding of CS-US pairings.[1] These findings pose a challenge to theories assuming that repeated pairings of a neutral CS with a valenced US influence attitudes toward the CS in an automatic fashion (e.g., Gawronski & Bodenhausen, 2006).

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In the current research, we investigated another, yet unacknowledged feature of automaticity in EC: the controllability of acquiring a conditioned attitude. Although the umbrella term *automatic* subsumes several distinct processing features (e.g., unawareness, unintentionality, efficiency, uncontrollability), these features do not necessarily co-occur, which prohibits inferences about the presence versus absence of one feature from the presence versus absence of another feature (Bargh, 1994; Moors & De Houwer, 2006). Hence, although EC effects may depend on cognitive resources, processing goals, and higher order construals, the formation of conditioned attitudes may nevertheless be difficult to control, such that repeated CS-US pairings may create attitudes toward the CS despite the intention not to be influenced by its co-occurrence with a US.

An important issue in this context is the difference between the *formation* of a conditioned attitude and the *expression* of this attitude on a behavioral measure of evaluation (Gast, Gawronski, & De Houwer, 2012). Criticizing the common conflation of procedure, mechanism, and effect in research on EC, De Houwer (2007) argued that the term *evaluative conditioning* should be used to describe a behavioral effect, namely, the change in the evaluation of a CS due to its pairing with a valenced US. However, behavioral measures of evaluation differ considerably with regard to whether the expression of a conditioned attitude can be intentionally controlled. For example, responses on self-report measures are quite susceptible to strategic influences during the assessment of evaluations, which could falsely suggest that people have control over the formation of conditioned attitudes. Thus, to distinguish between intentional control over the formation versus the expression of conditioned attitudes, it is important to use measures that reduce participants' opportunity to influence the expression of their attitudes.

Toward this end, the current study compared EC effects on a traditional self-report measure to EC effects on an evaluative priming measure (Fazio, Jackson, Dunton, & Williams, 1995). Although responses on evaluative priming tasks are not entirely immune to strategic influences (Degner, 2009; Klauer & Teige-Mocigemba, 2007), they are much more difficult to control than responses on traditional self-report measures (Bar-Anan, 2010). Thus, to the extent that the formation of conditioned attitudes can be intentionally controlled, instructions to prevent (promote) the influence of subsequently presented CS-US pairings should reduce (enhance) EC effects on both measures. Such a finding would provide further evidence for the nonautomaticity of the learning processes underlying EC effects (Mitchell, De Houwer, & Lovibond, 2009). Alternatively, instructions to prevent (promote) the influence of subsequently presented CS-US pairings may reduce (enhance) EC effects only on the self-report measure, but not EC effects on the evaluative priming measure. Such a finding would suggest that, although the expression of conditioned attitudes on self-report measures can be intentionally controlled (cf. Balas & Gawronski, 2012), the formation of conditioned attitudes is more difficult to control. The primary goal of the current research was to test these competing predictions.

To the extent that participants are able to control the expression of conditioned attitudes, but not their formation, an interesting secondary question concerns the processes underlying the intentional control of expressing a conditioned attitude (cf. Wegener & Petty, 1997). One possibility is that participants intentionally adjust the reliance on spontaneous evaluative responses to a given CS when expressing an evaluative judgment about the CS (*response-focused adjustment*). Specifically, participants may observe their spontaneous evaluative response to the CS and then strategically modulate the expression of this response when making an evaluative judgment about the CS. To the extent that evaluative priming tasks capture such spontaneous evaluative responses (Fazio et al., 1995), this account implies that control motivation should moderate the relation between EC effects on the evaluative priming task and EC effects on the self-report measure, such that their relation should be reduced (enhanced) when participants are motivated to prevent (promote) the influence of CS-US pairings. Yet, another possibility is that participants intentionally adjust the reliance on recollective memory for CS-US pairings when expressing an evaluative judgment about a CS (*memory-focused adjustment*). Specifically, participants may recall the US a given CS had been paired with and then strategically modulate the use of the recalled pairing when making an evaluative judgment about the CS. According to this account, control motivation should moderate the relation between recollective memory for CS-US pairings and EC effects on the self-report measure, such that this relation should be reduced (enhanced) when participants are motivated to prevent (promote) the influence of CS-US pairings. Evidence for either of the two accounts would not only clarify the processes underlying the intentional control of expressing a conditioned attitude but it would also provide deeper insights into functionally distinct contributions of response-related versus memory-related processes to EC effects on evaluative judgments.

Experiment 1

To investigate the controllability of EC effects, participants in Experiment 1 were presented with repeated pairings of neutral CSs and valenced USs. Before the presentation of the CS-US pairings, participants were instructed to either prevent or promote the attitudinal effects of CS-US pairings. Participants in a control condition were asked to simply watch the images on the screen. After the conditioning procedure, participants completed a self-report measure of CS evaluations and an evaluative priming task that used the CSs as prime stimuli. In addition, we measured participants' recollective memory for CS-US pairings by means of a recognition task and their motivation to prevent versus promote the influence of CS-US pairings. To enhance participants' motivation

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to comply with the control instructions, participants were offered a monetary reward for high performance.

Method

Participants and design. A total of 120 undergraduate students (69 female, 51 male) at The University of Western Ontario were recruited for a 1-hr battery titled "How Do We Evaluate Consumer Products and Novel Visual Images?" that included the current study and two unrelated studies. Sixty participants received research credit for an introductory psychology course; the remaining 60 participants were paid CAD$10.[2] The study included a 2 (US Valence: positive vs. negative) × 3 (Task Instructions: visual perception vs. preventive control vs. promotive control) × 2 (Measurement Order: self-report first vs. evaluative priming first) mixed-model design with the first variable as a within-subjects factor and the other two as between-subjects factors.

Materials. As CSs, we used five computer-generated images of shapes with different color patterns that were adapted from Gawronski and Mitchell (in press). Two of these images were paired with a positive picture as the US; two were paired with a negative picture as the US; and one was not paired with a valenced picture to serve as a neutral baseline CS. As USs, we used two positive and two negative pictures from the International Affective Picture System (Lang, Bradley, & Cuthbert, 2008) showing puppies (Image 1710; mean valence rating = 8.34), bunnies (Image 1750; mean valence rating = 8.28), a cockroach (Image 1270; mean valence rating = 3.68), and skulls (Image 9440; mean valence rating = 3.67).

EC procedure. The EC procedure included seven presentations of each CS-US pair and the neutral baseline CS, resulting in a total of 35 trials. Each trial started with a fixation cross that was displayed for 250 ms in the center of the screen. The fixation cross was followed by the CS for 1,000 ms, which was replaced by the US for 1,000 ms. For the neutral baseline CS, the screen turned blank for 1,000 ms after the presentation of the CS. The intertrial interval was 1,500 ms. The images used as CSs were displayed in a size of 2.00 × 1.43 inches; the pictures used as USs were displayed in a size of 14.22 × 10.67 inches. Each CS was presented with the same US. The particular pairings of CSs and USs were counterbalanced by means of a Latin square design.

Task instructions. To investigate the controllability of EC effects, participants in the preventive control condition received the following instructions before they were presented with the CS-US pairings:

> The next component of this study deals with evaluative conditioning. As you may know, research has shown that repeated pairings of a neutral stimulus (e.g., a neutral drawing) with a positive or negative stimulus (e.g., a positive or negative photograph) can influence people's responses to the neutral stimulus. Specifically, it has been shown that responses to a formerly neutral stimulus become more positive when it has been repeatedly paired with a positive stimulus and more negative when it has been repeatedly paired with a negative stimulus. In the current study, we are interested in whether such conditioning processes can be inhibited by people's intentional efforts to prevent the influence of repeated pairings with positive or negative stimuli. For this purpose, you will be presented with pairs of pictures that will appear sequentially on the screen. One of the two pictures will always be a neutral computer-generated drawing; the other picture will be a positive or negative photograph. Your task is to try your absolute best to prevent the influence of the positive or negative photographs on your feelings toward the neutral computer-drawings.

The instructions were intentionally framed in a broad manner, so that they apply to all parts of the study. Moreover, to ensure that participants do not simply close their eyes or look away from the screen during the presentation of the CS-US pairings, they were instructed to pay attention to the pictures throughout the entire task and told that they will be asked which drawing has been paired with which photograph at the end of the task.

The instructions in the promotive control condition were identical, the only difference being that participants were told that (a) we are interested in whether conditioning processes can be facilitated by people's intentional efforts to learn the conditioned meaning of the neutral images and (b) they should try their absolute best to learn the positive or negative meaning of the computer-drawings that is implied by their pairings with the positive or negative photographs.

To compare the effects in the preventive and the promotive control conditions to a neutral baseline, we included a third condition in which participants were told that the study is concerned with visual perception, and that they will be presented with various pictures on the screen. The instructions further informed participants that some of the pictures will be neutral computer-generated drawings whereas others will be photographs. Participants' task was to pay close attention to the images. The instructions included no reference to EC and no information about the subsequent recognition task.

To enhance participants' motivation to follow the task instructions in the three experimental conditions, they were told that we would give five dinner-and-movie packages worth CAD$75 to those participants who showed the best performance on the task. Each dinner-and-movie package included one movie gift card worth CAD$25 and one restaurant gift card worth CAD$50. After completion of the study, we randomly selected five winners for the awards. The winners were notified by means of a mass email to all participants, indicating the student numbers of the five participants that had been identified for the awards.

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Evaluation measures. After completion of the EC task, participants were shown each of the five CSs and asked to rate how pleasant or unpleasant each image made them feel on a 7-point scale ranging from 1 (*very unpleasant*) to 7 (*very pleasant*). In addition, participants were asked to complete an evaluative priming task (Fazio et al., 1995) that included the CSs as primes and positive and negative adjectives as targets. The positive target words were *pleasant, good, outstanding, beautiful, magnificent, marvelous, excellent, appealing, delightful, nice*; the negative target words were *unpleasant, bad, horrible, miserable, hideous, dreadful, painful, repulsive, awful, ugly*. Each trial started with a fixation cross that was displayed for 500 ms in the center of the screen. The fixation cross was followed by a prime stimulus, which was replaced by the target word after 200 ms. Participants' task was to press a right-hand key (*Numpad 5*) as quickly as possible when the target word was positive and a left-hand key (*A*) when the target word was negative. The target words remained on the screen until participants made their response. Incorrect responses were followed by the word *ERROR!* for 1,500 ms. The intertrial interval was 500 ms. Each CS was presented once with each of the 10 positive target words and once with each of the 10 negative words, resulting in a total of 100 trials.

Supplementary measures. To assess participants' recollective memory for CS-US pairings, they were given a variant of the four-picture recognition task in which they were asked to identify which of the four USs was paired with which CS (Walther & Nagengast, 2006). For this purpose, participants were presented with the four USs at the top of the screen and one of the CSs at the bottom of the screen. Each US was marked with a number from 1 to 4, and participants were asked to make their response by pressing the corresponding key on the keyboard. For the CS that was not paired with a US, participants were asked to press the 9 key. As a manipulation check, participants were asked to rate their motivation on a 7-point scale ranging from −3 (*very motivated* to *prevent the influence of the pairings*) to +3 (*very motivated* to *promote the influence of the pairings*).

Results

Data aggregation. Baseline-corrected scores of self-reported CS evaluations were calculated by subtracting participants' ratings of the neutral baseline CS from their ratings of each of the four CSs that had been paired with a positive or negative US. Thus, higher values indicate more favorable evaluations of the CS compared to baseline. The resulting difference scores were then aggregated by averaging the baseline-corrected scores of the two CSs that had been paired with a US of the same valence (Cronbach's α = .79 and .71, respectively). The response latency data of the evaluative priming task were aggregated by excluding latencies from trials with incorrect responses (4.4%) and truncating latencies lower than 300 ms and higher than 1,000 ms (7.2%).[3] For each CS that had been paired with a valenced US, a positivity index was calculated by subtracting the mean response latency to positive target words preceded by a given CS from the mean response latency to positive target words preceded by the neutral baseline CS (Wentura & Degner, 2010). Negativity indices were calculated accordingly by subtracting the mean response latency to negative target words preceded by a given CS from the mean response latency to negative target words preceded by the neutral baseline CS. The negativity scores of each CS were then subtracted from the positivity scores of the same CS. Thus, higher values indicate more favorable evaluations of the CS compared to baseline. As with self-reported evaluations, the resulting priming scores were aggregated by averaging the priming scores of the two CSs that had been paired with a US of the same valence (Cronbach's α = .72 and .61, respectively).

Manipulation check. To confirm the effectiveness of our task instruction manipulation, scores of self-reported motivation were submitted to a univariate analysis of variance (ANOVA) with Task Instructions as independent variable. The analysis revealed a significant main effect, $F(2, 117) = 20.16$, $p < .001$, $\eta_p^2 = .256$. Whereas participants in the preventive control condition revealed a stronger motivation to prevent the influence of the CS-US pairings ($M = -0.43$), participants in the promotive control condition showed a stronger motivation to promote the influence of the CS-US pairings ($M = 1.74$), $t(79) = 6.30$, $p < .001$. Participants in the visual perception condition showed scores in-between the two experimental groups ($M = 0.72$) with their scores differing from both the preventive control condition, $t(79) = 3.10$, $p = .003$, and the promotive control condition, $t(76) = -3.25$, $p = .002$.

Self-reported evaluations. Submitted to a 2 (US Valence) × 3 (Task Instructions) × 2 (Measurement Order) mixed-model ANOVA, self-reported CS evaluations revealed a significant main effect of US Valence, $F(1, 114) = 99.28$, $p < .001$, $\eta_p^2 = .465$, indicating that CSs that had been paired with a positive US were rated more favorably than CSs that had been paired with a negative US (*M*s = 0.92 vs. −0.87, respectively). Evaluations significantly differed from zero for CSs that had been paired with positive USs, $t(119) = 5.93$, $p < .001$, and CSs that had been paired with negative USs, $t(119) = -6.27$, $p < .001$. More importantly, the main effect of US Valence was qualified by a significant two-way interaction with Task Instructions, $F(2, 114) = 13.34$, $p < .001$, $\eta_p^2 = .190$ (see Figure 1). Although participants in all task instruction conditions revealed a significant difference between CSs that had been paired with positive versus negative USs, EC effects on self-reported evaluations were strongest in the promotive control condition, $t(38) = 8.35$, $p < .001$, and weakest in the preventive control condition, $t(41) = 3.09$, $p = .004$, with participants in the visual perception condition showing EC effects in-between the two experimental groups, $t(38) = 4.63$,

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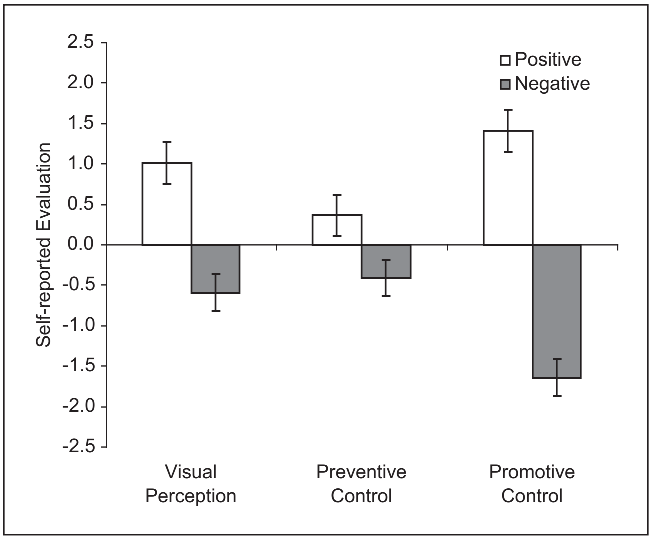

Figure 1. Self-reported CS evaluations as a function of US valence (positive vs. negative) and task instructions (visual perception vs. preventive control vs. promotive control), Experiment 1.
Note. Higher values indicate more favorable evaluations. Error bars depict standard errors.

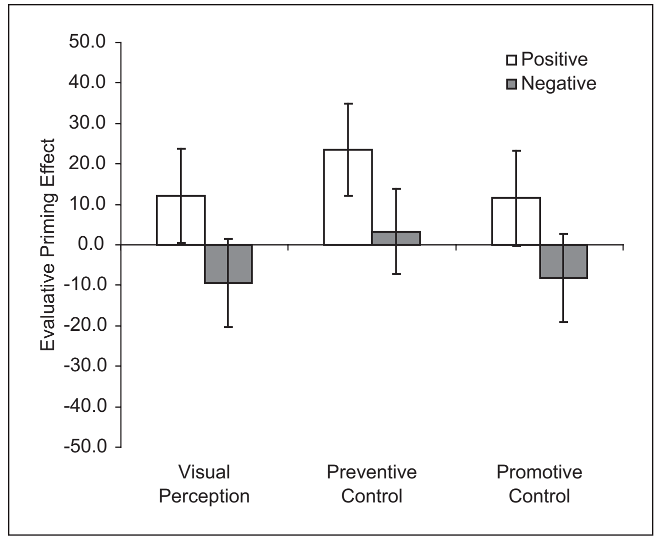

Figure 2. Evaluative priming effects of CS evaluations as a function of US valence (positive vs. negative) and task instructions (visual perception vs. preventive control vs. promotive control), Experiment 1.
Note. Higher values indicate more favorable evaluations. Error bars depict standard errors.

$p < .001$. The size of EC effects—defined as the difference in evaluations of CSs that had been paired with positive versus negative USs—differed between the preventive control and the visual perception conditions, $t(79) = 1.96$, $p = .05$, the promotive control and the visual perception conditions, $t(76) = 2.88$, $p = .005$, and the preventive and the promotive control conditions, $t(79) = 5.20$, $p < .001$. Unexpectedly, a significant three-way interaction of US Valence, Task Instructions, and Measurement Order, $F(2, 114) = 4.38$, $p = .01$, $\eta_p^2 = .071$, further indicated that Task Instructions were more effective in qualifying EC effects when participants completed the self-report measure first, $F(2, 57) = 18.22$, $p < .001$, $\eta_p^2 = .390$, than when they completed the evaluative priming measure first, $F(2, 57) = 1.11$, $p = .34$, $\eta_p^2 = .038$. The main effect of US Valence was statistically significant in both order conditions (Fs > 38, ps < .001).

Evaluative priming. The same ANOVA on evaluative priming scores revealed a significant main effect of US Valence, $F(1, 114) = 16.26$, $p < .001$, $\eta_p^2 = .125$, indicating that CSs that had been paired with a positive US elicited more favorable responses than CSs that had been paired with a negative US (Ms = 15.94 vs. −4.55, respectively). Evaluations significantly differed from zero for CSs that had been paired with positive USs, $t(119) = 2.40$, $p = .02$, but not for CSs that had been paired with negative USs, $t(119) = -0.74$, $p = .46$. More importantly, Task Instructions failed to produce any significant effect by itself, $F(2, 114) = 0.45$, $p = .64$, $\eta_p^2 = .008$, or in interaction with US Valence, $F(2, 114) = 0.01$, $p = .99$, $\eta_p^2 < .001$ (see Figure 2). The size of EC effects did not statistically differ between the preventive control and the visual perception conditions, $t(79) = 0.11$, $p = .91$, the promotive control and the visual perception conditions, $t(76) = 0.14$, $p = .89$, and the preventive and the promotive control conditions, $t(79) = 0.56$, $p = .96$. To test whether the effects of task instructions differed for self-reported evaluations and evaluative priming effects, we z-transformed the difference scores reflecting the size of EC effects and submitted them to a 2 (Measure) × 3 (Task Instructions) × 2 (Measurement Order) mixed-model ANOVA. The hypothesized difference between EC effects on the two kinds of measures was confirmed by a statistically significant two-way interaction between Measure and Task Instructions, $F(2, 114) = 8.50$, $p < .001$, $\eta_p^2 = .130$.

Recollective memory. To investigate the role of recollective memory for CS-US pairings, we calculated a score reflecting the proportion of correct responses on the recognition task. Overall, recognition memory was significantly above the chance-level of 20% with an average of 85%, $t(119) = 27.06$, $p < .001$. However, recognition memory varied considerably with a minimum of 0% and a maximum of 100% (SD = 0.26). Mean levels of recognition memory were unaffected by task instructions, $F(2, 117) = 0.77$, $p = .47$, $\eta_p^2 = .013$.[4]

Correlations. The correlations between all dependent measures are summarized in Table 1.[5] Although EC effects on self-reported evaluations and EC effects on the evaluative priming measure showed a significant positive correlation, only EC effects on self-reported evaluations were significantly correlated with self-reported control motivation and recollective memory for CS-US pairings. Specifically, EC effects on self-reported evaluations decreased as a function

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Table 1. Correlations Between EC Effects on Self-Reported Evaluations, EC Effects on an Evaluative Priming Measure, Motivation to Prevent the Influence of CS-US Pairings, and Recollective Memory for CS-US Pairings, Experiment 1.

	1	2	3	4
1. EC effect—self-report	—			
2. EC effect—evaluative priming	.27**	—		
3. Motivation to prevent influence	−.42***	−.11	—	
4. Memory for CS-US pairings	.32***	.12	−.11	—

$^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Table 2. Regression Coefficients for EC Effects on Self-Reported Evaluations as Predicted by EC Effects on an Evaluative Priming Measure, Motivation to Prevent the Influence of CS-US Pairings, Recollective Memory for CS-US Pairings, and Their Interactions, Experiment 1.

	B	*SE*	*t*	*p*
Intercept	1.722	.176	9.786	< .001
EPM	0.508	.188	2.707	.008
MOT	−0.785	.184	−4.272	< .001
MEM	0.650	.183	3.552	.001
EPM × MEM	0.200	.227	0.880	.381
MEM × MOT	−0.502	.224	−2.242	.027
EPM × MOT	0.167	.225	0.739	.461
EPM × MEM × MOT	0.006	.264	0.024	.981

Note. EPM = EC effect on evaluative priming measure; MOT = motivation to prevent the influence of CS-US pairings; MEM = recollective memory for CS-US pairings.

of motivation to prevent the influence of CS-US pairings and increased as a function of recollective memory. EC effects on the evaluative priming measure were not significantly related to either of the two measures. Recollective memory was unrelated to self-reported motivation.

Regression analysis. To investigate the role of response-focused versus memory-focused adjustment in the expression of self-reported CS evaluations, we conducted a multiple regression analysis using EC effects on self-reported evaluations as the dependent measure and standardized scores of EC effects on the evaluative priming measure, recollective memory, self-reported control motivation, and all of their interactions as predictors (see Table 2). The analysis revealed a significant positive relation of EC effects on the evaluative priming measure, a significant positive relation of recollective memory, and a significant negative relation of self-reported control motivation. More important for the current investigation, the analysis revealed a significant interaction between recollective memory and control motivation. Consistent with the hypothesis of memory-focused adjustment, simple slope analyses revealed a positive relation between recollective memory and EC effects on self-reported evaluations when participants were motivated to promote the influence of CS-US pairings, B = 2.30, SE = .50, $t(112) = 4.60$, $p < .001$, but not when they were motivated to prevent the influence of CS-US pairings, B = 0.30, SE = .39, $t(112) = 0.58$, p = .45. A comparison to participants with neutral motivation scores further revealed that the positive baseline relation between recollective memory and EC effects on self-reported evaluations was reduced for participants who were motivated to prevent the influence of CS-US pairings and enhanced for participants who were motivated to promote the influence of CS-US pairings (see Figure 3). Counter to the hypothesis of response-focused adjustment, the main effect of EC effects on the evaluative priming measure remained unqualified by control motivation.[6]

Discussion

The main goal of Experiment 1 was to investigate (a) whether the formation of conditioned attitudes can be intentionally controlled and (b) whether the self-reported expression of conditioned CS attitudes is controlled by response-focused or memory-focused adjustment processes. The results showed that, whereas EC effects on self-reported evaluations were moderated in line with instructions to prevent or promote the influence of subsequently presented CS-US pairings, EC effects on an evaluative priming measure remained unaffected by control instructions. Moreover, although EC effects on self-reported evaluations varied as a function of both recollective memory for CS-US pairings and EC effects on the evaluative priming measure, control motivation qualified only the predictive relation of recollective memory, but not the predictive relation of the evaluative priming measure. Taken together, these results indicate that (a) the formation of conditioned attitudes is rather difficult to control and (b) the self-reported expression of conditioned CS attitudes is controlled by a process of memory-focused adjustment rather than response-focused adjustment.

Experiment 2

Although the results of Experiment 1 suggest that the formation of conditioned attitudes is rather difficult to control, one could argue that monetary rewards influence only external motivation to control attitudinal effects of CS-US pairings. To the extent that enhanced levels of internal motivation improve the effectiveness of cognitive control (e.g., Devine, Plant, Amodio, Harmon-Jones, & Vance, 2002), motivating participants by means of a self-related goal might be more effective in influencing the formation of conditioned attitudes. To rule out this concern, the instructions in Experiment 2 linked successful control of EC effects to high levels of

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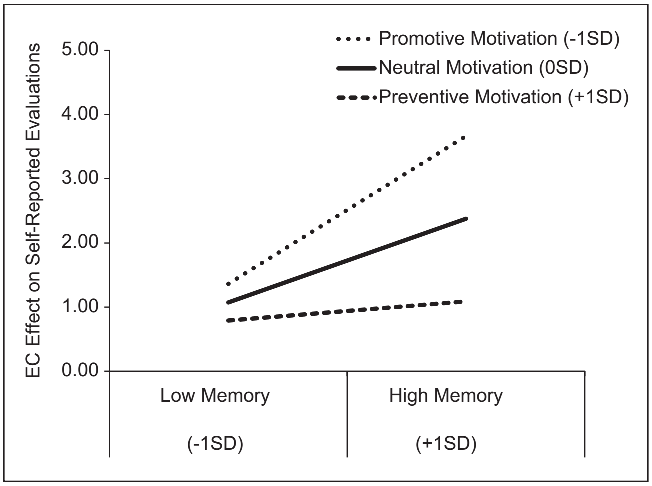

Figure 3. EC effects on self-reported evaluations as a function of self-reported control motivation (promotive, neutral, preventive) and recollective memory for CS-US pairings, Experiment 1.

fluid intelligence, which was described as being related to important life outcomes (e.g., professional success). This information was assumed to motivate participants to perform the instructional task to affirm a positive self-view. Based on the findings of Experiment 1, we expected that instructions to prevent (promote) the influence of subsequently presented CS-US pairings would reduce (enhance) EC effects on self-reported evaluations, but not on an evaluative priming measure. In addition, we aimed to replicate the pattern obtained for the prediction of self-reported evaluations, suggesting that the self-reported expression of conditioned CS attitudes is controlled by a process of memory-focused rather than response-focused adjustment.

Method

Participants and design. A total of 120 undergraduate students (82 female, 38 male) at The University of Western Ontario were recruited for a study titled "How do we evaluate novel visual images?" All participants were paid a performance-independent compensation of CAD$5 for their participation in the current study, which lasted approximately 20 min. The study included a 2 (US Valence: positive vs. negative) × 3 (Task Instructions: visual perception vs. preventive control vs. promotive control) × 2 (Measurement Order: self-report first vs. evaluative priming first) mixed-model design with the first variable as a within-subjects factor and the other two as between-subjects factors.

Materials and procedure. The materials, EC procedure, and measures were identical to Experiment 1. The task instructions were also identical to Experiment 1, the only difference being that we enhanced participants' motivation to prevent versus promote the attitudinal influence of CS-US pairings by linking high performance levels to high levels of intelligence. Specifically, participants in the two experimental conditions were told that the ability to intentionally influence conditioning effects has been linked to fluid intelligence, which has been shown to predict a number of important life outcomes such as academic success and job performance. The instructions in the visual perception condition were identical to Experiment 1.

Results

Data aggregation. Baseline-corrected scores of self-reported evaluations were calculated according to the procedures in Experiment 1 (Cronbach's $\alpha = .69$ and .79, respectively). For the aggregation of the evaluative priming data, we again excluded latencies from trials with incorrect responses (5.3%) and truncated latencies lower than 300 ms and higher than 1,000 ms (7.0%). Baseline-corrected priming scores were aggregated according to the procedures in Experiment 1 (Cronbach's $\alpha = .76$ and .74, respectively).

Manipulation check. Submitted to a univariate ANOVA with Task Instructions as independent variable, self-reported control motivation revealed a significant main effect, $F(2, 117) = 37.58$, $p < .001$, $\eta_p^2 = .391$. Whereas participants in the preventive control condition showed a stronger motivation to prevent the influence of the CS-US pairings ($M = -1.40$), participants in the promotive control condition showed a stronger motivation to promote the influence of the CS-US pairings ($M = 1.37$), $t(78) = 8.53$, $p < .001$. Participants in the visual perception condition showed scores in-between the two experimental groups ($M = 0.55$) with their scores differing from both the preventive control condition, $t(78) = 5.81$, $p < .001$, and the promotive control condition, $t(78) = -2.53$, $p = .01$.

Self-reported evaluations. Submitted to a 2 (US Valence) × 3 (Task Instructions) × 3 (Measurement Order) mixed-model ANOVA, self-reported CS evaluations revealed a significant main effect of US Valence, $F(1, 114) = 46.08$, $p < .001$, $\eta_p^2 = .288$, indicating that CSs that had been paired with a positive US were rated more favorably than CSs that had been paired with a negative US (Ms = 0.52 vs. −0.58, respectively). Evaluations significantly differed from zero for both CSs that had been paired with positive USs, $t(119) = 3.62$, $p < .001$, and CSs that had been paired with negative USs, $t(119) = -4.07$, $p < .001$. More importantly, the main effect of US Valence was qualified by a significant two-way interaction with Task Instructions, $F(2, 114) = 12.14$, $p < .001$, $\eta_p^2 = .176$ (see Figure 4). Replicating the findings of Experiment 1, EC effects on self-reported evaluations were strongest in the promotive control condition, $t(39) = 6.24$, $p < .001$, somewhat less pronounced in the visual perception condition, $t(39) = 3.78$, $p = .001$, and weakest (nonsignificant) in the preventive control condition, $t(39) = 0.86$, $p = .39$. A comparison of the size of EC effects revealed significant differences

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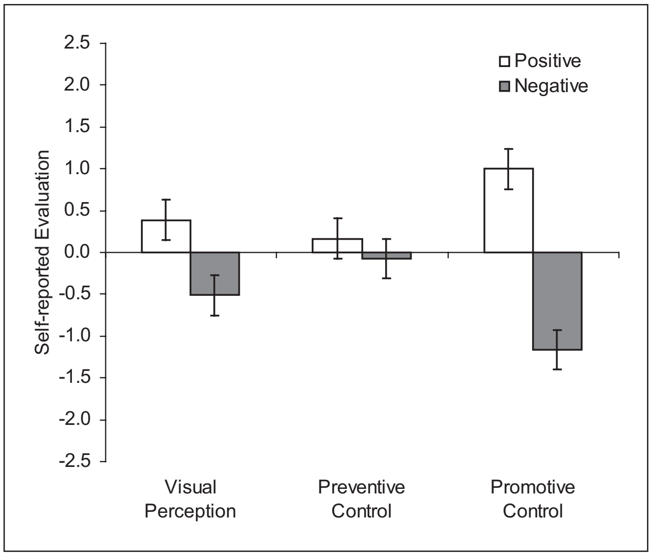

Figure 4. Self-reported CS evaluations as a function of US valence (positive vs. negative) and task instructions (visual perception vs. preventive control vs. promotive control), Experiment 2.
Note. Higher values indicate more favorable evaluations. Error bars depict standard errors.

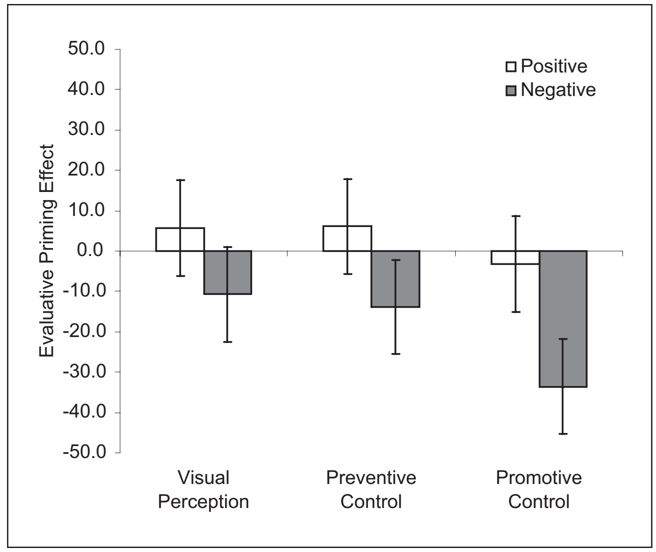

Figure 5. Evaluative priming effects of CS evaluations as a function of US valence (positive vs. negative) and task instructions (visual perception vs. preventive control vs. promotive control), Experiment 2.
Note. Higher values indicate more favorable evaluations. Error bars depict standard errors.

between the preventive control and the promotive control conditions, $t(78) = 4.35$, $p < .001$, and the promotive control and the visual perception conditions, $t(78) = 3.00$, $p = .004$, and a marginally significant difference between the preventive control and the visual perception conditions, $t(78) = 1.82$, $p = .07$. Replicating the unexpected order effect of Experiment 1, a significant three-way interaction of US Valence, Task Instructions, and Measurement Order, $F(2, 114) = 4.03$, $p = .02$, $\eta_p^2 = .066$, indicated that Task Instructions were again more effective in qualifying EC effects when participants completed the self-report measure first, $F(2, 57) = 14.58$, $p < .001$, $\eta_p^2 = .338$, than when they completed the evaluative priming measure first, $F(2, 57) = 1.63$, $p = .20$, $\eta_p^2 = .054$. The main effect of US Valence was statistically significant in both order conditions (Fs > 12, ps < .001).

Evaluative priming. The same ANOVA on evaluative priming scores revealed a significant main effect of US Valence, $F(1, 114) = 17.17$, $p < .001$, $\eta_p^2 = .131$, indicating that CSs that had been paired with a positive US elicited more favorable responses than CSs that had been paired with a negative US (Ms = 2.85 vs. −19.37, respectively). Evaluations significantly differed from zero for CSs that had been paired with negative USs, $t(119) = -2.87$, $p = .005$, but not for CSs that had been paired with positive USs, $t(119) = 0.42$, $p = .68$. More importantly, Task Instructions failed to show any significant effect by itself, $F(2, 114) = 0.65$, $p = .52$, $\eta_p^2 = .011$, or in interaction with US Valence, $F(2, 114) = 0.62$, $p = .54$, $\eta_p^2 = .011$ (see Figure 5). The size of EC effects did not significantly differ between the preventive control and the visual perception conditions, $t(78) = 0.28$, $p = .78$, the promotive control and the visual perception conditions, $t(78) = 1.04$, $p = .30$, and the preventive and the promotive control conditions, $t(78) = 0.77$, $p = .45$. To test whether the effects of Task Instructions differed for self-reported evaluations and evaluative priming effects, we again z-transformed the difference scores reflecting the size of EC effects and submitted them to a 2 (Measure) × 3 (Task Instructions) × 3 (Measurement Order) mixed-model ANOVA. The hypothesized difference between EC effects on the two kinds of measures was confirmed by a statistically significant two-way interaction between Measure and Task Instructions, $F(2, 114) = 4.53$, $p = .01$, $\eta_p^2 = .074$.

Recollective memory. To investigate the role of recollective memory for CS-US pairings, we calculated a score reflecting the proportion of correct responses on the recognition task. Recognition memory was again significantly above the chance-level of 20% with an accuracy rate of 82%, $t(119) = 23.09$, $p < .001$. Yet, recognition memory varied considerably with a minimum value of 0% and a maximum value of 100% ($SD = 0.29$). Mean levels of recognition memory were unaffected by task instructions, $F(2, 117) = 0.76$, $p = .47$, $\eta_p^2 = .013$.[7]

Correlation analysis. The correlations between all dependent measures are summarized in Table 3.[8] EC effects on the two evaluation measures again showed a significant positive correlation. However, only EC effects on self-reported

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Table 3. Correlations Between EC Effects on Self-Reported Evaluations, EC Effects on an Evaluative Priming Measure, Motivation to Prevent the Influence of CS-US Pairings, and Recollective Memory for CS-US Pairings, Experiment 2.

	1	2	3	4
1. EC effect—self-report	—			
2. EC effect—evaluative priming	.21*	—		
3. Motivation to prevent influence	−.30**	−.07	—	
4. Memory for CS-US pairings	.25**	.12	−.09	—

*p < .05. **p < .01. ***p < .001.

Table 4. Regression Coefficients for EC Effects on Self-Reported Evaluations as Predicted by EC Effects on an Evaluative Priming Measure, Motivation to Prevent the Influence of CS-US Pairings, Recollective Memory for CS-US Pairings, and Their Interactions, Experiment 2.

	B	*SE*	*t*	*p*
Intercept	1.041	.170	6.141	< .001
EPM	0.329	.180	1.830	.070
MOT	−0.412	.176	−2.341	.021
MEM	0.467	.176	2.652	.009
EPM × MEM	0.042	.222	0.190	.850
MEM × MOT	−0.588	.243	−2.424	.017
EPM × MOT	−0.035	.190	−0.182	.856
EPM × MEM × MOT	−0.077	.292	−0.262	.794

Note. EPM = EC effect on evaluative priming measure; MOT = motivation to prevent the influence of CS-US pairings; MEM = recollective memory for CS-US pairings.

evaluations, but not EC effects on the evaluative priming measure, showed significant correlations to recollective memory and self-reported control motivation. Replicating the findings of Experiment 1, EC effects on self-reported evaluations increased as a function of recollective memory and decreased as a function of self-reported control motivation. The correlation between recollective memory and self-reported control motivation was not statistically significant.

Regression analysis. To investigate the role of response-focused versus memory-focused adjustment in the expression of self-reported CS evaluations, EC effects on self-reported evaluations were again regressed onto standardized scores of EC effects on the evaluative priming measure, recollective memory, self-reported control motivation, and all of their interactions (see Table 4). The analysis revealed a marginally significant positive relation of EC effects on the evaluative priming measure, a significant positive relation of recollective memory, and a significant negative relation of self-reported control motivation. More importantly, the analysis replicated

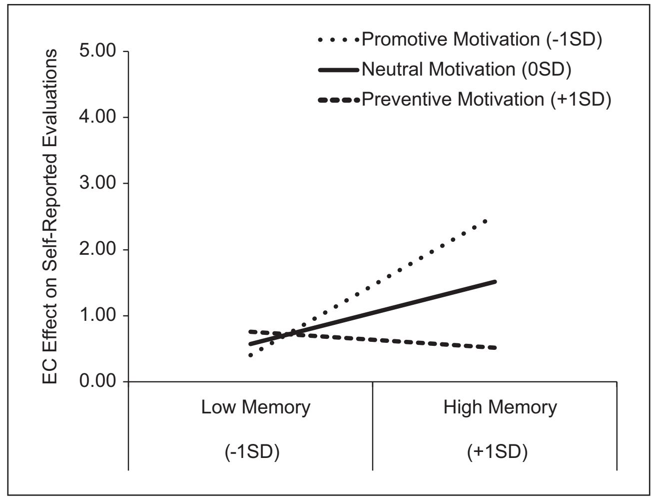

Figure 6. EC effects on self-reported evaluations as a function of self-reported control motivation (promotive, neutral, preventive) and recollective memory for CS-US pairings, Experiment 2.

the significant interaction between recollective memory and control motivation, corroborating the proposed role of memory-focused adjustment. Simple slope analyses revealed that EC effects on self-reported evaluations were positively related to recollective memory when participants were motivated to promote the influence of CS-US pairings, $B = 2.11$, $SE = .49$, $t(112) = 4.27$, $p < .001$, but not when they were motivated to prevent the influence of CS-US pairings, $B = -0.24$, $SE = .45$, $t(112) = -0.54$, $p = .59$. A comparison to participants with neutral motivation scores further revealed that the positive baseline relation between recollective memory and EC effects on self-reported evaluations was reduced for participants who were motivated to prevent the influence of CS-US pairings and enhanced for participants who were motivated to promote the influence of CS-US pairings (see Figure 6). Counter to the hypothesis of response-focused adjustment, the main effect of EC effects on the evaluative priming measure remained unqualified by control motivation.[9]

Discussion

To rule out concerns that the results of Experiment 1 were due to the ineffectiveness of monetary rewards in enhancing cognitive control, the instructions in Experiment 2 linked successful control of EC effects to important life outcomes. Because internal motivation has been shown to be more effective in enhancing cognitive control than external motivation (e.g., Devine et al., 2002), one could argue that motivating participants by means of a self-related goal might help to prevent (promote) the formation of conditioned attitudes. Counter to this claim, Experiment 2 replicated the basic findings of Experiment 1. Thus, taken together the two studies corroborate the conclusions that (a) the formation of

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conditioned attitudes is rather difficult to control and (b) the self-reported expression of CS evaluations is controlled by a process of memory-focused adjustment rather than response-focused adjustment.

General Discussion

Counter to the widespread view that the learning mechanisms underlying EC effects operate in an automatic fashion, recent research has shown that EC depends on the availability of cognitive resources (e.g., Davies et al., 2012; Pleyers et al., 2009), momentary processing goals (e.g., Corneille et al., 2009; Gast & Rothermund, 2011), and higher-order construals of CS-US relations (e.g., Fiedler & Unkelbach, 2011; Förderer & Unkelbach, 2012) during the encoding of CS-US pairings. The main goal of the current research was to investigate another, yet unacknowledged feature of automatic processing in EC: the controllability of acquiring a conditioned attitude. Testing the effectiveness of external (Experiment 1) and internal (Experiment 2) motivation to control the influence of CS-US pairings, we found that EC effects on self-reported evaluations were reduced (enhanced) when participants were instructed to prevent (promote) attitudinal effects of CS-US pairings. However, EC effects on an evaluative priming measure remained unaffected by control instructions. These results indicate that, although the *expression* of self-reported CS evaluations can be intentionally controlled, the *formation* of conditioned attitudes is rather difficult to control.

Expanding on these findings, we also investigated the processes underlying the intentional control of expressing a conditioned attitude (cf. Wegener & Petty, 1997). On one hand, the expression of conditioned attitudes could be controlled by intentionally adjusting the reliance on one's spontaneous evaluative response to a given CS when expressing an evaluative judgment about the CS (*response-focused adjustment*). On the other hand, the expression of conditioned attitudes could be controlled by intentionally adjusting the reliance on recollective memory for CS-US pairings when making an evaluative judgment about a CS (*memory-focused adjustment*). Consistent with the latter hypothesis, the relation between recollective memory and EC effects on self-reported evaluations was reduced (enhanced) when participants were motivated to prevent (promoted) the influence of CS-US pairings. However, counter to the hypothesis of response-focused adjustment, the relation between EC effects on the evaluative priming measure and EC effects on self-reported evaluations was unaffected by control motivation.

The current findings expand on earlier research by Balas and Gawronski (2012) investigating whether the expression of conditioned attitudes on self-reported evaluations can be intentionally controlled. Their results showed that instructions to prevent or promote the influence of previously presented CS-US pairings moderated EC effects in line with task instructions. However, this moderation was observed only when participants were able to recall the valence of the US that had been paired with a given CS. By including an evaluative priming measure and providing control instructions before the encoding of CS-US pairings, the current research goes beyond these findings showing that, although the expression of conditioned attitudes can be intentionally controlled, their formation is more difficult to control. In addition, the current findings provide deeper insights into the processes underlying the intentional control of expressing a conditioned attitude. To the extent that spontaneous evaluative responses to a CS are positively related to memory judgments about the valence of the US it has been paired with (Gawronski & Walther, 2012), Balas and Gawronski's findings are consistent with either of the two potential adjustment processes. By including separate measures of spontaneous evaluative responses and recollective memory, the current research resolves this ambiguity showing that the expression of self-reported CS evaluations is controlled by a process of memory-focused adjustment rather than response-focused adjustment.

Balas and Gawronski's (2012) findings also help to explain an unexpected order effect in the relative effectiveness of control instructions. In the current studies, control instructions were more effective in qualifying EC effects on self-reported evaluations when the self-report measure was administered first than when it followed the evaluative priming task. Although this order effect was unexpected, it replicated in both studies. To the extent that successful control depends on participants' memory for the valence of the US a given CS had been paired with, a potential explanation is that recollective memory decreases as a function of increasing delays, thereby decreasing the effectiveness of intentional control. This interpretation is consistent with the current finding that control motivation was less effective in influencing EC effects on self-reported evaluations when recollective memory for CS-US pairings was low than when it was high (see Figures 3 and 6).

Two Sources of EC Effects

Taken together, the current findings highlight the contribution of two functionally distinct processes to EC effects on self-reported evaluations. First, our findings indicate that EC effects can be the result of an *uncontrollable encoding-related process* involving the formation of conditioned CS attitudes during the encoding of CS-US pairings. In the current studies, EC effects on the evaluative priming measure were not only unaffected by instructions to control the attitudinal effects of CS-US pairings; they also showed a significant positive relation to EC effects on self-reported evaluations and this relation remained unqualified by control motivation. This pattern suggests that the uncontrollable effect of CS-US pairings on the formation of conditioned CS attitudes had a downstream effect on the expression of

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self-reported CS evaluations, such that participants used their spontaneous evaluative responses to the CSs in judging the valence of the CSs in the self-report measure.

Second, our findings indicate that EC effects on self-reported evaluations can be the result of a *controllable expression-related process* involving the intentional use of recollective memory for CS-US pairings in evaluating the CS. In the current studies, EC effects on self-reported evaluations varied not only as a function of spontaneous responses to the CSs in the evaluative priming task, but also as a function of recollective memory for CS-US pairings. Importantly, although the predictive relation of the evaluative priming measure remained unqualified by control motivation, the predictive relation of recollective memory was reduced when participants were motivated to prevent the influence of CS-US pairings and enhanced when they were motivated to promote the influence of CS-US pairings. Taken together, these results indicate that EC effects on self-reported evaluations can be due to the use of (a) spontaneous evaluative responses to the CSs or (b) recollective memory for CS-US pairings (or both) in judging the valence of the CSs.

Features of Automaticity

The current research echoes earlier concerns against conceptualizations assuming that different features of automaticity generally occur in an all-or-none fashion. The central argument is that, because different features of automaticity are conceptually and empirically independent, evidence for the presence versus absence of one feature cannot be used to infer the presence versus of another feature (Bargh, 1994; Moors & De Houwer, 2006). In line with this argument, our findings indicate that the formation of conditioned attitudes is rather difficult to control, although the learning mechanisms underlying EC effects may depend on cognitive resources (e.g., Davies et al., 2012; Pleyers et al., 2009), processing goals (e.g., Corneille et al., 2009; Gast & Rothermund, 2011), and higher order construals (e.g., Fiedler & Unkelbach, 2011; Förderer & Unkelbach, 2012).

Nevertheless, it is important to note that our findings speak only to the relative difficulty of controlling the formation of conditioned attitudes; they do not indicate that control is impossible in a general sense. Any such claim would be premature, because successful control may depend on the employed strategy to prevent or promote the influence of CS-US pairings. For example, although spontaneous evaluative responses to verbal stimuli have been shown to be unaffected by negation (e.g., Deutsch, Gawronski, & Strack, 2006), recent evidence suggests that instructions to "think of the opposite" can reverse the impact of negated evaluative information on spontaneous evaluative responses when this strategy is applied during encoding (Peters & Gawronski, 2011). Similarly, research on emotion regulation has shown that reappraising the meaning of an emotion-evoking stimulus is a more effective control strategy than emotion suppression (Gross, 1998). Drawing on these finding, one could argue that the effectiveness of intentional control could be enhanced by strategies involving contrastive construals of CS-US pairings or reappraisals of the USs. However, recent evidence suggests that the effects of contrastive construals may be limited, in that they qualify only self-reported evaluations, but not spontaneous evaluative responses (Moran & Bar-Anan, 2013). Thus, although the current findings indicate that the formation of conditioned attitudes is rather difficult to control, more research is needed to determine the effectiveness of different strategies in controlling the attitudinal effects of CS-US pairings.

Potential Objections

A potential objection is that the CS-US pairings in the current studies were rather obvious and easy to detect. By using concealed presentations of CS-US pairings that involve subliminal presentations of the CSs (e.g., Dijksterhuis, 2004), subliminal presentations of the USs (e.g., Rydell, McConnell, Mackie, & Strain, 2006), or a large number of distracter stimuli (e.g., Olson & Fazio, 2001), recollective memory for CS-US pairings could have been eliminated, thereby reducing participants' ability to control the expression of conditioned attitudes (see Balas & Gawronski, 2012). Although concealed presentations of CS-US pairings are very useful to investigate the role of conscious awareness in EC, they are detrimental for the current question because they undermine a comparison of memory-focused versus response-focused adjustment. In the current research, recollective memory for CS-US pairings and EC effects on the evaluative priming measure showed comparable zero-order correlations to EC effects on self-reported evaluations. Yet, control motivation qualified only the predictive relation of recollective memory, but not the predictive relation of the evaluative priming measure. These results indicate that participants spontaneously employed a memory-focused adjustment strategy rather than a response-focused adjustment strategy. If recollective memory had been eliminated by using subliminal presentations or including a large number of distracter stimuli, the current studies would have been unable to test the relative contribution of the two adjustments strategies.

Another potential objection is that the evaluative priming measure may have been insufficiently reliable to capture the effects of our control manipulation. In fact, evaluative priming tasks often suffer from substantial measurement error, which decreases the reliability of their measurement scores (Gawronski & De Houwer, in press). Counter to this objection, however, the evaluative priming measure in the current studies revealed reliability estimates that were comparable to the ones revealed by the self-report measure. Moreover, the evaluative priming measure showed the predicted effects of the CS-US pairings and significant relations to self-reported evaluations, which should not emerge if the measure was unreliable (LeBel & Paunonen, 2011). Thus, low reliability

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of the evaluative priming measure cannot account for the current pattern of results.

A final objection is that participants might have been insufficiently motivated to control the influence of CS-US pairings. Specifically, one could argue that the null effect of our control instructions on the evaluative priming measure is due to insufficient motivation to comply with these instructions. There are a number of reasons why insufficient motivation seems rather unlikely to account for the present findings. First, to rule out concerns that our participants were insufficiently motivated to comply with the task instructions, we made every effort to link high performance levels to desirable outcomes. Whereas participants in Experiment 1 were promised a monetary reward for high performance levels (external motivation), participants in Experiment 2 were told that high performance levels are linked to desirable personality characteristics (internal motivation). Second, our manipulation check clearly supported the effectiveness of our task instructions, in that participants reported different levels of motivation to promote versus prevent the influence of CS-US pairings in the three instruction conditions. Moreover, responses on the motivation measure moderated the relation between recollective memory for CS-US pairings and EC effects on self-reported evaluations, indicating that it reliably captured differences in the motivation to promote versus prevent the influence of CS-US pairings. Finally, although control instructions did not moderate EC effects on the evaluative priming measure, they did influence EC effects on self-reported evaluations. On the basis of these findings, insufficient motivation seems rather unlikely to account for the present findings.

Theoretical Implications

Theoretically, EC effects are often explained in terms of associative processes of automatic link formation, in which the mental representation of the CS becomes automatically associated with the representation of the US (e.g., Walther et al., 2009) or the evaluative response elicited by the US (e.g., Sweldens et al., 2010). More recently, however, several researchers have questioned the idea of automatic link formation, arguing that EC effects are due to the nonautomatic acquisition and validation of propositional knowledge about CS-US relations (e.g., De Houwer, 2009; Mitchell et al., 2009). Although moderating effects of cognitive resources, processing goals, and higher order construals are consistent with a single-process, propositional account, the currently available evidence is still conflicting and difficult to reconcile by either associative or propositional accounts alone (see Hofmann et al., 2010). These inconsistencies have led some researchers to speculate that EC effects might be the result of two distinct processes: an associative process of automatic link formation and a propositional process involving the nonautomatic acquisition and validation of propositional knowledge about CS-US relations (e.g., De Houwer, 2007; Gawronski & Bodenhausen, 2011; Jones, Olson, & Fazio, 2010).

The current findings are consistent with such dual-process accounts, in that uncontrollable effects of CS-US pairings on the formation of conditioned attitudes may be driven by an associative process of automatic link formation, whereas the controllable use of recollective memory in the expression of self-reported CS evaluations reflects the nonautomatic validation of propositional knowledge about CS-US relations. However, it is worth noting that, the current data do not rule out a potential contribution of propositional processes to the formation of conditioned attitudes. After all, it is possible that the uncontrollable effect of CS-US pairings depends on awareness, such that the conscious identification of CS-US contingencies creates conditioned attitudes despite the intention not to be influenced by the identified contingencies. Thus, although the current findings indicate that the formation of conditioned attitudes is rather difficult to control, they are still consistent with a single-process propositional account to the extent that it allows uncontrollable effects of consciously generated propositions about CS-US relations (e.g., De Houwer, in press). Nevertheless, our findings provide clear evidence for the contribution of two functionally distinct processes to the expression of CS evaluations, in that EC effects on self-reported evaluations can be the result of either (a) an *uncontrollable encoding-related process* involving the formation of a conditioned attitude during the encoding of CS-US pairings and (b) a *controllable expression-related process* involving the intentional use of recollective memory for CS-US pairings in evaluating the CS.

Conclusion

Although recent evidence for various nonautomatic features of EC may lead one to conclude that the attitudinal effects of CS-US pairings can be intentionally controlled, the present results suggest a different conclusion. Our findings indicate that, although the *expression* of self-reported CS evaluations can be intentionally controlled, the *formation* of conditioned attitudes is more difficult to control. Moreover, the current results suggest that the expression of self-reported CS evaluations is controlled by a process of memory-focused adjustment rather than response-focused adjustment. Because the identified adjustment process simply undermines the use of recollective memory for CS-US pairings instead of inhibiting the downstream effects of spontaneous evaluative responses to a CS, even self-reported CS evaluations can reflect counterintentional effects of CS-US pairings. Applied to our introductory example, these findings suggest that pairings of a consumer product and a positive stimulus can have attitudinal effects despite one's best intention not to be influenced. Thus, the most effective way to prevent such influences is to avoid the encoding of the relevant pairings by looking away or turning off the TV.

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Authors' Note

Bertram Gawronski is now at the University of Texas at Austin Laura A. Creighton is now at AOL, Canada.

Declaration of Conflicting Interests

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Notes

1. Another important question is whether EC depends on conscious awareness of CS-US pairings during encoding. Research on this question has predominantly relied on memory tasks, investigating whether EC effects depend on recollective memory for CS-US pairings (e.g., Pleyers, Corneille, Luminet, & Yzerbyt, 2007; Stahl, Unkelbach, & Corneille, 2009). However, because performance on memory tasks depends on encoding-related and retrieval-related processes, memory measures remain ambiguous about the role of conscious awareness during encoding of CS-US pairings (Gawronski & Walther, 2012). The available evidence regarding the effects of cognitive resources, processing goals, and higher order construals is more diagnostic about the role of automatic versus nonautomatic processes during the formation of conditioned attitudes, in that the relevant processing conditions were experimentally manipulated during encoding of CS-US pairings.
2. Type of compensation did not qualify any of the reported results.
3. The treatment of outliers followed procedures by Gawronski and Deutsch in earlier studies using evaluative priming tasks (e.g., Deutsch & Gawronski, 2009; Gawronski, Deutsch, Mbirkou, Seibt, & Strack, 2008).
4. Because the distribution of memory scores was negatively skewed, we reran all of the following analyses using inverse transformations of reflected memory scores (see Tabachnick & Fidell, 1989). All of the reported results replicated for transformed and nontransformed memory scores.
5. For ease of interpretation, we recoded the measure of motivation, such that higher values reflect higher motivation to prevent the influence of CS-US pairings.
6. Because some research suggests that EC effects depend on recollective memory for the valence of the US that had been paired with a given CS rather than memory for the nominal US (e.g., Stahl et al., 2009), we also calculated an index of US valence memory on the basis of US recognition judgments that were consistent with the valence of the US that had been paired with a given CS (see Walther & Nagengast, 2006). The results for US valence memory replicated the ones obtained for US identity memory.
7. Because the distribution of memory scores was again negatively skewed, we reran all of the following analyses using inverse transformations of reflected memory scores (see Tabachnick & Fidell, 1989). All of the reported results replicated for transformed and nontransformed memory scores.
8. For ease of interpretation, we again recoded the measure of motivation, such that higher values reflect higher motivation to prevent the influence of CS-US pairings.
9. As with Experiment 1, we also conducted the same analysis using an index of US valence memory. The results again replicated the ones obtained for US identity memory.

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