Journal of Experimental Social Psychology 45 (2009) 279–282

Contents lists available at ScienceDirect

Journal of Experimental Social Psychology

journal homepage: www.elsevier.com/locate/jesp

FlashReport

Beyond awareness and resources: Evaluative conditioning may be sensitive to processing goals ☆

O. Corneille [a,*], V.Y. Yzerbyt [a], G. Pleyers [a], T. Mussweiler [b]

[a] Université catholique de Louvain at Louvain-la-Neuve, Department of Psychology, Place du Cardinal Mercier 10, B-1348 Louvain-la-Neuve, Belgium
[b] Institut für Psychologie, Erziehungswissenschaftliche Fakultät, Universität zu Köln, Gronewaldstraße 250931, Köln, Germany

ARTICLE INFO

Article history:
Received 24 June 2008
Revised 18 August 2008
Available online 29 August 2008

Keywords:
Attitudes
Evaluative conditioning

ABSTRACT

Evaluative conditioning (EC) is often regarded as an automatic affective learning process. Yet, recent empirical evidence suggests that EC may actually be sensitive to contingency awareness and to the availability of attentional resources. Here, we examine for the first time a third horseman of EC automaticity: processing goals. Specifically, we had participants engage an EC task after completing a task known to elicit the goal of processing either the perceptual similarities or the perceptual differences between stimuli. EC was predicted and found to be larger in the former (similarity-focus) than in the latter (difference-focus) condition. This finding provides original evidence that EC is sensitive to the processing goal activated in participants as they encode the CS–US pairings. The theoretical implications of this finding are discussed.

Evaluative conditioning (EC) is obtained when a stimulus of neutral valence (or conditioned stimulus – CS) acquires the valence of a valenced stimulus (or unconditioned stimulus – US) after being pairing with it (*e.g.*, De Houwer, 2007). EC is of interest to practitioners concerned with modifying attitudes in the social (*e.g.*, Walther, Nagengast, & Trasselli, 2005), political (*e.g.*, Razran, 1954), consumer (*e.g.*, Stuart, Shimp, & Engle, 1987) and clinical (*e.g.*, Eifert, Craill, Carey, & O'Connor, 1988) domains. Theoretically, EC is often regarded as an automatic affective learning process (*e.g.*, Walther, 2002). The latter conclusion rests on evidence suggesting that EC is obtained without participants' awareness of the CS–US contingencies (*e.g.*, Baeyens, Eelen, & Van den Bergh, 1990; Fulcher & Hammerl, 2001; Olson & Fazio, 2002) and is not impeded by attentional load (Fulcher & Hammerl, 2001, Exps. 1 & 2; Walther, 2002, Exp. 5).

However, recent research questioned the validity of this conclusion. Using a rigorous design and sensitive awareness measures, Pleyers, Corneille, Luminet, and Yzerbyt (2007) found no evidence for the evaluative conditioning of CSs that could not be paired with their US in an identification task. Other recent studies that relied on psychophysiological measures of valence acquisition (Dawson, Rissling, Schell, & Wilco, 2007) and that examined EC effects in other sensorial modalities (Wardle, Mitchell, & Lovibond, 2007) similarly failed to obtain evidence for EC in the absence of awareness for CS–US pairings. Regarding attentional resources, Pleyers, Corneille, Yzerbyt, and Luminet (in press) found that EC was less likely to emerge when participants' resources were concurrently used by a secondary task during conditioning (see also Field & Moore, 2005). A reduction of attentional resources prevented participants from correctly encoding the CS–US pairings, lowering contingency awareness and EC effects on average.

If EC proves sensitive to contingency awareness and availability of resources, then one may start questioning the idea that EC qualifies as an automatic affective learning process. The present research contributes to this debate by examining for the first time the impact of a third horseman of automaticity in EC: processing goals. Specifically, we predicted that EC would be larger for participants primed with the goal of processing similarities rather than differences in the context of a drawing task completed prior to the conditioning task, as these goals would likely remain active as participants would then be processing the CS–US pairings in a subsequent conditioning task. This prediction was based on related conditioning effects obtained in the animal learning research. For instance, Rescorla and Furrow (1977) reported evidence that the perceptual similarity between to-be-associated stimuli facilitates acquisition through Pavlovian conditioning in animal learning.

Only a handful of studies examined the impact of perceptual similarity in EC. Martin and Levey (1978) observed greater EC effects for CS–US pairs selected so as to be explicitly similar in form or content. Other studies, however, observed EC effects when arranging for CS–US pairings that were structurally very dissimilar, such as pairing nonsense syllables with the immersion of a hand in cold water (Faw & Parker, 1972). More recently, Baeyens, Eelen, van den Bergh, and Crombez (1989) reported a study aimed at overcoming some conceptual and methodological limitations of

☆ This work benefited from a grant ARC06/11-337 from the Communauté Française de Belgique to the first and second authors as well as a EURYI award from the European Science Foundation to the last one.

* Corresponding author.
E-mail address: olivier.corneille@uclouvain.be (O. Corneille).

0022-1031/$ - see front matter © 2008 Elsevier Inc. All rights reserved.
doi:10.1016/j.jesp.2008.08.020

the aforementioned experiments. These authors predicted an effect of perceptual similarity in EC but found none. In sum, EC research led to divergent conclusions regarding the role of perceptual similarity in EC.

The above studies differed in a number of ways but had one feature in common: in all cases, the impact of the CS–US similarity was examined by selecting pairs of similar or dissimilar parings that differed in content. Hence, the perceptually similar pairs were not structurally identical to the perceptually dissimilar ones. This procedure is problematic as it introduced a confound between the perceptual and the objective similarity of the pairs. Perhaps even more important, it prevented the experimenter from randomly assigning the CS–US pairings under the low and high similarity conditions or from counterbalancing these pairings across participants, which may have induced CS–US selection biases.

A more satisfying procedure would consist of keeping constant the pairings but manipulating the perception of their similarity. This was done here by keeping constant the identity of the CS–US pairs but having participants engage the conditioning task with the goal of processing either the similarities or the differences in the CS–US pairs. A non-obtrusive manipulation of processing goals that provided good results in past research was used here. Specifically, participants completed a first task prior to their confrontation with the EC task. In this task, they were asked to list similarities or differences between two drawings of market places (Mussweiler & Damisch, in press; see also Mussweiler (2001)).

Method

Participants and design

A total of 111 French-speaking undergraduate students at the Université catholique de Louvain participated for course credits. They were randomly assigned to the two conditions of a 2 (Processing Goal: similarities vs. Differences) × 2 (CS type: CS$^+$ [*i.e.*, CS paired with an US of positive valence vs. CS$^-$ [*i.e.*, CS paired with an US of negative valence]) mixed design, with the first factor varying between participants and the second within them.

Conditioning materials

The stimuli were borrowed from Pleyers et al. (2007, in press). The 8 CSs were common consumption products whose brands were unknown to the participants. Each CS was pretested so as to elicit a neutral affective response and to be different from existing brands within the product category. The 8 USs were 4 positive (USs$^+$) and 4 negative (USs$^-$) pictures taken from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 1999). They were chosen so as to be non gender-specific. USs$^+$ and USs$^-$ were of opposite valence but of equivalent emotional intensity.

Procedure

Participants were tested in a computer room in groups from 2 to 10 individuals. They were welcomed by a male experimenter and seated at a table in front of an individual computer. They were first asked to complete a paper and pencil task aimed at providing participants with the goal of processing either the differences or the similarities in the CS–US pairs. This task was borrowed from Mussweiler and Damisch (in press) and required that participants listed for 2 min either as many similarities (similarity-focus condition) or as many differences (difference-focus) between two black and white artistic drawings of village market places. Instructions read as follows: "*This study aims at pre-testing some pictures that will be used in future experiments. First, please examine carefully during two minutes the two images depicted on this sheet of paper and detect their similarities [differences]. It is important that you observe with great care these images and that you write down as many similarities [differences] as possible*".

After 2 min, the experimenter asked participants to turn to the second phase of the study (*i.e.*, the conditioning experiment proper) by reading the following instructions on their computer screen: "*This study deals with perceptual processing of various stimuli. It comprises two phases. In the first phase, you will see various stimuli appearing on the screen. These stimuli will be presented in a random order by the computer program (you don't have to memorize them as no recall task will be used). In the second phase, you will simply be asked to spontaneously answer a set of questions. Please press the space bar to start the experiment*."

The conditioning phase relied on a procedure similar to the one used by Pleyers et al.(2007, in press). All instructions, stimulus presentation, and data collection were conducted via computer. For each participant, four CSs were superimposed on a positive picture (CSs$^+$) and 4 CSs were superimposed on a negative picture (CSs$^-$). CS were superimposed on the US in order to improve the ecological validity of our research as most advertisement strategies based on EC effects rely on simultaneous CS–US presentations.

For any given participant, a given CS picture was always paired with the same US picture. CS–US assignments were counterbalanced across participants (4 different CS–US assignments were used). This procedure contributes to making slight variations in CS evaluations distributed evenly across conditions and so rules out undesirable effects in stimulus selection (Field & Davey, 1999). Each CS–US pairing appeared five times for 1 s each and was presented at the center of the screen in a random order.

Immediately after the conditioning phase, participants were asked to evaluate the CSs by reporting their global feelings toward the CSs (the order of which was counterbalanced) on a 9-point scale ranging from 1 (= "*very negative feelings*") to 9 (= "*very positive feelings*")[1]. All CSs were presented sequentially at the center of the screen (using the same size as in the conditioning phase) with the global feelings scale presented below it.

Finally, participants completed the awareness assessment task. For each of the 8 CS pictures, the order of which was randomized, participants were presented with 8 US pictures and asked to indicate (by pressing the correspondent number of the US on the numeric pad of the keyboard) the one with which it had been paired. Participants could respond "I don't know" by pressing the number 9. Participants were asked to report the content rather than the valence of the CS picture in order to minimize the risk that they would simply infer the valence of the US on the basis of their feeling toward the CS.

Results

Processing goal and awareness

A CS was categorized as 'contingency aware' when the US with which it was paired was correctly identified. CSs that did not meet this criterion were categorized as 'contingency unaware'. The mean number of contingency-aware items was 6.71 (*SD* = 1.98) out of a maximum of 8. In line with predictions, the number of contin-

[1] Participants also evaluated each CS on three specific evaluative dimensions (attractiveness, pleasantness, intention to purchase the product) but, as it was already the case in Pleyers et al. (in press), these variables did not reveal consistent results and so will not be discussed further. Several researchers have noted that they found EC effects only when participants were encouraged to rely on their global and spontaneous feelings for evaluating the stimuli and were invited not to think too much about their evaluation (*e.g.*, De Houwer, Baeyens, & Field, 2005).

gency-aware items did not differ across processing conditions, $t(109) < .05$, *ns*.

Perceptual processing goal and EC

A mixed-design ANOVA was used to examine the mean evaluation of the CSs as a function of Processing Goal and CS type. A main effect of CS type emerged, with CSs^+ rated more positively ($M_{CSs+} = 6.16$, $SD_{CSs+} = 1.39$) than CSs^- ($M_{CSs-} = 4.18$, $SD_{CSs-} = 1.41$), $F(1,110) = 108.20$, $p < .001$. Hence, an EC effect was obtained. More importantly, the predicted CS Type X Processing Goal interaction was significant, $F(1,109) = 6.67$, $p < .02$. Follow-up analyses revealed that CSs^+ were evaluated more positively than CSs^- in both cases, although the difference was larger in the similarity-focus ($M_{CSs+} = 6.38$, $SD_{CSs+} = 1.17$ *vs.* $M_{CSs-} = 3.91$, $SD_{CSs-} = 1.35$, $F(1,53) = 90.07$, $p < .001$) than in the difference-focus ($M_{CSs+} = 5.95$, $SD_{CSs+} = 1.56$ *vs*. $M_{CSs-} = 4.44$, $SD_{CSs-} = 1.44$, $F(1,56) = 32.84$, $p < .001$) condition (see Fig. 1).

Discussion

Participants primed with the goal of processing perceptual similarities in stimuli showed larger EC effects than did those primed with the goal of processing perceptual differences in stimuli. This pattern suggests that orienting participants' attention to the CS–US similarities or to the CS–US differences moderates EC effects. Interestingly, an EC effect was obtained in the latter condition as well. This is informative for two reasons. First, this finding indicates the robustness of EC effects. This is consistent with research finding EC effects using CS–US pairings involving structurally different stimuli, sometimes pertaining to different sensory modalities (*e.g.*, Trodank, Byrnes, Wrzesniewski, & Rozin, 1995). Second, this finding suggests that the moderation effect obtained here is unlikely to have been driven by experimental demands. If it were, a contrastive EC should have been observed in the difference-focus conditions. That the observed moderation effect reflected the impact of top–down processes at the encoding stage is further supported by the use a non-obtrusive processing goal activation procedure. Participants merely had to list for 2 min similarities or differences between drawings of market places prior to engaging in an EC task concerned with common consumption products.

Future studies may examine whether a similarity-focus magnifies and/or whether a difference-focus weakens EC effects. This may be done by running a control condition where participants are not primed with a particular goal prior to completing the EC task. However, it may be difficult to activate a pure difference-focus processing mode as it is likely that participants process at least some similarities in the stimuli when assessing their differences (*e.g.*, Gentner & Markman, 1994). The latter mechanism may actually contribute to explain why an EC effect emerged in the difference-focus condition: directing one's attention to only one CS–US feature overlap may suffice for an EC effect to emerge. Future studies may also examine the potential role of other goals in moderating EC effects. In the current study, we decided to concentrate on processing goals that would influence the perception of the CS–US similarities because past animal learning research demonstrated the impact of perceived CS–US similarities in conditioning. Only a few EC studies manipulated this factor in human conditioning but reported inconsistent effects, possibly due to selection biases. By manipulating participants' perceptual processing goal while keeping constant the CS–US pairings, we avoided selection problems.

The present finding, along with recent findings suggesting the role of contingency awareness and attentional resources in EC, cast further doubts about the automaticity of EC. As such, they also question the associative nature of EC. Admittedly, the findings observed here and in our previous research are not entirely incompatible with an associative learning account. One may argue that the use of semantically meaningful CSs or that the large proportion of contingency-aware pairings (*i.e.*, 84%) favor propositional rather than associative learning. However, the role of contingency awareness was recently observed in EC studies where the proportion of contingency-aware items was brought down to 21% (*e.g.*, Pleyers et al., in press) or where meaningless letter strings were conditioned (*e.g.*, Stahl & Unkelbach, in press; Stahl, Unkelbach, & Corneille, 2008). One may also correctly point out that a learning process may be sensitive to attentional effects, yet remain associative (*e.g.*, Kamin, 1968; Kruschke, 2005; Mackintosh, 1975; Pacton & Peruchet, 2008). However, that EC proves sensitive to contingency awareness, resources, and goals may be accounted for more parsimoniously under a unitary, propositional, framework (see also De Houwer, in press). At the very least, proponents of a dual approach to evaluative learning may be expected to specify conditions under which purely associative learning contributes to EC.

The present research does not pretend to settle the debate but seeks to contribute to it. Clarifying the contribution of associative and propositional processes in EC has critical implications, in particular for dual-process models of attitudes that often consider EC as the best case for associative affective learning (Gawronski & Bodenhausen, 2006). Given the remarkable ubiquity of evaluative conditioning as well as the theoretical importance of better understanding its underlying mechanisms, more research is needed to clarify its boundary conditions.

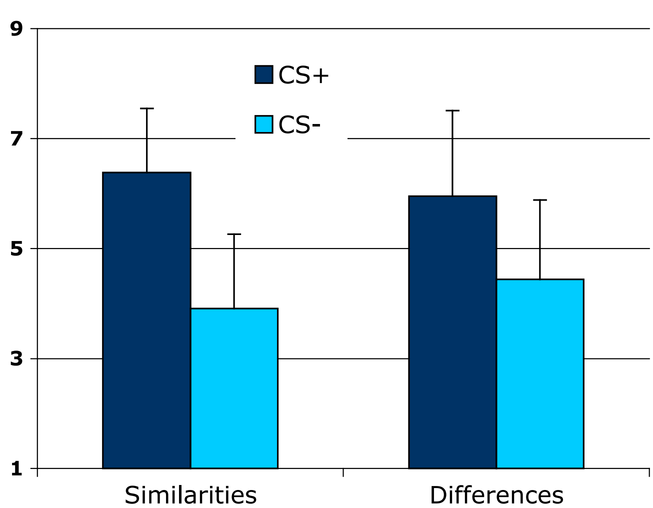

Fig. 1. Mean evaluation (and *SD*) of the CSs as a function of CS type and perceptual processing goal.

References

Baeyens, F., Eelen, P., van den Bergh, O., & Crombez, G. (1989). The influence of CS-UCS perceptual similarity/dissimilarity on human evaluative learning and signal learning. *Learning and Motivation, 20*, 322–333.

Baeyens, F., Eelen, P., & Van den Bergh, O. (1990). Contingency awareness in evaluative conditioning: A case for unaware affective-evaluative learning. *Cognition and Emotion, 4*, 3–18.

Dawson, M. E., Rissling, A. J., Schell, A. M., & Wilco, R. (2007). Under what conditions can human affective conditioning occur without contingency awareness? Test of the evaluative conditioning paradigm. *Emotion, 7*, 755–766.

De Houwer, J. (in press). The propositional approach to associative learning as an alternative for association formation models. *Learning and Behavior*.

De Houwer, J. (2007). A conceptual and theoretical analysis of evaluative conditioning. *The Spanish Journal of Psychology, 10*, 230–241.

De Houwer, J., Baeyens, F., & Field, A. P. (2005). Associative learning of likes and dislikes: Some current controversies and possible ways forward. *Cognition and Emotion, 19*, 161–174.

Eifert, G. H., Craill, L., Carey, E., & O'Connor, C. (1988). Affect modification through evaluative conditioning with music. *Behaviour Research and Therapy, 26*, 321–330.

Faw, T. T., & Parker, R. K. (1972). Acquisition and generalisation of conditioned reward value. *Psychological Reports, 30*, 167–170.

Field, A. P., & Davey, G. C. L. (1999). Reevaluating evaluative conditioning: A nonassociative explanation of conditioning effects in the visual evaluative conditioning paradigm. *Journal of Experimental Psychology: Animal Behavior Processes, 25*, 211–224.

Field, A. P., & Moore, A. C. (2005). Dissociating the effects of Attention and contingency awareness on evaluative conditioning effects in the visual paradigm. *Cognition and Emotion, 19*, 217–243.

Fulcher, E. P., & Hammerl, M. (2001). When all is revealed: A dissociation between evaluative learning and contingency awareness. *Consciousness and Cognition, 10*, 524–549.

Gawronski, B., & Bodenhausen, G. V. (2006). Associative and propositional processes in evaluation: An integrative review of implicit and explicit attitude change. *Psychological Bulletin, 132*, 692–731.

Gentner, D., & Markman, A. B. (1994). Structural alignment in comparison: No difference without similarity. *Psychological Science, 5*, 152–158.

Kamin, L. J. (1968). Attention-like processes in classical conditioning. In M. R. Jones (Ed.), *Miami symposium on the prediction of behavior: Aversive stimulation* (pp. 9–33). Coral Gables, FL: University of Miami Press.

Kruschke, J. K. (2005). Learning involves attention. In G. Houghton (Ed.), *Connectionist models in cognitive psychology* (pp. 113–140). Hove, United Kingdom: Psychology Press.

Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (1999). *The international affective picture system (IAPS): Technical manual and affective ratings*. Gainesville, FL: The Center for Research in Psychophysiology, University of Florida.

Mackintosh, N. J. (1975). A theory of attention: Variations in the associability of stimuli with reinforcement. *Psychological Review, 82*, 276–298.

Martin, I., & Levey, A. (1978). Evaluative conditioning. *Advances in Behaviour Research and Therapy, 1*, 57–102.

Mussweiler, T. (2001). Seek and Ye shall find: Antecedents of assimilation and contrast in social comparison. *European Journal of Social Psychology, 31*, 499–509.

Mussweiler, T., & Damisch, L. (in press). Going back to Donald – How comparisons shape judgmental priming effects. *Journal of Personality and Social Psychology*.

Olson, M. A., & Fazio, R. H. (2002). Implicit acquisition and manifestation of classically conditioned attitudes. *Social Cognition, 20*, 89–103.

Pacton, S., & Peruchet, P. (2008). An attention-based associative account of adjacent and Nonadjacent dependency learning. *Journal of Experimental Psychology: Learning, Memory and Cognition, 34*, 80–96.

Pleyers, G., Corneille, O., Luminet, O., & Yzerbyt, V. (2007). Aware and (dis)liking: Item-based analyses reveal that valence acquisition via evaluative conditioning emerges only when there is contingency awareness. *Journal of Experimental Psychology: Learning, Memory and Cognition, 33*, 130–144.

Pleyers, G., Corneille, O., Yzerbyt, V., & Luminet, O. (in press). Evaluative conditioning incurs attentional costs. *Journal of Experimental Psychology: Animal Behavior Processes*.

Razran, G. (1954). The conditioned evocation of attitudes (cognitive conditioning?). *Journal of Experimental Psychology, 48*, 278–282.

Rescorla, R. A., & Furrow, D. R. (1977). Stimulus similarity as a determinant of Pavolovian conditioning. *Journal of Experimental Psychology: Animal Behavior Processes, 3*, 203–215.

Stahl, C., & Unkelbach, C. (in press). Evaluative learning with single versus multiple USs: The role of contingency awareness. *Journal of Experimental Psychology: Animal Behavior Processes*.

Stahl, C., Unkelbach, C., & Corneille, O. (2008). On the respective contributions of awareness for US valence and US identity in valence acquisition through evaluative conditioning. Manuscript under preparation..

Stuart, E. W., Shimp, T. A., & Engle, R. W. (1987). Classical conditioning of consumer attitudes: Four experiments in an advertising context. *Journal of Consumer Research, 14*, 334–349.

Trodank, J., Byrnes, D., Wrzesniewski, A., & Rozin, P. (1995). Odors can change preferences for people in photographs: A cross-modal evaluative conditioning study with olfactory USs and visual CSs. *Learning and Motivation, 26*, 116–140.

Walther, E. (2002). Guilty by mere association: Evaluative conditioning and the spreading attitude effect. *Journal of Personality and Social Psychology, 82*, 919–934.

Walther, E., Nagengast, B., & Trasselli, C. (2005). Evaluative conditioning in social psychology: Facts and speculations. *Cognition and Emotion, 9*, 175–196.

Wardle, S. G., Mitchell, C. J., & Lovibond, P. F. (2007). Flavor evaluative conditioning and contingency awareness. *Learning and Behavior, 35*, 233–241.