Evaluative Conditioning in the Surveillance Paradigm is Moderated by Awareness
Exclusion Criteria

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Abstract

Whether attitudes can be acquired unconsciously is a question of both theoretical and practical interest. One paradigm supporting the possibility of unconscious attitude learning is the surveillance paradigm (Olson & Fazio, 2001), which relies on incidental learning conditions. In a recent pre-registered replication report, Moran (2020) claimed that they obtained evidence for attitude learning in this paradigm that was not moderated by the level of awareness of the participants. Here, we explain that this claim is unwarranted and report meta-analytic results supporting our conclusion. Specifically, we distinguish between independent sets of fully aware, partially aware, and fully aware participants. We show that evaluative learning effects are moderated by participants' set and are found in the latter two sets only. We discuss this finding in the broader perspective of associative attitude learning models. Manuscript and code are available at <https://osf.io/qs35v>.

Keywords: evaluative conditioning, awareness, Surveillance Task, incidental learning

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Pre-registered reports are meant to improve quality in science. When large groups of collaborators are involved, however, compromises soon become necessary, and these may run against accuracy goals. In addition, constraints imposed by the pre-registration of the analytic rationale can prevent optimal conclusions when analytic issues have gone undetected. Fortunately, high-quality research is one that corrects itself. With the present commentary, we would like to correct what we see as two suboptimal features of Moran et al.'s (2020) pre-registered replication report.

The first issue is conceptual and relates to the confusion between awareness and contingency memory. The second is analytic and relates to the statement that no clear conclusion can be drawn on the role of contingency memory in the surveillance paradigm. Contrary to these views, we explain here (1) that measures collected in the surveillance paradigm do not allow reaching reliable conclusions about the role of awareness in attitude formation, and (2) that these measures support the role of contingency memory in the sustainability of evaluative conditioning effect. We discuss each of these points in the remainder of the introduction. Then, we revisit Moran et al.'s (2020) conclusions based on a more reliable analysis.

Incidental paradigm vs. unaware attitude formation vs. recollective memory

In trying to make the best of the various perspectives of its contributing authors, the pre-registered report navigates between three constructs: (i) the incidental nature of the surveillance paradigm, (ii) unconscious attitude formation, and (iii) the role of contingency memory in evaluative conditioning effects. These notions, however, should not be confounded with each other. The incidental nature of the paradigm points to the absence of intentional attitude formation. That evaluative conditioning effects may emerge

unintentionally is an important question on its own (see also Stahl, Haaf, & Corneille, 2016). However, intentionality does not perfectly align with another feature of automaticity: awareness (e.g., Moors & De Houwer, 2006). In addition, no measure of intention was collected in the current studies, so that we actually do not know which participants may have or not have intentionally created an attitude in the learning phase of the experiment.

Admittedly, the surveillance paradigm makes it more difficult for participants to encode the CS-US pairings and it does not heavily direct their attention towards the evaluative implications of these pairings. It is therefore interesting to examine what information is encoded in memory in this paradigm, and how participants' capacity to retrieve this information relates to evaluative conditioning effect. As extensively discussed in several previous articles (e.g., Corneille & Stahl, 2019; Gawronski & Walther, 2012; Sweldens, Corneille, & Yzerbyt, 2014), however, examining this relation in the context of a purely correlational design allows conclusions about whether EC effects are sustained in the absence of memory at the evaluation stage. It does not allow conclusions about whether attitudes are formed in the absence of awareness at encoding.

For addressing this unaware attitude formation question, one needs to rely on experimental manipulations of awareness at the encoding stage. The surveillance paradigm ambiguously achieves this, and truly experimental studies that manipulated awareness at encoding largely failed to support unconscious attitude formation in EC procedures (for a recent comprehensive review, see Corneille & Stahl, 2019; see also Corneille & Hütter, 2020). The question that Moran et al.'s pre-registered report addressed, therefore, is whether, in a procedure that can be reasonably considered incidental, evaluative conditioning effects are observed in the absence of retrospective memory for the CS-US pairings. This is a valuable question, but one that does not validly speak to unconscious attitude formation.

In addressing that recollective-memory question, original measures of contingency memory were collected, and more sensitive measures were added in the pre-registered report. Based on a non-significant moderation of the EC effect by awareness exclusion criteria, the pre-registered report states that “we also cannot conclude that EC effects in the surveillance task depend on or differ between the specific way in which contingency awareness/recollective memory is measured.” (p. zz). While this statement is sensible based on the analytic rationale imposed by the pre-registration, we now explain (i) that this analytic rationale itself is problematic, and (ii) that a more accurate analytic approach reveals a much clearer picture: EC effects are moderated by exclusion criteria, and no EC effect is observed under stringent criteria.

Revisiting Moran et al’s conclusions

The analytic rationale in the (original and replication) study is to exclude participants who are “aware”, so that all remaining participants are supposedly “unaware”. If an EC effect is found in the “unaware” participants, it is then taken as evidence for “unaware EC”. Conclusions about unaware EC therefore crucially depend on the choice of criterion, which needs to be carefully scrutinized.

Two pairs of criteria for classifying participants as “aware” were considered in Moran (2020). We focus here on the first pair of criteria, which are based on the same data (i.e., on the coding of participants’ text responses to two open-ended questions). The *original* authors’ criterion (according to which cases of partial awareness were classified as “unaware”); and a more stringent *modified* version of this criterion (which classified partial-awareness cases as “aware”).¹

¹ The questions were “Did you notice anything out of the ordinary in the way the words and pictures were presented during the surveillance tasks?” and “Did you notice anything systematic about how particular words and images appeared together during the surveillance tasks?”

Moran et al.’s results imply that EC is absent for unaware participants.

Moran (2020) report that the original but not the modified criterion yielded a significant “unaware EC” effect. Based on the nonsignificant difference between the two estimates of unaware EC, they concluded that there was no moderation by criterion. We argue here that this conclusion is misleading: When the relation between the criteria is considered, a clear pattern emerges that *EC effects depend on the way in which awareness/memory is measured*.

The two criteria differ in how many subjects they exclude as “aware”: Of the total $N=1450$, the original criterion excluded 8%, whereas the modified criterion excluded 31% of the participants. That is, in addition to the “aware” participants according to both criteria, there were 23% of *partially aware* participants who were classified as “unaware” by the original but not the modified criterion. Put differently, the two criteria, considered jointly, yield three subgroups: (i) a small *fully aware* subgroup (8% of the data; “aware” by both criteria), (ii) a medium-size *partially aware* subgroup (23%; “aware” only by the modified criterion, but “unaware” by the original criterion), (iii) a large *fully unaware* subgroup (69%; “unaware” by both criteria).

Note that the two criteria agree in the majority of their classifications (i.e., fully aware and fully unaware subgroups); they differ only in how they classify the subset of partially aware participants. This explains the different results: The original criterion sets a lower bar for a classification as “unaware”, leaving partially aware participants in the “unaware” category. Therefore, EC effects associated with partial awareness are interpreted as “unaware”, and the EC-without-awareness test is easy to pass; using the original -liberal- criterion, the replication yielded a significant “unaware EC” effect. The bar for an “unaware” classification for the modified criterion is more conservative, excluding partially aware participants from that category. The unaware EC effect was therefore unaffected by partial awareness, yielding a more stringent test of the EC-without-awareness hypothesis, which fails: Using this more stringent criterion, “unaware EC” is not found.

It thus follows from the findings reported by Moran (2020) that the “unaware EC” effect in the original criterion was based on the subset of *partially aware* participants who were called “unaware” by the more lenient original criterion but excluded as “aware” by the more stringent modified criterion; and that there was no EC effect for the remaining *fully unaware* participants. To further support this conclusion, we report an additional meta-analysis of EC effects for the three subgroups.

Meta-analysis of EC effects for aware, partially aware, and unaware participants. We used the subgroup distinction as a moderator in a random-effects meta-analysis that investigated EC effects across all samples.² Results confirmed the above considerations (see Figure 1): Subgroup membership moderated the magnitude of the EC effect, $Q_{(df=2)} = 12.39, p = .002$. The EC effects for partially and fully aware participants were of comparable (small-to-medium) magnitude (and significantly different from zero, despite the relatively small data subset). Most importantly, the EC effect was very small and did not differ from zero for unaware participants.

Discussion

The possibility of unconscious attitude formation in evaluative conditioning procedures is critical to practice and theory. On a practical level, it would imply that simple unconscious social influence techniques can be designed that people may find difficult to resist. On a theoretical level, it would support dual-learning models of attitudes that often see unconscious attitude formation as a typical feature of associative learning (e.g., Rydell, McConnell, Mackie, & Strain, 2006; Gawronski & Bodenhausen, 2014). Because of its incidental nature, as well as correlational findings suggesting a poor encoding of the CS-US pairings, results found in the surveillance paradigm have been

² We used R (Version 3.6.1; R Core Team, 2019) and the R-packages *dplyr* (Version 0.8.5; Wickham, François, Henry, & Müller, 2020), *meta* (Version 4.11.0; Balduzzi, Rücker, & Schwarzer, 2019), and *papaja* (Version 0.1.0.9942; Aust & Barth, 2020) for all our analyses.

considered supportive of this unconscious learning possibility. As explained by Moran (2020), however, surveillance studies generally reported weak effects, and evidence pointed to a publication bias. This justified a pre-registered replicative effort.

The meta-analytic evidence found here suggests that no EC effect emerges in the surveillance paradigm in the full absence of recollective memory. This is consistent with experimental studies that manipulated participants' capacity to encode the CS-US pairings at the encoding stage, which largely converged in the conclusion that no EC is found when CS-US pairings are not encoded (see Corneille & Stahl, 2019). A recent experimental study further demonstrated that this encoding is both necessary and non-efficient (Mierop, Maurage, & Corneille, 2020).

Yet, a weak EC effect was observed under conditions of partial recollection; that is, when only part of the pairing information could be retrieved. This finding certainly deserves further investigation. One has to keep in mind that, in addition to speaking to memory -not to learning-, the memory measures collected in the surveillance paradigm lack sensitivity. These measures capture the non-cued retrieval of information stored in memory, among participants who may not have been overly motivated to make their best efforts at retrieving this information. A more sensitive assessment of participant's true memory state would require incentivized identification measures. How much of an evaluative conditioning effect remains when participants partially fail to retrieve relevant information under sensitive measurement conditions is worth addressing in future research. For now, we conclude that a large body of evidence supports the view that no attitude is formed when participants fail to successfully encode the CS-US pairings. There is no information collected in Moran et al. (2020)'s pre-registered report that allows questioning this conclusion.

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Figure 1. Meta-analytic results showing EC is moderated by awareness criterion