Is there a real preferential detection of negative stimuli? A comment on Dijksterhuis and Aarts (2003)

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Abstract

In a recent article, Dijksterhuis and Aarts (2003) investigated the preferential detection of negative stimuli. According to them, their data clearly indicate that it requires less stimulus input or less stimulus exposure to detect a negative stimulus than to detect a positive stimulus. However, we believe their research suffers from a number of limitations and methodological flaws that cast doubt on their conclusions. Using signal detection analyses, we demonstrate that none of their three studies provides sufficiently informative data with respect to their hypotheses. Moreover, we show that their experimental designs seem to be inadequate to test their hypotheses.

Dijksterhuis and Aarts (2003) recently investigated the preferential detection of negative stimuli. They interpreted their data as clearly indicating that it requires less stimulus input or less stimulus exposure to detect a negative stimulus than to detect a positive stimulus. They adopt an evolutionary perspective: It would be highly adaptive for a negative stimulus to be detected as fast as possible. However, we believe their research suffers from a number of limitations, methodological flaws, and theoretical ambiguities. Here, we focus on certain specific logical and methodological problems that cast doubt on their conclusions. It appears that none of their three studies provides sufficiently informative data with respect to their hypotheses. Moreover, their experimental designs seem to be inadequate to test their hypotheses.

The first experiment they report was designed to test the hypothesis that participants correctly detect negative words more frequently than positive words under suboptimal conditions. The task was a pure detection task in which participants had to discriminate a signal (i.e., a word, sometimes negative (e.g., "bomb"), sometimes positive (e.g., "sun")) from noise (i.e., no word). There seem to be two problems in their data analysis. First, their data analysis yields, at best, only very weak evidence in favour of the predicted hypothesis: None of the conditions presents sample means significantly higher than chance. In other words, their data is also compatible with the following interpretation: Participants actually do see the words most of the time and but reply randomly. The issue of plausible alternative explanations is not addressed, which is crucial, given that results from this experiment serve as the basis for the next experiments. Second, analyzing mean proportions of correct answers is valid *only* if no response bias is present, which is clearly not the case here where participants thought a word was flashed in 60% of the trials, whether or not a word was actually present. A signal detection analysis (MacMillan & Creelman, 1991) would allow us to compute a discrimination index d', which is independent of a decision bias, between flashed words and no word (i.e., the ability of participants to detect flashed words from noise). Nevertheless, computing both discrimination indices between negative words and no word and, between positive words and no word, is arguably inappropriate in this case, given their "word – no word" experimental design. "Hit" rates might be different for negative and positive words but false alarms should be assumed to be equal. In other words, it is impossible to compute a false alarm for negative words and another one for positive words (i.e. participants had only to identify words, and not positive words or negative words).

The second experiment involves a different task in which participants had to decide whether the flashed word was negative or positive. Again, the authors implicitly assume that there was no response bias and analyze mean proportions of correct affective categorizations. But again, there *is* a response bias: Participants assign 54% of the words to the negative answer and 46% to the positive answer (independently of their true valence). Consider a hypothetical case in which participants responded randomly with respect to actual stimulus but with a "negative" response bias in 80% of the trials. The mean percentage of correct answers would be 80% for negative words and, 20% for positive words. Should we conclude, like the authors, that participants are far better at identifying negative stimuli? No, because this pattern has nothing to do with the ability to discriminate, but is, rather, simply a decision bias.

However, it is possible to perform a signal detection analysis on this dataset to disentangle a decision criterion from a true discrimination. Unfortunately, computing an unbiased index, such a d', cannot be used to substantiate the authors' claim that the rate of identification of negative words is better than the identification of positive words. Given the experimental design, a d' could only give a measure of the ability to discriminate *negative from positive* words which, with their data, leads to an average value of $d' = 0.11$. Unfortunately, this value, in itself, is largely meaningless and barely indicates some discrimination ability. Moreover, once we recognize this experimental task as a discrimination task, regardless of the value of d', various possible explanations coexist. In this two-alternative forced choice paradigm, a correct answer when a negative word was flashed does not mean, necessarily, that the word is identified as negative, but instead, it may seem that the word was identified *as something that is not positive*. In other words, their design can explore the theoretically challenging issue of the capacity to discriminate negative from positive words when these are presented for very short durations. But this design cannot give evidence for a preferential or a quicker detection of negative words.

The third experiment suffers from the same problems and is not discussed here.

Furthermore, in all the experiments, complementary analyses with items as a random factor should have been performed or, if they were performed by the authors, should have been reported, given that these experiments focused on the valence of words.

Finally, the rationale behind the experiments in their paper relies crucially on the concepts of "subliminal" and "detection". Even if there is still much debate on the issue of unconscious perception (Holender, 1986), there are clear tenets and positions shared by everyone. In particular, detection is usually construed as evidence of conscious perception. To our knowledge, the concepts of "subliminal detection" or "unconscious detection" are never currently used in the scientific literature and, certainly, the use of such concepts would require more caution than was shown by the authors.

Investigating a preferential detection for negatively valued items is an interesting and reasonable goal. It is, therefore, crucial to tackle this issue with careful and solid methodology, accurate data analyses and precise theoretical arguments. Unfortunately, it appears that the authors fall short on these aspects on which their conclusions depend.

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