Affective blindsight: are we blindly led by emotions?

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The recent findings that facial expression can be recognized in the absence of awareness by blindsight patients suggest that, as the saying goes, we might indeed be blindly led by emotions. Although we are entirely in agreement with the comments made by Heywood and Kentridge (Heywood, C.A. and Kentridge, K.W. [2000] Affective blindsight? Trends Cognit. Sci. 4, 125–126) we would like to take this opportunity to discuss some of the questions that they raised and to describe our most recent data that may clarify some of the important issues.

Heywood and Kentridge remark, the finding of covert discrimination by a blindsight subject of facial expressions presented to his blind field (‘affective blindsight’) raises the question of how blindsight can be recognized in the absence of striate cortex. Indeed, our most recent results in a small number of moving dots3. The results showed that incongruency between the expressions as presented to the two hemifields significantly delayed the judgment of the facial expression in the seeing field.

This is an illustrative example that covert processing can often only be found with an indirect rather than a direct method, in which subjects are required to ‘guess’ the identity of stimuli they patently deny seeing. As Heywood and Kentridge suggest — in line with some recent findings about qualitative differences between overt and covert processes — the superior sensitivity of indirect methods for uncovering covert processing or residual processing abilities might be due to an absence of conflict between overt, reflexive answering and covert responding. We addressed

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Facial expression, whenever amygdala activation has been demonstrated in the absence of conditioned fear, subjects have not been required to make a forced-choice response about the nature of the unseen expression. That is, they were not engaged in the sort of guess-work undertaken by blindsight patients. It is plausible that GY, a much-practised observer, is able to monitor his autonomic responses and use them to mediate above-chance performance in the discrimination of facial expression. However, the differential responsiveness of the amygdala to different facial expressions2 is consistent with its role in the processing of at least some facial expressions. The response with which the responses to unmasked fear-conditioned stimuli desensitize2 leaves open the possibility that repeated presentation could mitigate against GY’s performance. Moreover, it remains an interesting possibility that an improvement in performance might have been obtained had GY been asked to make a reflexive response, such as a key press, which is less likely to verbalization to invoke reflexive conscious processes. The genuine cues of an unformed conscious system might potentially interfere with the stimulus-driven responses of the putative collicular circuitry. We will have to wait for further experiments to answer this question.

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homologies for numerical memory span?

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As some of the case of Clever Hans represents the kind of trap that animal researchers often fall into when searching for human capacities in other creatures. Hans was certainly clever with respect to picking up on human cues, but was unquestionably clueless when it came to solving mathematical problems. Ever since the debunking of Clever Hans, however, an extraordinary amount of evidence has accumulated[1], showing beyond a shadow of doubt, that we share many of the core building blocks of our capacity with other animals. We know, for example, that several avian (pigeon, African gray parrot) and mammalian (rat, rhesus monkey, chimpanzee) species can be trained to classify sets of objects with respect to their ordinal relationships, appreciate that number is property indifferent (i.e., as long as the object or event is an entity that can be counted or individuated, its properties are irrelevant), and that there is a one-to-one correspondence between the numerical tag and the object. In fact, rhesus monkeys show a certain level of numerical sophistication in the absence of training. Specifically, using techniques that are analogous to those used with humans, cotton-top tamarins and rhesus monkeys have been shown to compute simple arithmetical operations such as additions and subtractions. Now, in an exciting new report in Nature[2], Kawai and Matsuzawa add to our growing understanding of the evolutionary origins of the human capacity for number by showing that a chimpanzee has a numerical memory span that falls well within the range of the ‘magician number’ 7, at least on some accounts[3]. Kawai and Matsuzawa worked with their star chimpanzee, a female by the name of ‘Ai’ with over 20 years of experiential experience. Prior to conducting the current study, Matsuzawa had shown that Ai could learn the Arabic numerals from 0 to 5. Specifically, based on extensive training, Ai had learned to respond on a touch-sensitive monitor to the ordinal relationships between numbers. Thus, when shown a sequence of four numbers, with inter-integer differences of either one or more, she would touch each number from lowest to highest, and with remarkable speed and accuracy. Taking advantage of this ability, Kawai and Matsuzawa set up a memory span task. A set of numbers was displayed on a monitor, such as 1,3,4,9. As soon as Ai pressed the first number in the sequence (i.e., 1), all of the remaining numbers were removed from the display screen. Ai’s task was to press the remaining numbers (now masked) in order. For set sizes of two to four numbers, her performance was above 90% correct. Although her performance dropped to 65% for set sizes of five, this was nonetheless significantly above chance (i.e., 4%; note that in the original manuscript this was incorrectly calculated as 4%). Of considerable interest was her reaction time to respond. Independent of set size, Ai was slowest on the first press, with reaction time remaining relatively constant for all subsequent responses. Thus, for example, mean reaction time for the first response to a set size four was 1,717 ms, and then 390, 432, and 457 respectively for the last three, masked, responses. This strongly suggests that Ai first explored the number space, calculating the ordinal relationships and spatial locations of each number, and then used this stored information to guide her subsequent responses. As in all well-designed research with interesting results, many questions remain. To understand better whether Ai’s capacity for calculating ordinal