Neal Miller's Somatic Marker

To rephrase a famous saying by the philosopher Santayana: those who don't remember the experiments of the past are condemned to repeat them. Thus I present a 1935 version of the somatic marker.

In 1935, the psychologist and learning theorist Neal Miller conducted the following experiment.

To human subjects he presented in unpredictable order the symbols T (followed by electric shock) and 4 (not followed by shock). The shock was followed by a large galvanic response (GSR) that was soon conditioned not only by seeing the symbol T, but by anticipating it. From this and subsequent experiments Miller concluded that organisms should "behave 'foresightfully' because fear (i.e. anxiety), would be mediated by cues from a distinctive anticipatory goal response." Miller further concluded that the 'learned drive' of fear or anxiety, as marked by the GSR, obeys the same laws as do overt responses".

In other words anticipatory somatic changes mediate not choice, but avoidance, and may be described fully by learning principles.

Compare this experiment to Damasio's IGT experiment, where an individual again is confronted with a succession of symbols (in this case, markings on a card), and with unpredictable aversive consequences and similar changes in an equivalent somatic measure, the SCR. In this case the unpredicted aversive consequences were large negative card values occurring from time to time. If it is assumed that unexpected 'bad information' is painful as well, then both experiments assume equivalence.

The difference between both experiments is not in their structure, which are more or less equivalent, but rather in the interpretation of the role of the galvanic skin response as a dependent measure. Specifically, the GSR for the Miller experiment correlated with a subjective response that was interpreted as anxiety or fear. For Damasio, the subjective response to arousal as marked by the SCR was subtler, or a mildly or non aversive 'gut feeling'. In other words, if one assumes that the level of arousal was higher for Miller's subjects than Damasio's, the level of arousal could lead to distinctly different interpretations as to the role *of* arousal. Thus, it is easy to see how Miller assumed that tension based arousal (or anxiety) mediated avoidance, and why Damasio assumed that

arousal mediated choice. In other words, if turning a bad card in the IGT experiment signified not a loss of play money but a loss of real money or a painful shock, then avoidance and not choice would have been a more likely interpretation.

So we are left with the original question: what is the role of autonomic arousal? If arousal is dependent upon learning, as both Miller and Damasio hold, what is its function: avoidance, choice, or some mixture of the two that is dependent upon the level of arousal?

One way to ascertain the role of avoidance is to simply examine whether elevated autonomic arousal occurs under response contingencies that either eliminate the ability to avoid or obviate the need *to* avoid. If results under a response contingency are all bad and unavoidable, then we have Seligman's learned helplessness, and if all results are good and thus create no need to avoid, then we have Csikszentmihalyi's 'flow' response. Both are marked by low autonomic arousal as marked by a reduction in SCR and a corresponding lack of reported tension, anxiety, or fear. Thus it may be construed that avoidance is an essential function of autonomic arousal. This of course does not directly challenge Damasio's position, but raises the avoidance hypothesis front and center as an alternative explanation for his findings.

Source:

Miller, N. E. (1971) Selected Papers, Atherton, Chicago

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