

Stephan Garhammer

Damasios' hypothesis of somatic markers: Are rational and conscious deliberations sufficient for decision making?

In the following paper I want to show, that rational and conscious reasoning is not sufficient for making a decision advantageously. Further I mention briefly the possibility to synthesis emotion and cognition for decision making in philosophical discussions. This position contradicts an idea of man and a theory of action that is known as the "cognitive view". Their exponents deal with intentions, wants, purposes, desires, beliefs, plans, and volitions, whereas give limited attention emotions. The disregard of emotions' role in the enterprise of understanding human action is very likely based on some misconceived notions of the nature of emotion: (1) emotions are irrational and troublesome; (2) emotions are things that just happen to people rather than that people do freely; and (3) the impact of emotions on good and rational action or decision is at best indirect and not important. So emotions are insignificant to human action and decisions.

Antonio Damasio, neurologist in Iowa, presents in his book "Descartes' Error" a clinical case, which begs the question of the position above.

The name of the patient is "Elliot". During the successfully removing of a brain tumor, his frontal lobes were inevitably damaged during the operation. Although his intelligence was unchanged, he could no longer carry on his professional work. He had to be pressed to go to his job, and when he got there he start on one task and keep on with it even when it was time to change to something else, or he spend the whole day pondering how to categorize a paper he had just read. Over and above that he could handle isolated tasks well, but couldn't combine them into a wider frame of reference. As a result he lost his job, became get in unwise financial speculations, and ended up bankrupt. Despite of being confronted with the terrible consequences of his decisions, he was not able to learn from them.

The instruments usually considered necessary and sufficient for rational behavior were intact in him. He had the requisite knowledge, attention, and memory. He could perform calculations, he could deal with the logic of an abstract problem. There was only one significant accompaniment to his decision-making failure: a evident alteration of the ability to experience feelings.

Because of this strange relationship of wrong long-termed decisions and missing emotions, Damasio suggests the somatic hypothesis theory (in forward: SMH). This theory proposes that a defect in emotion and feeling plays an important role in impaired decision making.

The SMH could be divided in two conceptually different components. The first is a theory of the nature and origin of emotions. The second is a theory of how emotions affect cognition and how they drive behavior. As a theory of the nature of emotions, the SMH is basically a reenactment of the James-Lange theory (James, 1884; Lange, 1885/1912) that considers emotions as reactions to perceived changes in our bodily states. This is the oldest mode of emotional processes, but not the only one. Damasio introduces another type of emotions, that refers to this older one, but involves other structures of the brain. He calls them “secondary or social emotions”.

Damasio defines this secondary emotions as the combination of a (mental) evaluative process, that could be simple or complex, and dispositional responses to that process, which refers mostly toward the body proper, resulting in an emotional body state, but also toward the brain itself, resulting from additional mental changes.

Secondary emotions begin with cognition and follow a way that has been created by learning; objects or situations, that have been associated with emotions, could trigger the same emotional state of the body while thinking on them. Responsible for this mechanism is the ventromedial prefrontal cortex (in forward: VM). It is an repository of dispositionally recorded links between factual knowledge and bioregulatory states. Structures in this part of the cortex provide the neuronal substrate to associate between certain classes of complex situations and the type of bioregulatory state, which are usually linked to that class of situation in the past individual experience. These links are “dispositional” in the sense, that they do not hold an exact representation of the fact or the corresponding bioregulatory state, but rather hold the potential to reactivate an emotion by acting on appropriate cortical or subcortical structures.

The second component of the SMH concerns the relationship between emotions and cognition. Bechara, Damasio, Tranel, and Damasio (1997) argued that the effect of emotions is implicit: somatic markers affect behavior without people being aware of them.

The evidence for this component of the somatic marker hypothesis comes primarily from the Iowa Gambling Task. This task involves four decks of cards (A, B, C, and D) that each give an immediate reward when they are flipped over. Participants are given a "loan" to start, and they are

told to earn as much money as possible by flipping over cards from one of the four decks. These decks are pre-programmed, not known to the participants: The A and B decks give a large immediate reward (\$100), while the C and D decks give a smaller immediate reward (\$50). By reward alone, they should pick cards from A and B. However, in each deck there are some cards that also result in a penalty. This penalty is set to be higher in the high-paying decks A and B, and lower in the low-paying decks C and D. In decks A and B the subject encounters a total loss of \$1250 in every 10 cards. In decks C and D the subject encounters a total loss of \$250 every 10 cards. In the long term, decks A and B are disadvantageous, while the decks C and B are advantageous. Thus, the optimal strategy is to pick from C and D.

As the task progresses from the first to the 100th trial, participants with normal brains or brain areas damaged outside the prefrontal cortex select more cards from the “good” decks (C, D) and fewer cards from the “bad” decks (A, B). In contrast to them, participants with VM-damage do not increase the number of their selection of cards from the good decks (C, D); they persist in selecting more cards from the bad decks (A, B). This result is even stable over the time: when a sample patients with VM-damage were re-tested after various time intervals, their performance did not improve.

The Gambling-Task shows that persons with VM-damage are unable to learn from their previous mistakes. These demonstrate the difficulty in real-life of those patients, to perform advantageously, especially in personal and social matters, in which an exact calculation of the future outcome is not possible.

But is this damage really connected to emotional processes? Some theorists think that decision-making is a fundamental cognitive affair and independent to emotional activity. The VM-damage is interpreted by them as a loss of knowledge.

To refute this theoretical account Bechara et al. analysis the psychophysiological activity during a task performance. Since there is a relationship between sympathetic activity and emotional arousal, the skin conductance response (in forward: SCR) is used to measure emotional changes of a body. In the Iowa Gambling-Task the magnitude of the SCR is measured in a time window of 5 seconds before and after the participants picked the card. During this modified performance of the task three types of SCRs are identified: 1) the so called reward SCRs. They occur after picking the cards with rewards only. 2) the penalty SCRs. They occur after picking the cards with reward and penalty. 3)

the anticipatory SCRs. They occur before turning a deck, during the time the participants ponder from which deck to choose. The results show, that normal participants like patients with VM-damage produce SCRs as a reaction to reward and punishment. However, normal subjects begin to generate a SCR before the selection of any card. They develop this over the time (after selecting several cards from each deck) and generate more activity before selecting cards from the disadvantageous decks. Instead of the normal participants, the subjects with VM-damage do not generate an anticipatory SCR. Thus Bechara et al. conclude, that “VM patients have a specific impairment in their ability to generate anticipatory SCRs in response to a possible outcome of their action. Since SCRs are physiological indices of an autonomically controlled change in somatic state, it seems reasonable to conclude that the absence of anticipatory SCRs is an indication that this patients’ ability to change somatic states in response to an imagined scenario is severely compromised.” Since VM-Patients failure to produce an emotional state experienced in the past, they are not able to chose advantageously.

But theorists of an cognitive account of decision-making are not ruled out in this moment. There is still the possibility, that anticipatory SCR conduce cognitive knowledge. Therefore this theorists claim, that normal subjects have an idea of the game, after picking several cards. The patients with VM-damage do not generate such an idea. But Bechara et al. are convicted of the emotional bias in decision making. So they determine the role of explicit knowledge during the generation of anticipatory SCRs. For this purpose the participants were asked after picking the card 10 times to describe whatever they know, what had been going on in the task. The results propone, that the subjects went through four knowledge periods: 1) the pre-punishment period, when picking cards before they experience any penalty. 2) pre-hunch period, when the subjects began to encounter penalty, but had no idea about the “rules” of the game. 3) hunch period, when subjects began to express a hunch about decks that were riskier. 4) conceptual period, when the participants knew very well the contingencies in the game.

Three interesting results from this issue of the task have to be mentioned. First, the substantial arise of the anticipatory SCR begun in the pre-hunch period. The period, in which the subjects do not have any clue of the game, i.e. before any conscious knowledge is developed. Second, that 30% of the subjects with no VM-damage did not reach the fourth or fifth period, i.e. explicit knowledge. Even this was the case, they performed the task like all the other participants with VM-damage: advantageously. However, 50% of the VM frontal patients did reach the conceptual period, in

which they were able to recognize and identify the bad decks. Even so they still performed disadvantageously.

“This suggest, that the anticipatory SCRs represent unconscious biases, probably derived from prior experiences with reward and punishment.” From the Iowa Gambling-Task the conclusion has to been drawn, that conceptual knowledge is not sufficient to act advantageously in the future. Adding some other experiments with VM-patients it is “reasonable that the failure to generate anticipatory SCRs is the inability to re-experience the emotional state associated with punishment when recalling previous instances of punishment.”

This mechanism of producing “re-experience” could be made in two different ways: It could be carried out via a “body loop”, in which the whole body changes in response to the activation and in which the ensuing changes are relayed to somatosensory cortices; or via an “as-if body loop”, in which the body is bypassed and the re-activation signals are conveyed to the somatosensory structures which then adopt the appropriate pattern. Damasio stated, that the “body loop”, the participation of the whole body, is the original mechanism, but it has been superseded by the “as-if body loop”. It is to emphasize, that for Damasio these two mechanisms could become conscious or remain covert. When this process is conscious, the emotional state operates as an alarm or incentive signal. It alerts the owner of this state to the goodness or badness of a certain option-outcome pair. When the process is covert (through a non-specific neurotransmitter system) the emotional state constitutes a biasing signal, and influences the cognitive processes in an advantageously way. This is the core of the somatic marker hypothesis: By a re-experience of past situations with the associated emotions the body “marks” an probable future outcome with specific emotions. Damasio thinks that this markers without reflecting about it, some of the options a subject imagine could be automatically eliminated. This markers could then operate either outside consciousness, by inhibiting a tendency to act, or consciously, by giving an experience of an unpleasant feeling, to convince the subject to avoid this option. Thus, spoken with the theory of emotions by Damasio it could be blamed, that emotions could influence our decisions unconsciously. Somatic markers are, according to Damasio, what enable us, in new circumstances, to experience feelings before we start evaluating the situation rationally.

Elliot and all the other patients with VM-damage could not establish such a somatic marker, neither via “body loop” nor via “as-if body loop”. They decision making remains impaired caused by an irreversible damage in the prefrontal cortex.

But what do the experiments mean for the normal way of decision making? As shown above somatic markers are necessarily involved in decision making. Without them a subject do not come to an end with reasoning about the possible outcomes and taking account of to the circumstance or decide disadvantageously. Shows this the determination of emotions for decision making? Are we determined of a process, that even not become conscious?

The emotions constitutes, like shown above, the somatic marker, our guidance through life. Damasio considers that only emotions are the source of somatic markers. This position leads some theorist of the emotional account to the conclusion that our reason is based on our emotions, we are all determined by often unconscious processes. This view, often represented by emotional theorists, is one-dimensional like the pure cognitive theory. This one-sided view can be ruled out by our own “daily” experiences: when we play with other students some gambling-games. Although all participants have not a VM-damage (I hope so, nor this neither some other brain damage!) some of them decide disadvantageously and loose the game. Beside of the lucky looser, some of them could be identified as risky players. They could also be found in the Iowa Gambling-Task. Without measuring the SCR this risky players behave like patients with VM-damage. But at the moment of measuring SCR this risky players generate anticipatory SCR and could therefore be separated from VM-patients. This suggests, that somatic markers could be override by higher cognitive processes. At this point, it has to be noted, that reasoning is not dependent of the outcome of somatic markers. Furthermore it could be possible, since we can use our reason by neglecting the produced somatic marker to choose an option, our reason is also an important cause of the resulting emotional state, and thus of the new marker. In other words: if our reason had enabled us to make a better choice, the final emotion would have been different, and therefore the new marker would have been different.

Emotions and cognitions are two necessary parts to make a decision. Even if the somatic markers are necessary and sufficient, it does not imply a determination by the evolutionary older mechanism: that the emotions reign over the cognition. As shown above with the risky players at the Gambling-Task. With Damasio this relation should be better thought as an interrelation, generate to produce instant good decisions. Yet, this view of relation presented by Damasio through neurophysiological experiments was elaborated by Aristotle and Thomas Aquinas within the concept of the virtue. Maybe it could be generated a fruitful dialogue between this position and the presented view by Damasio.

Bibliography:

Bechara, Antoine/ Damasio, Hanna/ Damasio, Antonio R., Emotion, decision-making, and the orbitofrontal cortex, in: *Cerebral Cortex*, 10, 2000, 295–307.

Damasio, Antonio R., *Descartes' Irrtum. Fühlen Denken und das menschliche Gehirn*, übers.v. Kober, Hainer, München, 1997.