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From Boxology to Scientific Theories: On the Emerging Field of Emotional Action Sciences

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Abstract

There is consensus among emotion scientists that emotions can be powerful motivators of actions. However, little progress has been made so far in the scientific study of that relation. The main reason for this disappointing state of affairs lies, in my view, in an overly simplistic "boxology" that treats actions as outputs of emotional stimulations. A promising way out of this situation is an interdisciplinary approach that connects emotion sciences with theories in motivation and action sciences—an emerging field that I call "emotional action sciences."

Keywords

action sciences, boxology, emotion sciences, emotional action, motivation sciences

The study of the relationship between emotion and action is an important one. Emotions can make the difference when one fights for life. Love makes people bond with one another and hatred makes them seek destruction—to name just a few examples. There is a broad agreement that emotions can be powerful motivators of actions (Frijda, 2004). After all, what matters most for dealing with the environment is what people do and not how they feel or what they think (Cosmides & Tooby, 2000).

Despite its undisputed importance, the study of the relationship between emotion and action is in its infancy at best. As reviewed by Scarantino (2017), some scientists have questioned whether emotions motivate actions directly (e.g., Baumeister, Vohs, DeWall, & Zhang, 2007). Other researchers have pointed out that emotional behaviors are too manifold for a unitary account with emotions (e.g., Russell, 2009). Still others exclude purposive actions from emotion accounts because their genesis is too complex (e.g., Scherer, 2009). I do not believe that these concerns can be sufficiently addressed with logical arguments. In the end, scientific theories are measured by correct predictions of emotional behaviors. At present, these predictions are far from satisfactory. To give a revealing example, let us take the simple situation of a laboratory rat that gets frightened by painful electric shocks. Knowing that the shock is emotionally aversive, behavior analysts had a hard time predicting whether the rodent will bite an object in the vicinity, move to another location, crouch in a defensive posture, bury the shock source with bedding material, or exhibit a complex combination of these behaviors (Blanchard, 1997). Thus, prediction of emotional behavior is poor even with fair knowledge of the motivational state, the environmental situation, and the animal's action repertoire.

In view of this complexity, many researchers resorted to "boxology" to fill missing links and holes in the explanation of emotional actions. According to Wikipedia, a boxology is "a representation of an organized structure as a graph of labeled nodes (boxes) and connections between them (as lines or arrows)" (n.d.). Boxology is popular in science because it can be used to decompose complex systems into modular boxes and connections between them. For instance, Blakemore and Vuilleumier (2017) decompose action preparation into a sequence of information-processing stages that starts with "stimulus identification" and ends with "response initiation." However, boxology was in use long before the appearance of the information-processing approach. For instance, Charles Darwin (1872), the venerable founder of emotional action science, was an early advocate of a boxology when he connected emotional mind states (the input box) with action (the output box) through a habit process (the arrow). Many followed him, filling the space between emotion and action with boxes labeled as "motive states," "cognitive appraisal," "action schema," and so forth. Most boxologies place an action box after an emotion box, but there are also ones that place an action box before the emotion box (James, 1884). Irrespective of the placement, they view emotional actions as being evoked by an (internal or external) emotional stimulus. Their basic structure hence consists of input (stimulus) and output (action) boxes and appropriately connected translation boxes in between.

Boxology can be useful for scientists because the approach identifies "black boxes" or "miraculous steps" in the explanation

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of phenomena that call for further scientific inquiry. However, often scientists seem to treat the placeholder as a satisfactory explanation, disguised by simple "tricks." One trick is the invention of a new box when there is need for a behavior explanation. The invention of fight-flight-freeze systems, in my opinion, falls into this trick category. Other examples are motives or action schemas that are more or less aptly named after the to-be-explained behavior (e.g., aggression motive, retaliation script, etc.). Another trick is the creation of very broad boxes that are applicable to many different behaviors. For instance, a "defensive motivation" box can be linked to a broad range of behaviors (freezing, fighting, fleeing, etc.), pretending parsimony in explanation by attaching a functional label to the box. Certainly, there are theories that dig very deep into the (neuro)psychological mechanics of constructs labelled "defensive motivation" and so on (e.g., LeDoux, Schiller, & Cain, 2009). However, it seems that these theories are outnumbered by shallow boxologies. So the question is: how can we move from a boxology to scientific theories of emotion actions?

The answer to this question, in my view, lies in an interdisciplinary collaboration between emotion, motivation, and action sciences that I call "emotional action sciences." Motivation sciences are concerned with the processes that direct and energize purposive behavior, while action sciences examine how intentions to act are translated into body movements. With these definitions, it seems to be clear that motivation and action sciences should be natural allies of emotion sciences in the study of emotional actions. Certainly, there were emotion scientists who argued for a central role of motivational concepts in the explanation of emotional actions, as epitomized by the work of Nico Frijda (2004) and William McDougall (1909). However, these accounts typically do not integrate mechanistic models of motivation and action (cf. Blakemore & Vuilleumier, 2017). Thus, when it comes to a mechanistic theory of emotional action, I do not see much of this alliance at the moment and I can only speculate about the reasons for that.

One reason may lie in the widespread belief that emotional actions are governed by processes different from voluntary actions because they are "automatic," "stimulus-driven," "impulsive," and so on. However, as most contributions to this issue have pointed out, there are no good arguments to exclude goal-directed actions from a study of emotional behaviors. Purposive action can have automatic features and impulsive actions can have controlled features, implying that the juxtaposition may represent a false dichotomy (Moors, Boddez, & De Houwer, 2017). Furthermore, goal-directedness does not entail optimality of a behavior, which is why people often do (seemingly) stupid things when they are emotional (Railton, 2017). Moreover, a range of body movements can be functional in coping with an "emotional concern" depending on the situation (Blakemore & Vuilleumier, 2017). Accordingly, it makes sense that evolutionary pressures may have (also) favored action control systems that allowed for flexibility in emotional behaviors (Cosmides & Tooby, 2000).

A second reason for the current neglect may directly have to do with the boxological approach. In boxology, an action box is often placed after an emotion box, implying that emotions or emotional action tendencies are precursors that can be studied independently of the subsequent motor act. However, this approach overlooks that action is more than an observable body movement, because those movements are oriented towards a prospective goal state. Ridderinkhof (2017) identifies those goal states in the effects that are anticipated with the execution of a movement. Based on a forward model, anticipated action effects are appraised before the actual production of movement in respect to their relevance to a personal concern. Those emotional appraisals affect ideomotor impulses to carry out a movement triggered by the neurocognitive activation of the associated movement effect (Eder, Rothermund, De Houwer, & Hommel, 2015). In this way, the theory provides an elegant solution to what Railton (2017) identified as the agency-without-regress problem. That is, to explain how action comes about, the theory does not need to presuppose any intervening mental operation (such as a will) or any additional mental antecedent. Emotional appraisals can direct actions through the interface of ideomotor mechanisms without invoking a homunculus that ponders about the benefits and feasibility of an action course.

From a cognitive action perspective, action preparation consequently starts long before the execution of a movement, affecting even the perception of the environment in which the action is situated (Schütz-Bosbach & Prinz, 2007). Furthermore, control theory even outright rejects the classical notion of a linear causation of human actions by stimuli or cognitive plans. For this approach, purposive behavior is directed at reducing gaps between perceptions of a current state and perceptions of a desired end state. Behavior serves to control for "perturbations" in the perception of a world state, and since the results of a control process are known to the organism only as perceptions, it can be argued that "behavior is the control of perception" (Powers, 1973). Because actions have feedback effects on the events that cause them, it is not meaningful to distinguish between perceptual inputs and motor outputs, or between causes and behavioral effects. It is clear that this idea of a circular causation cannot be easily integrated within accounts that view emotional actions as being caused by internal (goals) or external (stimulus) events.

My concluding point is that emotion science has to come up with fresh theories that could be connected to mechanistic approaches of motivation and action sciences. Ridderinkhof (2017) has in my opinion shown how such an approach is possible, and there are other promising approaches (e.g., LeDoux et al., 2009). However, the transition to emotional action sciences will not be easy. As Blakemore and Vuilleumier (2017) have pointed out, controversy is likely to occur about the appropriate language, methodology, and theory. Emotion scientists must show interest in insights from action science and action scientists must be open-minded about ideas central to emotion science. It is mutual interest and investment that brings success to an interdisciplinary discourse. I am confident that the outcome is worth the struggle.

David Rosenbaum (2005) once identified action science as the Cinderella of psychology. If emotion science is a prince, it is

time to give her a long kiss and a cozy home. I am curious what their children will look like.

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Comment: Affective Control of Action

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Abstract

This commentary challenges Railton's claim that the affective system is the key source of control of action. Whilst the affective system is important for understanding how acting for a reason is possible, we argue that there are many levels of control of action and adaptive behaviour and that the affective system is only one source of control. Such a model seems to be more in line with the emerging picture from affective and movement neuroscience.

Keywords

action control, affective control, inhibition, problem of action, reasons for action

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