

RUNNING HEAD: FUNCTIONAL-COGNITIVE FRAMEWORK

**Toward a Cumulative Science of Emotion:
A Functional-Cognitive Framework for Emotion Research**

Jan De Houwer and Sean Hughes

Ghent University, Belgium

In press. Cognition & Emotion

Main text: 2883 words

mailing address:

Jan De Houwer
Ghent University
Henri Dunantlaan 2
B-9000 Ghent
Belgium
email: Jan.DeHouwer@UGent.be

phone: 0032 9 264 64 45
fax: 0032 9 264 64 89

Abstract

Definitions of emotion and emotional phenomena are often infused with intuitions and theoretical ideas about what is “truly” emotional. Although these intuitions and ideas motivate people to study emotion, their prominence at the conceptual level can hamper progress in emotion research. In this paper, we argue that there is merit in defining emotional phenomena as much as possible in terms of behavioral principles that have been developed outside of emotion research. We clarify that such a functional approach is compatible with, and can even strengthen, cognitive approaches to emotion research. This functional-cognitive perspective reveals ways to increase the cumulative nature of emotion research and to surpass initial intuitions and theoretical ideas.

Keywords: emotion, levels of explanation, functional psychology, cognitive psychology

Toward a Cumulative Science of Emotion:

A Functional-Cognitive Framework for Emotion Research

The concept of emotion is at the same time the biggest asset and the biggest liability of emotion research. It is an asset because most people have an intuitive sense of what an emotion is, that emotion is important, and that they lack insight into this important phenomenon. Hence, there is widespread interest in and support for emotion research. The concept of emotion is, however, also the main liability of emotion research. It is a pre-scientific term that stems from everyday language and lacks a precise definition that is generally agreed upon. Because different people have different intuitions about what a “real” emotion is, there is no consensus about what it is that needs to be explained in emotion research (i.e., explanandum).

This lack of consensus resulted in unproductive and persistent debates about the definition of emotion and emotional phenomena (Russell, 2003). Although there definitely is merit in having debates about definitions, such debates tend to be fruitless when definitions are infused by subjective (e.g., an intuitive understanding of what emotion is) and theoretical ideas (e.g., pet theories about what processes underlies emotions; Wittgenstein, 1958). Moreover, emotion research is destined for failure if its success depends on how readily the results it produces fit with our initial, intuitive understanding of emotion. Just like the scientific analysis of the physical universe has led to insights that differ in important ways from, and even surpass, intuitive understandings of the universe, so too should we be willing to accept that the scientific analysis of emotion may lead to conceptualizations of emotion that differ from, and even surpass, people’s initial intuitive understanding of this concept. The prerequisite that emotion research should explain “true” emotion as it is intuitively understood, constrains emotion research in ways that are scientifically counterproductive.

In this paper, we outline a functional-cognitive framework for emotion research that allows for functional definitions of emotional phenomena, that is, definitions in terms of well-established behavioral principles rather than pre-scientific intuitions and layman terms. These behavioral principles (e.g., operant conditioning, stimulus control, motivating operations) have been developed outside of the realm of emotion research and refer solely to the way in which environment and behavior interact (see Catania, 2013, for a review). Within the functional-cognitive framework, pre-scientific intuitions about what is truly emotional can be used to guide which behavioral phenomena are considered worthy of study within emotion research but the behavioral phenomena themselves are described without reference to these intuitions. Functional definitions of emotional phenomena are also void of mental concepts that feature in cognitive explanations of emotional phenomena (e.g., semantic networks, appraisals). Unlike the strictly functional approaches advocated by radical behaviorists such as Skinner (1953), the functional-cognitive framework that we put forward (De Houwer, 2011; De Houwer, Hughes, & Barnes-Holmes, 2017a; Hughes, De Houwer, & Perugini, 2016) highlights that functional definitions of emotional phenomena are perfectly compatible with, and can even strengthen, cognitive approaches to emotion.

In the remainder of this paper, we first explore ways in which emotional phenomena can be defined in terms of behavioral principles. Next, we briefly explain why these functional definitions are compatible with and can strengthen the cognitive approach to emotion research. Finally, we discuss possible limitations and implications of the functional-cognitive framework for emotion research.

The Functional Approach to the Study of Emotion

Within the confines of this paper, we can only hint at ways in which emotional phenomena can be linked to behavioral principles. We therefore encourage our readers to consult other papers that discuss these issues in much more detail (e.g., Friman, Hayes, & Wilson, 1998; Lewon & Hayes, 2014). With this caveat in mind, we would like to briefly discuss a functional perspective on five phenomena: emotional behavior, emotional dispositions, emotional situations, emotional learning, and conscious emotional states.

Like other types of behavior, emotional behavior can be characterized on the basis of the antecedents and/or consequences that control it. Respondent behavior is behavior that is solely under the control of its antecedents, that is, those elements in the environment that precede it. For instance, it has been documented that behavior which might be labelled as anger or aggression (e.g., biting) can be elicited by painful stimulation (Ulrich & Azrin, 1962). Most instances of emotional behavior, however, seem to qualify as instances of operant behavior, that is, behavior under the control of the consequences it had in the past (Moors, 2017). The concept of “operant behavior” implies only functional causation (i.e., the consequences of current behavior will influence the probability of subsequent behavior) much like evolution theory implies only functional causation (e.g., the current consequences of a trait will affect the frequency of that trait in subsequent generations). It has merit regardless of whether there is agreement about the (mental) mechanism via which past consequences influence current behavior (e.g., the anticipation of future consequences) just like the merits of evolution theory do not hinge upon agreement about the (genetic) mechanisms underlying evolution (see Chiesa, 1992; Skinner, 1953). Note that operant behavior also depends on antecedents such as discriminative stimuli that signal when a

behavior was followed by certain consequences in the past. Emotional behavior that appears to depend primarily on antecedents (e.g., showing pride, sadness, happiness, surprise) could thus still be operant in that it is also a function of the consequences it had in the past (e.g., support or admiration from others).

The statement that an (emotional) behavior qualifies as an operant simply implies that a manipulation of (a) the consequences or (b) the impact of the behavior on those consequences should influence the behavior (also see Layng, 2017). It has been argued that emotional behavior can be grouped in different classes according to the type of outcomes that control the behavior (Skinner, 1953, Chapter 10). For instance, behaving in an angry or aggressive manner can be said to differ from other (emotional) behavior in that it depends on damage being inflicted on persons or objects (Skinner, 1953, p. 163; see Layng, 2017, for an alternative functional perspective).¹

It is important to realize that by defining emotional behavior as a class of responses that are under the control of specific consequences, the classification of emotional behavior goes beyond the superficial (topographical) features of individual responses. For instance, it captures the fact that aggressive behavior is not restricted to responses that inflict physical damage to others (e.g., hitting others) but can include also the absence of responding (e.g., not interacting with others because this adversely affected others in the past). In other words, conceptualizing emotional behavior as operant behavior captures the fact that physically

¹ As noted by a reviewer, certain aggressive acts appear to be emotionless but still driven by the same consequences as “truly” emotional behavior (e.g., an army general who orders the destruction of a city in an emotionless manner). One could, however, question whether those seemingly non-emotional aggressive acts are indeed a function of the extent to which they inflicted harm on others (e.g., the order of the army general might be related to winning wars, not to the harm that is inflicted upon the inhabitants of the city, as would be evidenced by the fact that the general would still order the destruction of the city if the inhabitants would not be harmed, provided that similar acts facilitated victory in the past). Moreover, the example of emotionless aggression illustrates how intuitions about what “real” emotions are (e.g., they must be accompanied by “hot” feelings) can put a priori constraints on scientific thinking in emotion research.

different behaviors (e.g., biting, kicking, verbal criticisms, avoiding others) are all members of the same class of responses in that they are controlled by the similar consequences (e.g., getting rid of, or avoiding, a disliked person; Catania, 2013). Identifying the consequences that determine emotional behavior not only increases understanding of those behaviors but also allows one to influence them, for instance, by changing (the appeal of) those consequences.

Emotional dispositions can be described in terms of the probability of emotional behavior (Skinner, 1953). For instance, we often label people as being fearful when there is a high probability that they will show fearful responses. Likewise, emotional situations are situations that increase the probability of emotional behavior. What is important here is that the increase in probability occurs across many situations (in the case of emotional dispositions) or across many individuals (in the case of emotional situations). This of course does not explain why certain people are fearful or why certain situations evoke fearful responses but it offers a description of these emotional phenomena that does not make a priori assumptions about the mental causes of those phenomena (e.g., inner causes such as schemata in memory or psychodynamic conflict). Moreover, describing emotional behaviors in terms of emotional dispositions or situations implies a hypothesis about the functional causes of those behaviors. It singles out factors related to the person (e.g., the learning history of that person) or to the situation that are crucial in bringing about specific emotional behaviors, thus highlighting ways to influence those behaviors (e.g., offering new learning experiences or changing the situation).

The notion of emotional dispositions clarifies that a functional approach to emotional behavior not only takes into account the events that are present in the current environment but

also those that were present in the past. It thus provides an intrinsically historical perspective that stimulates researchers to clarify how emotional dispositions arose during the history of the organism. In examining the learning history that underlies emotional behavior, researchers can draw upon the vast knowledgebase that has been generated as the result of the functional analysis of behavior in general, such as research on classical and operant conditioning (see Catania, 2013, for a review).

Unlike to what is often assumed, also internal states such as conscious feelings can be included in a functional analysis of emotion. For instance, when a feeling is considered as (covert) behavior, it can be examined what the antecedents and consequences are of those feelings (Skinner, 1953; see Layng, 2017, for an alternative). Moreover, events leading to internal emotional states have been conceptualized as motivating operations, that is, as events that determine the reinforcing value of certain outcomes (see Lewon & Hayes, 2014, for an in depth discussion). For instance, the antecedents of subjective feelings of anger (e.g., painful stimulation) increase the extent to which damage to others functions as a reinforcer, much like the antecedents of hunger (e.g., food deprivation) increase the extent to which eating functions as a reinforcer (see Michael, 2004, pp. 141-143). In fact, motivating operations are thought to play a central role in many aspects of emotion (Lewon & Hayes, 2014). As Skinner (1953, p. 165) already noted, “the fields of motivation and emotion are very close. They may, indeed, overlap”.

The Cognitive Approach to the Study of Emotion and Its Relation to the Functional Approach

Many researchers are not satisfied with describing emotional phenomena in terms of environment and behavior relations; they want to know the mechanisms underlying those

phenomena. Cognitive psychology offers a mechanistic approach to the study of emotion in which the mediating mechanisms are composed of informational units that operate on each other to produce behavior, much like cogwheels in a mechanical clock operate on each other to produce the movement of dials (Bechtel, 2008). Other mechanistic approaches are also possible (e.g., a neurological approach) but the latter focus on mechanisms that involve other parts and operations (e.g., chains of electrical and chemical activity in neurons).

Multiple ideas have been put forward about the nature of the mental mechanisms that underlie emotion, such as the appraisal of situations in terms of goals. It is clearly beyond the scope of the present paper to review all of these theories (see Moors, 2017, for an insightful analysis of cognitive emotion theories). The main point we want to make here is that - from a functional-cognitive perspective - those theories are perfectly compatible with the sorts of functional analyses of emotional phenomena outlined in the previous section. The framework highlights that the functional and cognitive approaches in psychology are located at two different levels of explanation that have different things they aim to explain (explanandum), and that use different concepts in order to achieve explanation (explanans). Whereas functional psychology aims to understand *behavior* (explanandum) in terms of the *environment* (explanans), cognitive psychology wants to understand the *impact of environment on behavior* (explanandum) in terms of *mental processes* (explanans; De Houwer, 2011; Hughes et al., 2016). For instance, whereas the claim that an emotional behavior is an operant behavior explains the behavior by highlighting the past consequences it is a function of, appraisal theories explain the impact of those past consequences on current behavior by describing the goals and appraisals that have been shaped by those past consequences and that produce the current behavior.

Because the two approaches have different aims, they are not competitors. In fact, elements of one approach can be used to help achieve the aims of the other. Most important within the present context, a definition of emotional phenomena in purely functional terms (e.g., in terms of motivating operations) helps researchers to remove from those descriptions concepts that are tied into specific cognitive theories (e.g., semantic networks, appraisals). This can improve communication between proponents of different theories because they can now share a way of describing the phenomena that they study without having to use concepts that are tied into their own theoretical perspective. Moreover, using the framework maximizes theoretical freedom in that it allows researchers to consider novel theoretical ideas without having to change the definition of to-be-explained phenomena. In that way, the functional-cognitive framework increases the cumulative nature of emotion research because knowledge about emotional phenomena is unaffected by changes in cognitive theories about those phenomena.

Possible Limitations and Implications

As noted above, some readers might doubt whether it is possible to capture the full complexity of emotion in terms of abstract behavioral principles. They might point out that functional researchers such as Skinner (1953) already tried and failed, and that there is thus no point in trying again. This argument presupposes that Skinner's approach was the only possible functional approach, or perhaps the best one, and that knowledge about behavioral principles has remained the same since Skinner's attempt to study emotion functionally over sixty years ago. Even a cursory inspection of the recent literature will show that a lot has changed in functional psychology over the past decades. For instance, new functional analyses of language have been proposed that differ substantially from Skinner's (1957) ideas

about language (Hayes, Barnes-Holmes, & Roche, 2001; see Hughes & Barnes-Holmes, 2016 for a general introduction; also see Barnes-Holmes & Hughes, 2013, and Friman et al., 1998, for a discussion of the implications for emotion research). Hence, one should not underestimate the power of the functional approach. Moreover, it would be beneficial even if only some (aspects of) emotional phenomena could be described in functional terms (see Moors, 2017, for an analysis that draws heavily on functional terms but still combines this with cognitive concepts). In contrast to Skinner's approach, the functional-cognitive framework also acknowledges that the functional approach will never satisfy the aims of cognitive researchers. The realization that both approaches have fundamentally different aims removes the need for competition and hence maximizes opportunities for mutually beneficial collaboration.

This message is important also for functional researchers. As noted by Lewon and Hayes (2014, p.814), "failure to develop a behavior analytic account of emotions unnecessarily limits the scope of a science of behavior and precludes the discovery of important functional relations not currently being addressed. A comprehensive science of behavior must ultimately account for all sorts of human activity". The functional-cognitive framework reveals that in studying emotions, functional researchers can benefit from the vast literature on emotions that has been produced by cognitive researchers.

This does not mean that it will be easy to foster interactions between the two approaches. Cognitive researchers will have to learn the language of functional psychology, that is, to analyze behavior in terms of behavioral principles. Functional researchers need to respect the aims of cognitive psychology rather than simply dismiss them based on their own aims (as, for instance, Skinner, 1990, did) and allow themselves to explore the rich cognitive

literature while remaining true to their own aims. Bridging the historic divide between both approaches will, however, provide benefits for psychology as a whole, including emotion research.²

Conclusion

We started this paper by noting that the concept of emotion is both the biggest asset and the biggest liability of emotion research. The functional-cognitive framework for emotion research that we outlined in this paper allows researchers to maintain the motivating and orienting function of intuitions about emotion while reducing the risks inherent to an intuitive or theoretical conceptualization of emotion. Describing emotional phenomena as much as possible in terms of behavioral principles will result in a more cumulative science of emotion that has the potential to surpass our initial intuitions and theoretical ideas.

² A reviewer wondered whether interactions between cognition and emotion (e.g., the impact of emotional states on working memory) would fall outside of the scope of a functional approach to emotion. They do not because, from a functional perspective, cognition-emotion interactions are in fact behavior-behavior interactions (e.g., the impact of emotional behavior on the ability to selectively respond to stimuli).

References

- Barnes-Holmes, D., & Hughes, S. (2013). A functional approach to the study of human emotion: The centrality of relational/propositional processes. In D. Hermans, B. Rimé, & B. Mesquita, (Eds). *Changing Emotions* (pp. 202-209). Hove, UK: Psychology Press.
- Bechtel, W. (2008). *Mental mechanisms: Philosophical perspectives on cognitive neuroscience*. New York: Taylor & Francis.
- Catania, A. C. (2013). *Learning* (5th ed.). Cornwall-on-Hudson, NY: Sloan Publishing.
- De Houwer, J. (2011). Why the cognitive approach in psychology would profit from a functional approach and vice versa. *Perspectives on Psychological Science*, 6, 202-209.
- De Houwer, J., Hughes, S., & Barnes-Holmes, D. (2017a). Psychological engineering: A functional-cognitive perspective on applied psychology. *Journal of Applied Research in Memory and Cognition*, 6, 1-13.
- De Houwer, J., Hughes, S., & Barnes-Holmes, D. (2017b). Bridging the divide between functional and cognitive psychology. *Journal of Applied Research in Memory and Cognition*, 6, 47-50.
- Friman, P. C., Hayes, S. C., & Wilson, K. G. (1998). Why behavior analysts should study emotion: The example of anxiety. *Journal of Applied Behavior Analysis*, 31, 137-156.
- Hayes, S. C., Barnes-Holmes, D., & Roche, B. (Eds.). (2001). *Relational Frame Theory: A Post-Skinnerian account of human language and cognition*. New York: Plenum Press.
- Hughes, S., & Barnes-Holmes, D. (2016). Relational Frame Theory: The basic account. In S. Hayes, D. Barnes-Holmes, R. Zettle, and T. Biglan (Eds.), *Handbook of Contextual Behavioral Science* (pp.129-178). New York: New Harbinger.

- Hughes, S., De Houwer, J., & Perugini, M. (2016). The functional-cognitive framework for psychological research: Controversies and resolutions. *International Journal of Psychology, 51*, 4-14.
- Layng, T. V. J. (2017). Private emotions as contingency descriptors: Emotions, emotional behavior, and their evolution. *European Journal of Behavior Analysis, 18*, 168-179.
- Lewon, M., & Hayes, L. J. (2014). Toward an analysis of emotions as products of motivating operations. *The Psychological Record, 64*, 813–825.
- Michael, J. L. (2004). *Concepts and principles of behavior analysis*. Kalamazoo, MI: Society for the Advancement of Behavior Analysis.
- Moors, A. (2017). The integrated theory of emotional behavior follows a radically goal-directed approach. *Psychological Inquiry, 28*, 68-75.
- Russell, J. A. (2003). Core affect and the psychological construction of emotion. *Psychological Review, 110*, 145-172.
- Skinner, B.F. (1953). *Science and human behavior*. New York: MacMillan.
- Skinner, B. F. (1957). *Verbal behavior*. Englewood Cliffs, NJ: Prentice-Hall.
- Skinner, B. F. (1990). Can psychology be a science of mind? *American Psychologist, 45*, 1206-1210.
- Ulrich, R. E., & Azrin, N. H. (1962). Reflexive fighting in response to aversive stimulation. *Journal of the Experimental Analysis of Behavior, 5*, 511-520.
- Wittgenstein, L. (1958). *Philosophical investigations*. Englewood Cliffs, NJ: Prentice Hall.

Author Note

Jan De Houwer, Sean Hughes, Ghent University, Ghent, Belgium. Correspondence should be addressed to Jan De Houwer, Ghent University, Henri Dunantlaan 2, B-9000 Ghent, Belgium. Electronic mail can be sent to Jan.DeHouwer@UGent.be . The preparation of this paper was made possible by Ghent University Grant BOF16/MET_V/002 to Jan De Houwer. We thank Dermot Barnes-Holmes and Agnes Moors for the many helpful discussions on topics related to this paper and Agnes Moors for feedback on an earlier version of the paper.