



Cybernetic Big Five Theory



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ABSTRACT

Cybernetics, the study of goal-directed, adaptive systems, is the best framework for an integrative theory of personality. Cybernetic Big Five Theory attempts to provide a comprehensive, synthetic, and mechanistic explanatory model. Constructs that describe psychological individual differences are divided into *personality traits*, reflecting variation in the parameters of evolved cybernetic mechanisms, and *characteristic adaptations*, representing goals, interpretations, and strategies defined in relation to an individual's particular life circumstances. The theory identifies mechanisms in which variation is responsible for traits in the top three levels of a hierarchical trait taxonomy based on the Big Five and describes the causal dynamics between traits and characteristic adaptations. Lastly, the theory links function and dysfunction in traits and characteristic adaptations to psychopathology and well-being.

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1. Introduction: Cybernetic Big Five Theory

The mission of personality psychology is “to provide an integrative framework for understanding the whole person” (McAdams & Pals, 2006, p. 204), but such grand theoretical frameworks are in short supply in modern research. An adequate theory of personality must explain not only *how* individuals differ from each other in their persisting patterns of emotion, motivation, cognition, and behavior, but also *why*. In other words, it must be an explanatory, causal theory. Further, to have any claim to being a “grand” theory, it must be comprehensive, synthetic, and mechanistic. To be comprehensive, it should encompass everything that psychologists mean by “personality.” To be synthetic it should integrate what is known about the various components of personality within a single coherent framework. And to be mechanistic, it should explain what causes the components of personality to be what they are and to function as they do. Cybernetic Big Five Theory (CB5T) is designed to provide a framework capable of meeting these criteria.

A complete mechanistic theory of personality should encompass the biological basis of the mechanisms responsible for personality, and CB5T is designed to be fully compatible with the current state of personality neuroscience (DeYoung, 2010b, 2013; DeYoung & Gray, 2009). Biological constructs are not necessary for use of CB5T, however, because the theory is designed to offer a reasonably complete description of personality in psychological terms. The present article will not focus on the biological component of CB5T, referring to biological research only when it provides partic-

ularly useful evidence for a given psychological argument. This is not to say that psychological processes are in any way independent from biological processes; rather, psychological processes supervene on biological processes, meaning that any change in psychological function must involve a change in biological function, but not vice versa because biological constructs are at a higher (more fine-grained) level of resolution than psychological constructs (Kim, 2009). Nonetheless, an adequate theory of psychological mechanisms does not depend on complete or immediate translation into biological mechanisms for its utility.

The fundamental premise of CB5T is that any adequate theory of personality must be based in cybernetics, the study of goal-directed, self-regulating systems (Austin & Vancouver, 1996; Carver & Scheier, 1998; DeYoung, 2010c; Peterson & Flanders, 2002; Van Egeren, 2009; Wiener, 1961). Cybernetic systems are characterized by their inclusion of one or more goals or reference values, which guide the work carried out by the system. (In psychology, the term “goal” is sometimes reserved for conscious representations of goals, but the term is more general in cybernetics, and many goals are not conscious.) Further, all cybernetic systems receive feedback, through some kind of sensory mechanism, indicating the degree to which they are moving toward their goals. Finally, they are adaptive and adjust their behavior, based on feedback, to pursue their goals. Cybernetics is a useful, and perhaps even necessary, approach to understanding living things (Gray, 2004, chap. 3).

In psychology, “personality” is often used to describe the array of constructs that identify variables in which individuals differ, but “personality” also refers to the specific mental organization and processes that produce an individual's characteristic patterns of behavior and experience. These are the between-person, or

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interpersonal, and within-person, or *intrapersonal*, senses of “personality,” respectively. Most intrapersonal personality constructs are causally interacting psychological elements that generate the ongoing flux of behavior and experience. These elements constitute a cybernetic system that, when functioning well, allows the organism to fulfill its needs (Block, 2002; DeYoung, 2010c). CB5T is an attempt to create a theory bridging the two senses of “personality,” explaining interpersonal personality differences in terms of variation in the intrapersonal elements of personality.

The cybernetic component of CB5T renders it mechanistic, but a central aim is also to provide an explanatory framework capable of synthesizing the full range of phenomena that psychologists signify by the term “personality.” McAdams and Pals (2006) provided an elegant delineation of the scope of personality, and the words “Big Five” in “Cybernetic Big Five Theory” serve as a reference not only to the well-known Big Five personality traits but also to their “New Big Five”—a set of five “principles for an integrative science of personality.” These principles serve as a guide for the development of any personality theory and are themselves integrated within a definition of personality that is a useful starting point for CB5T: “Personality is conceived as (a) an individual’s unique variation on the general evolutionary design for human nature, expressed as a developing pattern of (b) dispositional traits, (c) characteristic adaptations, and (d) self-defining life narratives, complexly and differentially situated (e) in culture and social context” (McAdams & Pals, 2006, p. 204). Each principle will be discussed at the appropriate point in what follows.

2. Personality as an evolved cybernetic system

The first of the five principles is that personalities are “individual variations on a general evolutionary design” (McAdams & Pals, 2006, p. 205). In many ways, all people are fundamentally similar, reflecting the species-typical, evolved design of the human organism. Understanding this design is a crucial step toward understanding the variations that constitute personality. In characterizing human nature, McAdams and Pals (and many evolutionary psychologists; e.g., Cosmides & Tooby, 1992) emphasize adaptations specific to *Homo sapiens*, those that occurred in the Pleistocene and more recently. Although specifically human adaptations are certainly of interest in understanding human nature, equally important are adaptations that occurred prior to the appearance of hominids. Human beings share the basic mammalian brain plan, and many features of the brain, as a cybernetic system, are shared with nearly all vertebrates. Comparing the human brain with those of other mammals reveals that our cerebral cortex has been greatly expanded by evolution, but the proportions of subcortical structures are strikingly similar (Deacon, 1997; Gray, 2004). Gray (1995, p. 1165) referred to subcortical structures known as the limbic system and basal ganglia as “a mechanism for the attainment of goals.” This cybernetic architecture has been extremely well preserved by evolution because it provides the general behavioral control system that allows organisms to adjust their behaviors to their situation from moment to moment to accomplish their goals and, hence, to survive and reproduce. The foundation of the mechanistic component in CB5T is a description of the major functional elements of the human cybernetic system.

The operation of cybernetic systems can be characterized by a cycle with five stages: (1) *goal activation*, (2) *action selection*, (3) *action*, (4) *outcome interpretation*, (5) *goal comparison*. In the first stage, one of the person’s goals is activated and guides the rest of the upcoming cycle. In the second, decision making takes place to select an appropriate action to move toward the goal. In the third, that action is carried out. In the fourth, the consequences of that action are interpreted; feedback processes provide

information about the state of the world after the action, and that information is analyzed and structured using remembered knowledge (again, not necessarily conscious knowledge). Finally, the current state is compared to the goal to detect any mismatch. If the current state and the goal match, then that goal has been accomplished and a new goal will emerge to guide the next iteration of the cycle. If a mismatch is detected, however, the cycle will begin again with the same goal in place, and another action will be selected in order to attempt to move toward the goal (or, as discussed in Section 4.2, the goal may be abandoned).

This cycle is a useful schematic, but it is misleading in one crucial way (Austin & Vancouver, 1996; DeYoung, 2010c): Most of the five stages describe processes that are carried out simultaneously, in parallel rather than serially. For example, people are almost constantly interpreting feedback about the world from their sensory systems, and they are almost constantly comparing what is perceived to what is predicted or desired in order to detect mismatches, before and during action, as well as afterward. They are often engaged in selecting an upcoming action, even while carrying out the current action or interpreting their situation. Why, then, is it useful to model the cybernetic process as a linear cycle? Primarily because a bottleneck exists at stage 3 (action), which renders motor action mainly serial despite the fact that most psychological functioning is massively parallel. It is very difficult for people to carry out more than one action at once. Occasionally, someone will manage two actions at once (i.e., actions aimed at two different goals, not subcomponents of a single goal-directed action such as moving the head and arm simultaneously), usually when one of them is very well-practiced or habitual, but these are the exceptions to the rule. Given that actions are mainly serial, we can conveniently delineate the necessary elements of the cybernetic system in relation to a cycle built around action.

These elements can be divided into two basic categories. First, there is a collection of mechanisms that evolved to carry out the different processes associated with each stage of the cycle. Some mechanism must activate a particular goal, so that it is sufficiently influential on psychological functioning to cause relevant actions to be carried out; some mechanism must carry out comparisons between current state and goal state and output a signal of match or mismatch; etc. Second, stored in memory is a collection of goals, actions, and knowledge about the world. Human beings adopt many different goals, possess a huge behavioral repertoire, and understand a great many patterns that exist in the world, and most of these are learned through experience rather than innately pre-programmed. These learned, updateable memory contents of the cybernetic system are deployed by the mechanisms (in the first category) that are necessary to carry out the cybernetic cycle regardless of what goal is being pursued, what action selected, and what specific situation perceived. In the following section, I will argue that these two different categories of cybernetic elements, the general functional mechanisms and the specific contents of memory, account for the distinction between dispositional personality traits and characteristic adaptations, which constitute the second and third of McAdams and Pals’ (2006) five principles. Following definition and explanation of traits and characteristic adaptations in Section 3, I will return, in Section 4, to describing in more detail the mechanisms that carry out the cybernetic cycle.

3. Defining personality traits and characteristic adaptations

A basic premise of CB5T is that *personality traits* and *characteristic adaptations* provide a complete description of everything that psychologists consider as psychological individual differences. McAdams and Pals (2006) listed these as only two of three types

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