

Being realist(ic) about behavioral variability

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Abstract

Though we concur with the conclusions of the target article by Arocha (2021), in this commentary, we argue that his critiques of psychology's standard research practices are not grounded in his scientific realism but in a (tacit) *realistic* theory about human behavioral variability. Then, we argue that both this tacit theory and his recommendations are already encompassed by the complex systems approach to psychology. We conclude that, taken together, these arguments strengthen Arocha's conclusion and recommendations.

Keywords

behavioral variability, complex systems, complexity, idiographic approach, realism

In his target article, Arocha (2021) attacks psychology's standard research practices on account of their inability to meaningfully engage with its individual subjects' behavioral variability. Instead of attempting to *eliminate* this behavioral variability from our data and theories through, among others, the usage of group-level aggregate statistics and theoretical assumptions about its inherent indeterminacy, Arocha argues that psychologists should take this behavioral variability to be a core explanandum of our science. Furthermore, he argues that without such a move we cannot uncover either unique individual mechanisms, nor any invariant laws of human behavior (Arocha, 2021, pp. 385–386).

While we welcome and support this contribution, we also have two misgivings about his paper. First, we argue that Arocha's (2021) scientific realism (SR) is largely irrelevant to his argumentation and conclusions, and that these instead rely on a tacit *realistic* theory of human behavior. Second, we believe that the Complex System Approach (CSA) to psychological science incorporates this tacit theory, and already successfully addresses Arocha's concerns about current psychological practice. We will support these claims in the remainder of this commentary.

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Realist or realistic?

Arocha (2021) claims to attack the underlying assumptions of psychology's standard research practice (that he identifies) on the basis of his scientific realism (SR). Yet, none of the identified research practices are at odds with his specific SR, besides the frequentist and Bayesian interpretations of probability. Nor could they be: Arocha specifies his SR as a set of ontological theses about the world (e.g., it consists of entities and processes, it is not entirely deterministic) combined with the epistemic claim that we can gain approximate knowledge about this reality underlying empirical appearances, and the normative claim that it is the aim of science to do so. This set does not imply any norms or standards for scientific practice on the basis of which current practices can be criticized, but only a set of claims they possibly could be incoherent with—as Arocha *does* show in the aforementioned case of antirealist interpretations of probability.

This becomes clear upon closer scrutiny. Arocha (2021) attacks the *input–output* assumption, that is, that there always are (in)direct causal connections between an external stimulus and a behavioral outcome, on account of (a) never being directly tested and (b) not being grounded in the structure or dynamics of behavior. Whilst (a) is a valid but generic methodological critique, argument (b)—which also is at the core of his attack on the *frame of reference* assumption—appears to be grounded in the tacit position that psychologists *ought to* investigate and take into account the mechanisms underlying real-world structure and dynamics of behavior if we wish to understand or manipulate it. This is a normative methodological claim, independent from Arocha's specified SR. Neither counterargument therefore appears to be directly related to his SR or derivable from it. Furthermore, the input–output assumption itself also does not violate or contradict his SR in any way: one could simply assume that this assumption holds in the real world (i.e., being *realist* about it). If anything, this assumption and the resultant practice is not conducive to gaining knowledge because it is *unrealistic*: the input–output assumption is very unlikely to be met in human systems. Yet, this low likelihood does not violate any element of Arocha's SR.

Similarly, he attacks the *random variable* assumption (i.e., that behavior is affected by many random stimuli leading to its high variability) by pointing out its ill fit with the observed consistency of real-life behavior. This argument is not related to his SR either, but instead grounded partially in day-to-day observations, and partially in his subsequent theoretical claim that currently observed human behavioral variability would in fact be explainable through individual internal differences in purposes and understanding (Arocha, 2021, p. 378).

Furthermore, Arocha (2021) criticizes current interpretations of sample aggregate statistics as “true indicators” of the underlying psychological reality (i.e., the *aggregate assumption*) as having no ontological status as real, nor having anything to do with our field's real subject: individuals and their behavior. Why his SR would necessitate that all our data values and concepts have “real” ontological referents remains unclear. More importantly, Arocha's third described approach to the ontological status of aggregate statistics (i.e., that estimated population characteristics apply to individuals) is viable if we assume that the process we investigate is essentially *homogeneous* and *stationary* over time in every single population member (i.e., if the assumption of *ergodicity* is valid; Molenaar, 2004). If

Arocha instead assumes that individuals are all unique such that this assumption is violated, he implicitly adopts an idiographic approach to psychology (Molenaar, 2004)—which once more may be more *realistic*, but not necessarily *realist*.

This raises a question. If his critiques are not grounded in his SR, what *are* they grounded in? Drawing from the above, Arocha (2021) instead appears to be arguing that there is a misfit between the properties of our object of study (i.e., humans) and our research methods. Such an argument can only be grounded in theoretical claims about the object in question, and (derivable) methodological recommendations. These have already partially been identified above, but can also be inferred from his remaining discussion. The theoretical claims in question appear to be that human behavior is (a) unique to individuals, (b) nonprobabilistic, (c) influenced by myriad external and especially also *internal* factors, and (d) subject to common constraining factors that are either present in underlying internal mechanisms or the environment. From these theoretical claims follow the methodological recommendations that we *ought* to investigate underlying mechanisms in order to become aware of relevant internal processes and factors, to engage in research at the level of individuals instead of aggregates, and to embrace behavioral variability from our data as the core explanandum of our science. It is these claims and recommendations that ground his critical assessment of the discussed assumptions, not his SR.

Arocha's (2021) argumentation, then, is not grounded in SR but in a (tacit) theory about human subjects, which roughly follows the idiographic approach to psychology (Molenaar, 2004). This theory is not *realist* in nature, but primarily more *realistic* than the assumptions Arocha (2021) criticizes. Furthermore, this shows that both Arocha's critiques and conclusions can be adopted by those who adhere to philosophical positions *other* than his SR. And notably, its lack of grounding in SR is not problematic: most of these claims have merit of their own, and have been adopted and defended by other psychologists (e.g., Molenaar, 2004; Thelen & Smith, 1994) previously.

Realistic complexity

This brings us to our second point. Given his arguments and concerns, we were surprised that Arocha's proposed alternatives did not include the Complex System Approach (CSA) to the study of human behavior. The CSA covers multiple interrelated theories and research paradigms, often rooted in ecological realism (cf. Turvey & Carello, 2012), which consider human beings to be complex adaptive systems whose behavior emerges from the interactions between many different processes operating on many different spatial and temporal scales in both its internal and external environment. In contrast to Arocha's examples, CSA thereby provides a general theoretical framework that applies to all living (and some nonliving) systems, which has been adapted into a successful empirical strategy for psychological science (e.g., Thelen & Smith, 1994). Furthermore, CSA's specification of humans as complex adaptive systems (already) encompasses Arocha's (implicit) views and criteria for theories and methodologies necessary to understand behavioral variability, as we show below.

First, the behavior of complex adaptive systems is co-ordinated by a unique history of experienced events (i.e., a memory), which means that they violate the assumptions of ergodicity. This renders group-to-individual generalizations based on aggregated

population statistics useless at best, but at worst, invalidates years of research on humans (Fisher et al., 2018). Thus, CSA is fully concerned with individual systems, which for most research questions in psychological sciences correspond to individual persons. Aggregates of individual behavior, however, are appropriate when an ensemble of subsystems forms a larger complex adaptive system, for example when studying the collective behavior of human crowds (Warren, 2018).¹ It is also possible to study the dynamics of specific subsystems within the individual (e.g., the motor system or the brain), as long as one includes the fundamental nesting in larger systems, such as the individual and their sociocultural environment, in subsequent interpretations (Van Geert, 2019). Thus, CSA incorporates Arocha's *individuality criterion*, but also extends it by introducing the notion of nested systems, allowing for a multilevel psychological science.

Second, the CSA takes human behavioral variability to be *nonprobabilistic*. Its core explanandum is behavioral variability over time, which is assumed to be *nonrandom*, and to display abrupt transitions and intertimescale relationships, which are the main vehicles of change and development in complex systems. Because of the dependencies in (time series) data of within-system variability, complex adaptive systems generally do not allow modeling in a typical probabilistic framework (Olthof et al., 2020).

Third, complex adaptive systems are extremely high-dimensional, composed of—and influenced by—myriad interdependent internal and external variables. CSA tries to understand how the interactions between such incredibly numerous variables generate co-ordinated behavior, without assuming some kind of “controller,” that steers the system.² Instead, CSA proposes the physical processes of self-organisation and emergence as the mechanisms that underlie the co-ordination, and therefore the *structure and dynamics*, of human behavior (Thelen & Smith, 1994). These mechanisms also allow for a novel understanding of *intention* or *purpose* and their role in human behavior (van Orden et al., 2011).

Conclusion

In this commentary, we have shown that Arocha's (2021) critiques of psychological research practice—while relevant and valid—are not grounded in his scientific realism (SR), but in a tacit *realistic* theory about human behavior. Furthermore, we have shown that both this tacit realistic theory and his recommendations are already incorporated in the existing CSA research program.

The upshot of these points is that be(com)ing *realistic* about behavioral variability does not necessarily require any form of scientific realism (or antirealism, for that matter), but a theory about human behavior itself—which luckily already exists within CSA, and is well-supported. This does not disqualify Arocha's (2021) critiques and recommendations, but instead only serves to strengthen his attack on standard psychological research practices by making it less dependent on a particular philosophical position and providing a broader empirical and theoretical embedding.

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Notes

1. Note that this way of using aggregates is more similar to its use in statistical physics than in psychology.
2. Assuming a “controller” as the cause of co-ordination leads to the logically regressive question of what caused the controller to cause co-ordination (van Orden et al., 2011).

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