



HOT TOPICS



Field experimentation enhances translation for behavioral neuroscience

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The brain did not evolve in a lab. It evolved in forests, deserts, oceans—amid predators, rivals, mates, and uncertainty. Yet, behavioral neuroscience continues to extract behavioral and physiological information from captive animals in socially and ecologically impoverished conditions. Laboratory studies have begun to incorporate more ethological elements—social housing, testing both sexes, naturalistic paradigms, even “re-wilding” animals into semi-natural enclosures [1]. Yet progress in field studies has not kept pace. We simultaneously need field research to become more experimental, mechanistic, and causally informative – to better inform laboratory studies and enhance their translational value.

Field studies are rich in ecological validity, offering insight into how behavior unfolds in the wild. But field research sacrifices precision and control—key ingredients for inference about brain mechanisms. Laboratory studies, meanwhile, offer exquisite control and tractability but at the cost of generalizability, resulting in a translational gap [1]. We continue to develop theories of brain-behavior relationships under conditions that no animal—including humans—has evolved to navigate.

This is not just a philosophical problem. If our goal is translational relevance—understanding behavior to inform human health and disease—we need models that behave naturally to complement laboratory studies. For example, mice housed in naturalistic environments exhibit stable, individually distinct behavioral patterns tied to underlying brain mechanisms [2]—variation that is rarely observed within strains in standard laboratory housing. Because individual differences shape vulnerability, resilience, and treatment outcomes in clinical contexts, capturing such variation in model organisms may improve the translational value of behavioral neuroscience. Moreover, studying animals in the environments that shaped them allows us to observe how motivation, stress, and resilience function under real-world pressures, and why these processes vary across individuals. This perspective is especially important for translational psychiatry, where subtle variations in experience can heighten risk for psychopathology. Examining behavior in natural settings, therefore, enhances—not replaces—the insights gained in laboratories, especially when the goal is to understand traits underlying vulnerability or resilience across diverse human populations.

Technological advances are making it increasingly possible to experimentally probe brain-behavior relationships in the field. Wireless tracking, AI-powered recognition, and “smart” testing

systems now allow experimental designs previously unimaginable in wild settings. A neuroethological approach [3]—anchoring neural data in species-typical behavior [4]—is no longer just aspirational. It is achievable.

But doing this right requires more than advanced technology. It demands better frameworks. Recent theoretical work [5] highlights that behavior is shaped not simply by internal states, but by how animals acquire, process, and act on information—what cues are prioritized, how social context modulates decisions, and how memory is deployed under risk. Studying animals *in situ* lets us ask: how does this animal, in this environment, solve this problem? And, what brain mechanisms make this possible?

This is not a call to abandon the lab. It is a call to expand our vision. Neuroscience will benefit most when laboratories become more naturalistic and field sites more experimental. Only then can we truly understand how brains produce behavior—not just in theory, but in the real world.

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AUTHOR CONTRIBUTIONS

JB and SBF both contributed to the conception of this framework and article. JB wrote the original draft with edits and revisions by SBF. Both authors approved the final version to be published.

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COMPETING INTERESTS

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ADDITIONAL INFORMATION

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