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This is the Published version of the following publication

Withagen, Rob, van der Kamp, John and Woods, Carl (2024) Conceptualizing the environment in a time of ecological collapse. *Ecological Psychology*. ISSN 1040-7413

The publisher's official version can be found at
<https://www.tandfonline.com/doi/full/10.1080/10407413.2024.2397764>
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Conceptualizing the Environment in a Time of Ecological Collapse

Rob Withagen^a, John van der Kamp^b and Carl T. Woods^c

^aDepartment of Human Movement Sciences, University Medical Center Groningen, University of Groningen; ^bDepartment of Human Movement Sciences, Vrije Universiteit Amsterdam; ^cInstitute for Health and Sport, Victoria University


ABSTRACT

We live in troubling times. Amongst global political instability, rising economic inequality and a rapacious Western consumerist lifestyle, we face the impending risks of global warming and ecological collapse. In this short opinion paper, we bring this topic to the agenda of ecological psychology in the hope of stimulating fruitful conversation. To do so, we ask how ecological psychologists should conceptualize the environment in these precarious times. We will argue that the current ecological catastrophe shows that the environment should not be described simply in terms of affordances, but as an ecosystem on which many affordances depend. Not only does this conceptualization hold scientific implications, it speaks to an active morality that could help us change our ways, and play our part in holding open a just future for all.

Man's power to change and control seems to be increasing faster than man's realization and understanding of the result of the profound changes of which he is now capable. As many writers have pointed out, this is a dangerous situation, because tinkering with basic ecosystems of the world can result either in a glorious future for mankind, or in his complete destruction if too many large-scale mistakes are made. (Odum, 1953, p. 12)

Introduction

These are disruptive times. We¹ face political instability, several nations are at war, and global economic inequality continues to rise. In addition, and perhaps even more fundamentally, man is transgressing six out of nine safe and just planetary boundaries (Rockström et al., 2023)—ecological collapse has become more and more apparent. Although several intellectuals and activists have been warning us for decades that there are 'limits to growth,' to cite one landmark publication (Meadows et al., 1972), it is abundantly clear that we have not succeeded in changing a Western lifestyle that is largely responsible for the current planetary crisis. Glaciers are melting at a rate that even the most alarming models have not predicted; species are becoming extinct at

CONTACT Rob Withagen  r.g.withagen@umcg.nl  Department of Human Movement Sciences, University Medical Center Groningen, University of Groningen, Antonius Deusinglaan 1, Groningen, The Netherlands.
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unprecedented speed; heat records are being broken year after year; and some parts of the world are experiencing long periods of drought, making inhabitation virtually impossible.

In this short opinion piece, we examine whether the ecological collapse has implications for how ecological psychology should conceptualize the environment. Our aim is emphatically not to be exhaustive, but to put this topic on the ecological psychologists' agenda, hopefully stimulating some fruitful conversation (see also Donald & Bruineberg, 2022; Ingold, 2024; Van Dijk, 2021a; Woods, Araújo et al. 2024). After discussing Gibson's original conceptualization of the environment and some developments of it, we will briefly address the ecological collapse we are in the midst of witnessing. It is argued that this collapse shows that the environment should not be described simply in terms of affordances human and nonhuman animals can use or actualize, but as an ecosystem on which many affordances depend (see also Donald & Bruineberg, 2022; Van Dijk, 2021a). That highlights that the use of affordances *can* have widespread implications for the entire biosphere. Hence, explicitly adopting the ecosystem concept weaves a moral undercurrent, pointing toward a responsibility to change our lifestyle.

Ecological approach to the environment

As has been argued before (e.g. Chemero, 2009), Gibson was unique among psychologists in paying so much attention to the environment in his books and articles. Indeed, he is perhaps the only psychologist who had spent about half of a book detailing the environment in which all animals live. An important distinction Gibson (1979/1986) made was between the 'animal environment' and 'the physical world':

The world of physics encompasses everything from atoms through terrestrial objects to galaxies. These things exist at different levels of size that go to almost unimaginable extremes. The physical world of atoms and their ultimate particles is measured at the level of millionths of a millimeter and less. The astronomical world of stars and galaxies is measured at the level of light-years and more. Neither of these extremes is an environment. (p. 8)

Gibson (1979/1986) was rebelling against the mechanistic concept of the environment as 'bodies in space' (p. 16), and argued for an ecological description of the environment that 'includes the animal' (see Costall, 1999). His celebrated concept of affordances was groundbreaking in this respect.

The *affordances* of the environment are what it *offers* the animal, what it *provides* or *furnishes*, either for good or for ill. The verb *to afford* is found in the dictionary, but the noun *affordance* is not. I have made it up. (Gibson, 1979/1986, p. 127; emphases in original)

With this concept, Gibson overcame the traditional subject-object dichotomy that had gripped much thinking for centuries. After all, affordances are relational in nature. Whether a cup affords grasping with one hand depends on the size of the cup relative to the span of the hand. Hence the concept of affordances 'cuts across the dichotomy of subjective-objective and helps to understand its inadequacy' (Gibson, 1979/1986, p. 129).

Gibson's concept of affordances has been influential ever since its inception. It was seen as an important alternative conception of the environment, with great potential for psychology and perhaps even the whole of social sciences (e.g. Costall, 1995;

Djebbarra, 2022; Heft, 2001; Ingold, 2000; Reed, 1996a). For example, attempting to understand the play behavior of children, Heft (1988) made a compelling plea for a functional description of the environment, grounded in the concept of affordances. To understand children playing, one should describe the park not in terms of trees and lawns, but in terms of the possibilities for action (i.e. climbing in and running on). Those capture what the child can do in the park and thereby regulate the play behavior (see also Kyttä, 2002).

Importantly, Gibson (1979/1986) stressed that the environment we live is profoundly shaped by human activity. Yet, he highlighted that:

This is not a new environment—an artificial environment distinct from the natural environment—but the same old environment modified by man. It is a mistake to separate the natural from the artificial as if there were two environments; artifacts have to be manufactured from natural substances. (p. 130)

Inspired by Gibson and drawing upon Dewey's writings and the concept of niche construction (e.g. Odling-Smee, Laland, & Feldman, 2003), several ecologically inclined authors have furthered this line of thinking. Centralizing mutuality in ecological thinking, Costall (2023) approvingly cited Dewey:

The increasing control over the environment is not as if the environment were something there fixed and the organism responded at this point and that, adapting itself by fitting itself in, in a plaster-like way. [...] The psychological or historical fallacy is likely to come in here and we conceive the environment, which is really the outcome of the process of development, which has gone on developing along with the organism, as if it was something which has been there from the start, and the whole problem has been for the organism to accommodate itself to that set of given surroundings. (Dewey, 1898/1976, pp. 283-284; cited in Costall, 2023, p. 42)

Indeed, the environment we live in is not ready-made. We are surrounded by artifacts that we have created. Stairs, postboxes, chairs, paved roads, airplanes and trains are all things we have made and each play their specific roles in our social and conventional practices. In fact, 'nature' is incorporated into those practices as well. As Heft (2007) pointed out:

[O]ne would be hard-pressed to find a place on Earth that does not bear the mark of human actions of both an intentional and an unintentional nature [...]. Even our so-called natural areas in cities (urban parks) are in fact designed and require constant maintenance to preserve their 'natural' qualities. In more remote locations in the United States, places such as national parks are *products* of conservation efforts that go back to the early 20th century. (p. 90; emphasis in original)

Ecological collapse

In a frightening way, the planetary crisis within which we currently find ourselves provides compelling evidence for the claim made by Gibson, Dewey and others. In his alarming, yet hopeful book *Less is more: How degrowth will save the world*, Hickel (2020/2022) reported several scientific studies showing that we are 'living in an age of mass extinction' (p. 5) that is largely the result of human behavior (see also Richardson et al., 2023; Van Dooren, 2014). Among the investigations Hickel included is the startling one performed by Hallmann et al. (2017). In their longitudinal study,

they examined ‘the total insect biomass’ in nature protection areas in Germany. The results were shocking. Over a period of only 27 years, they found a decline of more than 75%. And crucially, this is not only happening in Germany, but is occurring at a global scale, although the rates of extinction naturally vary (e.g. Cardoso et al., 2020; Wagner et al., 2021). Given the key roles insects play in the web of life (e.g. being a vital food source for birds; turning organic waste into soil; pollination, and so on), their rapid disappearance is alarming.

In view of these results, Blakemore (2018) examined the earthworm population and found that they suffer a similar fate. Indeed, agricultural intensification and the increasing use of chemical fertilizers proved detrimental for the existence of earthworms. Moreover, due to overfishing, a more acidic sea because of global warming, and the enormous algae concentration (partly caused by our use of nitrogen and phosphorus in farming), the decline in the marine species is even stronger than in the land animals (Hickel, 2020/2022).

In their collective call to action, Wagner et al. (2021) summarized this alarming situation as follows:

Nature is under siege. [A]tmospheric CO₂ levels are at their highest concentrations in more than 3 million years, and climates are erratically and steadily changing from pole to pole, triggering unprecedented droughts, fires, and floods across continents. Indeed, most biologists agree that the world has entered its sixth mass extinction event, the first since the end of the Cretaceous Period 66 million years ago, when more than 80% of all species, including the nonavian dinosaurs, perished. (p. 1)

It is well agreed among scientists that climate change and the allied global biodiversity decline is largely the result of human behavior (e.g. Hickel, 2020/2022; Monbiot, 2022/2023; Petrini, 2009; Skidelsky & Skidelsky, 2012; Van Dooren, 2014). The clearing of tropical forest; the excessive plowing of farming pastures; the increasing use of agricultural chemicals; the creating of monocultures that seriously disrupt ecosystems; the still rapidly growing live-stock population; ongoing combustion of fossil fuels to run factories, drive cars and fly all over the world; failure to install an economic model that is not based on environmental extractivism; and a relentless consumptive hunger, has all brought us to the brink of ecological collapse.

The primacy of ecosystems

In his final book, Gibson (1979/1986) cautioned us about such anthropogenic changes, claiming we have altered the environment ‘wastefully, thoughtlessly, and, if we do not mend our ways, fatally’ (p. 130; see also Reed, 1996a, p. 27). Following this, more recent ecological authors (e.g. Donald & Bruineberg, 2022; Rietveld, 2022; Van Dijk, 2021a, 2021b; Woods, Araújo et al., 2024) have emphasized the current planetary crisis and ecological collapse in their work. Still, to our minds, this crisis has not received the attention it deserves in the ecological movement (cf. Donald & Bruineberg, 2022; Van der Kamp, 2024; Van Dijk, 2021a; Woods, Araújo et al., 2024; see also the interview with Heft by Rietveld and Kiverstein (2023)). One possible reason for this is that ecological psychologists have not explicitly adopted the concept of ecosystem, perhaps because they have taken its stability for granted. Indeed, by describing the environment

simply in terms of affordances, one does not sufficiently emphasize the sometimes devastating consequences of our use of these affordances. In fact, Donald and Bruineberg (2022) recently argued that Gibson *can* be read as endorsing an extractive logic, in which the world is conceived as a collection of resources that is there for us to exploit. '[This] logic reinforces the idea of a uni-directional offering, a taking without reciprocity; humans can *use* the affordances of the environment as they see fit. (Donald & Bruineberg, 2022, pp. 24-25; emphasis in original).

Conceiving the world merely as a collection of resources has of course a long history and certainly predates the concept of affordances (see Dreyfus (1999/2017) on Heidegger's notion of the technological understanding of being; and Hickel (2020/2022) on the origin of capitalism). Yet describing the environment simply in terms of possibilities for action certainly does not break with this way of thinking. Viewing the environment as an ecosystem (on which affordances depend), on the other hand, does provide one with an alternative framework that immediately brings the interdependencies within nature to the fore, emphasizing the effects of human and nonhuman activity alike (see also Donald & Bruineberg, 2022; Van Dijk, 2021a).

In our view, it is telling that when developing the idea of nature as a web of life, Alexander von Humboldt immediately realized how much impact our actions can have. Specifically, when conducting fieldwork in Venezuela, he was arguably the first scientist to point to the wide-ranging effects of deforestation. As he penned in his observations:

When forests are destroyed, as they are everywhere in America by the European planters, with an imprudent precipitation, the springs are entirely dried up, or become less abundant. The beds of the rivers, remaining dry during a part of the year, are converted into torrents, whenever great rains fall on the heights. The sward and moss disappearing with the brush-wood from the sides of the mountains, the waters falling in rain no longer impeded in their course: and instead of slowly augmenting the level of the rivers by progressive filtration, they furrow during heavy showers the side of the hills, bear down the loosened soil, and form those sudden inundations, that devastate the country. (cited in Wulf, 2015/2016, pp. 57–58)

Although von Humboldt and other naturalists from the nineteenth century stressed the ecology of organisms and the interdependencies in nature (see Darwin, 1859/1985, pp. 124-125; Forbes, 1925), it was not until 1935 that Tansley coined the term 'ecosystem.' Like the Gestalt psychologists at that time (e.g. Koffka, 1935/1999), Tansley adopted the systems concept from physics and applied it to the biological realm. Although the idea of ecosystems did inspire the ecologists, it was not widely used as a concept in the decades following its introduction (see Hagen, 1992; Willis, 1997). From the 1950s, however, this changed. In his influential book *Fundamentals of ecology*, Odum (1953) started out with the following statement:

Living organisms and their nonliving (abiotic) environment are inseparably interrelated and interact upon each other. Any entity or natural unit that includes living and nonliving parts interacting to produce a stable system in which the exchange of materials between the living and nonliving parts follows *circular* paths is an ecological system or ecosystem. The ecosystem is the largest functional unit in ecology, since it includes both organisms (biotic communities) and abiotic environment, *each influencing the properties of the other and both necessary for maintenance of life as we have it on the earth.* (p. 9; emphases added)

Note that the concept of ecosystems shows parallels with the way ecological psychologists typically characterize the environment. In line with one of the tenets of ecological psychology (see e.g. Blau & Wagman, 2022; Turvey, 2019), ecosystem thinkers argue that animal and organism are ‘inseparably interrelated’ (Odum, 1953, p. 9), and ‘form one physical system’ (Tansley, 1935, p. 299). Moreover, ecosystems thinking naturally embraces the idea that animals not only live in an environment but also construct or alter it. In recent decades, and as mentioned earlier, the concept of niche construction (Odling-Smee et al., 2003) has been adopted by several ecological psychologists (e.g. Heft, 2007; Heras-Escribano & De Pinedo-García, 2017; Withagen & van Wermeskerken, 2010) to highlight that the environment animals live in is to a large extent the result of their own activity (see also Gibson, 1979/1986). But the concept of ecosystem goes beyond these characterizations by emphasizing that life forms, together with the abiotic environment, are *all* connected and interdependent, implying that actions can have far-reaching consequences for the biosphere as a whole.

Take the example of setting up a farm to grow crops. The trees in the way are cut down, the pastures are plowed, and the seeds are planted. Here we see an example of niche construction where some people alter the environment to produce food. The current conceptual apparatus of ecological psychology (e.g. information, affordances, niche construction) allows one to describe the setting up of the farm and all the activities involved, including the production of the tools (e.g. plough) and chemicals (e.g. fertilizers, pesticides) used. But through ecosystem thinking, we can get a much better grip on the *often wide-ranging effects* of our actions. Plowing has not only prepared the ground for sowing (it now affords sowing), but also disrupts soil life. The use of pesticides may protect the crops, but it does so by killing insects. And this implies not only fewer apples (not all the flowers of the apple trees will be pollinated), but also that the birds will have less insects to eat, causing the population to shrink (or even to go extinct eventually). Consequently, the farmer will use even more pesticides in the years that follow that will adversely affect the soil life and thus the quality (and ultimately the quantity) of the crops.

Since the formative years of ecosystems thinking, much progress has been made. Although much thinking about ecosystems was metaphorical in the early years, a more mathematical approach was pioneered around the time Tansley introduced systems thinking in ecology (Hagen, 1992). And especially recent decades have seen the upsurge of mathematical modeling of complex ecosystems, frequently inspired by the idea of self-organization (e.g. Solé & Bascompte, 2006). Such models are regarded as critical to come to grips with ‘the effects of various degrees of utilization’ (Ågren & Andersson, 2012, p. xv). For example, Lande (1987) developed a famous demographic model that predicts the effects of intense logging and habitat fragmentation on rare and endangered territorial species like owls. And more recent modeling shows a real possibility that deforestation of the Amazon forest reaches a critical transition point that will induce a large-scale collapse of the ecosystem (Flores et al., 2024).

In several respects, it is strange that ecological psychologists have not explicitly embraced the concept of ecosystem. The concept in general, and the work on mathematical modeling of such systems in particular, fit seamlessly with a dynamical systems perspective that many ecological psychologists regard as a natural ally of the Gibsonian framework (e.g. Chemero, 2009; Turvey, 2019). Ecosystems thinking stresses that the world is a whole

that cannot be understood in terms of its parts. In addition, it comes with a familiar conceptual and mathematical apparatus that reveals the workings of ecosystems, including the effects of our actions in it (see e.g. Flores et al., 2024; Solé & Bascompte, 2006).

Crucially, adopting the concept of ecosystem is not dismissing the concepts of affordances and invitations. It in no way means that ecological psychologists should stop their meaningful research into how affordances are used and what information is detected (e.g. Bril et al., 2010; Warren, 2006; Zaal & Michaels, 2003). However, placing the concept of ecosystem at the center of ecological theorizing highlights the fact that the affordances on which human and nonhuman lives depend cannot be taken for granted—they often are the result of processes in ecosystems (see also Costall, 1999; Van Dijk, 2021a). In addition, it emphasizes that the use of affordances *can* have a major impact on other life forms and can even result in ecosystems to collapse. Moreover, and here the complementarity of ecosystems and ecological thinking comes to light, the concepts of affordances and invitations are helpful in coming to grips with the workings of ecosystems. To go back to the farm example, but now with a more positive twist: by taking care of the land, one ensures that worms will flourish and transform lifeless dirt into nutritious soil that *affords* the healthy growing of crops. Such a rich and lively soil invites planting seeds and looking after the plants that grow out of them (Woods, Davids et al., 2024). Moreover, those plants *afford* nutrition for aphids that, in turn, invites eating for ladybirds, and on and on. To evaluate the extent to which animals can survive and thrive within an ecosystem, one needs a concept that captures what certain objects and events in the system offer them. The concept of affordances is particularly suited to capture such ecological facts—indeed, it was born to describe them (see Withagen, 2022, 2023).

Concluding remarks

In this short paper we have explored the implications of the current ecological catastrophe for how ecological psychologists should describe the environment. It is now abundantly clear that the environment we live in does not consist of possibilities for action we can use at our will. Frequently, our actions have devastating effects on nature. Thus, if we, ecological psychologists, take ecology seriously, we have to address the interdependencies in nature on which *all* lives depend. Human and nonhuman animals alike perceive and act in an interconnected, rapidly changing, and increasingly fragile environment. Hence, instead of focusing primarily on how affordances are used, or how animals construct their niches, ecological psychologists should *also* consider the effects of these actions on the biosphere. After all, and as we have seen above, affordances are not ready-made, but emerge in and co-constitute ecosystems. This means that a better understanding of affordances requires careful (ethnographical) studies of the workings of ecosystems (see Van Dijk, 2021a).

This immediately speaks to the moral dimension. Several ecological psychologists have already stressed the ethical and moral aspects of our discipline. Reed (1996b), for one, based his plea for ‘the necessity of experience’ on the concept of ecological information, emphasizing the implications for education and the whole of society. While Van Dijk (2021b) recently warned that ‘[p]sychology has a responsibility [...]

The way psychology teaches us to conceive of the world, and our relation to it, has consequences for the role we take ourselves to occupy in the world' (p. 9). And given the current state of our planetary crisis, scientists, including ecological psychologists, simply cannot afford to defend a conception of the environment that does not highlight the strong impact of our actions on the biosphere as a whole.

Note

1. The grammatical use of collective pronouns does not refer to a conformed view of human kind. Rather, we appreciate the profoundly diverse and uneven multiplicity of human (and nonhuman) becomings. To this, while we appreciate ecological collapse implicates us all, we acknowledge that it is a crisis that does not implicate all equally.

Acknowledgments

We are grateful to Alan Costall, two anonymous reviewers and the editor for very helpful comments on an earlier version of this paper.

Disclosure statement

No potential conflict of interest was reported by the author(s).

References

- Ågren, G. I., & Andersson, F. O. (2012). *Terrestrial ecosystems ecology: Principles and applications*. Cambridge University Press.
- Blakemore, R. J. (2018). Critical decline of earthworms from organic origins under intensive, humic SOM-depleting agriculture. *Soil Systems*, 2(2), 33. <https://doi.org/10.3390/soilsystems2020033>
- Blau, J. C. C., & Wagman, J. B. (2022). *Introduction to ecological psychology: A lawful approach to perceiving, acting, and cognizing*. Routledge.
- Bril, B., Rein, R., Nonaka, T., Wenban-Smith, F., & Dietrich, G. (2010). The role of expertise in tool use: Skill differences in functional action adaptation to task constraints. *Journal of Experimental Psychology. Human Perception and Performance*, 36(4), 825–839. <https://doi.org/10.1037/a0018171>
- Cardoso, P., Barton, P. S., Birkhofer, K., Chichorro, F., Deacon, C., Fartmann, T., Fukushima, C. S., Gaigher, R., Habel, J. C., Hallmann, C. A., Hill, M. J., Hochkirch, A., Kwak, M. L., Mammola, S., Ari Noriega, J., Orfinger, A. B., Pedraza, F., Pryke, J. S., Roque, F. O., ... Samways, M. J. (2020). Scientists' warning to humanity on insect extinctions. *Biological Conservation*, 242, 108426. <https://doi.org/10.1016/j.biocon.2020.108426>
- Chemero, A. (2009). *Radical embodied cognitive science*. MIT Press.
- Costall, A. (1995). Socializing affordances. *Theory & Psychology*, 5(4), 467–481. <https://doi.org/10.1177/0959354395054001>
- Costall, A. (1999). An iconoclast's triptych: Edward Reed's ecological philosophy. *Theory & Psychology*, 9(3), 411–416. <https://doi.org/10.1177/0959354399093011>
- Costall, A. (2023). Contrary imaginations: Radical empiricism or pragmatism?. In M. Segundo-Ortin, M. Heras-Escribano, & V. Raja (Eds.), *Places, sociality, and ecological psychology: Essays in honor of Harry Heft* (pp. 37–44) Routledge.

- Darwin, C. (1985). *On the origin of species by means of natural selection*. Penguin. (Original work published 1859)
- Dewey, J. (1976). *Lectures on psychological and political ethics: 1898* (Edited with an introduction by D. L. Koch) Haffner Press. (Original work published 1898)
- Djebbarra, Z. (2022). Ed.). *Affordances in everyday life: A multidisciplinary collection of essays*. Springer.
- Donald, M., & Bruineberg, J. (2022). Affordances and the logic of the gift. In Z. Djebbarra (Ed.), *Affordances in everyday life: A multidisciplinary collection of essays* (pp. 23–31) Springer.
- Dreyfus, H. L. (2017). Heidegger on the connection between nihilism, technology, art, and politics. In M. A. Wrathall (Ed.), *Background practices: Essays on the understanding of being* (pp. 173–197). Oxford University Press. (Original work published 1999)
- Flores, B. M., Montoya, E., Sakschewski, B., Nascimento, N., Staal, A., Betts, R. A., Levis, C., Lapola, D. M., Esquivel-Muelbert, A., Jakovac, C., Nobre, C. A., Oliveira, R. S., Borma, L. S., Nian, D., Boers, N., Hecht, S. B., Ter Steege, H., Arieira, J., Lucas, I. L., ... Hirota, M. (2024). Critical transitions in the Amazon forest system. *Nature*, 626(7999), 555–564. <https://doi.org/10.1038/s41586-023-06970-0>
- Forbes, S. A. (1925). The lake as a microcosm. *Illinois Natural History Survey Bulletin*, 15(1-9), 537–550. <https://doi.org/10.21900/j.inhs.v15.303>
- Gibson, J. J. (1979). / (1986). *The ecological approach to visual perception*. Houghton Mifflin.
- Hagen, J. B. (1992). *An entangled bank: The origin of ecosystem ecology*. Rutgers University Press.
- Hallmann, C. A., Sorg, M., Jongejans, E., Siepel, H., Hofland, N., Schwan, H., Stenmans, W., Müller, A., Sumser, H., Hörrn, T., Goulson, D., & de Kroon, H. (2017). More than 75 percent decline over 27 years in total flying insect biomass in protected areas. *PLoS One*, 12(10), e0185809. <https://doi.org/10.1371/journal.pone.0185809>
- Heft, H. (1988). Affordances of children's environments: A functional approach to environmental description. *Children's Environments Quarterly*, 5, 29–37.
- Heft, H. (2001). *Ecological psychology in context: James Gibson, Roger Barker, and the legacy of William James's radical empiricism*. Lawrence Erlbaum Associates.
- Heft, H. (2007). The social constitution of perceiver-environment reciprocity. *Ecological Psychology*, 19, 85–105.
- Heras-Escribano, M., & De Pinedo-García, M. (2017). Affordances and landscapes: Overcoming the nature-culture dichotomy through niche construction theory. *Frontiers in Psychology*, 8, 2294. <https://doi.org/10.3389/fpsyg.2017.02294>
- Hickel, J. (2022). *Less is more: How degrowth will save the world*. Penguin. (Original work published 2020)
- Ingold, T. (2000). *The perception of the environment: Essays in livelihood, dwelling and skill*. Routledge.
- Ingold, T. (2024). *The rise and fall of generation now*. Polity.
- Koffka, K. (1999). *Principles of Gestalt psychology*. Routledge. (Original work published 1935)
- Kyttä, M. (2002). Affordance of children's environments in the context of cities, small towns, suburbs and rural villages in Finland and Belarus. *Journal of Environmental Psychology*, 22(1-2), 109–123. <https://doi.org/10.1006/jevps.2001.0249>
- Lande, R. (1987). Extinction thresholds in demographic models of territorial populations. *The American Naturalist*, 130(4), 624–635. <https://doi.org/10.1086/284734>
- Meadows, D. H., Meadows, D. L., Randers, J., & Behrens, W. W. (1972). *Limits to growth: A report for the club of Rome's project on the predicament of mankind*. Potomac Associates.
- Monbiot, G. (2022). / (2023). *Regenesis: Feeding the world without devouring the planet*. Penguin.
- Odling-Smee, F. J., Laland, K. N., & Feldman, M. W. (2003). *Niche construction: The neglected process in evolution*. Princeton University Press.
- Odum, E. P. (1953). *Fundamentals of ecology*. Saunders Company.
- Petrini, C. (2009). *Terra Madre: Forging a new global network of sustainable food communities*. Chelsea Green.
- Reed, E. S. (1996a). *Encountering the world: Toward an ecological psychology*. Oxford University Press.

- Reed, E. S. (1996b). *The necessity of experience*. Yale University Press.
- Richardson, K., Steffen, W., Lucht, W., Bendtsen, J., Cornell, S. E., Donges, J. F., Drüke, M., Fetzer, I., Bala, G., von Bloh, W., Feulner, G., Fiedler, S., Gerten, D., Gleeson, T., Hofmann, M., Huiskamp, W., Kummu, M., Mohan, C., Nogués-Bravo, D., ... Rockström, J. (2023). Earth beyond six of nine planetary boundaries. *Science Advances*, 9(37), eadh2458. <https://doi.org/10.1126/sciadv.adh2458>
- Rietveld, E. (2022). Change-ability for a world in flux. *Adaptive Behavior*, 30(6), 613–623. <https://doi.org/10.1177/10597123221133869>
- Rietveld, E., & Kiverstein, J. (2023). Reflections on ecological psychology: An interview with Harry Heft. In M. Segundo-Ortin, M. Heras-Escribano, & V. Raja (Eds.), *Places, sociality, and ecological psychology: Essays in honor of Harry Heft* (pp. 10–22). Routledge.
- Rockström, J., Gupta, J., Qin, D., Lade, S. J., Abrams, J. F., Andersen, L. S., Armstrong McKay, D. I., Bai, X., Bala, G., Bunn, S. E., Ciobanu, D., DeClerck, F., Ebi, K., Gifford, L., Gordon, C., Hasan, S., Kanie, N., Lenton, T. M., Loriani, S., ... Zhang, X. (2023). Safe and just Earth system boundaries. *Nature*, 619(7968), 102–111. <https://doi.org/10.1038/s41586-023-06083-8>
- Skidelsky, R., & Skidelsky, E. (2012). *How much is enough: The love of money and the case for the good life*. Allen Lane.
- Solé, R. V., & Bascompte, J. (2006). *Self-organization in complex ecosystems*. Princeton University Press.
- Tansley, A. G. (1935). The use and abuse of vegetational concepts and terms. *Ecology*, 16(3), 284–307. <https://doi.org/10.2307/1930070>
- Turvey, M. T. (2019). *Lectures on perception: An ecological perspective*. Routledge.
- Van der Kamp, J. (2024). Joining the conversation on a corresponsive sport science. *Sports Medicine (Auckland, N.Z.)*, 54(5), 1085–1087. <https://doi.org/10.1007/s40279-024-02005-4>
- Van Dijk, L. (2021a). Affordances in a multispecies entanglement. *Ecological Psychology*, 33(2), 73–89. <https://doi.org/10.1080/10407413.2021.1885978>
- Van Dijk, L. (2021b). Psychology in an indeterminate world. *Perspectives on Psychological Science: A Journal of the Association for Psychological Science*, 16(3), 577–589. <https://doi.org/10.1177/1745691620958005>
- Van Dooren, T. (2014). *Flight ways: Life and loss at the edge of extinction*. Columbia University Press.
- Wagner, D. L., Grames, E. M., Forister, M. L., Berenbaum, M. R., & Stopak, D. (2021). Insect decline in the Anthropocene. *Proceedings of the National Academy of Sciences of the United States of America*, 118, 1–10.
- Warren, W. A. (2006). The dynamics of perception and action. *Psychological Review*, 113(2), 358–389. <https://doi.org/10.1037/0033-295X.113.2.358>
- Willis, A. J. (1997). An evolving concept viewed historically. *Functional Ecology*, 11(2), 268–271. <https://doi.org/10.1111/j.1365-2435.1997.00081.x>
- Withagen, R. (2022). *Affective Gibsonian Psychology*. Routledge.
- Withagen, R. (2023). The field of invitations. *Ecological Psychology*, 35(3), 102–115. <https://doi.org/10.1080/10407413.2023.2230192>
- Withagen, R., & Van Wermeskerken, M. (2010). The role of affordances in the evolutionary process reconsidered: A niche construction perspective. *Theory & Psychology*, 20(4), 489–510. <https://doi.org/10.1177/0959354310361405>
- Woods, C. T., Davids, K., & Araújo, D. (2024a). On ecological literacy through implicated participation. *New Ideas in Psychology*, 73, 101079. <https://doi.org/10.1016/j.newideapsych.2024.101079>
- Woods, C. T., Araújo, D., & Davids, D. (2024b). On a corresponsive sport science. *Sports Medicine (Auckland, N.Z.)*, 54(5), 1071–1084. <https://doi.org/10.1007/s40279-023-01981-3>
- Wulf, A. (2016). *The invention of nature: The adventures of Alexander von Humboldt, the last hero of science*. John Murray. (Original work published 2015)
- Zaal, F. T. J. M., & Michaels, C. F. (2003). The information for catching fly balls: Judging and intercepting virtual balls in a CAVE. *Journal of Experimental Psychology. Human Perception and Performance*, 29(3), 537–555. <https://doi.org/10.1037/0096-1523.29.3.537>