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An ecological approach to creativity in making

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ABSTRACT

Cognitive accounts of creativity generally assume that novel ideas originate in the head and precede the actual materialization of them. Over the last decades, this cognitive view has been criticized by, among others, proponents of a sociocultural perspective. In the present paper, we aim to further this critique by developing a genuine ecological approach to creativity in making. We do so by incorporating Ingold's theory of making into the ecological perspective that was initiated by Gibson. It is argued that because action is not preplanned but continuously unfolds over time, creativity is to be found in the process of making. Indeed, creativity can be conceived of as the discovery and creation of unconventional affordances (action possibilities) of objects and materials. Discussing the primacy of exploratory actions in this process, we argue that the concepts and research tools of ecological psychology may help to deepen the understanding of the creative process.

1. Introduction

> [T]he drawing is not the visible shadow of a mental event; *it is a process of thinking, not the projection of thought.* (Ingold, 2013, p. 128; emphases in original)

How is it possible that humans come up with ideas, thoughts, products, and ways of acting that did not exist before and are meaningful? Unsurprisingly, in addressing questions like this, different academic disciplines have paid attention to different aspects. Within the fields of arts, architecture, and archeology, the focus tends to be on the novel material product that is realized and the historical and social context in which that happened (e.g., Gombrich, 1950/1995; Frampton, 1980). In psychology on the other hand, the focus is not so much on the material object per se, but on how the new idea in the mind of the designer or actor takes shape (e.g., Jung-Beeman et al., 2004; Kounios & Beeman, 2014; Nijstad, De Dreu, Rietzschel, & Baas, 2010; Simonton, 2007a, 2007b). Yet, the underlying theory in these different academic disciplines tends to be the same. They generally adhere to what Ingold (2013) referred to as "hylomorphism",

> This is to start with an idea in mind, of what we want to achieve, and with a supply of the raw material needed to achieve it. And it is to finish at the moment when the material has taken on the intended form. (p. 20)

The novel idea in the mind of the designer and the material object that is subsequently constructed are isomorphic. The mental idea is supposed to instruct the (mechanical) body to impose the novel form on the material.

Over the last years this approach has been criticized by several authors (e.g., Costall, 2015; Glaveanu, 2014; Glaveanu, Gillespie, & Valsiner, 2015; Ingold, 2013; Malafouris, 2013). Shifting focus to the sociomaterial processes, they argued that creativity does not reside in the mind of the individual but is relational and extends into the (social) world. Glaveanu (2014), for example, argued that "creative action is *distributed between multiple actors, creations, places and times*" (p. 2; emphases in original). In the present paper, we aim to further the critique on the cognitive account by developing a genuine ecological approach to creativity, focusing on how goal-directed activity comes about. We will do so incorporating Ingold's recent ideas of making into the ecological framework that was developed by Gibson. It is argued that because behavior is not preplanned in the mind, but emerges out of the interplay of movement and information, creativity does not so much exist in the head but in the unfolding of action (see Hristovski, Davids, Araujo, and Passos (2011) and Orth, van der Kamp, Memmert, and Savelsbergh (2017) for accounts of creativity in movement sciences that follow a similar line of thinking). Moreover, we claim that Gibson's conceptual framework can further the investigation into creativity. It not only allows us to define creativity (see also Glaveanu, 2012; Yakhlef & Rietveld, 2017), but the ecological concepts of information, attunement, and exploratory behavior can also further (empirical) investigations into making and creativity.

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2. Some cognitive perspectives on creativity

Cognitive theories of creativity come in many forms. Applying the principles of classic cognitive psychology, Simon and colleagues defended the idea that creativity can simply be understood as general problem solving (e.g., Newell & Simon, 1972). Qin and Simon (1990), for example, conducted an experiment in which participants were to discover one of Kepler's laws, and the problem-solving searches of the participants were recorded. Based on their results, Qin and Simon concluded that, "the data for the successful subjects reveal no 'creative' processes in this kind of a discovery situation different from those that are regularly observed in all kinds of problem-solving settings" (p. 281). Indeed, one can write a computer program to solve this problem. Other researchers, however, have argued that unlike the deliberate analytic problem solving, creative insight genuinely reflects certain cognitive processes working together (e.g., Kounios & Beeman, 2014). Moreover, individual differences in solving problems in a sudden flash of insight are associated with different patterns in resting-state brain activity, particularly in the anterior cingulate of the right hemisphere (e.g., Jung-Beeman et al., 2004; Kounios & Beeman, 2014). In fact, researchers have stimulated these brain areas to try to facilitate creative insight (e.g., Chi & Snyder, 2011).

Earlier, Campbell (1960) defended a theory of creativity that is based on the Darwinian idea of variation and selection (see also Simonton, 1999). In his view, knowledge processes, including creative thought, are governed by a "blind-variation-and-selective-retention process" (Campbell, 1960, p. 380). New ideas "uncorrelated with the solution" (Campbell, 1960, p. 381) to problems are produced and amplified, and some of them are selected. In laying out his theory, Campbell focuses on scientific discoveries that he illustrated with reflections of scholars as Bain, Mach, and Poincaré. However, his theory is also used to understand artistic creativity of musicians and painters (see e.g., Simonton, 2007a, 2007b). The overall claim is that generating more ideas, typically through many years of persistent effort, should lead to more ideas that are creative. Creativity thus arises from sheer productivity, not from special psychological or cognitive predispositions.

Trying to combine many aspects of the above accounts, Nijstad et al. (2010) developed a "dual-pathway theory of creativity". According to this theory, there are two ways to achieve novel and creative ideas: through the "flexibility" pathway and through the "persistence" pathway. Flexibility indicates that creative ideas can be generated by switching to a different approach, considering a different perspective and by making remote associations, but creativity can also be achieved more analytically through systematic, focused, and effortful thinking. To generate creative ideas in problem solving, people interchangeably use the flexibility and persistence pathways but to different degrees depending on the individual's psychological and cognitive dispositions (e.g., working memory) and traits (e.g., mood and attention) and on situational factors (e.g., insight versus divergent thinking tasks). Hence, the interaction between flexible and persistent ways of thinking together with the factors that modulate them account for (variation in) human creativity.

Although cognitive theories of creativity can be rather diverse, they share, arguably by definition, the assumption that creativity resides in the mental realm—the formation of novel ideas occurs in the head. And when the idea concerns a novel object or product, the idea can (or cannot) be materialized through a process of making, but this latter process is not considered to be constitutive of the creativity. Indeed, the idea emerged prior to the construction of the product, the latter being a mere materialization of the mental idea.

3. An ecological view on how action emerges

The above line of thinking, in which the idea exists prior to the actual product or the creation of it, is deeply rooted in Western thinking. When patterns are to be explained, Western scientists generally assume that this pattern already existed, albeit in an abstract form. Ingold (2011) referred to this as the "logic of inversion" (p. 68). In the field of biology, for example, it is widely assumed that the genes contain a blueprint of the animal that guides the developmental process such that a certain animate form is realized. And traditional accounts of human movement claim that movement patterns are the result of a motor program, residing in the brain, which instructs the body what to do. Hence, in these accounts it is assumed that the animate form and the movement already existed in abstract forms in either the genes or the brain, respectively. Drawing upon the work of Gibson and Ingold, we describe an ecological approach to action that takes aim at this "logic of inversion" and holds that behavior continuously unfolds. Such an account necessitates a theory in which creativity resides in the unfolding of the action.

3.1. Gibson's ecological program

In the 1960s and 1970s Gibson developed an approach to psychology that was diametrically opposed to the dominant cognitive tradition. Indeed, Gibson took aim at the idea that the brain controls action, an assumption that holds psychology captive since the late 17th century (e.g., Martensen, 2004; Zimmer, 2004). As he stated in his last book, *The ecological approach to visual perception,* "[l]ocomotion and manipulation […] are controlled not by the brain, but by information, that is, by seeing oneself in the world. Control lies in the animal-environment system" (Gibson, 1979/1986, p. 225). Gibson developed several concepts to understand how behavior can "be regular without being regulated" (Gibson, 1979/1986, p. 225). For now, the concepts of information and affordances are most important.

Gibson introduced the concept of affordances to refer to the action possibilities of the environment for a certain animal.

> The *affordances* of the environment are what it *offers* the animal, what it *provides* or *furnishes*, either for good or 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)

So, for example, for a human being a chair affords sitting and the floor affords walking. By stressing that the environment consists of possibilities for action, and that animals perceive their environment in these terms, Gibson emphasized that the world is not primarily to look at but to act in. Moreover, the concept of affordances indicates that the environment in which animals live is a meaningful one. Being rooted in the mechanization of the worldview, psychology has traditionally assumed that the environment simply consists of matter in motion and that meaning has to be attached to it in a perceptual process (e.g., Neisser, 1967). However, if the environment consists of possibilities for action, then meaning does not have to imposed but can be discovered. Indeed, "the meaning or value of a thing consists of what it affords" (Gibson, 1982, p. 407).

To understand how the animal can perceive the affordances and regulate their encounters with them, the Gibsonian concept of information is crucial. Gibson stated that in the ambient arrays surrounding an animal there are patterns available that inform about the available affordances. Moreover, this information can also guide our activities in the environment to use an affordance. A classic example is the use of optic flow fields to guide locomotion (Gibson, 1958). Imagine a bird flying through the air. The movement of the bird through the air gives rise to an optic flow field that provides information about the animal's movements through the environment. Consequently, this information can guide the bird's behavior. The focus of expansion (the point at which the motion appears to arise), for example, coincides with the direction in which the bird is heading and can thus be used to navigate through the environment.

Hence, goal-directed behavior can result from the interplay of movement and information—the animal's behavior can be guided by

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