



The paradox of creativity

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ABSTRACT

Creativity seems to yield survival and reproductive benefits. Creative behaviors allow individuals to solve problems in new and appropriate ways, and thus to promote their survival. They also facilitate bonding and constitute a signal of one's fitness, favoring attraction of mates. However, to be creative, individuals often have to violate social norms in order to promote change. So far, this deviance induced by creative behaviors had not been seen as an adaptive disadvantage. This deviance entails negative consequences as social exclusion or ostracism, which are detrimental for both survival (e.g., reduced access to resources within the group) and reproduction (reduced reproductive fitness). Thus, the adaptive benefits yielded by creativity have to be nuanced by these potential disadvantages. The paradox of creativity proposes a finer-grained vision of the adaptive reasons why creativity has been maintained within the human species, has evolved, and is collectively regulated. Research perspectives are also proposed.

Creativity “involves the development of a novel product, idea, or problem solution that is of value to the individual and/or the larger social group” (Hennessey & Amabile, 2010, p.572). This aptitude or characteristic has become increasingly important (e.g., Chan & Yuen, 2014; Florida, 2012; Plucker & Makel, 2010) and creativity is considered as one of the four major century skills in the 21st century (see Qian, Plucker, & Yang, 2019). Consequently, research on creativity has been particularly flourishing over recent decades (e.g., Qian et al., 2019; Runco & Pritzker, 2011; Simonton, 2013).

Among this increasing amount of literature, numerous contributions are dedicated to important issues, such as defining creativity (e.g., Amabile, 1982; Harrington, 2018; Runco & Jaeger, 2012; Simonton, 2012; Weisberg, 2015, 2018), or investigating how creativity works and the factors that influence individuals' creativeness (e.g., Guegan, Lubart, & Collange, 2018; Haslam, Adarves-Yorno, Postmes, & Jans, 2013; Knasko, 1992; Madjar & Shalley, 2008; Madore, Addis, & Schacter, 2015; Schutte & Malouff, 2020). In that respect, the study of creativity has been placed at the crossroads of diverse disciplines (Simonton, 2013; Zhou, Wang, Bavato, Tasselli, & Wu, 2019), ranging from cognitive psychology and neuroscience (e.g., Saggat et al., 2019; Sunavsky & Poppenk, 2020) to social psychology (e.g., Amabile, 2018; Haslam et al., 2013) and marketing (e.g., Rubera, Ordanini, & Griffith, 2011).

An evolutionary perspective on creativity has also been developed. This perspective aims to highlight the processes by which creativity and innovation evolved among humans. To do so, this investigation involves studying early evidence of human creativity, as well as evidence of creativity and innovation among non-human primates in relation to the evolution of neuro-cognitive functions (Gabora & Kaufman, 2010; Navarrate & Laland, 2015; Reader & Laland, 2002). This perspective also examines the adaptive reasons why creativity has been maintained over generations (i.e., ultimate explanations; Muthukrishna & Henrich, 2019; Scott-Phillips, Dickins, & West, 2011).

The evolutionary perspective on creativity relies on a critical assumption that creativity is adaptive. This adaptiveness has been studied at different levels (Gabora & Kaufman, 2010). For instance, cultural evolution investigates how creative ideas would evolve through culture (Gabora & Kaufman, 2010), and explains how creative ideas spread and are regulated within a society in order to preserve the benefits of creativity for society at large (Gabora & Tseng, 2017). Although this approach can explain the emergence and diffusion of creative practices among given populations, the existence of creativity as an evolved individual characteristic still has contradictory implications.

On the one hand, successful adoption of creative practices would yield survival and reproductive benefits for the creative individual

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(Feist, 2001, 2007, pp. 15–30; Gabora & Kaufman, 2010). In this light, creativity is mainly seen as an adaptive advantage for individuals, both in terms of survival and mating. On the other hand, drawing from the idea according to which creative behaviors (i.e., behaviors linked to the production of creative products, ideas, or problem solutions; Amabile, 1996, 2018) remain intrinsically risky and uncertain from an individual perspective (Getzels & Jackson, 1962; Haefele, 1962; Tyagi, Hanoch, Hall, Runco, & Denham, 2017), the present contribution aims to introduce what can be called the “*paradox of creativity*”. Accordingly, we will argue that, because creative behaviors yield adaptive benefits but also entails some risks for the survival and the reproduction of creative individuals, an accurate evolutionary account of creativity should be able to account for this apparent paradox in a coherent way. As we will see, the paradox of creativity can be linked to the “*paradox of viscosity*” (Ehrlich & Levin, 2005). By linking the two paradoxes, we will conclude with novel perspectives to explain the ontogeny of creative practices in a social-psychological perspective, focusing on the crucial role of social costs and benefits to creative behavior (e.g., increased social status, ostracism).

1. Creativity as an adaptive individual characteristic

As recalled Puccio (2017), due to the supposed evolutionary benefits of creativity, all human beings are provided with a creative mind. However, these benefits differ depending on the form of creativity under consideration. Some forms of creativity could favor survival more directly than others (Feist, 2007, pp. 15–30). Indeed, the use of creative thinking to solve problems constitutes one of the key characteristics that could have enabled early humans to survive predation in a hostile environment (Puccio, 2017). For instance, the invention of weapons can be considered as a creative response to a need for protection from predators (Gabora & Kaufman, 2010). Early humans also used their creativity skills to fashion tools that made it easier to carry out crucial life-sustaining activities (e.g., tools that were used to split open fruits; Puccio, 2017). Thus, the use of creative thinking to solve problems represents a key adaptive characteristic of human beings, since creations can promote protection from predators and access to vital resources. This explains why creative thinking could have been selectively retained and handed down through generations up to this day (Puccio, 2017). Forms of creativity such as these, which bear direct consequences for survival, would mainly refer to applied forms of creativity (i.e., in applied domains such as technology or engineering; Feist, 2001, 2007, pp. 15–30).

At first glance however, the relevance to survival of more ornamental forms of creativity (e.g., art, music, dance, humor, fiction) is not so obvious (Gabora & Kaufman, 2010). If some authors consider these creative manifestations as side-effects of abilities that evolved for other purposes (Carroll, 1995; Gabora, 2003; Kaufman, Lee, Baer, & Lee, 2007; McBrearty & Brooks, 2000; Pinker, 1997), others rather argue for a mating value of ornamental creativity (e.g., Feist, 2001, 2007, pp. 15–30; Kaufman et al., 2007; Miller, 2000, 2001, 2011). According to Miller (1998, 2000, 2001, 2011; see Kaufman et al., 2007) sexual selection could have played a much greater role than natural selection (i.e., survival) in shaping important aspects of our minds. This would be the case for storytelling, art, music, sports, dance or even humor. Because all these behaviors generate pleasurable experiences which facilitate bonding and social closeness (through the release of endorphins; see Tarr, Launay, & Dunbar, 2016; Dunbar et al., 2012), creativity in these areas could yield reproductive rather than survival benefits, being the result of psychological adaptations which were primarily aimed at attracting mates. Indeed, in addition to enable social interactions and perceptions of closeness (including the context of mating), these ornamental forms of creativity could also signal one's fitness (e.g., good health, superior intellectual skills; Feist, 2001, 2007, pp. 15–30; Miller, 2000).

Empirical support in this direction can be seen in studies showing

that creativity is one of the factors which determine shifts in women's mating preferences throughout their reproductive cycle (Gangestad, Thornhill, & Garver-Apgar, 2005). For instance, Haselton and Miller (2002) presented women sets of vignettes depicting two men. They asked them to pick the one they thought was the most attractive one, in both a short- and long-term mating context. Within each set of vignettes, one man displayed a higher level of creativity (i.e., in painting works of art or in business), while the other displayed higher earning potential (i.e., a talented but successful abstract painter or an adopted heir of an important corporation). As expected, fertile women preferred the more creative men in the short-term mating context, but this pattern was reversed for the long-term mating. In another experiment, Haselton and Miller (2006; see Buss, 2019) showed that ovulating women displayed increased preference for men with creative intelligence. In addition, research in the field of implicit theories of creativity (i.e., naïve conceptions of creativity; Glăveanu, 2014; Runco & Johnson, 2002; Sternberg, 1985) corroborated the link between creativity and perceived fitness in terms of intellectual skills. Indeed, Runco (1999b) identified that some of the core characteristics spontaneously attached to creative individuals were intellectual skills such as “*capable*”, “*clever*”, “*curious*”, “*imaginative*”, “*intelligent*”, “*inventive*”, “*original*” and “*resourceful*”.

2. The paradox of creativity

The adaptive value of creativity has thus been repeatedly emphasized. Individuals use applied forms of creativity (in domains as technology or engineering) to solve problems in new and appropriate ways. These innovations promote individual's survival through a better adaptation to the environment and its changes. In addition, more ornamental forms of creativity (in artistic and aesthetics domains) could facilitate bonding and constitute a signal of one's fitness (e.g., good health and intellectual skills), favoring attraction of mates and therefore reproduction. In a nutshell, applied forms of creativity could yield survival benefits and ornamental forms of creativity reproductive benefits.

Paradoxically however, this tendency to create, innovate and promote change can constitute a threat to the survival of creators, as well as a risk for their reproduction. Indeed, creative behaviors are often considered as involving a departure from established social norms (Amabile, 1996; Csikszentmihalyi, 2014, 1990; Eisenman, 1990; Simonton, 2000). Though, human beings are born with a “*conformity bias*” (Dunbar, Barrett, & Lycett, 2007; O’Gorman, Wilson, & Miller; 2005; Puccio, 2017), a tendency to comply with established norms and behaviors.

Here, social norms broadly refer to representative or typical behavioral patterns and rules of behavior in a human group (Sumner, 1911), often supported by legal or other sanctions. In this liberal conception of norms, these can be seen as the standard (e.g., descriptive) or ideal (i.e., prescriptive) behaviors and worldviews of groups (Ehrlich & Levin, 2005; Schultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007). Yet, through the regulation of individual behavioral patterns, social norms achieve basic functions among social species, and their transgression has consequences for group members. It would be from this deviance that the risks associated with creativity would arise on the evolutionary level.

Among the functions of social norms, as a form of socially transmitted knowledge, we find that these rules may be the result of an evolved strategy designed to avoid the costs of individual learning (O’Gorman et al., 2005). For instance, socially learned knowledge about environmental threats are acquired quickly and directly encoded in long term memory from an early age (Barrett & Broesch, 2012). Social norms are hypothesized to play a key role in cultural evolution, as being shaped by cultural selection (i.e., of behaviors that promote fitness) and allowing for quick dissemination among a population for each new generation (Ehrlich & Levin, 2005; Henrich & McElreath, 2003). Also, if successful behaviors tend to be generalized to the group level, then adoption of generalized behaviors should lead to the acquisition of

beneficial behaviors (Boyd & Richerson, 1985).

In addition, conformity to social norms may reduce individuals' risks of errors when sampling prevalent beneficial behaviors (Boyd & Richerson, 2005), and individuals increasingly display conformist tendencies as task importance (i.e., survival stakes) increases (Baron, Vandello, & Brunsman, 1996; see also pathogen-avoidance mechanisms including conformism; Wu & Chang, 2012). In a nutshell, norms provide a "stickiness" (Kuper, 1999) or viscosity that can help maintain adaptive behavior and delay detrimental changes, but which can also inhibit the introduction and spreading of beneficial ones (Ehrlich & Levin, 2005). Consequently, if conformist behaviors favor the adoption of beneficial behaviors and minimizes the risk of adoption of detrimental ones, and if creativity involves deviating from established social norms, then it seems coherent to consider that creativity can increase the risk of errors and of adopting less effective – even dangerous – behaviors (i.e., detrimental innovations). In particular, threat to the survival of the creative individuals may come both from an error as to the effectiveness of the creation, as well as from an unforeseen side effects of their discovery. Here, innovation may be detrimental to the individual's physical integrity (e.g., Marie Curie died of a pernicious anemia caused by her prolonged exposure to radiation). Accordingly, it comes as no surprise that uncertainty and potential risk to individual and community health have been identified as key factors that shape social acceptability of innovations (e.g., Bearth & Siegrist, 2016; Flynn, 2007; Lo Monaco & Bonetto, 2018; Ronteltap, Van Trijp, Renes, & Frewer, 2007).

Another important aspect of social norms is that of conformity promotes smooth social interactions through cooperation and signal predictability of the conformist's behavior (Boyd & Richerson, 1985; Bugental, 2000; Puccio, 2017; Tomasello, 2014; Tooby & Cosmides, 1992), which is particularly important in social species as human beings (see Decety, Pape, & Workman, 2018; Tomasello, 2014). These norms have been observed in many animal societies, and have been found to regulate numerous activities (playing, grooming, mating; Cummins, 2005). Moreover, if compliance to norms may allow to gain social valorization, violation leads deviant individuals to be punished through social sanctions such as negative judgments, rejection, or ostracism (Bendor & Swistak, 2001; Hogg & Reid, 2006; Lapinski & Rimal, 2005; MacDonald & Leary, 2005; Panchanathan & Boyd, 2004; Rimal & Real, 2003; Tomasello, 2014; see Hall, 1964 for an example among non-human primates). This is especially true among humans since adopting certain behaviors is required to be considered part of the group (Boyd & Richerson, 1987; Fitch, 2000; Sosis, 2003; O'Gorman et al., 2005). This last point is consistent with recent research showing that creativity is associated with high likelihood of engaging in risky behaviors in the social domain (Tyagi et al., 2017). It is also in line with Sternberg's (1997) idea of "sensible" risk taking in creativity, that the risk of being different (and therefore rejected as deviant) is more important in creativity than risks directly endangering one's physical integrity or life. Thus, presenting a creative idea or innovation to the group (e.g., a technical invention, a new artwork, a collection of poems) involves a high degree of social risk, since there is always some uncertainty associated with the evaluation and potential approval by this group. Finally, this point is consistent with the observation of many cases of ostracism and social exclusion of creative youths in schools, or employees in their companies (Cramond, 2005; Richards, 2010).

It is therefore crucial for individuals to respect social norms since ostracism can mean death due to predation, starvation (Cummins, 2005), lack of access to the resources resulting from cooperation between the members of the group (Gilbert, 1992; MacDonald & Leary, 2005; MacLean, 1993; Whiten & Byrne, 1989) or direct physical assault (e.g., hate crimes). Indeed, inclusion in social groups has been a key to survival for human species (see Adam-Troian, Bonetto, Varet, Arciszewski, & Dezechache, 2020). Moreover, social exclusion experienced by modern humans is processed as a more basic and severe threat to one's safety, in the same way other primitive threats are processed (e.g., snakes; Öhman & Mineka, 2001). Incidentally, it has been found that

social exclusion is experienced as painful because reactions to rejection and ostracism are mediated by aspects of the physical pain system (MacDonald & Leary, 2005). Thus, from an evolutionary perspective, creativity, because of the deviance it involves, may imply a danger to the survival of the creative individuals.

As we said previously, social animals – among which human beings – who formed strong relationships and were well integrated into group living were most likely to survive. They are also more likely to reproduce and raise offspring to reproductive age (Baumeister & Leary, 1995; Kurzban & Leary, 2001; Silk et al., 2009). In other words, being socially excluded was often equivalent to death and a synonym of drastic decrease in the probability of reproduction, and therefore of transmission of genes. Group affiliation seems to yield adaptive value and to promote reproductive fitness among human beings through access to a mating pool (Adam-Troian, Bonetto, Varet, Arciszewski, & Dezechache, 2020). Thus, deviance-induced ostracism due to creative behaviors also constitutes a threat to the reproduction of the individual who adopts this behavior. Interestingly, and in addition to these potential disadvantages for survival and reproduction, creativity would be associated with a vulnerability to certain disorders. Social exclusion and ostracism are important factors in the etiology of health issues (Haslam, Jetten, Cruwys, Dingle, & Haslam, 2018; Haslam, McMahon, et al., 2018). These health issues can be considered as supplementary factors impeding the survival and reproduction of creative individuals.

The potential benefits and disadvantages linked to creative behaviors are summarized in Table 1.

3. Research perspectives

The introduction of the paradox of creativity into the study of creativity raises several research perspectives. For instance, previous research showed that everyday creativity, and *a fortiori* eminent creativity (i.e., displays of creativity that have an important impact on others; Hennessey & Amabile, 2010), are particularly rare phenomena (e.g., Hennessey & Amabile, 2010; Karwowski, Lebuda, Szumski, & Firkowska-Mankiewicz, 2017). This rarity is often explained by the fact that introducing novelty into daily life can have short-term cognitive and emotional costs that individuals try to avoid (e.g., Siegler & Shipley, 1995; Tamir, 2005). In this regard, Tamir (2005) showed that novelty in individuals' behaviors tends to decrease their ability to adapt effectively to a specific situation, resulting in negative emotions. In addition to these explanations, anticipating the potential risks induced by creative behaviors (potential threats of harmful creations, social sanctions) could play a role in (explicitly and/or implicitly) the inhibition of creative behaviors and in the cognitive and emotional costs of novelty. This kind of inhibition has been highlighted among children in middle childhood (Kohlberg, 1987; Runco, 1999a, 2007; Russ & Fiorelli, 2010). We therefore propose to generalize this inhibition mechanism beyond this specific stage of human development. Further research should therefore investigate the role of social regulation of creative behavior (and the anticipation of others' negative judgments) in the scarcity of creative behaviors. If such a role is highlighted in future research, it will become important to consider the factors that influence the individual's decision

Table 1

Summary of potential benefits and disadvantages linked to creative behaviors in terms of survival and reproduction.

	Benefits	Disadvantages
Survival	Problem-solving through beneficial creations (applied forms of creativity)	Potential danger of detrimental creations for the creative individual Ostracism-induced health issues
Mating	Mate attraction Signal of one's fitness (ornamental forms of creativity)	Ostracism reducing reproductive fitness Ostracism-induced health issues reducing reproductive fitness

to overcome potential risks due to creativity in order to adopt creative behaviors. Traits such as the individual's need to belong (Baumeister & Leary, 1995; Pickett, Gardner, & Knowles, 2004; see Gabora & Tseng, 2017 for a similar hypothesis), need for cognition (Cacioppo & Petty, 1982) or openness to experience (McCrae, 1987) could be involved.

As we have seen, certain norms help to regulate the expression of creativity in individuals in order to reduce the risks associated with creative behaviors regarding survival and reproduction. However, social norms play other roles in the display of creativity. Indeed, some studies have reported a positive relationship between norms and creativity. Some social norms would establish expectations of preferred creative behaviors (Adarves-Yorno, Postmes, & Haslam, 2007; Carmeli & Schaubroeck, 2007). It would be especially the case for individualistic norms (e.g., Walton & Kimmelman, 2012), risk-taking norms (Shin & Eom, 2014), or cooperative norms (Kim & Shin, 2015). Thus, social structures or communities displaying such specific norms could respond differently to the deviance induced by creative behaviors. Further research should investigate whether the different consequences of such a deviance would be impacted by characteristics of the environment. In addition, as we said previously, different levels of creativity can be distinguished (e.g., everyday creativity, eminent creativity; see Hennessey & Amabile, 2010). If the paradox of creativity is proposed to be general, it could be exacerbated in the case of eminent creativity. Indeed, it can be hypothesized that, to be defined as eminent creativity, the deviation to norms must be particularly important, or related to norms that are particularly important to the community or domain (Adarves-Yorno et al., 2007). Consequently, the more eminent the creativity, the greater the risks for the creative individual. Moreover, to be recognized as creative, individuals need social support, to be at the center of a relevant social network, and aligned with relevant standards and norms (Csikszentmihalyi, 1999; Gronum, Verreynne, & Kastelle, 2012; Haslam et al., 2013; John-Steiner, 2000). Finally, some studies indicate that innovative behaviors can respect certain normative boundaries (e.g., Adarves-Yorno et al., 2007). Consequently, the role of social norms needs to be clarified, in particular through the study of the factors that could explain, in a given context, which norms must be violated and which norms must be complied with in order to be creative. The question of whether creativity is domain specific or domain general is a key issue in the field of creativity (e.g., Baer, 2010; Plucker, 1998, Plucker & Beghetto, 2004; Qian et al., 2019), and we can hypothesize that the paradox described here applies to creativity, whether general or domain-specific. Indeed, both possibilities include novelty, that is a deviation from norms, and therefore potential negative consequences due to this deviation. Nevertheless, consideration of the domain in which the creative behavior takes place can provide information on the type of norms violated (societal norms vs. norms specific to a given domain and therefore a given community). In addition, some authors also proposed different dimensions or aspects of creativity. For instance, Kandler et al. (2016) distinguished two dimensions of creativity, namely perceived creativity (reflecting typical creative thinking and behavior) and creative test performance (or tested figural creativity, reflecting maximum task-related creative performance). They found that perceived creativity was mainly associated with personality traits (openness to experience and extraversion) while creative test performance was mainly linked with cognitive abilities. They also found that the former was more determined by genetic factors than the latter (see also De Manzano & Ullén, 2018). However, both aspects lead to creative behaviors involving a departure from established social norms. We can thus hypothesize that the paradox of creativity applies to creativity no matter what its predictors or associations with other individual characteristics are. This should especially be true since creativity – in any case – involves a deviation from social norms, hence potential detrimental consequences.

The paradox of creativity can also contribute to recent debates about the definition of creativity (see Harrington, 2018; Weisberg, 2015; 2018). Indeed, the “standard definition” of creativity proposes that a

creative product is novel and valuable (i.e., effective, useful, appropriate; Runco & Jaeger, 2012; see Hennessey & Amabile, 2010). Yet, the paradox of creativity describes the potential risks associated with creative behaviors for the creative individual (e.g., linked to social exclusion). These risks could be seen as nuancing the value of the productions resulting from these creative behaviors. The paradox of creativity could thus contribute to the reflections about the definition of this value in the field of creativity, through the consideration of the potential detrimental consequences of creative behaviors described here. It could also be relevant to discussions about the usefulness of the dimension of value for defining creativity (Weisberg, 2015, 2018).

With a completely different focus, the paradox of creativity could shed light on contrasting results in the literature. Notably, many studies have focused on the relationship between creativity and mental illness and various pathologies such as schizophrenia, depression or autism (e.g., Canitano & Pallagrosi, 2017; Kinney, Richards, Loring, LeBlanc, & Zimbalist, 2001; Silvia & Kaufman, 2010; Snyder, 2004). These studies present contrasting results that led Silvia and Kaufman (2010, p.391) to raise the difficulty of answering the question “*Is creativity related to mental illness?*”. Yet, the paradox could help to explain some of these results. Indeed, creativity could be particularly associated with pathologies involving social impairment and disinterest in socialization. This social impairment could bring individuals to an indifference towards the potential social sanctions induced by creative behaviors, which could support the risk-taking necessary for such behaviors.

4. Conclusion

Creativity therefore involves by definition a deviation from established social norms, and this deviation entails negative consequences for the (deviant) creative individual. Thus, the paradox described here would be inherent to creativity. It would therefore be applicable not only to modern human beings, but also to their ancestors, since those ancestors manifested a creative mind.

The paradox of creativity can be included in the broader framework of the so-called paradox of viscosity (we previously tackled the question of the viscosity of norms; see Ehrlich & Levin, 2005). The paradox of viscosity is considered as “one of the central problems in evolutionary theory” (Ehrlich & Levin, 2005). It is based on the fact that evolving organisms must balance their need to change in response to the variations in the environment against their need to maintain a proper functioning. The paradox of viscosity thus refers to the necessary compromise between stability and exploration (Ehrlich & Levin, 2005). The paradox of creativity can be considered as an expression of this broader necessity to balance between conservatism and novelty. If the former is synonym of security, the latter is synonym of uncertainty, since the innovation can be beneficial and/or detrimental for both survival and reproduction.

Creativity seems to yield survival and reproductive benefits (Feist, 2001, 2007, pp. 15–30; Gabora & Kaufman, 2010). However, to be creative, individuals often have to violate social norms in order to promote change. So far, this deviance induced by creative behaviors had not been seen as an adaptive disadvantage for creative individuals. This deviance entails negative consequences as social exclusion or ostracism, which are detrimental for both survival (e.g., reduced access to resources emerging from cooperation within the group) and reproduction (reduced reproductive fitness). Thus, the adaptive benefits yielded by creativity have to be nuanced by these disadvantages.

This kind of paradox is not a unique case. For instance, the omnivore's paradox (Fischler, 1980, 1988; Lo Monaco & Bonetto, 2018; Rozin, 1976) describes how the adaptive benefits of omnivorousness (omnivores have the ability to thrive on various foodstuffs and diets, and so are able to adapt to changes in the environment) must be balanced by the danger induced by the search for new foodstuffs (any new unknown food is a potential danger for survival). It is worth noting that, as for creative behaviors, social norms play a protective role by helping to

socially regulate individuals' food choices (Fischler, 1980; 1988). More related to creativity, we also observe regarding openness to experience (a trait closely related to creativity; DeYoung, Grazioplene, & Peterson, 2012; McCrae, 1987) a "fitness cliff" (DeYoung et al., 2012; Nesse, 2004; Nettle & Clegg, 2006). According to this one, the relationship between openness and fitness would imply taking into account negative consequences of this openness such as apophenia (the perception of illusory patterns or causal connections).

Given the potential evolutionary disadvantages associated with creative behaviors, one may wonder why human beings persist in such behaviors. Certainly because, when properly regulated through social norms, the huge benefits of these behaviors outweigh these disadvantages. The consideration of the paradox of creativity thus allows to obtain a finer-grained vision of the adaptive reasons why creativity has been maintained within the human species, why it has evolved, and is collectively regulated.

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