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Embodiment, evolution, and social cognition: An integrative framework

MICHAEL P. KASCHAK* AND JON K. MANER

Department of Psychology, Florida State University, USA

Abstract

This paper integrates concepts from evolutionary and embodied approaches to psychology to generate a theoretical framework for understanding social cognition. We begin with the claim that cognition evolved to facilitate the ability to plan and execute action in the world. This evolution was shaped by the adaptive challenges faced by humans throughout their evolutionary history (e.g., self protection, mate selection, navigating status hierarchies, building social coalitions). We discuss how several elements of the embodied cognitive system (perception–action links, the perception of projectable and non-projectable properties of the environment, and the ability to generate mental simulations) have been shaped by evolution, and how these elements of the cognitive system ground our understanding of social cognition. We also point to areas where our framework can lead to novel directions for research. Copyright © 2009 John Wiley & Sons, Ltd.

Why do some living things have nervous systems and others not? The answer lies not in the complexity of the organism—trees and humans are both complex organisms, but only humans have a nervous system. Rather, the answer lies, at least in part, in the organism's need for locomotion (Glenberg, Jaworski, & Rischal, 2007). Organisms that need to move have nervous systems because those systems provide a way to coordinate the influx of perceptual information from the environment with the organism's own movements. This observation serves as the starting point for the embodied approach to cognition: Nervous systems, brains, and cognition are adaptations that evolved to allow organisms to successfully plan and execute action in the world (Glenberg, 1997). Large portions of the brain are devoted to systems of perception and action planning, and it is these systems that form the basis not only for cognitive abilities such as planning, categorization, and language comprehension (see Barsalou, 1999, 2008; Fischer & Zwaan, 2008; Glenberg, 1997, for reviews) but also for social cognitive processes such as person perception and social judgment (e.g., Ackerman et al., 2006; Ferguson & Bargh, 2004; Keysers & Perett, 2004; Shah & Kruglanski, 2003). Our ability to think and comprehend the world around us is grounded in the same neural systems that support our ability to act.

The purpose of this paper is to integrate an embodied view of cognition with insights from evolutionary psychology, and to describe the implications of this integration for social cognition—the way we perceive and think about other people. An evolutionary perspective not only implies that the human nervous system evolved so as to coordinate action *vis a vis* events in the environment but also helps identify specific ways in which recurrent interactions between humans and their environments (both physical and social) have shaped the structure of cognition. From an evolutionary perspective, the mind consists of adaptations—mechanisms passed down over thousands of generations that arose as a consequence of the recurrent social and physical challenges ultimately associated with reproductive success (Buss & Schmitt, 1993; Cosmides & Tooby, 1992; Daly & Wilson, 1987; Gangestad & Simpson, 2000; Kenrick & Keefe, 1992; Pinker, 2002). Many of these challenges are inherently social, involving domains such as mating, friendship, and social exchange. When integrated with an evolutionary perspective, an embodied approach provides a content-rich theoretical framework for understanding the content, processes, and functions of social cognition.

*Correspondence to: Michael P. Kaschak, Department of Psychology, Florida State University, Tallahassee, FL 32306, USA.
E-mail: kaschak@psy.fsu.edu

There is quite a bit of agreement regarding the adaptive challenges that humans have faced over evolutionary time (e.g., Bugental, 2000; Kenrick, Maner, Li, Butner, Becker, & Schaller, 2002). As with other sexually reproducing species, human evolution has been driven by differential reproductive success—some members of the species have been more successful than others at reproducing and passing their genes onto subsequent generations. Although the *sine qua non* of reproductive success is success in mating, successful reproduction involves a diverse array of challenges, including protecting oneself from predators and other forms of physical harm, avoiding contagious diseases, forming and maintaining social alliances, navigating status hierarchies, caring for one's offspring, and so on (Kenrick, Li, & Butner, 2003; Kenrick et al., 2002). Evolutionary psychology provides an overarching conceptual structure that delineates the domains within which embodied cognitive processes are likely to operate. As discussed by Cosmides and Tooby (2005), domains can be thought of as “a set of represented inputs, contents, objects, outcomes, or actions that a functionally specialized set of evaluative procedures was designed by evolution to act over” (p. 48). Kenrick et al. (2002) provided a framework for defining a basic set of evolutionary challenge domains (see Table 1). These domains include (a) self-protection, (b) social affiliation, (c) mating, and (d) status/power. There is evidence that many of the basic adaptive problems faced by humans throughout evolutionary history can be distilled into these domains. The content of embodied-evolutionary approaches to cognition, therefore, can be meaningfully derived from this framework.

EMBODIMENT

The embodied approach to cognition implies that brains and nervous systems evolved in service of allowing organisms to successfully plan and execute action in the world (Glenberg, 1997). Cognition is shaped by a dynamic interplay among the nature of one's nervous system, the nature of the environment in which one lives, and the manner in which one's body can move in that environment. The backbone of cognition is the perception–action contingencies that develop as the organism acts in the world—when the organism takes action, changes in the input to the perceptual system occur, which in turn trigger further action (see O'Regan & Noe, 2001, for an extensive treatment of a sensorimotor-contingency approach to vision in humans).

From the perspective of biological evolution, human embodied cognition reflects the development from simple perception–action systems in lower organisms to more complex cognitive systems that incorporate the ability to generate perception–action simulations. The most primitive nervous systems function as basic perception–action loops. Such nervous systems respond to a limited range of input from the environment, and allow organisms to execute basic actions in response. These systems are quite simple, but surprisingly powerful in terms of generating adaptive and flexible behavior (Brooks, 1999). Those simple nervous systems evolved into increasingly complex brains, culminating in the development of the neocortex in mammals and the prefrontal cortex in primates. These complex nervous systems not only involve fundamental links between the systems involved in perception and action planning but also incorporate more complex cognitive processes such as perceptual simulation, logical reasoning, and conscious thought.

Table 1. Fundamental social motives and their embodiment

Social domain	Adaptive challenges	Embodied social cognitive processes	Adaptive behaviors
Self-protection	Avoiding threat from other people, predators, natural hazards	Rapid & automatic attention to evolutionarily relevant threat (e.g., angry faces, snakes, spiders)	Avoidance; fight or flight; tonic immobility (behavioral freezing)
Social affiliation	Gaining acceptance & avoiding exclusion; reaping benefits from social exchange; helping others while minimizing costs to self	Vigilance to sources of social rejection; identifying and representing level of kinship with others	Exchanging resources based on level of kinship and history of reciprocity; empathy-based helping with kin but not strangers
Mating	Identifying and selecting suitable mating partners; protecting relationships from rivals	Attention to signs of physical attractiveness; vigilance to attractive rivals	Choosing partners displaying signs of high genetic fitness; mate-guarding
Status/power	Gaining high social status & power; avoiding conflict with high status group members	Cognitive representation of hierarchical relationships	Social approach and disinhibition; deference when in a subordinate position

The relationship between perception and action in cognition is famously represented in Gibson's (1979) notion of *affordances*. Affordances are possibilities for interaction that are perceived in one's surrounding environment. The nature of the affordances that are perceived depends on the type of body the organism has, in concert with the nature of the present environment. For humans, objects such as cups and books may afford grasping and objects such as chairs and tree stumps may afford sitting. For organisms with different sorts of bodies (e.g., cats), chairs and tree stumps may still afford sitting, but cups and books do not afford grasping. Gibson (1979) argued that the perception of the environment involves the direct perception of affordances: One does not perceive cups and books so much as one perceives graspability, liftability, and so on. Tucker and Ellis (1998) and Bub, Masson, and Cree (2008) present evidence for this claim, showing that viewing pictures of an object or hearing the object's name activates the motor programs necessary to interact with the seen or named object.

Because humans are highly social creatures, much of our interaction with the environment involves interactions with other people. As such, the links between perceiving affordances and acting on those affordances have particular implications for understanding social cognition (McArthur & Baron, 1983). Other people can both provide important social opportunities and pose important social threats, and thus other people reflect important affordances of the environment. The cognitive system is designed not only to readily perceive social opportunities and threats when they exist (e.g., Maner et al., 2005) but also to facilitate appropriate behavioral responses (Maner, DeWall, Baumeister, & Schaller, 2007). Embodied perception–action systems, then, are the basis for virtually all forms of human social interaction. Information about the kinds of opportunities and threats afforded by other people are manifest in the most basic levels of our perception–action systems, allowing us to adaptively and flexibly coordinate our social behavior.

One illustrative example pertains to the embodiment of a particular social concept: Power. Powerful individuals have the capacity to control or punish others, but they tend not to be susceptible to punishment from other people. This disproportionate exposure to rewards versus punishments has played an important role in the evolution of many hominid species (de Waal, 1982). Consequently, nervous systems have evolved so as to regulate social behavior based on an organism's position within its hierarchy (e.g., Barinaga, 1996; Schultheiss et al., 2005). Many species have evolved such that those low in the pecking order behave in a submissive and deferential fashion, with the aim of avoiding potentially dangerous conflicts with more dominant individuals (e.g., Barkow, 1975). In contrast, those with power tend to become more socially engaged and action-oriented, thus reaping the benefits of their high social status (e.g., Galinsky et al., 2003; Keltner et al., 2003).

The concept of power—and its relation to action—is embodied within the architecture of the human mind. Studies by Schubert (2004, 2005) have shown that power is symbolically represented in the cognitive system such that power is inextricably connected with verticality, and with motor activity typically associated with exercising power (e.g., making a fist). In the case of making a fist, Schubert (2004) showed that performing this action produced different effects for men and women. For men, making a fist increased desire for power and elicited positive judgments of an assertive social target, whereas for women it decreased desire for power and elicited negative social judgments. This sex difference is consistent not only with cultural norms that encourage status and bodily influence more for men than for women but also with sex differences in evolutionary biology, as males of many species are more inclined than females to aggress and to assert their dominance over one another (Wilson & Daly, 1985). Data from our own lab suggest that the concept of power is connected to basic stages of motor planning: Priming the concept of power facilitated the planning of simple motor responses—reaching one's hand out toward the environment—that reflect behavioral activation (Maner, Kaschak & Jones, in press). These studies demonstrate that social power is embodied at fundamental levels of perception and action.

PROJECTABLE VERSUS NON-PROJECTABLE PROPERTIES

It is useful to distinguish between two types of perceptual properties that govern behavior: *Projectable* and *non-projectable* properties (e.g., Epstein, 1993; Glenberg, 1997). Projectable properties are those that are immediately present in the objective features of the stimulus and are thus directly available for processing by the perceptual system (Epstein, 1993). Such properties include, among other things, the spatial layout of the environment, the shape of objects, and motion. Non-projectable properties of the environment are those that are not immediately available in the stimulus input but instead require additional mental operations to be ascertained. Non-projectable properties include information about

ownership (e.g., I know that this book belongs to you, although there is nothing in the visible stimulus to tell me that). Non-projectable properties of the social environment are acquired through a history of social interaction and, in the case of humans, through teaching and learning (Tomasello, 1999).

In organisms with simple nervous systems and limited capacity for learning and memory, behavior is governed by projectable properties. Glenberg (1997) refers to this as being “clamped” to the environment, as the organism’s behavior is almost entirely beholden to the features of the current environment. As brains and nervous systems become more complex, the ability to abstract and remember information about one’s environment increases, and so too does the possibility that one’s behavior can be controlled by non-projectable properties of the environment (i.e., by knowledge and goals that cannot be directly abstracted from the perceptual information in the current environment).

It can be difficult to draw a sharp and principled distinction between projectable and non-projectable properties (Epstein, 1993). The Gibsonian tradition in perception research, for example, has tried to demonstrate that many seemingly non-projectable properties of the environment actually turn out to be projectable (Gibson, 1966; Warren, 1984). This conceptualization fits with an evolutionary, embodied approach to social cognition. Many non-projectable elements of the environment may have had strong survival and reproduction implications across the history of the human species, thus leading to the evolution of systems designed to detect the relevant affordances of those entities. For example, whereas the danger associated with spiders and snakes would seem to be non-projectable, humans evolved perceptual systems designed to detect such danger (Öhman & Mineka, 2001). That is, evolution has built categories of *a priori* information into the cognitive system, in this case changing the danger of spiders and snakes from a non-projectable property of the environment to a projectable one. An important agenda for research should be to determine just which elements of behavior are driven by projectable and non-projectable properties of the social environment. Gaining clarity on this issue is central to understanding the nature of the processing mechanisms involved in various forms of social cognition.

As ancestral humans faced challenges posed by their physical and social environments, natural and sexual selection led to the development of cognitive mechanisms that facilitated the preferential processing of adaptively relevant information. Over evolutionary time, these mechanisms became attuned specifically to particular categories of information (affordances), and consequently allowed for the direct perception of that information (Barrett & Kurzban, 2006). Facial expressions of emotion provide an illustrative example. A rich literature dating back to Darwin demonstrates that angry faces connote aggressive intent. In turn, research indicates that people are especially quick to perceive angry faces at a low level of processing, and to link that perception directly and automatically to behavioral and physiological reactions associated with fight or flight (e.g., Esteves, Dimberg, & Öhman, 1994). People do not need to learn the meaning of an angry face (Ekman & Friesen, 1971); its meaning is communicated directly by the configuration of the face, and is detected directly by the mental “fear module” (Öhman & Mineka, 2001). Conversely, the meaning of a smiling face—benevolence and a desire to affiliate—is also embodied *a priori* within the cognitive system (e.g., Parkinson, 2005). Even early in childhood, humans use smiles as a way of forming new social bonds (Jones & Raag, 1989; Schneider & Josephs, 1991).

As another example, consider perceptions of physical attractiveness. Although colloquial wisdom sometimes suggests that “beauty is in the eye of the beholder,” an evolutionary perspective implies that, in fact, much of what makes a person physically attractive reflects projectable features within a person’s body and face (Penton-Voak et al., 1999). A person’s level of attractiveness, for example, can signal their genetic quality (e.g., Gangestad & Simpson, 2000). Additionally, among women, the placement of fat around particular areas of the body can signal her age and level of fertility (Singh, 1993). Among men, the presence of testosterone markers (e.g., a square jaw) can signal their level of social dominance (Mazur & Booth, 1998). Each of these characteristics—symmetry, fat distribution, and endocrinological markers—is intimately tied to judgments of physical beauty, and each directly signals information about the person’s reproductively relevant qualities.

The direct perception of these qualities appears to play an integral part in mating-related cognition. Studies show, for example, that such qualities are perceived within the first few hundred milliseconds of stimulus perception (Maner, Gailliot, & DeWall, 2007) and when people are interested in finding a mate, attention becomes automatically attuned to physical features underlying judgments of attractiveness (Maner, Gailliot, Rouby, & Miller, 2007). Moreover, consistent with an embodied approach to cognition, being attracted to a potential mate co-opts portions of the motor system responsible for producing approach-oriented actions. Hofmann, Friese, and Gschwendner (in press) presented men with images of attractive women (or control images) and instructed them to either pull or push a lever. Men who viewed the images of attractive women were faster at pulling the lever, and this was particularly true for men who were especially

inclined to stare at the attractive images (reflecting greater attraction). Pulling a lever in such a context has been shown to reflect approach-oriented behavior—as in pulling the stimulus image closer to the perceiver. Thus, the direct perception of physical attractiveness cues may activate motor systems responsible for producing approach-oriented action—the very type of action needed to initiate romantic courtship.

In addition to being shaped by the direct perception of projectable properties, human perception–action systems are also influenced by non-projectable properties. The ability of non-projectable properties to affect behavior is central to the development of social structure and to social cognition. Tomasello (1999) argues that the evolutionary piece separating humans from other primates (and from all other species) is the ability to read the intentions of others and to see others as beings like oneself. Such an understanding begins with our ability to follow the gaze of others and both to understand that they are attending to something and to jointly attend to the same element of the environment. That is, a central component of the development of social cognition is being able to perceive the non-projectable properties of faces: The face and eyes are not simply oriented in a given direction (information given by projectable properties of the environment), but are *looking at* something (Adams & Kleck, 2003). Tomasello (2003) suggests that this sort of social perception is key to many aspects of social life, such as theory of mind, and the development of language.

The perception of non-projectable properties of the social environment—in concert with the perception of projectable properties—plays a central role in several domains of social cognition. For example, the perception of ownership—a non-projectable property—is essential for social exchange, which plays a key role the development and maintenance of social structure (Fiske, 1992). As another example, facial expressions may yield direct perception of socially relevant information, but non-projectable elements of the circumstance in which a facial expression is perceived provide an important source of information when deciding what action to take. Should one perceive anger in a face, the direction of that person's gaze (along with one's recent history with that individual) likely suggests whether that anger is directed toward you or toward someone else (Adams et al., 2003). Similarly, non-projectable elements of the social context may influence the way an individual responds to physical attractiveness cues in others—an attractive member of the opposite sex is likely to elicit different reactions depending on whether that person is single versus already in a committed relationship.

The ability to perceive non-projectable properties is based in processes of learning and the capacity for learning is itself based on a set of evolutionary adaptations (Moore, 2004). Indeed, many specific psychological processes that are rooted in evolved mechanisms are still responsive to social learning histories (Kenrick et al., 2002). Rather than being “hardwired” to respond innately to specific stimuli, the human mind evolved to be especially adept at learning the non-projectable properties of stimuli that are relevant to evolutionarily relevant motives, and to implement adaptive responses when those properties are perceived. Research on fear provides an excellent example: There is no simple catalog of stimuli that innately arouse fear; rather, it appears that there is an evolved capacity to rapidly learn specific stimuli that are dangerous, and for those stimuli to thereafter arouse fear and other functionally relevant psychological responses (Öhman & Mineka, 2001). The fundamental evolutionary need for survival precipitates domain-specific psychological mechanisms that operate in necessary conjunction with general learning processes.

SIMULATION

Thus far, we have discussed the embodied view of cognition largely with respect to one's ability to spot affordances in the environment via projectable and non-projectable properties. There is one further element of the embodied cognitive systems of humans (and, perhaps other primates) that plays a key role in social cognition: The ability to take systems of perception and action-planning “off-line” so that *simulations* of things not in the present environment can take place (e.g., Glenberg, 1997; Barsalou, 1999, 2008). Particular brain states arise when something is perceived in the environment, or when action is taken in the environment, and organisms with complex cognitive systems have developed the ability to reinstate these brain states in the absence of the things that are perceived or the actions that are taken. Thus, one can co-opt the visual system to reinstate the brain states that arose when viewing a particular person or co-opt the motor system to reinstate the brain states that arose when reaching out to touch that person. On the embodied view, the ability to construct perception–action simulations of things that are not in the present environment forms the basis of people's ability to retrieve vivid memories from their lives (e.g., Dijkstra, Kaschak, & Zwaan, 2007), make plans (e.g., Glenberg, 1997),

think about abstract concepts (e.g., Barsalou, 1999), and comprehend language describing perceptions (e.g., Kaschak et al., 2005; Meteyard, Bahrami, & Vigliocco, 2007), actions (Glenberg & Kaschak, 2002; Zwaan & Taylor, 2006), and novel situations (e.g., Kaschak & Glenberg, 2000). As with the non-projectable properties of the environment discussed earlier, simulations are important to social cognition as they allow us to consider, and have our behavior controlled by, knowledge and goals that are not directly signaled by the current environment.

Simulation plays a key role in regulating social interaction. The ability to take another person's perspective for example, relies on the capacity for simulating the thoughts and feelings one would experience if one were in the situation the person is in. Perspective taking plays a key role in social cognition across a wide variety of social contexts including self-regulation (Ackerman, Goldstein, Shapiro, & Bargh, 2009), power (e.g., Gruenfeld, Inesi, Magee, & Galinsky, 2008), stereotyping (Galinsky, Wang, & Ku, 2008) and prosocial behavior (Batson, 1991). Within each of these contexts, the ability to simulate other people's thoughts and emotional experiences is linked with adaptive responses to evolutionarily relevant challenges (e.g., engaging in effective social exchange, navigating status hierarchies, caring for kin). Within the domain of prosocial behavior, for example, perspective-taking has been implicated as a key cause of altruistic behavior (e.g., Preston & de Waal, 2002). For example, put yourself in the shoes of a person who has just lost his job and his home and whose wife has asked him for a divorce. Simulating another person's experience in this way can give rise to empathy (Batson et al., 1997). Empathy serves as a basis through which people can understand the emotions, intentions, and goals of other people. Empathy for another person in need has been hypothesized to produce actions aimed at helping that person (see Batson, 1991).

The link between empathic simulation and prosocial behavior is shaped by adaptive evolutionary concerns. Research suggests that empathy and the ability to simulate another person's experiences are more likely to promote helping among kin members and close group members, than among strangers (Maner & Gailliot, 2007; Stürmer, Snyder, & Omoto, 2005). In the case of kin members, these findings are consistent with evolutionary theories of inclusive fitness (Hamilton, 1964), which suggest that empathy-based helping is most likely to occur within kin because such acts serve to benefit one's own genetic success. In the case of close group members, the findings are consistent with evolutionary theories of reciprocal altruism, which suggest that long-term reciprocal relationships can benefit all parties (Trivers, 1971). At the same time (and also consistent with an evolutionary approach), there is little evidence that empathy, or the ability to cognitively take another's perspective, promotes prosocial behavior among strangers (e.g., Maner & Gailliot, 2007).

THE ROLE OF MOTIVATION

Adaptive systems of perception and action are inextricably linked to the operation of fundamental adaptive motives. Motivational states lead organisms to prioritize particular goals, thereby helping them respond to the presence of particular opportunities or threat (Maner et al., 2005). Motives not only bring particular stimuli to the forefront of the perceptual field but also coordinate the perception of those stimuli with the execution of adaptive behavioral responses. Thus, motives serve as global organizing parameters that help coordinate patterns of perception, cognition, and action.

Because the stimulus value of things in the environment depends on the motivational state of the observer, motivational states have the capacity to change the affordance structure of the social world. If a person is motivated to make new friends, a stranger at a party may reflect an opportunity for social affiliation. In contrast, if one is feeling anxious and motivated to avoid social rejection, that same stranger may reflect a source of potential harm (Maner, DeWall, et al., 2007). Thus, depending on the motivational state of the observer, a stranger can afford positive social opportunities or salient social threats. This link between motivation and affordances has important implications for embodied perception and action. If motivated to avoid rejection, a stranger is likely to be perceived in a negative light—the perceiver may actually see that person as displaying a scowling facial expression. Conversely, if motivated to make a new friend, the very same face may be perceived as displaying a warm and inviting facial expression (Maner, DeWall, et al., 2007). These social perceptions, in turn, have been shown to promote prosocial and antisocial behavior responses. Moreover, whereas fear of rejection leads people to attend selectively to signs of social threat (angry faces) at early stages of visual perception (e.g., Buckner, Maner, & Schmidt, *in press*), being motivated to make new friends instead leads people to become perceptually attuned to smiling faces (DeWall, Maner, & Rouby, 2009). The embodied perception–action loop, then, is profoundly shaped by the perceiver's current motives.

As another example, consider the domain of mating. Different mating goals can dramatically shape the activation of perception–action systems designed to enhance reproductive success. When people are motivated to find a mating partner, they tend to exhibit perceptual attunements to highly attractive members of the opposite sex (Maner, Gailliot, Rouby, et al., 2007). When people are feeling jealous and motivated to protect a mate from potential rivals, however, attention becomes fixated on highly attractive members of one's own sex, rather than of the opposite sex. Indeed, the stimulus value of physical attractiveness is shaped by one's mating-related motives. Attractive individuals in the environment can be a source of great romantic opportunity or threat, depending on the sex of those people in concert with the perceiver's mating goals. These goals, and the perceptual attunements they evoke, have been shown to promote adaptive mating-related behaviors, such as mate selection on one hand, and mate guarding on the other (e.g., Buss & Schmitt, 1993; Buss & Shackelford, 1997). Indeed, the embodied cognitive system provides the means through which perception and action are coordinated dynamically. Responding to important social challenges requires attention to goal-relevant elements of the social world, and it appears that attention to goal-relevant aspects of the environment resides within embodied systems of perception and action planning.

CONCLUSION

Systems of perception and action planning form the basis of human cognition. As these systems evolved, fundamental motivations associated ultimately with successful reproduction shaped the development of cognitive structures tuned to specific adaptively relevant elements of the social environment. The evolved capability to perceive and respond to projectable properties of the environment plays a key role in many domains of social cognition. The cognitive system has also evolved the flexibility to allow one's social learning history to shape the perception of non-projectable properties of the environment. In addition, humans have developed the capacity to cognitively simulate events that are not present in the here-and-now. As we have described, the perception of projectable and non-projectable properties, in concert with the ability to generate psychological simulations, plays a foundational role in social cognition.

Our approach grounds social cognition in the union of two research traditions (evolutionary psychology and embodiment) that, despite having produced independent successes in many domains, have not heretofore been integrated in the psychological literature. Although, embodied approaches to cognition have provided a framework for understanding the operation of perception–action systems, these approaches have not tended to consider the specific social challenges that such systems may be designed to face. Conversely, evolutionary perspectives provide unique insight into the specific adaptive challenges the human mind is designed face, but have not tended to focus on the proximate psychological processes used to solve those challenges. The integration of these two perspectives provides a new, content-rich framework useful for understanding previous findings in social and cognitive psychology, as well as for producing new empirical work designed to illuminate the embodied nature of the adapted human mind.

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