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Music, Lyrics, and Dangerous Things

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In the traditional, information-processing model of cognition the human mind does well with lyrics, but it just can't dance. Real life is like a musical, rich with elaborate sets, costumes, music, and movement as well as dialogue, and impossible to appreciate fully just by reading the script. That's not to say that words are unimportant: They carry a huge amount of information, and language is a defining feature of our species. Language is especially important to academics since our own histories and battles take place largely through print. But people are actors in the show, not just readers in a library, and our minds must serve this performance. Whereas the traditional approach to cognition was all about the lyrics, the embodied cognition approach turns on the video and sound to help us understand how people feel the beat in their social interactions.

As nicely articulated by Kaschak & Maner (2009) in the target article, the principle of embodied cognition is that nervous systems "evolved to allow organisms to successfully plan and execute action in the world" (p. 3). In other words, thinking is grounded in simulated physical experience, which informs our judgments and behaviors. The authors take a fresh approach in applying an evolutionary framework to the role of embodiment in social cognition, offering a rich basis for new research questions and hypotheses about how embodied cognition works. Our commentary explores three broad issues raised by the target article: (1) implications for the role of non-verbal communication in social cognition; (2) emotion as an important mechanism for embodied social cognition; and (3) the challenges of embodied cognition in an increasingly disembodied social world.

Getting in Step: Non-Verbal Communication and Social Cognition

Traditional social cognition paradigms emphasized lyrics and dialogue in our understanding of other people – information easily represented through words. In contrast, Kaschak and Maner's approach emphasizes the choreography of our physical interactions with the world. Even in social interaction, the most important information may be communicated non-verbally, through facial expressions, tone of voice, gaze direction, gestures, and so on (Knapp & Hall 2006). Words alone are often quite ambiguous. For example, the comment "nice outfit" can function as an insult, a compliment, or a flirtation depending on costume, choreography, and plot – what the target is actually wearing, how the speaker moves, and where the words occur in the sequence of nonverbal exchange between both parties. Another distinctive feature of Kaschak and Maner's evolutionary approach is that embodied cognition may involve different modules for comedies, tragedies, and histories – a.k.a. domain-specific processes that organize our patterns of response to particular kinds of adaptive challenge.

Taken together, these points call to mind a rich body of research on the non-verbal "dance" characterizing certain kinds of relationships. If Kaschak and Maner are correct, embodied social cognition may be especially well-articulated for interactions that reflect one of a small number of evolutionarily fundamental motives, such as self-protection, status-seeking, mate-seeking, and alliance formation (Kenrick, Li, & Butner, 2003; Kenrick & Shiota, 2008). Each of these plot types may have its own distinct choreography. In fact, there is evidence for rich non-verbal communication in precisely these contexts. With respect to self-protection, people

can easily decode others' facial and vocal expressions of fear and aggressive intent (Banse & Scherer, 1996; Becker, Kenrick, Neuberg, Blackwell, & Smith, 2007; Ekman, Friesen, O'Sullivan, Chan, Diacoyanni-Tarlatzis, Heider et al., 1987; Matsumoto, Keltner, Shiota, O'Sullivan, & Frank, 2008). People respond automatically to such signals, with emotional alarm systems reacting to others' fearful and angry expressions even before awareness of having seen them (e.g., Morris, Frith, Perrett, Rowland, Young, Calder, et al., 1996). In the status domain, dominance is communicated with expanded body posture, submissiveness with constricted posture and frequent smiling (e.g., Hall, Coats, & LeBeau, 2005; LaFrance et al., 2003; Tiedens & Fragale, 2003; Tracy & Robins). In the mate-seeking domain, non-verbal cues of sexual attraction have been documented for both sexes (e.g., Gonzaga, Keltner, Londahl, & Smith, 2001; Moore, 1985). In alliance formation, laughter can be used to express social support or embarrassment, as well as simple appreciation of humor (Provine, 2000).

Little of this communication takes place consciously, and the effects of nonverbal displays are rarely recognized by the interaction partners (e.g. Cheng & Chartrand, 2003). Thus, the mechanisms behind these elaborate processes remain something of a mystery. Embodied cognition offers an exciting framework for thinking about the mechanisms behind non-verbal communication. People may automatically simulate interaction partners' dance steps, thereby generating the corresponding internal state, which in turn is used to decode the partner's state. A rich body of evidence already documents people's rapid and often unconscious *actual* mimicry of each other's facial expressions of emotion (e.g., Dimberg, Thunberg, & Elmehed, 2000; Hess, Philippot, & Blairy, 1998) – a complex behavior that begins to emerge in infancy (Jones, 2007). In adults, subtle mimicry of expressions, gestures, and posture appears to facilitate affiliation (Chartrand & Bargh, 1999). The role in social cognition of *simulated* mimicry, and whether these processes are indeed more prominent in social interactions reflecting fundamental evolutionary motives (as Kaschak and Maner's perspective suggests), are exciting topics for future research.

Research on non-verbal communication also points to one limitation of current embodied cognition work. These dances are duets, not solos, so the meaning of each move depends on the context and sequence of expression. A scowl can elicit laughter, or a smile fear, depending on the relationship and on preceding events. Social interaction is smoother and more enjoyable when the parties' dominance signals are complementary (one dominant, one submissive) rather than competing (Tiedens & Fragale, 2003), and escalating dominance displays set the stage for conflict. In contrast, researchers studying embodied cognition tend to emphasize single movements, such as moving one's hand forward or backward. This allows for carefully controlled measurement, but seems to sacrifice much of the ecological validity promised by the broader theoretical perspective – a single step does not make a dance. Indeed, the interpretation of such gestures is often a bit contradictory and confusing. Maner and Kaschak note at one point that men viewing attractive women are faster at *pulling* a lever toward themselves, presumably a form of behavioral activation, whereas elsewhere *pushing* the lever is interpreted as a sign of behavioral activation. It is undoubtedly difficult to study movement sequences, and still more difficult to study them in an interactive context, but the promise of the embodied cognition approach will be best met by confronting these challenges.

Dangerous, Lovable, and Awe-Inspiring Things: The Role of Emotion in Embodied Social Cognition

Kaschak and Maner frame embodied cognition as an extension of primitive perception-action systems, elaborated by capacities for logical simulation and deliberate, conscious thought (p. 5). These capacities certainly offer one route to embodied social cognition, and like language may be among the defining abilities of our species. Ultimately, though, musicals make us *feel*, not think. Emotion processes shared with other mammals likely play a major role in

embodied social cognition, as well as the rational processes unique to humans. Like cognition, emotion is fundamentally in the service of preparing one for fitness-enhancing action (Cosmides & Tooby, 2000; Ekman, 1992; Frijda, 1986; James, 1884; Levenson, 1999), especially social interaction (Keltner, Haidt, & Shiota, 2006; Shiota, Campos, Keltner, & Hertenstein, 2004). This preparation involves sensory biases and motor response priming, but also includes autonomic nervous system responses that help prepare the body for appropriate action and contribute greatly to the phenomenology of emotion (Cacioppo, Berntson, Larsen, Poehlmann, & Ito, 2000). This visceral aspect of embodiment may be especially important for embodied cognition.

The distinction between logic and emotion as mediators of embodied cognition, and perhaps even the primacy of the latter, is suggested by Damasio's (1994) studies of patients with lesions to the ventromedial prefrontal cortex, a region of the brain important for decision-making. These patients are often able to describe the consequences of possible actions, as in a gambling task, suggesting that the logical aspects of mental simulation are intact. However, these patients show little evidence of the physiological arousal that non-patients show when contemplating a risky choice, and despite their explicit knowledge of the task's contingencies, the patients make some very bad decisions. It may be that the emotional aspects of simulation, especially those felt in the body, are at least as powerful in driving judgment as the consciously logical and deliberate aspects of simulation.

An example of the role emotional embodiment might play in social cognition comes from studies of empathy. Kaschak and Maner note that the ability to simulate others' emotions may be crucial in promoting adaptive responses to social situations (p. 14), citing the effects of cognitive perspective-taking on empathy and altruism (Batson, Sager, Garst, Kang, Rubchinsky, & Dawson, 1997; Preston & DeWaal, 2002). Empathic accuracy is also facilitated by the physical manifestation of another person's emotional experience and expression. For example, rapid mimicry of someone else's facial expression facilitates explicit knowledge of the target's emotional state (e.g., Hatfield, Cacioppo, & Rapson, 1998). Emotional simulation in the form of physiological "linkage" – when the perceiver's physiology covaries with a target's physiology over a period of time – also characterizes perceivers who are more accurate at tracking the target's felt emotions over time, even when the target is a stranger (Levenson & Ruef, 1992). The exact mechanisms behind these effects are still being explored by researchers, and require much further research (Hess et al., 1998; Moody, McIntosh, Mann, & Weissner, 2007). However, in the context of embodied social cognition these findings suggest that "seeing" someone else's point of view may be less meaningful than *feeling* their point of view.

Emotion may also play a central role in another process critical for complex embodied cognition – the process by which non-projectible stimulus properties become projectible. Kaschak and Maner note that evolution can produce an inclination toward inferring fitness-relevant non-projectible properties of objects on the basis of their observable characteristics. For example, although the danger of a snake's venom is not projected by any observable feature, humans have evolved a predisposed aversion to slithering, legless animals with flickering tongues (e.g., Öhman & Mineka, 2001). However, mammals also show a remarkable ability to learn new fear associations in a short period of time. There is increasing evidence that emotion contributes substantially to this conditioning. Within the brain, the amygdala becomes more active during distress, and this activation appears to help consolidate memory for events that just took place (e.g., Canli, Zhao, Brewer, Gabrieli, & Cahill 2000; Phelps, 2004). Visceral aspects of the stress response may be important in the emotional enhancement of memory as well. Cahill and colleagues (1994) found that participants given beta-blockers (which interfere with sympathetic nervous system effects on organs such as the heart, lungs, and sweat glands) failed

to show enhanced memory for the emotionally distressing parts of a story, unlike control participants.

Although these processes have been studied mostly in the context of frightening events, a broad range of emotional responses may facilitate memory consolidation, helping us learn the environmental cues predicting threats against us or opportunities to enhance our reproductive fitness. The extent to which this process generalizes beyond fear to other emotional responses, and whether the mechanisms differ somewhat depending on the type of emotion experienced, are subjects deserving continued research.

Out of Tune: Embodied Cognition in a Disembodied Social World

Evolved motivational systems were designed by selection to deal with recurrent problems faced by our ancestors. People still obsess over many of the same problems – finding friends, gaining status, protecting themselves from ill-intentioned strangers, finding mates, and caring for their children. However, the channels of communication are often narrowed in the modern world. Our brains often must make social decisions in a world with the sound and/or the video turned off. Email, for example, transmits only lyrics. Ironically, this produces an information-processing world that might delight a traditional cognitive psychologist, but it makes it hard to act naturally or be sure what another character in life's musical is feeling and doing. Cell phones turn on the sound, but are still quite impoverished compared to face-to-face interaction. Time delays and one-way-at-a-time transmission lead to stilted conversation, low sound fidelity distorts vocal properties that communicate emotion, and it's hard to hear what the other person says while walking down a crowded street - much less catch subtle irony that might have been communicated in a facial expression. The implications of this emotional impoverishment are discussed often by Communications scholars, but psychologists have paid less attention to the effects of telecommunication technologies on the process of social cognition and interaction. Kaschak and Maner's embodied social cognition approach offers a sound theoretical framework for developing hypotheses about these effects.

Conclusion

The marriage of evolutionary psychology and embodied cognition has the promise to be a fruitful one. Kaschak and Maner have raised a number of interesting theoretical questions, with the potential to move the field of social cognition in exciting directions.

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