

Take a Walk on the Cultural Side:
A Journey into Embodied Social Cognition

Bettinsoli Maria Laura¹, Suitner Caterina², Maass Anne²

¹New York University Abu Dhabi, Abu Dhabi

²University of Padova, Italy

Correspondence concerning this chapter should be addressed to Maria Laura
Bettinsoli (mlaurabettinsoli@gmail.com), New York University Abu Dhabi, PO Box
129177, Abu Dhabi, UAE

Abstract

According to current embodied cognition models, sensorimotor experiences play a critical role in cognition, including social cognition. Since our bodies are embedded in a socio-cultural context, it is likely that the link between bodily states and cognition are shaped and constrained by culture. Here we argue that culture affects embodied cognition through three distinct means: 1) the physical environment and the affordances it offers, 2) cultural values and conventions that encourage certain sensorimotor experiences while discouraging others (such as body postures of submission or pride, smile, hand-washing, and touch) and 3) cultural differences related to language, including metaphors and script direction. The present review is not meant to be exhaustive, but to offer selective insights into the paths through which diverse cultural environments shape embodied cognition. We also discuss possible future venues for research on cultural embodied cognition.

Key words: affordances, social-cognition, culture, cognitive processes, non-verbal behaviors, verbal behaviors, language, social communication

Take a Walk on the Cultural Side: A Journey into Embodied Social Cognition

“Cultural assumptions, values, and attitudes are not a conceptual overlay which we may or may not place upon experience as we choose. It would be more correct to say that all experience is cultural through and through, that we experience our “world” in such a way that our culture is already present in the very experience itself.”

Lakoff and Johnson (1980: 57)

Social psychologists have always assumed that cognition is situated and action-oriented and that the presence of others affects thoughts, feelings, and behaviors (Ross, Lepper, & Ward, 2010; Zajonc & Markus, 1984). Human beings vary in the way they use their body in relation to and with others and their bodies do not only reflect, but also determine, what is active in their mind at any particular time. Along this line, the growing field of the embodied cognition (Barsalou, 1999; Wilson, 2002) builds upon the general notion that bodily experiences and sensorimotor capabilities are integral parts of mental representations and cognitive processes. Several scholars have recognized the importance of the body and its involvement also in social interactions, with thoughts and feelings envisaged as closely linked to sensory experiences and bodily states (Barsalou, 2008; Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005; Spellman & Schnall, 2009; Zajonc & Markus, 1984).

Embodiment theory is commonly tested by experimentally inducing bodily experiences associated with a particular valence or psychological state, and to observe the mental representations that form as a consequence. For instance, people holding a pen between the teeth so as to activate the muscles involved in smiling tend to evaluate cartoons as funnier (Strack,

Martin, & Stepper, 1988). Importantly, even the mental representation of abstract concepts such as “success” has been shown to be affected by bodily states, often through metaphors involving the body such as “moving forward” (Robinson & Fetterman, 2015; for a theoretical review of the embodiment of abstract concepts see Borghi et al., 2017).

In this chapter we will examine the question whether and through which processes embodied cognition is moderated by culture. Culture is a slippery concept that includes both variations between and within nations. Here we adopt Hofstede’s broad definition of culture as “*the collective programming of the mind that distinguishes the members of one group or category of people from another*” (Hofstede, 2001, p. 9). We hypothesize that such “collective programming of the mind” occurs, in part, through an embodied process in which cultures facilitate or inhibit certain sensorimotor experiences which in turn channel mental processes.

While some theories (e.g., Izard, 1977; Izard & Abe, 2004; Zajonc, Murphy, & Inglehart, 1989) have explained bodily movement effects by innate physical structures, others have suggested that the association between sensorimotor experiences and concepts is learned and culturally-specific (e.g., Barsalou, 1999, 2008; Förster & Strack, 1996; Niedenthal, et al., 2005). There are various reasons to believe that embodied cognition is universal rather than culture specific. The most obvious reason is that human bodies, including their visual and motor systems, are very similar regardless of the physical and cultural environment they inhabit. Thus, embodied cognition may, to some extent, be interpreted as innate and universal (e.g., Wallbott & Scherer, 1986). Human bodies are also subject to common forces, such as gravity, and depend on common substances, such as oxygen, that determine to a large degree what actions bodies can perform. Thus, embodied cognition is subject to constraints that are common to all cultures.

Despite these universal features, one may argue that embodied cognition is moderated by culture and that people experience the body-cognition link in culture-specific ways (Wierzbicka, 1994, 1995). At the most general level, the body is not the ultimate grounding of experience, but the result of historical experiences and cultural practices (Merleau-Ponty, 2004). Before representing knowledge, we already embody it. Similarly, Soliman and Glenberg (2019, p. 217) define culture as “a repertoire of bodily modes of interaction” that lay the ground for culture-specific knowledge. Put ~~it~~ simply, body and cognition are always encultured, therefore there is no culture-free experience.

Despite the theoretical and practical relevance of a culture-specific approach to embodiment, this perspective has been largely neglected in the empirical literature. There is conspicuous evidence for cultural differences in nonverbal expressions (such as body postures, gestures or interpersonal distance), and for the link between bodily states and cognition. We also find a corpus of literature that argues for the influence of culture on cognitive processes, yet studies that specifically and simultaneously test the three elements in a unique paradigm (see Figure 1) are quite rare. We will here argue for the need of an integrative approach to cultural embodied cognition and speculate on the triangulation by inferring possible processes or effects to be tested in future studies.

Commentato [MOU]: Questa affermazione mi sembra un po' estrema. Se dicessimo qualcosa di un attimo più soft, per esempio: therefore it is hard to imagine experiences that are truly “culture-free”.

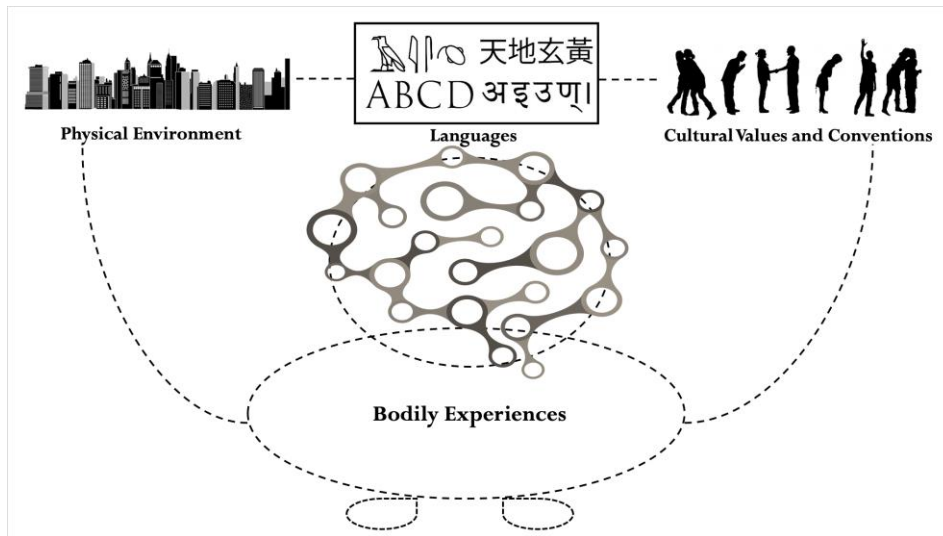


Figure 1: An integrated approach to cultural embodied cognition

We will argue here that there are at least three ways in which culture guides or restraints embodied cognition. The first concerns the *physical environment* created by each culture, in particular architecture, including the layout of cities, homes, institutional buildings and the like. The second concerns *social norms and conventions* that prescribe certain motor actions while discouraging others. Such norms may be very broad as in the case of interpersonal distance, touch, gaze or smiling considered appropriate in a given culture. Or they may allow or prohibit very specific behaviors such as “eating with one’s hand, fork or chopstick” or “stepping on books”. The third concerns specific features of *language*. For instance, our knowledge of abstract concepts is strictly linked to metaphorical language that varies across languages (Lakoff & Johnson, 1980). Similarly, writing systems exert a systematic influence on cognition through the repeated performance of specific visuo-motor actions. Although we are unable to provide a

comprehensive review of the literature, in this chapter we will illustrate each of these three realms through examples that provide empirical support for, or ~~are~~ at least are compatible with, the hypothesized process. We will close the chapter with a brief discussion of possible future research that could test the moderating function of culture in embodied cognition in more stringent ways.

The built environment

The close link between culture and the built environment has long been acknowledged (Levi-Strauss, 1984) and continues to be debated in anthropology and ethnology (Vellinga, 2007). The built environment not only reflects culture, but also shapes and maintains culture-specific structures, social identities, and behaviors. An example is Levi-Strauss' (1984) work on House Societies where political and kinship relations are organized around physical buildings that define the social identity of the group and provide continuity across generations, quite independently of the membership of specific individuals at any given time.

Although architecture and design are becoming increasingly uniform in modern societies, traditional architecture still shows remarkable variations in building materials (e.g., wood vs. cement), building shapes (e.g., favoring round vs. square shapes in dwellings), seating arrangement (e.g., on the ground vs. on chairs), surface textures, and the like. Even current urban areas, where the majority of the world's population lives, vary strikingly in density, walkability, compactness, enclosure, color, height, complexity, and on an infinite number of additional dimensions that provide different visual, auditory, olfactory and haptic stimulations and solicit distinct behavioral responses. Thus, every culture creates, through specific artifacts such as houses, furniture, public squares, malls, bicycle routes etc., affordances that invite certain behaviors while discouraging others. For instance, Venice "invites" its citizens to walk almost

every place they want to reach, whereas Los Angeles “invites” its citizens to spend over 250 hours per year sitting in their cars just to commute to work (Washington Post, 7.10.2019). Starting from Gibson’s (1966) ground-breaking book, the concept of *affordance* has had a long tradition in environmental and ecological psychology, and has regained importance when embodied cognition models emerged over the last decades (as an example of the revival of ecological psychology see Meagher, 2020). According to Gibson, physical environments offer species-specific action opportunities, called affordances, that shape behavior and perception. Environments become walkable, sittable, graspable, climbable etc. to the degree to which the environment matches the body of the person or animal inhabiting it. For instance, a baby bouncer allows and invites toddlers and possibly small dogs, but not adult humans, to climb inside and enjoy the movement. If cultures create affordances that invite specific sensorimotor experiences, will these also affect cognition? Or put differently, do cultures affect embodied cognition by creating culture-specific physical environments?

There is now growing evidence that physical environments can affect not only wellbeing and stress regulation, but also cognitive processes such as reaction times, likelihood estimates and future-orientation. To cite only a few examples, the psychological benefits of visual contact with nature are well substantiated and have motivated architects and designers to increasingly include natural elements in buildings (for an overview see Grinde & Patil, 2009). For instance, hospital buildings with views of nature tend to have restorative effects, facilitate healing and create a buffer to stress (e.g., Ulrich, 1984; for a review of the biophilic design hypothesis see Gillis & Gatersleben, 2015). Exposure to nature also boosts creativity, by allowing attention restoration and mind wondering (Martínez-Soto, Gonzales-Santos, Pasaye, & Barrios, 2013; Williams et al.,

2018). Thus, the great variability in green areas per capita across and within countries may have a number of important psychological implications.

A similar argument can be made for architectural styles. For instance, *high-style* architecture, also known as Structural Expressionism, with its “cold” building materials and large volumes, may be experienced as intimidating, making the person feel small and insignificant, which in turn may affect cognition. An example is courthouse architecture. Compared to smaller and “warmer” historical courthouses, large high-style courthouses were found to make people more pessimistic about the outcome of a trial (Maass et al., 2000). Similarly, the exposure to very tall (vs. lower) buildings produces a feeling of awe, combined with behavioral immobility (“freezing” response) which in turn produces a slowdown in reaction times (Joye & Dewitte, 2016).

Another aspect of built environments that differs remarkably across cultures and geographical areas is population density, ranging from very densely populated urban areas (e.g. Macau) to low density places such as Mongolia. Even cities of comparable population size (such as Manila and Damascus) may have very different population density, as a function of distinct urban planning strategies. Recently, population density has received renewed attention in psychological research (Sng, Neuberg, Varnum, & Kenrick, 2017). Even after controlling for other relevant variables such as GDP and population size, Sng et al. find that, as density increases, people become more future-oriented. For instance, they delay reproduction, have fewer children, invest more in education, etc. Population density is also one of the ecological conditions that, according to Gelfand and collaborators (Gelfand, 2012; Gelfand, Raver, Nishii, Leslie, et al., 2011), are predictive of more stringent social norms and less tolerance towards deviant behavior (*tight* vs. *loose* cultures). Although the exact psychological processes driving the greater future-

orientation, long-term planning and normative regulations in high-density conditions remain to be understood, it is not unlikely that embodied reactions to over-crowding (including overstimulation) may play a role in this picture.

Importantly, built environments also exert a remarkable influence on children's cognitive and social development. Cognitive abilities of infants and children develop in interaction with their physical and social environment, both of which show remarkable cultural variation. As Linda Smith (2005) puts it "The physical world serves to bootstrap higher mental functions". One example are child-friendly environments that Kyttä (2004) defines as those that (a) offer positive affordances for children and (b) allow independent mobility. Children growing up in walkable, child-friendly cities (e.g., Venice) that allow autonomous roaming from an early age tend to develop spatial abilities much earlier than those living in car-dominated urban spaces (Malucelli & Maass, 2001).

Together, the above lines of research illustrate (a) that cultures create distinct physical environments and (b) that such cultural variations in physical environments have tangible effects on people's emotions, cognition, and well-being. However, the role of embodied experiences linking culture-specific environments to psychological outcomes are under-investigated and, hence, less well understood. In particular, the link from culture-specific spaces to embodiment to cognition is rarely investigated within a single research paradigm. Although there is now growing interest in the role the body plays in culture-environment interactions (for an overview see Raymond, Giusti & Barthel, 2018), the empirical evidence linking cultural artifacts, body and cognition is currently rather limited.

The one notable exception is research on environmental complexity, suggesting that the physical environment created by each culture, and the actions and sensory experiences it affords, may

Formattato: Rientro: Prima riga: 0 cm

affect people's cognition in systematic ways. Urban complexity varies greatly across cultures. Think about the grid plan of many American cities compared to the daedal layout of European cities. Or compare the linear street views of New York City with the intricate street views of Venice or New Delhi, with their winding and densely populated streets (see Figure 2).



Figure 2. Street view of New York City (on the left) and Venice (on the right)

Different authors have argued that urban complexity will train people to pay attention to multiple stimuli and ultimately shape their capacity to integrate focal and background information. A remarkable example is a study by Miyamoto, Nisbett and Masuda's (2006) in which the authors randomly sampled photos from cities in Japan and in the US, finding a much greater complexity of the urban environment in Japan, where urban scenes objectively contained considerably more elements. The authors argued that this greater complexity may encourage people to pay more attention to the environment. In support of this idea, the authors found that both Japanese and US participants paid more attention to context when viewing Japanese rather than American urban scenes. Strikingly, people adapt their visual attention patterns very rapidly to new physical environments, as shown by subsequent eye-tracking studies (Ueda & Komiya, 2012).

The differential complexity of the urban environment, together with the effect it has on attention to context, may help explain why Japanese in general are more inclined to focus on context and to integrate foreground and background information (*binding*), whereas Americans tend to concentrate on foreground objects. Interestingly, such cultural differences in visual processing emerge as early as 3 years of age, with Japanese children perceiving objects more holistically than American children (Kuwabara & Smith, 2016).

Thus, one way in which people from different cultures may develop more holistic vs. analytic styles of thinking (Nisbett, Nisbett, Peng, Choi, & Norenzayan, 2001) is through the built environment created by each culture. This interpretation receives support from a set of cross-cultural studies involving, among others, a remote population in Namibia, the Himba, who are considered a highly interdependent culture (Caparos et al., 2012). Interdependent cultures (such as Japan) are generally believed to promote global or holistic rather than local or analytic information processing. The Himba constitute a remarkable exception to this rule. Caparos et al. tested the hypothesis that this may be attributable to their distinctly non-urban living conditions. In line with predictions, the authors observed a shift toward global or holistic processing among those Himba citizens who had moved to urban areas or who visited urban environments frequently. Thus, much like Miyamoto et al.'s study, this research sustains the idea that the exposure to complex urban environments, characterized by visual clutter, is, at least in part, driving the relatively stable cultural differences in analytic vs. holistic processing.

We are not arguing that architecture is the only, or even the most important, factor in the development of cognitive styles. Countries with particularly heterogenous urban spaces may experience greater visual complexity also in other realms, including language scripts and cultural artifacts such as websites (Wang, Masuda, Ito & Rashid, 2012). Thus, it is likely that cognitive

styles develop through multiple routes, but it remains an intriguing idea that culture-specific holistic (vs. analytic) cognition derives, at least in part, from visual experiences with more complex and cluttered physical environments.

The above research supports the idea that knowledge representation derives, at least in part, from the bodily experiences in interaction with the physical and cultural dimensions of the surrounding world (Gibson, 1979; Johnson 1987, 1997; Schubert & Semin, 2009). In short, although people share a similar neurophysiological makeup, the culture-specific physical environments in which bodies act may be very different and generate diverse embodied mental representations of (social) thought.

Social norms and conventions

The physical environment is not the only way in which cultures shape embodied cognition.

Probably the most common path through which culture affects our senses and motor system is through implicit and explicit rules governing our body postures, our gaze, smile, the distance we keep from others, whether we touch others in social interactions, whether we eat from a shared bowl, and the like. To the degree that such body postures and comportments affect our cognition, cultural norms and conventions should also shape our mind. Here, we will selectively report on five areas of research in which this hypothesis has been tested in cross-cultural comparisons, namely gestures of submission and dominance, gestures of pride and shame, smiling, hand-washing, and touch.

Gestures of submission and dominance

Many cultures prescribe situation-specific gestures of submission or dominance in social interactions and they may do so in gender-specific ways. For instance, in many European countries until the 1950ies, girls were expected to greet adults with a curtsy gesture, bending

their legs in an asymmetrical fashion with one foot moving backwards. Boys instead were expected to bow their heads. Both can be interpreted as gestures of submission from the person of inferior status (here, the child) in a social hierarchy. From an embodied cognition perspective, such socially expected motor actions are likely to activate associated feelings and thoughts of inferiority. These ~~embodying representations~~ gestures of submission ~~seem to~~ could be stronger for girls (vs. boys) as their curtsy gesture involves ~~ed~~ the whole body, and this might have contributed to make girls feel even more inferior than boys ~~when interacting with adults~~. Although, this specific convention has since disappeared in Europe, similar signs of submission continue to be prevalent in many cultures, especially for women, attesting to both temporal and cultural variability of norms regulating body posture.

There is now ample evidence that different cultures value different characteristics and encourage different behaviors. Although the distinction between individualistic vs. collectivistic cultures is certainly an oversimplification that ignores the nuances of cultural specificities, overall individuals in many Western nations are seen as independent and separate from one another and are encouraged to express their feelings, self-enhance, and stand out relative to others (Morling, Kitayama, & Miyamoto, 2002). Therefore, in Western cultures individuals are usually evaluated in terms of their personal influence, achievement, and assertiveness (Zhong, Magee, Maddux, & Galinsky, 2006). By contrast, in East Asian cultures such as Korea and Japan individuals are more likely to be seen as interconnected and interdependent, and greater value is placed on the preservation of group harmony, the fulfillment of duties and responsibility as a community rather than on personal achievement. As a consequence, people are culturally expected to display signs of modesty and humility more than in Western cultures (Crocker & Park, 2004; Markus & Kitayama, 1991; Triandis, 1989). Therefore, postures of modesty vs. dominance, that are often

assumed to be universal, may have culture-specific meanings and may be encouraged to different degrees. As a consequence, distinct cultural codes of display may also yield different psychological experiences for people from different cultures.

We therefore ~~suspect~~^{suggest} that embodied effects reported by ~~W~~^Western research and observing Western participants ~~would~~^{may} lead to different conclusions if culture were taken into account. For example, a great deal of Western literature shows that expansive body postures signal power and dominance (e.g., Ellyson & Dovidio, 1985; Hall, Coats, & Le Beau, 2005; Tiedens & Fragale, 2003), and that powerful body postures produce increased feelings of power, tolerance for risk and power-related thoughts (Carney, Cuddy, & Yap, 2010; Goldin-Meadow & Beilock, 2010; Huang, Galinsky, Gruenfield, & Guillory, 2011; for a comprehensive review see Cuddy, Schultz, & Fosse, 2018; but see Simmons & Simonsohn, 2017, for a critical analysis). Based on previous research, Park, Streamer, Huang, and Galinsky (2013) investigated whether power-related expansive postures are compatible with both Western and East-Asian norms and values and whether they may be experienced differently in different cultures. Expansive power postures such as those often displayed in North America may contrast with East Asian norms of modesty and humility, and therefore such postures may not cause the same power-related effects in participants from these cultures. Park and colleagues provided American and East Asian participants with three types of expansive postures tested in previous research (i.e., the *expansive hands spread on desk* pose; the *expansive upright sitting* pose; and the *expansive feet on desk* pose). The *expansive hands spread on desk* and the *expansive upright sitting* postures led to greater sense of power than a constricted posture for both Americans and East Asians, whereas the *expansive feet on desk* pose led to greater power activation and action orientation only for Americans, but not for East Asians. This particular power pose may have violated general

modesty norms or, more likely, specific norms regarding placing shoes on a table. The US is probably one of the few cultures in which putting shoes on tables or seats is considered normative; in many Asian cultures, this same behavior is likely to be considered offensive and unacceptable (see for instance diplomatic incident in Israel in 2018, when the Japanese prime minister was served dessert in an aluminum shoe; see also Goyal, Adams, Cyr, Maass, & Miller, 2020 for a discussion on norms concerning shoes). Independent of the precise norm violation, Park et al.'s findings clearly support the embodied cultural hypothesis according to which the effects of postures are contingent upon both the type of posture and the cultural symbolic meaning of the specific posture (see also Matsumoto & Kudoh, 1987 for differences in body posture perception between Japanese and Americans).

Importantly, the concept of culture is not limited to nations, but can also refer to cultural subgroups such as gender. Men and women may well express power in distinct forms and experience bodily expressions of power differently, in line with gender-related expectations. For instance, Schubert and Koole (2009) showed that male participants making a fist activated an empowered self-concept, both explicitly and implicitly, perceiving the self as being more assertive and socially esteemed. The same effect did not occur among female participants. Similarly, Schubert (2004) found that making a fist activated power-related concepts in both males and females, but only for men this gesture was also associated with higher control, whereas women performing the same gesture perceived lower control. Put simply, making a fist appears to make men feel more powerful, whereas the same bodily experience in women produces a feeling of powerlessness. Authors argued that the mere gesture of making a fist—without being aware of its bodily force—might be enough to affect social information processing, in line with the conceptions one's gender has about physical aggression. These gender

differences for the same bodily experience can be explained in terms of cultural gender role expectations, where men are culturally expected to use bodily force to gain power and control over others, whereas women are seen as reluctant of using bodily force (see also Ijzerman & Cohen, 2011 for cross-cultural differences depending on gender).

Thus, it is the culture-specific and gender-specific meaning rather than the gesture itself that produces the corresponding mental state. This is also evident in acculturation effects. For example, the tendency to tilt the head (head canting) is interpreted as a signal of submission and is more prevalent in the representation of women than men in artworks (Costa, Mezzani, & Bitti, 2001), therefore suggesting that visual representations are permeated with bodily cues that perpetuate gender roles. Interestingly, this tendency is modulated by culture. Cardon, Li and Shi (2018) ~~looked at~~analyzed head canting in ~~their study of~~ LinkedIn profiles and, besides replicating a stronger head canting among women than men (see also Tifferet & Vilnai-Yavetz, 2018), they also found that American users engage in head canting more often than Chinese users.

Importantly, the extent to which gender affected self-presentation was different in the two cultural samples, with almost 60% of women among the American professionals tilting their head in their profile picture, but only 47% of women among Chinese professionals.

~~Eventually, Possibly,~~ head canting may not be a meaningful cue in the Chinese culture.

Interestingly, the percentage of female (vs. male) who tilted their heads was higher (81%) among Chinese professionals having their profile in English, suggesting a use of body signals that is congruent with the cultural context. The linguistic context therefore activated the broader cultural context which also involves specific embodied signals. This example shows that non-verbal behaviors might ~~operate~~work at both encoding and decoding levels: an actor performs a non-verbal behavior (i.e., head-tilting) in order to be perceived in line with interlocutor's

expectations ~~and s/he does so in line with the. And this works accordingly to~~ cultural-specific meanings attributed to ~~that~~ particular non-verbal behavior. Future studies may address the interpretation of nonverbal cues in relation to the contextually activated culture.

ha formattato: Non Evidenziato

Commentato [MOU2]: Needed?

Gestures of pride and shame

Closely related to dominance and submission gestures are bodily expressions of pride and shame.

Victory gestures (arms raised above the shoulders, torso pushed out, making a fist) are well studied in athletes, for instance while crossing the finish line or after scoring a goal. This spontaneous bodily response to victory seems to serve the function to communicate the positive emotion and is, indeed, understood by observers as exactly that: a sign of triumph. The social acts of communicating (athlete) and perceiving (audience) victory are embedded in specific bodily movements which represent the abstract concept of success. To which degree are these gestures of pride and their opposite, shame, universal?

Tracy and Matsumoto (2008) compared postural displays of pride and shame in sighted, blind, and congenitally blind athletes from over thirty countries while competing in Olympic and Paralympic Games. Individuals from all cultures displayed the *same* bodily components typical of pride (victory) described in the initial example (e.g., raising arms and open chest) in reaction to winning, suggesting that the abstract concept of victory and success is embodied in innate behavioral responses. However, the prototypical posture for shame in reaction to defeat (i.e., chest narrowed and shoulders slumped) ~~was~~ found to be displayed in a culture-specific way. Athletes from individualistic cultures (e.g., USA) were less likely to show these bodily postures as compared to individuals from collectivistic cultures (e.g., Asia), where shame is seen as an appropriate response to social failure. This is not to say that Americans do not embody the

Commentato [MOU3]: Sembra molto generico ... forse meglio nominare 1 paese, anche perche' il confronto tra 1 paese e un enorme continente e' un po' asimmetrico

emotion of shame, but it suggests that the suppression of this particular emotion might depend on ‘higher’ goals, such as social communication, which make individuals sensitive to cultural codes and values (e.g., regulating public emotions). Interestingly, the authors found the strongest expression of shame among blind athletes from all cultures, suggesting that those who had never seen others suppressing this particular emotion ~~are~~ less likely to be affected by cultural codes regulating emotions in public. Although this study did not investigate the cognitive consequences of such bodily shame displays, thus remaining silent as to the embodied cognition deriving from them, there are reasons to hypothesize such a process. For instance, related research has shown that holding prototypical guilt poses (head tilted downwards, slumped shoulders, constricted chest) increases personal and collective guilt and intentions to repair misdoings (Rotella & Richeson, 2013). Thus, it is likely that the cultural differences in the display of public shame observed by Tracy and Matsumoto (2008) may well trigger corresponding culture-specific thoughts and feelings of shame.

Commentato [MOU4]: Toglierei culture-specific here

Smiling

Another interesting non-verbal behavior that is, at least in part, guided by cultural norms and conventions is smiling. To explore the influence of culture on the social perception of nonverbal behaviors, Krys and colleagues (2016) investigated samples from 42 countries (i.e., GLOBE project, House, Hanges, Javidan, Dorfman, & Gupta, 2004) and examined whether smiling individuals were perceived equally across cultures. Smiling individuals are usually perceived more positively than non-smiling ones; they are seen as happier, friendlier, more honest, more attractive, and more competent. However, this was not true in 6 cultures involved in the GLOBE project (2004). In fact, Krys and colleagues found that a smiling individual was judged as less

intelligent than the same individual with a neutral expression in those cultures that had a high tolerance for uncertainty and ambiguity (scoring low on GLOBE's uncertainty avoidance dimension). Only people in countries seeking predictability interpreted smiling as a sign of intelligence, possibly due to the fact that smiling may signal certainty (Hareli & Hess 2010). Additionally, authors showed that in those societies in which the level of corruption is high, the trust toward smiling people was considerably reduced. Importantly, the key to understanding this variability was not geographical (e.g., neighboring countries like China and Japan scored differently) nor economic, but cultural.

Together, this and related research suggests that smiling has a different function and signals different characteristics in different cultures. Importantly, it also suggests that smiling is encouraged to different degrees in different cultures. The idea of culture-specific display rules is supported both by self-report (Matsumoto, Yoo, & Fontaine, 2008; Rychlowska et al., 2015) and by observational studies (Girard & McDuff, 2017). The former line of research suggests that the facial expression of emotions is considered more appropriate in individualistic countries, especially those with a history of immigration. This occurs presumably due to the fact that the expression of emotions facilitates communication and builds trust, which becomes critical in more heterogeneous societies. This general idea was confirmed by Girard and McDuff's (2017) large scale observational study on smiling across cultures. Actual smiling was more frequent in countries that are individualistic, have lower population density and a history of immigration of heterogeneous populations.

Together, these and related studies show that social norms governing smiling differ greatly across cultures. What these studies do not show is that such norms encouraging or discouraging

Commentato [MOU5]: Neighboring e' una parola grossa qui, e' e' l'oceano (e Corea) in mezzo

smiling also lead to corresponding shifts in cognition in the person performing the smile. To close the cycle, we need to look at complementary literature showing that the activation or inhibition of muscles involved in smiling (in particular the zygomaticus major muscles) do affect cognitive and emotional responses. In particular, research on the facial feedback hypothesis suggests that induced facial expressions (e.g., smiling) create corresponding subjective experiences of emotions (e.g., happiness; see Coles, Larsen, & Lench, 2019, for a meta-analytic review). Particularly telling is research on emotional display rules enforced by organizations such as hotels or airlines, requiring employees to show friendly facial and bodily displays (including smiling). This kind of “emotional labor” may result in an alignment between facial expression and inner feelings of the employee, resulting in increased job satisfaction and reduced burnout. However, when such superficial displays are clearly in contrast to inner feelings, the resulting effects on satisfaction may be negative (e.g., Chen, Sun, Lam, Hu, Huo & Zhong, 2012). Thus, facial expressions do not automatically and not always translate into corresponding psychological states.

Importantly, facial displays such as smiling or frowning may extend to the evaluations of external stimuli, such as cartoons (Strack et al., 1988) and people (Ohira & Kuroono, 1993), and may even affect behavior (such as food cravings; Schmidt & Martin, 2017). Moreover, it is known that ~~the~~ smiles (and other facial expressions) tend to produce facial mimicry in observers suggesting that the embodied effects produced in the actor may spread to others (Niedenthal, Mermillod, Maringer & Hess, 2010; Schilbach, Eickhoff, Mojzisch & Vogeley, 2008). Although the above findings are supportive of the embodied cognition hypothesis, the complete embodied cultural cognition cycle, from culture to facial display to cognition, is still awaiting systematic investigation.

Handwashing and religion

Another motor behavior that has received much attention in the embodied cognition literature is handwashing and its relation to morality and, in particular, to purity and guilt. Rules concerning this behavior vary greatly across religions. It is therefore conceivable to find religion-specific embodiments due to diverse normative/religious constraints. Leung and Cohen (2007, cited in Leung, Qiu, Ong, & Tam, 2011) explored the effects of specific bodily gestures on embodied morality with a sample of student participants who identified themselves as a Muslim, Protestant, Hindu, or Jewish. Under the guise of investigating hand temperature and hand-eye coordination, the authors asked unaware participants to perform the motion of hand washing through rubbing their hands (which should correspond to the act of removing physical contamination). After performing this hand washing gesture, participants were asked to rate various scenarios by providing their moral stance on purity-related offenses with regard to committing physical contamination acts (e.g., having sex with a chicken before cooking it; wearing the clothes of a child molester) or endorsing blasphemous or other improper beliefs (e.g., saying hateful things against God) along with other scenarios involving autonomy-related violations (e.g., infringing on another person's rights or privacy). First, across religious groups, participants who embodied the hand cleaning gesture rated the scenarios as more morally wrong as compared to participants who had not performed this gesture, providing evidence for the embodied effect on cognition. More relevant to the religion-specific hypothesis, as all four religious groups believe in good actions, they equally condemned contamination-related acts when embodied hand washing gesture was performed. However, cultural differences emerged when it came to the condemnation of blasphemous and improper beliefs. Here the effects were especially strong for Muslims and, to a lesser degree, for Protestants because these religions

condemn also immoral beliefs, which are seen as the equivalent of immoral (social) actions. However, the same was not found for Hindus and Jews. Together, Leung and Cohen findings suggest that hand washing gestures may have primed purity in all religions, but that cultural differences emerged in what was considered pure and moral for each religion.

Social touch

Finally, cultures differ greatly in the degree to which they allow or encourage interpersonal touch. Starting from the 60ies, a large body of literature has distinguished high contact (e.g., Latin America, Mediterranean) from low contact cultures (e.g., UK, Japan; Hall, 1966). People in high contact cultures tend to have smaller personal spaces, keep closer distance from others in social interactions, and engage considerably more in interpersonal touch. Also, the areas of the body that others are allowed to touch are, on average smaller, in countries like the UK (Suvilehto, Glerean, Dunbar, Hari, & Nummenmaa, 2015). Even infants receive motor and tactile stimulation from their mothers that differ systematically from culture to culture (e.g., Carra, Lavelli, & Keller, 2014; Hsu & Lavelli, 2005). Thus, spatial behavior and interpersonal touch are governed by specific implicit norms in each culture, often defined in rather complex ways (with precise variations depending on gender, status, age, familiarity, context and the like). These norms tend to be internalized by members of each culture and displayed in a largely automatic way in social interactions.

Over the past decades, the effects of social touch have been investigated in a lively and expanding line of research including both adult populations (for overviews see Gallace & Spence, 2010; Jakubiak & Feeney, 2017) and infants (for an overview see Cascio, Moore & McGlone, 2019). Social touch has been shown to have remarkable effects on diverse human

experiences including wellbeing, learning, persuasion, intergroup relations, and cognition. In infants, social touch (including skin-to-skin contact and massage) has long lasting beneficial effects on the physical and cognitive development of the child, including executive function and cognitive control (e.g., Feldman, Rosenthal & Eidelman, 2013). In adults, touch tends to increase compliance, including courtship compliance (Guéguen, 2007), to facilitate bonding, to strengthen romantic relationships, to improve wellbeing, to buffer stress and even to improve intergroup relations by reducing implicit prejudice (Seger, Smith, Percy & Conrey, 2014).

What is less clear is whether touch produces the same or distinct effects in different cultures. For instance, Suvilehto, et al. (2015, p. 138) have argued that the primary mechanism through which physical closeness and touch create and maintain social bonds is universal and biologically determined, but that “cultural conventions may up- or down-regulate the average magnitude of social touching”. Taking this argument one step further, one may argue that low-contact cultures (or those with explicit no-touch policies in specific settings such as schools) deprive people from experiencing the positive effects of touch. There is indeed some preliminary for this idea. For instance, Lowe et al.’s (2016) research suggests that children in cultures in which mothers engage more in playful touch may be better prepared to regulate their emotions after stressful situations (such as the *still face paradigm* to which infants were exposed in this study). Other authors have argued that the benefits deriving from touch may actually be stronger in low-contact cultures, exactly because touch is less normative, less common and therefore more telling (for instance about the toucher’s affection for the touched; Jakubiak & Feeney, 2017). In the above cases, touch would produce similar effects across cultures, but the magnitude of the benefits deriving from it may differ. However, theoretically, it is also possible that the same bodily experience of being touched, coming from the same source (for instance an acquaintance)

may produce positive reactions (e.g., greater agreement) in some cultures while producing negative reactions in others, thus differing not only in magnitude but in quality of the embodied cognition effect. The same touch that may be considered pleasant and that may reduce stress and improve emotion regulation in high contact cultures, may lead to opposite effects in low contact cultures. In fact, not all social touch is experienced the same way. What touch conveys and how it is felt and reacted to depends not only on who is performing and who is experiencing it, but also on the meaning it has in a given social and cultural context. Importantly, the cultural environment provides critical information on how touch is interpreted (and hence experienced) and what type of touch should be considered normative or counter-normative. However, to the best of our knowledge, empirical evidence for the culture-specific effects of touch is not easily available at this point.

Together the reported empirical findings on gestures of submission and dominance, gestures of pride and shame, smiling, hand-washing, and touch highlight that culture should be taken into account for a better understanding of embodied cognition. However, to date research investigating how norms and conventions shape the body-cognition link across multiple cultures is still relatively rare. In the next section we will selectively review research on a third mechanism through which culture may affect embodied cognition, namely language, including the writing systems involved.

Language and writing systems

Language is arguably the chief vehicle of cultural transmission (Kashima, Kashima, & Kidd, 2014). Over the last years, neuroscientists, cognitive linguistics, and psychologists have addressed the question whether language is an embodied simulation process to represent

knowledge (Gallese & Goldman, 1998; Glenberg and Kaschak, 2002; Foroni & Semin, 2009). Prompted by failures to detect embodied effects in word comprehension (e.g., Petrova, et al., 2018; Zwaan, 2004), the literature is currently stressing the need to put embodiment in context, arguing that linguistic comprehension is tuned to embodied simulations that are relevant for information processing (Estes & Barsalou, 2018). The context that has so far received most attention is the type of task. We here move the attention to a wider context, namely culture, suggesting that embodied cognition is likely to be tailored to match the specific demands of the cultural context in which the cognizer is embedded.

Languages vary on an infinite number of dimensions, including the vocabulary, phonetics, grammar, and the like, all of which may potentially relate to embodied cognition. We will here focus on two aspects of language that may affect embodied cognition above all, namely metaphorical language and writing systems.

Metaphorical language

One of the main challenges of embodiment are abstract concepts (such as democracy, power, justice, God), which are by definition detached from specific bodily experience. The primary tool bridging concreteness and abstraction are metaphors, which are linguistic and cognitive instruments deeply grounded in culture. Metaphors map complex abstract *target domains* (such as 'love') onto simpler and more comprehensible *source domains* (e.g., 'journey') that are accessible to our senses. Metaphors not only facilitate the comprehension of abstract concepts, but they make comprehension possible in the first place (Lakoff & Johnson, 1980). If abstract concepts show greater situational and cultural variations than concrete concepts as many have argued, then they may be particularly suitable for testing embodied cognition (Barsalou, 1987) or multiple representation theories (Borghi et al., 2017) under a cross-cultural perspective.

Although there is evidence for universal conceptual metaphors across different cultures (Gibbs, 2011; Kövecses, 2003), metaphors are, in part, culture-specific. For instance, 75% of the animal metaphors investigated by Talebinejad and Dastjerdi (2005) were the same in English and Persian, whereas 25% were distinct. Another example of cultural variation even in very basic metaphors is the following: when German-speakers talk about things improving or becoming easier, for instance after a period of illness, they tend to use the upward metaphor (*es geht bergauf* / *it's going uphill*); in contrast, Italians use the downward metaphor for the same concepts (*è tutto in discesa* / *it's all downhill*). The apparent contradiction may be explained by the fact that Germans view the scene from an observer perspective, such as when observing a graph of economic development towards a higher point. In contrast, Italians imagine themselves as part of the scene and, of course, going downhill is much less effortful than going uphill.

In the case of emotion metaphors, scholars have proposed the embodied cultural prototype view (Kövecses, 2005; Maleej, 2004), which holds that the conceptualization of emotions across cultures is based on both universal human embodied experiences and more specific sociocultural construal, whereby different cultures highlight different aspects of human experiences. For instance, in Western cultures getting attention and being assertive is generally viewed as positive, whereas in Japanese culture is not particularly desirable. These differences are reflected in two different metaphors: “The squeaky wheel gets the grease” and “The nail that stands out gets hammered down first”, in American and Japanese culture respectively (Yu, 2008). In a similar vein, Ansah and Kantar (2007) examined the conventionalized love metaphors in Turkish and English. Despite a large number of common metaphorical source domains, the analyses revealed that, different from English speakers who conceptualize love in terms of a collaborative work or a success-oriented journey, Turkish speakers see it mainly as a compelling (almost

deadly) force whose intensity is typically measured by the amount of pain it imposes on the self, therefore displaying differences in the expressions of metaphorical imagery as a function of sociocultural backgrounds. The conceptualizations of the primary emotion of fear, in two languages—Akan (a West African, Kwa language) and English, showed similarities in the conceptualization of fear, but differences in language-specific elaborations of the metaphors in the two languages (Ansah, 2014).

These findings provide support for the cultural embodied cognition perspective: the similarities in the conceptualization of emotions across cultures may be explained in terms of universal embodied cognition, conversely, the differences shown in the language-specific conceptualizations may be interpreted as cultural filters of universal embodied cognition. Put simply, metaphors constitute a generic schema that gets defined by each culture, such that the metaphors receive unique cultural content at a specific level. For instance, Matsuki (1995) observed^{ds} that all metaphors for anger in English can also be found in Japanese. At the same time, she also points out that there is a large number of anger-related expressions that map onto the specific-Japanese concept of *hara* (literally, ‘belly’). This is a culturally specific concept unique to Japanese culture, and so the conceptual metaphor “*Anger is (in the) hara*” is limited to Japanese (for similar differences in metaphors for anger and happiness between English and Chinese see Yu, 1995; for a comprehensive overview of cultural differences and similarities in metaphors see Kövecses, 2005).

Importantly, first evidence now shows that enacting such metaphors may affect cognitive processes in metaphor-coherent ways. For instance, Leung, Kim, Polman et al. (2012) asked participants to physically enact different metaphors for creativity (for instance, in the case of the “thinking outside the box” metaphor, performing a task while sitting inside or outside a box).

Across different metaphors, the authors found an increase in creativity, suggesting that the physical enactment of metaphors may not only activate metaphor-consistent knowledge, but also stimulate knowledge generation. From a theoretical perspective ~~this~~ also suggests the possibility that, at least in some cases, the embodiment serves as a mediator of metaphor-coherent cognition. However, it remains to be seen whether such mediation also occurs in spontaneous behavior, that is in the absence of an explicit instruction to enact the metaphor. In a similar vein, Gilead, Gal, Polak, and Cholow (2015) invited Israeli participants to eat sweet (vs. spicy) food before being involved in a social judgment task. There are reasons to believe that sweet and spicy tastes may be embodied in cultural-specific linguistic practices. For instance, words associated with sweetness denote affection and love (e.g., the adjective ‘sweet’ is used to describe gentle, kind, or friendly people), whereas in China saying that a person is ‘spicy’ means easily irritable (Ji, Ding, Deng, Jing, & Jiang, 2013). Despite the innately positive valence associated with sweet foods, and the negative valence associated with spiciness (e.g., O’Doherty, Deichmann, Critchley, & Dolan, 2002; Klein, Carstens, & Carstens, 2013), in Israeli culture attributing the character of spiciness to a person is associated with ~~a~~ positive valence (i.e., ‘s/he is *Harifa*’ means ‘s/he is a smart person’). On the contrary, sweetness is not always associated with positive traits. For instance, ‘s/he is *mataktaka*’ (i.e., a Hebrew word to describe sweetness) is associated with a negative trait, namely, inauthenticity. On the basis of Israeli cultural-specific linguistic metaphors, Gilead and colleagues (2015) tested their influences on preverbal experiences, namely, social judgements. The authors found that priming participants with spicy (vs. sweet) tastes increased judgments of intellectual competence, decreased judgments of inauthenticity, and increased the overall evaluation of social targets, ~~and this is~~ in line with

Israelis cultural-specific linguistic associations between-of sweetness with inauthenticity, and spiciness with intellectual competence.

In most research, the overlap between embodiment and linguistic metaphors makes it difficult to identify whether the two processes function additively or interactively, or whether linguistic metaphors trigger an embodied process which then affects cognition, evaluation and the like. In the next paragraph, we will present studies on the effects of writing direction, which allow us to investigate the effects of sensorimotor processes, independent of language (for a review see Suitner and Maass, 2016).

Script direction

Language links mental representations of abstract concepts to concrete experiences also through a second mechanism: by means of the practical motor activity involved in writing or reading. For example, the font of written words can convey the abstract concept of fluency. Instructions written in *mistral* font lead the reader to think that the described task is more difficult (Song, & Schwarz, 2008). Further, -whether languages are written alphabetically or ideographically greatly affects children's visual skill development. The massive practice of visuo-spatial processing required to learn ideograms leads to superior performance among Chinese, Japanese and Korean children in practically any task (processing efficiency, working memory etc.) related to space (e.g. Demetriou, Kui, Spanoudis, Christou, Kyriakides & Platsidou, 2005; McBride-Chang, C., Zhou, Y., Cho, J. R., Aram, D., Levin, I., & Tolchinsky, L. (2011). Thus, the visuo-motor experience afforded by different scripts has implications well beyond the simple activity of writing and reading.

In a similar vein, culturally defined writing and reading habits, such as writing from right to left rather than vice versa, may to some degree determine how we encode and decode the world. In

written texts, letters, words or symbols are arranged either horizontally (right–left or left–right) or vertically (top–bottom or, very rarely, bottom–top). Given this variance in writing and reading direction, it is possible that this dimension of language can affect thought differentially. Whether script direction influences the way in which we communicate, perceive, and perform tasks unrelated to writing and reading has been addressed as part of the theoretical model known as *Spatial Agency Bias* (SAB, Suitner & Maass, 2016). The SAB model rests on the general assumption that human action is preferentially envisaged in the direction in which one’s native language is written and read (e.g., left-to-right in English, right-to-left in Arabic). The SAB is the byproduct of two processes, namely a visuo-motor and a linguistic component. In short, the visuo-motor component is determined by scanning habits in line with a culture-specific trajectory (e.g., left to right in English but right to left in Arabic), whereas, the linguistic component refers to the fact that, in most languages, the *Agent* (who performs the action), in standard active sentences, precedes the *Patient* (who undergoes the action).

The presence of a rightward spatial asymmetry in cognitive processes has received a great deal of attention in cognitive psychology, including phenomena such as representational momentum (Hubbard, 2005), number and time line (Santiago, Lupiañez, Pérez, & Funes, 2007), thematic role assignment (Chatterjee, Maher, & Heilman, 1995). These findings were initially attributed to brain asymmetries. However, the emergence of flipped patterns in research involving Arabic and Hebrew (i.e., right-to-left direction) or Mandarin speakers (i.e., vertical script) (e.g., representational momentum, Morikawa & McBeath, 1992; imaginary number line, Dehaene, Bossini, & Giraux, 1993; timeline, Boroditsky, Fuhrman, & McCormick, 2011), the initial explanation based on hemispheric asymmetry gave way to a more functional *cultural* hypothesis, which attributed spatial asymmetries to writing and reading habits. For instance, Maass and

Russo (2003) found that the thematic role assignment (i.e., *who did what to whom*) varied as a function of writing and reading direction, such that Italians (rightward script) tended to draw the agent of an action to the left of the patient, whereas Arabs (leftward script) tended to draw the agent to the right of the patient. Moreover, when considering Arabic-speaking participants who were studying in Italy and who performed the task either with Italian ~~instructions~~ or with Arabic instructions, they showed an intermediate bias that was correlated with the number of years spent in a left–right writing country. These findings suggest that spatial bias in imaging of human interactions is a direct function of one’s exposure to different scripts. Thus, both initial learning and later exposure to a different script direction is sufficient to change the way people think and represent social interactions (see also Suitner, Maass, Bettinsoli, Carraro, & Kumar, 2017).

According to the SAB model, the attentional and motor asymmetries imposed by script direction lead to a generalized “schema for action” applied to several socio-cognitive processes (Suitner & Maass, 2016), including imaging and memory. For instance, Maass, Suitner, Favaretto, and Cignacchi (2009) found that Italian-speakers were more likely to position agentic groups (men and young people) to the left of less agentic groups (females and old people), whereas Arabic-speakers showed an opposite pattern, namely, positioning the more agentic groups to the right. These findings illustrate the subtle role of SAB even in intergroup relations, whereby a spatial schema of action coherent with script-direction is applied, further perpetrating the stereotypical view of social groups. By the same token, the repeated exposure to counter-stereotypical spatial displays (leftward facing men and rightward facing women) can contribute to the change of gender stereotypes (Suitner, Maass, & Ronconi, 2015).

One of the intriguing aspects of script-coherent spatial asymmetries is that they operate in a subtle way leaving people unaware of the powerful influence that writing and reading habits

have on the way they think and perceive the world. Importantly, the habitual visuo-motor activity of reading and writing leads people to not only represent actions, but also abstract social concepts (e.g., agency) coherent with the script direction. When asked to choose which, among four directional arrows (left/right-up/down-ward), best represented *agency*, 83% of Italian-speaking participants chose the rightward arrow (Suitner et al., 2015). This last example is crucial for the contribution of the SAB model to embodied social cognition theory because it disambiguates the representation of linguistic metaphors (e.g., agency) from the contribution of the sensorimotor system.

Culture and language are connected in many ways and their interconnections can be studied from a variety of different perspectives. Using two examples (metaphors and script direction) we showed that culture-specific forms of embodiment lead people to construe the surrounding world differently, and that this is likely to occur through an unconscious process. Although these two lines of research are supportive of the general idea of culture-specific embodied cognition, much socio-cognitive and cognitive-linguistic research is still needed to fully understand the role of the infinite language aspects involved in the process of meaning-making in cultures and to disentangle its universal aspects from its cross-cultural variety.

Conclusions

This brief and selective review of the literature suggests that there are different ways in which culture may channel embodied cognition. Together, they challenge the idea that embodied cognition is universal and culturally invariant. At the same time most of the cultural effects reported here are of relatively small magnitude as they necessarily operate within the limits defined by the shape and functions of our bodies and by the universal forces (gravity, air etc.) to

which our bodies are exposed. These commonalities set the limits within which culture may operate.

Although cultural embodied cognition still lacks a unifying theoretical framework, the examples reported here are promising as they illustrate a wide variety of cultural constraints on embodied cognition. Arguably, a possible theoretical proposition may distinguish between two roles that culture may assume in the body-cognition relation, namely a moderating role (see Figure 3) -and a distal cause (see Figure 4). On the one side, different cultures may change whether and how a bodily state or experience affects cognition according to the symbolic meaning that the given culture is assigning to the specific bodily experience, for example through metaphors and norms regulating interpersonal behaviors (such as distance). In this case culture ~~would~~ takes the role of a moderator that modifies the relation between cognitive processes and physical phenomena.

However, culture may also assume a distal role by prompting and determining physical phenomena, for example fostering a specific architectural style or urban design, ~~or~~ by employing a specific writing system, or by imposing norms that regulate bodily states and behaviors. In these cases, culture can be envisaged as a cause ~~offer~~ the physical grounding of cognitive appraisal.

Commentato [MOU6]: Forse meglio: between bodily cues and cognition.
(quindi mettendoli in ordine causale)

The moderating role of culture—Smiling in societies with high (vs. low) corruption

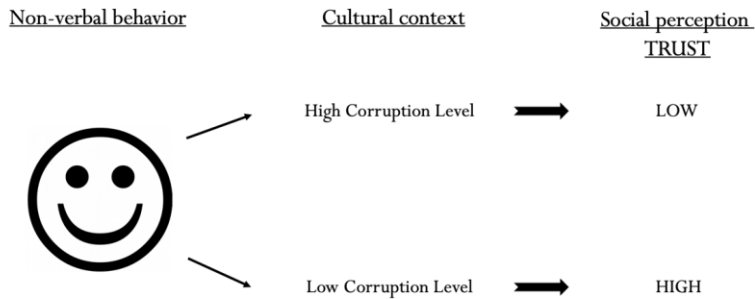


Figure 3. The moderating role of cultural contexts on cognition (i.e., perception)

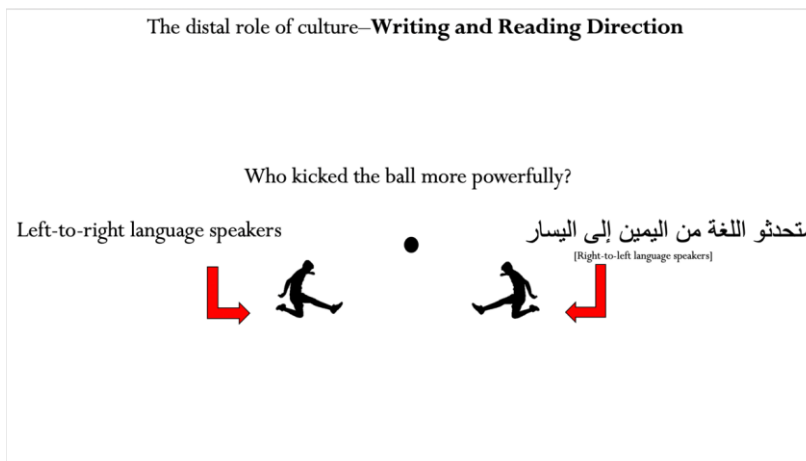


Figure 4. The distal role of culture on cognition (i.e., perception)

Following Cogen and Leung (2009), culture-specific embodied phenomena may roughly be divided into those that create body-cognition links ex-novo (so called *totem embodiment*) and those that enforce existing and often hard-wired links between physical comportment and

concepts. In the latter case, the principles of embodied cognition are universal, but the strength of the links between visuo-motor experiences and cognition are culturally defined. Culture in the latter case not only determines the likelihood and frequency of specific sensorimotor experiences, but also how strongly the (pre-wired) link between body and cognition is going to be experienced and how well it is going to be learned.

At the same time, cross-cultural comparisons in embodied cognition is still relatively rare. The majority of embodied cognition research continues to be conducted on WEIRD samples (Western, Educated, Industrialized, Rich, and Democratic; Henrich, Heine, & Norenzayan, 2010) and many cultural variations in embodied cognition are still awaiting empirical exploration. In the last section of this chapter, we will suggest three possible future lines of research, concerning, respectively, the mode of acquisition of embodied cognition, the cultural representation of abstract concepts, and the use of virtual reality to simulate cultural aspects of embodiment.

Mode of acquisition. If embodied cognition involves a simulation or reenactment of motor and sensory experiences associated with the initial acquisition of the concept (Barsalou, 2008), then culture-specific modalities of acquisition may affect cognition. For instance, if the concepts “chicken” and “baby” are, in some cultures (e.g., agricultural, high natality societies with tight social networks), acquired mainly through direct contact with the object, then visual, motor and olfactory reenactment can be expected. If, on the contrary, these same concepts are initially acquired mainly through films or cartoons, then the role of the motor and olfactory components during reenactment should be greatly reduced. Although we are not aware of any studies testing the link between culturally determined mode of acquisition and simulation/reenactment, we

believe that this would provide an ideal testbed for embodied cognition models and their cultural specificity.

The embodiment of abstract concepts. Also, if abstract concepts show greater situational and cultural variations than concrete concepts as many have argued, then they may be particularly suitable for testing embodied cognition (Barsalou, 1987) or multiple representation theories (Borghetti et al., 2017) under a cross-cultural perspective. Thus, we suggest to focus specifically on abstract concepts, not only for their greater cultural variation, but also because they are often sustained by metaphors that may vary across cultures.

Virtual reality. We would like to conclude this chapter in a conceptually provocative way, imagining a potential future situation determined by a progressive leak of cultural aspects in favor of a universality of cognitive processes. The remarkable progress in technology provides people with new tools, such as virtual and augmented reality. Besides being suitable for medical treatment for patients suffering, for instance, of neuropathic pain (Austin & Siddall, 2019) or mental health disorders (Freeman, Reeve, Robinson, Ehlers, Clark, et al., 2017), it may offer new visuo-motor experiences and generate new patterns of cognitive responses especially for the younger generations that will have frequent contact with these new technologies. We have recently come across a curious case of virtual reality (although not involving humans): a Russian farm (RusMoloko) has *experimentally* started to give its dairy cows virtual reality headsets featuring a unique summer field simulation program to reduce their anxiety, which in turn had a positive impact on the quality and quantity of their milk production

(<https://www.bbc.com/news/world-europe-50571010>). The next step ~~w~~ould, paradoxically, apply the same treatment to human beings. Based on the evidence that contact with nature has a strong positive effect on ~~f~~ subjective well-being (Zelenski & Nisbet, 2014), one may envisage

future generations to spend time immersing themselves in a natural virtual environment before going to work and, in turn, ~~show have a~~ higher job performance (Daniels & Harris, 2000).

As for any technological innovation, virtual reality's impact on cultural diversity could represent a double-edged sword. On one side, the use of virtual reality may contribute to a decrement in cultural diversity in favor of an increasing cross-cultural similarity of sensory and bodily experiences; on the flip side, at least in psychological research, virtual reality may provide a unique opportunity for people to experience novel physical environments or to encounter new objects that are currently not present in their culture. This would allow researchers to investigate the development of new concepts and their link to sensorimotor experiences during learning and during subsequent online or offline processing. Among others, this technological tool would allow researchers to immerse people into other cultures, including their urban and architectonic characteristics, offering an entirely new instrument to simulate culture.

While the authors were writing this chapter, the use of technology was becoming particularly relevant, as the COVID-19 pandemic was on its peak, physical distancing measures were imposed and interpersonal communication was almost entirely mediated through technological devices. We argue here that this new way of communication, which is totally mediated by technological devices-, might constitute a new ~~culture of a way to communication~~. In fact, this communication style greatly affects embodied processes, with potentially important outcomes at the individual, interpersonal, and societal levels. In this type of communication, nonverbal cues are greatly reduced, as tactile, olfactory (and sometimes also gustatory) stimuli are absent. The reduction to two senses, ~~sight and hearing~~, in interpersonal exchange makes them particularly central. The need for a clear auditory signal is essential to make communication possible, to the point that any auditory interference is barely tolerated. This prompts the persons who are not

ha formattato: Tipo di carattere: Corsivo

speaking to turn off their microphones, which delays any spontaneous taking the floor, and changes the dynamics of turn-taking in the conversation. Also, with microphone muted any para-semantic utterance is missing, hence not allowing feedback between speaker and listener.

Turning to visual stimuli, when video calls are used, faces tend to be seen from a close distance. The literature on face-ism (i.e., the proportion of face over body in the visual representation of a person) suggests that this full-face frame affects how we perceive people, and specifically their power and competence (XXX). Moreover, online exchanges alter the perceived distance between people, as we are all very near (especially if full-face video is running), yet we are all detached.

This lack of fit between the details available on the visual channel and the deficiency on any other channel may create an incongruence between the psychological distance of the interlocutor who is physically far away, and the immediately available communication exchange. Fujita, Eyal, Chaiken, Trope, Liberman (2008) showed that a lack of fit in construal level may reduce cognitive fluency, and agreeableness. Mismatching inputs in terms of psychological distance should be further investigated, as distance shapes interpersonal relations in significant ways. Physical proximity is generally prompting psychological proximity (Fujita, Henderson, Eng, Trope, & Liberman, 2006), as we tend to bond with people closer in space (Markovits & Benenson, 2010). Psychological distance also changes our cognitive focus by prompting more abstract elaboration, which turns into higher interpersonal goals (Carstensen, Isaacowitz, e Charles, 1999; Stafford, 2010).

Another key issue regards the lack of a common physical context. In online communication people do not share the physical surrounding, and hence lack both a real and a metaphorical common ground. It may not be trivial, as -for example- the temperature of the environment may

Commentato [MOU7]: e.g., Szillis, U., & Stahlberg, D. (2007). The face-ism effect in the internet differences in facial prominence of women and men. *International Journal of Internet Science*, 2(1), 3-11.
QUESTA SARABBE UNA POSSIBILITA'

help people to be on the same page in terms of affiliative needs and propensity toward social interaction (Zhang & Risen, 2014; Steinmetz, & Posten, 2017).

We ~~may~~ therefore argue that from a culture-specific embodiment perspective online communication offers a very specific setting, which may affect the relation between cognition and physical prompts in a very peculiar way by possibly creating a new cultural way to communicate. Similarly to the culture stemming from deafness, in which embodied cognition has its own specificities (e.g., Miozzo, Villabol, Navarrete, Peressotti, 2020; Mott, Midgley, Holcomb, & Emmorey, 2020), we may speculate that online communication creates a subculture, that is characterized by the specificity of the communication channel that is used. We can therefore close the circle of Figure 1, suggesting that the path from ~~physical-bodily~~ experience to culture is a promising endeavor for future investigations.

Commentato [MOU8]: Questo e' il termine usato nel grafico.

Devo dire che ho un po di problemi a capire questa frase (anche se e' elegante). Andando a vedere il grafico, vorrebbe dire che l'esperienza fisica con la comunicazione online ha un effetto sulla cultura (definita nel grafico come architettura, linguaggio e norme). Non vedo come questo possa avvenire. Secondo me la frase sta in piedi solo ad un livello molto astratto o generale, cioe' la online communication crea una specie di sottocultura. Ma a livello concreto non vedo proprio come possa succedere. Cambiera' le norme sociali? Non credo certo che cambi la architettura o la lingua. A me va benissimo lasciare la frase cosi com'e', quindi non propongo cambiamenti ma voglio solo far presente che io non riesco ad immaginarmi come questo link tra bodily experience a culture possa avvenire nel contesto del grafico 1

References

- Austin, P. D., & Siddall, P. J. (2019). Virtual reality for the treatment of neuropathic pain in people with spinal cord injuries: A scoping review. *The Journal of Spinal Cord Medicine*, 1-11. DOI: 10.1080/10790268.2019.1575554
- Barsalou, L. W. (1999). Perceptions of perceptual symbols. *Behavioral and Brain Sciences*, 22, 637-660.
- Barsalou, L. W. (2008). Grounded cognition. *Annual Review of Psychology*, 59, 617-645.
- Boroditsky, L., Fuhrman, O., & McCormick, K. (2011). Do English and Mandarin speakers think about time differently? *Cognition*, 118, 123-129.
- Borghi, A. M., Binkofski, F., Castelfranchi, C., Cimatti, F., Scorolli, C., & Tummolini, L. (2017). The challenge of abstract concepts. *Psychological Bulletin*, 143, 263-292.
- Caparos, S., Ahmed, L., Bremner, A. J., de Fockert, J. W., Linnell, K. J., & Davidoff, J. (2012). Exposure to an urban environment alters the local bias of a remote culture. *Cognition*, 122, 80-85.
- Cardon, P., Li, H., & Shi, H. (2018). Displays of status and expressiveness in professional profile pictures on LinkedIn and corporate websites: a cross-cultural comparison of China and the United States. *Global Advances in Business Communication*, 7, 1-45.
- Costa, M., Menzani, M., & Bitti, P. E. R. (2001). Head canting in paintings: An historical study. *Journal of Nonverbal Behavior*, 25, 63-73.
- Carney, D. R., Cuddy, A. J., & Yap, A. J. (2010). Power posing: Brief nonverbal displays affect neuroendocrine levels and risk tolerance. *Psychological Science*, 21, 1363-1368.

- Carra, C., Lavelli, M., & Keller, H. (2014). Differences in practices of body stimulation during the first 3 months: Ethnotheories and behaviors of Italian mothers and West African immigrant mothers. *Infant Behavior and Development, 37*, 5-15.
- Cascio, C. J., Moore, D., & McGlone, F. (2019). Social touch and human development. *Developmental Cognitive Neuroscience, 35*, 5-11.
- Chatterjee, A., Maher, L. M., & Heilman, K. M. (1995). Spatial characteristics of thematic role representation. *Neuropsychologia, 33*, 643–648.
- Chen, Z., Sun, H., Lam, W., Hu, Q., Huo, Y., & Zhong, J. A. (2012). Chinese hotel employees in the smiling masks: Roles of job satisfaction, burnout, and supervisory support in relationships between emotional labor and performance. *The International Journal of Human Resource Management, 23*, 826-845.
- Cohen, D., & Leung, A. K. Y. (2009). The hard embodiment of culture. *European Journal of Social Psychology, 39*, 1278-1289.
- Coles, N. A., Larsen, J. T., & Lench, H. C. (2019). A meta-analysis of the facial feedback literature: Effects of facial feedback on emotional experience are small and variable. *Psychological Bulletin, 145*, No. 6, 610–65.
- Crocker, J., & Park, L. E. (2004). The costly pursuit of self-esteem. *Psychological Bulletin, 130*, 392-414.
- Cuddy, A. J. C., Schultz, S. J., & Fosse, N. E. (2018). P-Curving a More Comprehensive Body of Research on Postural Feedback Reveals Clear Evidential Value for Power-Posing Effects: Reply to Simmons and Simonsohn (2017). *Psychological Science, 29*, 656–666.
- Daniels, K., & Harris, C. (2000). Work, psychological well-being and performance. *Occupational Medicine, 50*, 304-309.

- Dehaene, S., Bossini, S., & Giraux, P. (1993). The mental representation of parity and number magnitude. *Journal of Experimental Psychology. General*, *122*, 371–396.
- Demetriou, A., Kui, Z. X., Spanoudis, G., Christou, C., Kyriakides, L., & Platsidou, M. (2005). The architecture, dynamics, and development of mental processing: Greek, Chinese, or Universal? *Intelligence*, *33*, 109-141.
- Ellyson, S. L., & Dovidio, J. F. (1985). Power, dominance, and nonverbal behavior: Basic concepts and issues. In *Power, dominance, and nonverbal behavior* (pp. 1-27). Springer, New York, NY.
- Feldman, R., Rosenthal, Z., & Eidelman, A. I. (2014). Maternal-preterm skin-to-skin contact enhances child physiologic organization and cognitive control across the first 10 years of life. *Biological Psychiatry*, *75*, 56-64.
- Förster, J., & Strack, F. (1996). Influence of overt head movements on memory for valenced words: A case of conceptual-motor compatibility. *Journal of Personality and Social Psychology*, *71*, 421-430.
- Foroni, F., & Semin, G.R. (2009). Language that puts you in touch with your bodily feelings: The Multimodal Responsiveness of Affective Expressions. *Psychological Science*, *20*, 974-980.
- Gallace, A., & Spence, C. (2010). The science of interpersonal touch: an overview. *Neuroscience & Biobehavioral Reviews*, *34 interpersonal touch*, 246-259.
- Gallese, V., & Goldman, A. (1998). Mirror neurons and the simulation theory of mind-reading. *Trends in Cognitive Sciences*, *2*, 493-501.
- Gelfand, M. J., Raver, J. L., Nishii, L., Leslie, L. M., Lun, J., Lim, B. C., ... & Aycan, Z. (2011). Differences between tight and loose cultures: A 33-nation study. *Science*, *332*, 1100-1104.

- Gelfand, M. J. (2012). Culture's constraints: International differences in the strength of social norms. *Current Directions in Psychological Science*, 21, 420-424.
- Gibson, J. J. (1979). *The Ecological Approach to Visual Perception*. London: Erlbaum.
- Gillis, K., & Gatersleben, B. (2015). A review of psychological literature on the health and wellbeing benefits of biophilic design. *Buildings*, 5, 948-963.
- Girard, J. M., & McDuff, D. (2017, May). Historical heterogeneity predicts smiling: Evidence from large-scale observational analyses. In *2017 12th IEEE International Conference on automatic face & gesture recognition (FG 2017)* (pp. 719-726). IEEE.
- Goldin-Meadow, S., & Beilock, S. L. (2010). Action's influence on thought: The case of gesture. *Perspectives on Psychological Science*, 5, 664-674.
- Goyal, N., Adams, M., Cyr, T. G., Maass, A., & Miller, J. G. (2020, available on online first). Norm-based spontaneous categorization: Cultural norms shape meaning and memory. *Journal of Personality and Social Psychology*. <https://doi.org/10.1037/pspi0000188>
- Grinde, B., & Patil, G. G. (2009). Biophilia: does visual contact with nature impact on health and well-being?. *International Journal of Environmental Research and Public Health*, 6, 2332-2343.
- Guéguen, N. (2007). Courtship compliance: The effect of touch on women's behavior. *Social Influence*, 2, 81-97.
- Hall, J. A., Coats, E. J., & LeBeau, L. S. (2005). Nonverbal behavior and the vertical dimension of social relations: a meta-analysis. *Psychological Bulletin*, 13, 898-924.
- Hareli, S., & Hess, U. (2010). What emotional reactions can tell us about the nature of others: An appraisal perspective on person perception. *Cognition and Emotion*, 24, 128-140.
- Henrich, J., Heine, S. J., & Norenzayan, A. (2010). Most people are not WEIRD. *Nature*, 466(7302), 29.

Codice campo modificato

- Hofstede, G. (2001) *Culture's Consequences: Comparing Values, Behaviors, Institutions, and Organizations Across Nations*. 2nd ed., Thousand Oaks, London, New Delhi: Sage Publications.
- House, R., Hanges, P., Javidan, M., Dorfman, P., & Gupta, V. (2004). *Culture, leadership, and organizations. The GLOBE study of 62 societies*. Thousand Oaks: Sage.
- Hsu, H. C., & Lavelli, M. (2005). Perceived and observed parenting behavior in American and Italian first-time mothers across the first 3 months. *Infant Behavior and Development*, 28, 503-518
- Huang, L., Galinsky, A. D., Gruenfeld, D. H., & Guillory, L. E. (2011). Powerful postures versus powerful roles: Which is the proximate correlate of thought and behavior?. *Psychological Science*, 22, 95-102.
- Hubbard, T. L. (2005). Representational momentum and related displacements in spatial memory: A review of the findings. *Psychonomic Bulletin & Review*, 12, 822–851.
- Ijzerman, H., & Cohen, D. (2011). Grounding cultural syndromes: Body comportment and values in honor and dignity cultures. *European Journal of Social Psychology*, 41, 456-467.
- Izard, C. E. (1997). Emotions and facial expressions: A perspective from Differential Emotions Theory. *The Psychology of Facial Expression*, 2, 57-77.
- Izard, C. E., & Abe, J. A. A. (2004). Developmental changes in facial expressions of emotions in the strange situation during the second year of life. *Emotion*, 4, 251.
- Jakubiak, B. K., & Feeney, B. C. (2017). Affectionate touch to promote relational, psychological, and physical well-being in adulthood: A theoretical model and review of the research. *Personality and Social Psychology Review*, 21, 228-252.
- Ji, T.-T., Ding, Y., Deng, H., Jing, M., & Jiang, Q. (2013). Does. *Social Behavior and Personality: An International Journal*, 41, 1379–1385.

- Johnson, D. (Ed.). (1997). *Groundworks: Narratives of Embodiment* (Vol. 2). North Atlantic Books.
- Johnson, M. (1987). *The Body in the Mind: The Bodily Basis of Meaning, Imagination, and Reason*. 1987. *Chicago: U of Chicago P.*
- Joye, Y., & Dewitte, S. (2016). Up speeds you down. Awe-evoking monumental buildings trigger behavioral and perceived freezing. *Journal of Environmental Psychology, 47*, 112-125.
- Kashima, Y., Kashima, E. S., & Kidd, E. (2014). Language and culture. *The Oxford Handbook of Language and Social Psychology*, 46-51.
- Klein, A. H., Carstens, M. I., & Carstens, E. (2013). Eugenol and carvacrol induce temporally desensitizing patterns of oral irritation and enhance innocuous warmth and noxious heat sensation on the tongue. *Pain, 154*, 2078–2087.
- Kövecses, Z. (2003). *Metaphor and emotion: Language, culture, and body in human feeling*. Cambridge University Press.
- Kövecses, Z. (2005). *Metaphor in culture: Universality and variation*. Cambridge, UK: Cambridge University Press.
- Krys, K., Vaclair, C. M., Capaldi, C. A., Lun, V. M. C., Bond, M. H., Domínguez-Espinosa, A., ... & Antalfiková, R. (2016). Be careful where you smile: Culture shapes judgments of intelligence and honesty of smiling individuals. *Journal of Nonverbal Behavior, 40*, 101-116.
- Kuwabara, M., & Smith, L. B. (2016). Cultural differences in visual object recognition in 3-year-old children. *Journal of Experimental Child Psychology, 147*, 22-38.
- Kyttä, M. (2004). The extent of children's independent mobility and the number of actualized affordances as criteria for child-friendly environments. *Journal of Environmental Psychology, 24*, 179-198.

- Lakoff, G., & Johnson, M. (1980). Conceptual metaphor in everyday language. *The Journal of Philosophy*, 77, 453-486.
- Leung, K.-y. A., & Cohen, D. (2007). The soft embodiment of culture: Camera angles and motion through time and space. *Psychological Science*, 18, 824-830.
- Leung, A. K.-y., & Cohen, D. (2008). *Embodied morality*. Singapore Management University (unpublished manuscript).
- Leung, A. K. Y., Qiu, L., Ong, L., & Tam, K. P. (2011). Embodied cultural cognition: Situating the study of embodied cognition in socio-cultural contexts. *Social and Personality Psychology Compass*, 5, 591-608.
- Lévi-Strauss, Claude (1982). *The Way of the Mask*. Seattle: University of Washington Press
- Lowe, J. R., Coulombe, P., Moss, N. C., Rieger, R. E., Aragón, C., MacLean, P. C., ... & Handal, A. J. (2016). Maternal touch and infant affect in the Still Face Paradigm: A cross-cultural examination. *Infant Behavior and Development*, 44, 110-120.
- Maass, A., Merici, I., Villafranca, E., Furlani, R., Gaburro, E., Getrevi, A., & Masserini, M. (2000). Intimidating buildings: Can courthouse architecture affect perceived likelihood of conviction?. *Environment and Behavior*, 32, 674-683.
- Maass, A., & Russo, A. (2003). Directional bias in the mental representation of spatial events: Nature or culture? *Psychological Science*, 14, 296-301.
- Maass, A., Saitner, C., Favaretto, X., & Cignacchi, M. (2009). Groups in space: Stereotypes and the spatial agency bias. *Journal of Experimental Social Psychology*, 45, 496-504.
- Meagher, B. R. (2020). Ecologizing social psychology: The physical environment as a necessary constituent of social processes. *Personality and Social Psychology Review*, 24, 3-23.

- Markus, H. R., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review*, *98*, 224-253.
- Malucelli, E. & Maass, A. (2001) "The development of spatial abilities: Growing up with or without cars. *Bulletin of People-Environment Studies*, *18*, 6-11
- Martínez-Soto, J., Gonzales-Santos, L., Pasaye, E., & Barrios, F. A. (2013). Exploration of neural correlates of restorative environment exposure through functional magnetic resonance. *Intelligent Buildings International*, *5*, 10-28.
- Matsuki, Keiko. 1995. Metaphors of anger in Japanese. In Taylor, J. and R. MacLaury (eds.), *Language and the cognitive construal of the world*, 137-151. Berlin: Gruyter.
- Matsumoto, D., & Kudoh, T. (1987). Cultural similarities and differences in the semantic dimensions of body postures. *Journal of Nonverbal Behavior*, *11*, 166-179.
- Matsumoto, D., Yoo, S. H., & Fontaine, J. (2008). Mapping expressive differences around the world: The relationship between emotional display rules and individualism versus collectivism. *Journal of cross-cultural psychology*, *39*, 55-74.
- McBride-Chang, C., Zhou, Y., Cho, J. R., Aram, D., Levin, I., & Tolchinsky, L. (2011). Visual spatial skill: A consequence of learning to read?. *Journal of Experimental Child Psychology*, *109*, 256-262.
- Miyamoto, Y., Nisbett, R. E., & Masuda, T. (2006). Culture and the physical environment: Holistic versus analytic perceptual affordances. *Psychological Science*, *17*, 113-119.
- Merleau-Ponty, M. (2004). *The world of perception*. Routledge.
- Morikawa, K., & McBeath, M. K. (1992). Lateral motion bias associated with reading direction. *Vision Research*, *32*, 1137-1141.

- Kitayama, S., & Miyamoto, Y. (2002). Cultural practices emphasize influence in the United States and adjustment in Japan. *Personality and Social Psychology Bulletin*, 28, 311-323.
- Niedenthal, P. M., Barsalou, L. W., Winkielman, P., Krauth-Gruber, S., & Ric, F. (2005). Embodiment in attitudes, social perception, and emotion. *Personality and Social Psychology Review*, 9, 184-211.
- Niedenthal, P. M., Mermillod, M., Maringer, M., & Hess, U. (2010). The Simulation of Smiles (SIMS) model: Embodied simulation and the meaning of facial expression. *Behavioral and Brain Sciences*, 33, 417.
- Nisbett, R. E., Peng, K., Choi, I., & Norenzayan, A. (2001). Culture and systems of thought: holistic versus analytic cognition. *Psychological Review*, 108, 291.
- O'Doherty, J. P., Deichmann, R., Critchley, H. D., & Dolan, R. J. (2002). Neural responses during anticipation of a primary taste reward. *Neuron*, 33, 815-826.
- Ohira, H., & Kuroono, K. (1993). Facial feedback effects on impression formation. *Perceptual and Motor Skills*, 77, 1251-1258.
- Petrova, A., Navarrete, E., Suitner, C., Sulpizio, S., Reynolds, M., Job, R., & Peressotti, F. (2018). Spatial congruency effects exist, just not for words: looking into Estes, Verges, and Barsalou (2008). *Psychological Science*, 29, 1195-1199.
- Park, L. E., Streamer, L., Huang, L., & Galinsky, A. D. (2013). Stand tall, but don't put your feet up: Universal and culturally-specific effects of expansive postures on power. *Journal of Experimental Social Psychology*, 49, 965-971.
- Raymond, C. M., Giusti, M., & Barthel, S. (2018). An embodied perspective on the co-production of cultural ecosystem services: toward embodied ecosystems. *Journal of Environmental Planning and Management*, 61, 778-799.

- Robinson, M. D., & Fetterman, A. K. (2015). The embodiment of success and failure as forward versus backward movements. *PLoS one*, *10*, e0117285.
- Ross, L., Lepper, M., & Ward, A. (2010). History of social psychology: Insights, challenges, and contributions to theory and application. *Handbook of Social Psychology*, *1*, 3-50.
- Rotella, K. N., & Richeson, J. A. (2013). Body of guilt: Using embodied cognition to mitigate backlash to reminders of personal & ingroup wrongdoing. *Journal of Experimental Social Psychology*, *49*, 643-650.
- Rychlowska, M., Miyamoto, Y., Matsumoto, D., Hess, U., Gilboa-Schechtman, E., Kamble, S., et al. (2015). Heterogeneity of long-history migration explains cultural differences in reports of emotional expressivity and the functions of smiles. *PNAS*, *112*, E2429–E2436.
- Santiago, J., Lupiañez, J., Pérez, E., & Funes, M. J. (2007). Time (also) flies from left to right. *Psychonomic Bulletin & Review*, *14*, 512–516.
- Schmidt, J., & Martin, A. (2017). “Smile away your cravings”—Facial feedback modulates cue-induced food cravings. *Appetite*, *116*, 536-543.
- Schubert, T. W. (2004). The power in your hand: Gender differences in bodily feedback from making a fist. *Personality and Social Psychology Bulletin*, *30*, 757-769.
- Schubert, T. W., & Koole, S. L. (2009). The embodied self: Making a fist enhances men’s power-related self-conceptions. *Journal of Experimental Social Psychology*, *45*, 828–834.
- Schubert, T. W., & Semin, G. R. (2009). Embodiment as a unifying perspective for psychology. *European Journal of Social Psychology*, *39*, 1135–1141.
- Seger, C. R., Smith, E. R., Percy, E. J., & Conrey, F. R. (2014). Reach out and reduce prejudice: The impact of interpersonal touch on intergroup liking. *Basic and Applied Social Psychology*, *36*, 51-58.

Semin, G. R. (2009). Language and social cognition. In F. Strack & J. Förster (Eds.), *Frontiers of Social Psychology. Social cognition: The basis of human interaction* (p. 269–289).

Psychology Press.

Smith, L., & Gasser, M. (2005). The development of embodied cognition: Six lessons from babies. *Artificial Life*, *11*, 13-29.

Sng, O., Neuberg, S. L., Varnum, M. E., & Kenrick, D. T. (2017). The crowded life is a slow life: Population density and life history strategy. *Journal of Personality and Social Psychology*, *112*, 736.

Simmons, J. P., Simonsohn, U. (2017). Power posing: P-curving the evidence. *Psychological Science*, *28*, 687–693.

Soliman, T., Gibson, A., & Glenberg, A. M. (2013). Sensory motor mechanisms unify psychology: the embodiment of culture. *Frontiers in Psychology*, *4*, 885.

Spellman, B. A., & Schnall, S. (2009). Embodied rationality. *Queen's LJ*, *35*, 97-117.

Strack, F., Martin, L. L., & Stepper, S. (1988). Inhibiting and facilitating conditions of the human smile: a nonobtrusive test of the facial feedback hypothesis. *Journal of Personality and Social Psychology*, *54*, 768-777.

Suitner, C., & Maass, A. (2016). Spatial Agency Bias: Representing people in space. In *Advances in Experimental Social Psychology* (Vol. 53, pp. 245-301). Academic Press.

Suitner, C., Maass, A., & Ronconi, L. (2015). From spatial to social asymmetry: Spontaneous and conditioned associations of gender and space. *Psychology of Women Quarterly*, *41*, 46-64.

Suitner, C., Maass, A., Bettinsoli, M. L., Carraro, L., & Kumar, S. (2017). Left-handers' struggle in a rightward world: The relation between horizontal spatial bias and effort in directed movements. *Laterality: Asymmetries of Body, Brain and Cognition*, *22*, 60-89.

- Suvilehto, J. T., Glerean, E., Dunbar, R. I., Hari, R., & Nummenmaa, L. (2015). Topography of social touching depends on emotional bonds between humans. *Proceedings of the National Academy of Sciences*, *112*, 13811-13816
- Talebinejad, M. R., & Dastjerdi, H. V. (2005). A cross-cultural study of animal metaphors: When owls are not wise!. *Metaphor and Symbol*, *20*, 133.
- Tifferet, S., & Vilnai-Yavetz, I. (2018). Self-representation in LinkedIn portraits: Common features, gender, and occupational differences. *Computer in Human Behavior*, *80*, 33-48.
- Tiedens, L. Z., & Fragale, A. R. (2003). Power moves: complementarity in dominant and submissive nonverbal behavior. *Journal of Personality and Social Psychology*, *84*, 558-568.
- Tracy, J. L., & Matsumoto, D. (2008). The spontaneous expression of pride and shame: Evidence for biologically innate nonverbal displays. *Proceedings of the National Academy of Sciences*, *105*, 11655-11660.
- Triandis, H. C. (1989). The self and social behavior in differing cultural contexts. *Psychological Review*, *96*, 506-520.
- Ueda, Yoshiyuki, and Asuka Komiya. "Cultural adaptation of visual attention: Calibration of the oculomotor control system in accordance with cultural scenes." *PloS one* *7*, no. 11 (2012).
- Ulrich, R. (1984). View through a window may influence recovery. *Science*, *224*, 224-225.
- Vellinga, M. (2007). Review essay: Anthropology and the materiality of architecture. *American Ethnologist*, *34*, 756-766,
- Washington Post (2019) <https://www.washingtonpost.com/business/2019/10/07/nine-days-road-average-commute-time-reached-new-record-last-year/>

Codice campo modificato

- Wang, H., Masuda, T., Ito, K., & Rashid, M. (2012). How much information? East Asian and North American cultural products and information search performance. *Personality and Social Psychology Bulletin*, *38*, 1539-1551.
- Williams, K. J., Lee, K. E., Hartig, T., Sargent, L. D., Williams, N. S., & Johnson, K. A. (2018). Conceptualising creativity benefits of nature experience: Attention restoration and mind wandering as complementary processes. *Journal of Environmental Psychology*, *59*, 36-45.
- Wilson, M. (2002). Six views of embodied cognition. *Psychological Bulletin and Review*, *9*, 625-636.
- Wierzbicka, A. (1994). Emotion, language, and cultural scripts. In S. Kitayama & H. R. Markus (Eds.), *Emotion and culture: Empirical studies of mutual influence*. Washington, DC: American Psychological Association.
- Wierzbicka, A. (1995). The relevance of language to the study of emotions. *Psychological Inquiry*, *6*, 248-252
- Yu, N. (2008). Metaphor from body and culture. *The Cambridge Handbook of Metaphor and Thought*, 247-261.
- Yu, N. (1995). Metaphorical expressions of anger and happiness in English and Chinese. *Metaphor and Symbol*, *10*, 59-92.
- Zajonc, R. B., & Markus, H. (1984). Affect and cognition: The hard inter-face. In C. Izard, J. Kagan & R. B. Zajonc (Eds.), *Emotion, cognition, and behavior* (pp. 73–102). Cambridge: Cambridge University Press.
- Zajonc, R. B., Murphy, S. T., & Inglehart, M. (1989). Feeling and facial efference: Implications of the vascular theory of emotion. *Psychological Review*, *96*, 395-416.

Zelenski, J. M., & Nisbet, E. K. (2014). Happiness and feeling connected: The distinct role of nature relatedness. *Environment and Behavior*, *46*, 3-23.

Zhong, C. B., Magee, J. C., Maddux, W. W., & Galinsky, A. D. (2006). Power, culture, and action: Considerations in the expression and enactment of power in East Asian and Western societies. In *National culture and groups* (pp. 53-73). Emerald Group Publishing Limited.

Zwaan, R. A. (2004). The immersed experiencer: Toward an embodied theory of language comprehension. *Psychology of Learning and Motivation*, *44*, 35-62.