

GROUNDING DEVELOPMENT IN CULTURE: HOW TO STUDY THE INFLUENCE OF CULTURE ON DEVELOPMENT

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ABSTRACT. One way to understand the unfolding of human development is to consider it a culturally situated phenomenon. The present paper aims to provide a grounded perspective on how culture influences human development, specifically one in which shared practices, artifacts, ways of relating, and institutions become more important than the abstract norms of a culture in shaping development. We will analyze thus how development might become grounded in culture through the specific tools, cultural tasks and bodily actions that children from a culture are exposed to via parental practices. In the end, we discuss the implications of such a perspective for studying the interaction between culture and development.

Key-words: *embodiment; grounded cognition; culture; parental practices.*

ZUSAMMENFASSUNG. Eine Möglichkeit, die Entfaltung der menschlichen Entwicklung zu verstehen, besteht darin, diese als kulturgebundenes Phänomen zu betrachten. Anliegen dieser Arbeit ist es, eine fundierte Perspektive in Bezug auf den Einfluss der Kultur auf die menschliche Entwicklung zu bieten, vor allem eine in der gemeinsame Praktiken, Artefakte, zwischenmenschliche Beziehungen und Institutionen vor sämtlichen abstrakten kulturellen Normen für die Gestaltung der Entwicklung an Bedeutung gewinnen. Daher wird untersucht, inwieweit sich die Entwicklung auf Kultur, anhand spezifischen Instrumenten, kulturellen Aufgaben und körperlichen Handlungen zu denen Kinder einer Kultur über erzieherisches Handeln ausgesetzt sind, stützen könnte. Schließlich werden die Folgen einer solchen Perspektive für die Forschung der Wechselwirkungen auf dem Gebiet Kultur und Entwicklung diskutiert.

Schlüsselwörter: *Embodiment; Grounded Cognition; Kultur; erzieherisches Handeln.*

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Introduction

The way human development unfolds over time and the exact factors that dynamically shape this unfolding is still a mystery in the study of human functioning. One way to see this process is that human development is situated. As such, it is not a universal process but one which is influenced by the socio-cultural context in which it takes place (Dasen & Mishra, 2000; Levine, 2002). For example, children from Cameroon Nso become compliant to maternal interdictions and requests faster than children from Greece; on the other hand, children from Greece recognize themselves in the mirror faster than children from Cameroon (Keller, Yovsi, Borke, Kartner, Jensen & Papaligoura, 2004). These differences are associated with the culture specific parenting practices to which children are exposed to (Keller et al., 2004; Keller, 2013). The more distal parenting style, focused on object manipulation and face to face interaction found in Greece is associated with children recognizing themselves in the mirror earlier. The more proximal parenting style, focused on body contact and body stimulation (e.g., massage) found in Cameroon is associated with children being compliant to maternal interdictions earlier (Keller, 2013). Other cultural differences can be seen for example in processing speed. Processing speed has been found to be higher and develop faster in the case of children from Hong Kong than children living in the USA (Kail, McBride-Chang, Ferrer, Cho & Shu, 2013; McBride-Chang & Kail, 2002). The difference in processing speed might be explained by the fact that Chinese children learn to read in a language with a more complex orthography (Kail et al., 2013). Learning a visually complex orthography might lead children from China to having higher visual-spatial skills and a faster processing speed (Demetriou, Kui, Spanoudis, Christou, Kyriakides & Platsidou, 2005).

There are also cultural differences in recognizing the emotions represented by certain facial expressions. For example, four year old children from Japan are influenced by the context when they have to match a facial expression with an emotion, while children from the US are not (Kuwabara, Son & Smith, 2011). If children from Japan would see an individual with a happy facial expression surrounded by other happy people they would evaluate him as expressing more happiness than if the other people had an incongruent emotional expression. In contrast, children from the US wouldn't be influenced by the facial expression of the surrounding people when judging the emotion expressed by an individual (Masuda, Ellsworth, Mesquita, Leu, Tanida & Van de Veerdonk, 2008). These differences are consistent with the fact that Japanese parents stress the context dependency of the child's behavior and the way this behavior affects others while parents from the US frame the behavior as the effect of the child's characteristics, desires and needs (Kuwabara et al., 2011). It strikes us as obvious

from these few examples that for an accurate understanding of human development we need to understand the context that influences it, and this leads us naturally to the concept of culture.

Culture is a concept which is very difficult to pin down. As such, to this date, it has no agreed upon definition (Triandis, 2007). Despite this, most theories of culture agree that culture is constituted by a shared system of meanings which is made up of abstract values, beliefs or norms (e.g., Hofstede, 2011; Kartner & Keller, 2013; Markus & Kitayama, 1991; Triandis, 1996). This shared system of meanings is considered to provide then a framework that guides the way people in a certain group process incoming information, behave and feel (Berry & Poortinga, 2006; Soliman & Glenberg, 2014). In this paper we will call this the “classical view” on culture for the ease of reference.

Based on this view, the focus in several developmental research is on the way parental beliefs have an impact on parental behaviors and subsequently on child development. For example, the “developmental niche” framework developed by Super & Harkness (1986, 1999) states that the culturally influenced environment in which the child develops is composed of three interacting systems: a) the physical and social settings in which the child develops; b) caregiving practices that the child is exposed to; c) the psychology of caretakers, with a focus on parental ethnotheories (Harkness, Super, Bermudez, Moscardino, et al., 2010; Mone, Susa & Benga, 2014). Parental ethnotheories are belief systems that are shared by the parents from a community and that refer to the nature of children, their development, to family and parenting practices (Harkness & Super, 2005). The parental ethnotheories are considered central in this framework. As such, a caregiver’s ethnotheory, a system of abstract norms, is considered to provide caregivers with a framework that guides the way they structure the child’s physical and social environment and the childrearing practices they employ. A similar view can be found in the ecocultural model of development (Keller & Kartner, 2013). This model states that culture influences the child’s development through its influence on parental cultural models (i.e., set of shared beliefs within a community), socialization goals and ethnotheories. Again, we see that abstract norms are considered to be the main aspect that influences child development via their influence on parental practices. As such, caregiving practices are considered only a consequence of parental beliefs.

A possible alternative to the perspective on culture previously detailed is based on the embodied cognition framework. In contemporary cognitive science, the embodied/grounded view of cognition is a very influential post-cognitivist approach. It grew steadily in the past three decades and it challenges the classical view of cognition that tends to separate perception,

cognition, and action and to consider cognition as a higher order independent component (Gomila & Calvo, 2008; Ionescu, 2011). *The embodied cognition* approach states that cognition cannot be separated from perception and action and that higher order cognition is fundamentally shaped by our bodies, namely by sensory-motor neural networks, body morphology, and body states (Barsalou, Breazeal & Smith, 2007; Ionescu & Vasc, 2014). Furthermore, *the grounded cognition* account sees our representations as grounded in "the environment, situations, the body and simulations in the brain's modal systems" (Barsalou, 2010, p.717). We will use these two terms interchangeably in this paper to express the fact that cognition is in every moment shaped by the environment we are in and the bodies we have. Let us illustrate briefly with two examples.

First, one key aspect of cognition is the representations the system has. In classical cognition, representations are amodal and stored in semantic memory (Pylyshyn, 1980). Instead of this, grounded cognition sees representations as multimodal, thus grounded in the sensorial modalities of the brain and in the actions of the body (Barsalou, 2003, 2008, 2010). More and more data show that representations are mental simulations of the state the body had when learning. This new approach solves the symbol grounding problem (i.e., the way symbols acquire their meaning in our brain, Harnad, 1990), because the sensorimotor and the conceptual systems of the brains are linked together (Barsalou, 1993, 2003, 2008): concepts (or representations) are re-enactments of the sensorimotor states that captured their properties or, in other words, simulations. For example, empirical data show that when verifying properties of concepts people are faster if the properties are preceded by a same modality property (visual-visual) then when they are preceded by a property from another modality (tactile-visual) (Pecher, Zeelenberg & Barsalou, 2003). This proves that properties are stored in modality specific brain areas that are re-activated when mentally working with concepts. Second, and maybe more compelling, researchers talk about embodied mathematics. In classical cognition, mathematics is the prototype for abstract and independent thinking (Nunez, 2008). However, recent data show that the way we solve mathematical problems is grounded in immediate perception: the way formulas are written (e.g., $2+3 \times 2$ vs. $2 + 3 \times 2$) influences our accuracy because we tend to overlook abstract rules and compute in the first place the elements that are closer together (Landy & Goldstone, 2007). This shows again that higher order cognition is fundamentally influenced by perceptual processing, thus grounded. In sum, from a grounded or embodied perspective, cognition is not independent but fundamentally linked to the immediate and distal surrounding (i.e., the body and the environment) at any time, no matter how abstract an answer may be.

Based on the assumptions of the grounded cognition framework, we can speculate that culture is not to be identified with a system of abstract norms and values. Instead culture can be conceptualized firstly as the shared practices, artifacts, ways of relating and institutions of a community; and secondly, culture expresses the sensory-motor calibration of individuals from the respective community. This sensory-motor calibration arises from the interaction of individuals with a specific type of body with their social and physical environment and this calibration forms the psychological fabric of culture (based on Soliman & Glenberg, 2014). There is no duality between abstract norms on one hand and behavior on the other (Soliman & Glenberg, 2014). The different way people from different cultures develop, think, act and feel are hence brought about by the fact that they interact with different environments (i.e., with certain institutions, artifacts, practices and ways of relating). From a grounded cognition perspective on culture, abstract norms or beliefs become verbal labels that reflect the relevant constellation of bodily routines of individuals (Soliman & Glenberg, 2014). As such, we can differentiate cultures not based on abstract values, norms and beliefs but based on the prevalent institutions, artifacts, practices and ways of relating (Markus & Kitayama, 2010). For example, Canada or Germany can be described as individualistic not because most of the individuals from those societies explicitly hold individualistic beliefs but because they are composed of ways of relating, situations, practices, social institutions and systems that are fundamentally individualistic. The focus on autonomy and separation in the respective societies is evident in the prevalent dating practices, family structures or living arrangements individuals are confronted with (Markus & Kitayama, 2010). As such, culture itself becomes grounded.

The main focus of this paper is to provide a different perspective on the way culture influences child development. By linking the grounded cognition approach with an embodied view of culture we may arrive to a better comprehension of the mechanisms that shape human development. In this vein, we will review some of the mechanisms that influence development, and will analyze them from a grounded perspective. This endeavour is brought about by the fact that the “classical view” on culture can lead to a duality between the abstract norms of a culture and the behavior of the individuals living in that culture (Soliman & Glenberg, 2014). This duality is problematic because there might not be an association between individual’s self-reported beliefs or values and their behavior (Matsumoto, 2006). Oftentimes, parents do not behave in accordance with the norms, rules and beliefs they verbally state (Dasen, 2008). Taking this into consideration, can we still maintain that culture influences development through its impact on parental beliefs? Can we still

state that parental beliefs are central and parental practices only a consequence of these? Coupled with the difficulty of predicting parental practices from parental beliefs, the findings that sensory-motor behaviors and collective artifacts help us differentiate between cultures while abstract norms and beliefs don't, suggest that the answer to these questions is no (Kitayama & Imada, 2010).

Based on the arguments presented above, in the remainder of the article we will analyze how culture influences development through a series of concrete mechanisms. We will focus on tools, cultural tasks and bodily actions as possible ways through which culture molds children's development. In the end, we will argue that one way parental practices shape the development of children is via these specific cultural mechanisms.

Grounding development in culture

Development might become grounded in culture through a multitude of mechanisms. We have chosen to analyze the tools, cultural tasks and bodily actions individuals from a culture are provided with for two reasons: (1) there are intercultural differences in the tools, cultural tasks and bodily actions people are exposed to (Markus & Kitayama, 2010), and (2) these intercultural differences are further associated with differences in children's developmental pathways as we shall argue next (Gauvain, Munroe & Beebe, 2013; Keller & Kartner, 2013; Super & Harkness, 1986). Thus, we will consider each of these elements and argue that they are important mechanisms through which parental practices influence development.

Tools. An illustrative example of the impact of the tools individuals use on their development can be found in the research focused on the effects of using the abacus. Individuals who are expert users of the abacus perform the same arithmetic operations differently than individuals who are not expert users of the abacus (Miller and Stigler, 1991). Expert abacus users have specific knowledge about numerical structures and operations acquired through extended practice with this tool (Chen, Wu, Cheng, Huang, Sheu, Hsieh & Lee, 2006). This allows them to efficiently store and retrieve information by using a mental abacus; because of this they can perform mental computations at higher speed and accuracy. When performing a computation on a virtual abacus, all they have to do in order to attain the final result is to read the final imagined bead position and this shortens the computation time (Chen et al., 2006). As we can see, the physical instrument used for counting, the abacus, is the basis for the mental representations that are used in arithmetic computations even when the instrument is absent. As such, in the case of people from different cultures not only the result of a computation differs but also the cognitive process that leads to it.

The way people interact with certain tools also has an impact on the way they represent numbers. For example, there is a relationship between number magnitude and grasp aperture (Andres, Davare, Pesenti, Olivier & Seron, 2004). This was observed in a task in which adults were required to indicate the parity of visually presented numbers through a grip opening or closing. Participants were presented with Arabic digits ranging from 0 to 9. In half of the trials they were requested to close their grip if the number was even and open their grip if the number was odd. In the other half they were requested to close their grip if the number was odd and open their grip if the number was even. The task required making parity judgment so as to keep number magnitude processing implicit. The results of the study show that participants tended to close their grip faster when the number was small and open their grip faster when the number was big regardless of their parity (Andres et al., 2004). This is associated with a history of interacting with small objects with a grip that requires precision and interacting with large objects with a more powerful grip. This finding is consistent with the fact that numerical values and object size share common representations in the dorsal visual pathway (Walsh, 2003).

There is also evidence for the impact of using artifacts in a certain way on knowledge representation and lexical structure provided by Sinha and Lopez (2000). The sample used in their study was made up of children from Denmark and the Zapotec community from Mexico. There were two tasks: a language comprehension task and an action imitation task. In the language comprehension task children were required to put objects in, on or under an upright or inverted cup. In the action imitation task children had to imitate actions of placing an object in, on or under a cup with no instructions that contained locative items, but with statements like "Can you do what I did?" or "Can you do the same?". They found that Danish children displayed a canonical bias or the tendency to place objects *in* the cup. This was evident in both the language comprehension task and the action imitation task. In the case of Zapotec children, the canonical bias didn't appear at all. Thus, the authors suggest that these differences are driven by the way containers are used in the respective cultures and not by the semantics of the language used in the two cultures. For example, in the Zapotec culture containers are used flexibly: baskets are used in an upright orientation as well as in an inverted orientation (e.g., children's games, as covers for food items, etc.). In contrast to this, in Denmark, containers are used more in an upright orientation and individuals engage from early ages in interacting with upright oriented containers: children see adults using upright oriented glasses or cups. Moreover, they themselves play and drink from upright cups (Sinha & Lopez, 2000). As such, in the Zapotec culture containment is not canonically associated with an upright oriented container while in Denmark containment is canonically associated with an

upright oriented container. Hence we have proof that differences in artifacts and practices associated with their use might give rise to different conceptualizations of containment.

Another example of the way the tools individuals use ground development in culture comes from research on how gaining experience in weaving influences children. This type of expertise has an impact on processes involved in planning in the context of weaving as well as outside of it (Tanon, 1994). Support for this statement can be drawn from a study realized by Tanon (1994) with a sample of young men from Cote d'Ivoire. This sample included weavers and non weavers with varying levels of schooling and there were two tasks to assess planning skills. One task involved pattern matching based on either traditional or commercial weaving cloth. In the other task, the young men had to load and unload passengers and luggage in a small bus. This had to be done while considering the order in which the passengers would disembark. Both weaving and schooling were positively associated with planning skills but the highest performance on both tasks was attained by the schooled weavers (Tanon, 1994).

As we can see from the examples above, one route via which development becomes grounded in culture might be represented by the tools a culture uses. The "classical view" of culture acknowledges the influence of tools on development, but from a grounded perspective one might arrive at a new kind of explanation. Concrete tools, like the abacus, become cognitive tools, namely mental techniques that can lead to successfully solving specific tasks. Importantly, cognitive tools are not part of our innate cognitive architecture but can fundamentally change or alter it (Wilson, 2010). Wilson (2010) introduces the concept of *cognitive retooling*, which refers to the fact that the cognitive practices or tools that people from a culture frequently use lead to a recalibration of their cognitive system. The essential difference from the classical view is that the concrete tools activate certain sensory-motor networks when learned which will become part of the child's cognitive system (see the Situated Simulation Theory, Barsalou, 2003). The translators of tool use for children are parents who via parental practices make sure that their children will be able to solve problems in a way that is adapted to the immediate environment, in other words to the local culture. Thus concrete tools become part of the cognitive system and shape its functioning.

Cultural tasks. The cultural context in which individuals operate is made up of different cultural tasks. These can be construed as a structured set of goals and the procedures one can enact to attain those goals (Kitayama & Imada, 2010).

Rogoff and her colleagues (Rogoff, Mistry, Goncu, Moiser, Chavajay & Heath, 1993) have analyzed how mothers and children from different societies collaborate when solving different problems. The mothers and children (aged 12 to 24 months) were exposed to two kinds of tasks: mothers either had to help children interact with new objects (e.g., Jack-in-the-Box) or to help them get dressed. Mothers from all cultures worked together with their children in realizing these tasks but the way they worked together differed as a function of culture. Mothers from Guatemala for example did not consider themselves equal partners of the child. The interaction was a formal one in which the status difference between mother and child was emphasized: they preferred to ask an older child to interact with the younger one. They also directed the older child to aid the younger one to interact with the new object. Also, mothers from Guatemala did not treat their children as equal conversation partners, did not praise them often and relied more on nonverbal means to communicate with them. Mothers from the US considered themselves play partners of their children. They treated their children as equal conversation partners, asked them for their opinion and used “baby talk” in order to be at a similar verbal level with the child. They also praised their children more and framed the tasks as opportunities to collaboratively play with their children. The different ways in which mothers from Guatemala and USA interact with their children reflect the different power distances that characterize the two cultures (Hofstede, Hofstede & Minkov, 2010). As such Guatemala has a high Power Distance Index of 95 (a score above 70 is considered high) which signifies that it is a culture in which individuals believe that the inequalities between people are normal and to be accepted. The USA has a lower Power Distance Index of 40 (a score of 40 or below is considered low) which signifies that people expect and accept an unequal distribution of power to a lower extent. Also, in the USA there is an emphasis on autonomy, personal achievements and separation, while in Guatemala there is an emphasis on group harmony, fitting in and acting in accordance with the goals of the group (Hofstede, Hofstede & Minkov, 2010). These differences in power distance and emphasis on autonomy and the importance of the group were instantiated in the different way mothers from the two cultures helped their children during the tasks. As such these tasks can be understood as cultural tasks in which children are engaged.

These intercultural differences in the cultural tasks individuals frequently engage in are also associated with differences in their development. A set of important findings that point to the impact of engaging in cultural tasks on cognition are those obtained by Loucky (1976) who compared two Maya communities. One of the communities was engaged in commercial activities and the other was involved in subsistence agriculture. He found that in the case of

individuals from the community involved in commercial industry there was a higher internal locus of control. The extended family also placed a higher emphasis on autonomy. Individuals involved in commercial activities presumably engage in cultural tasks which attain the cultural mandate of independence: one must be competitive, assertive, capable of structuring one's activity to follow one's goals. This leads further to the development of higher autonomy and internal locus of control. Furthermore there are studies that show the effect of moving from agricultural subsistence to entrepreneurial commerce on Zinacatec Mayan children weaving practices and cognitive processes (Greenfield, Maynard & Childs, 2003). As the economy in Zinacatec Maya shifted from agricultural subsistence to entrepreneurial commerce, the children's weaving apprenticeship changed. It went from being structured based on a culturally conservative model (apprenticeship is highly structured by the master and opportunities for error and innovation are low) to being structured based on a culturally innovative model (low structure provided by the master, focus on trial and error learning by the novice and on innovation; Greenfield & Lave, 1982). Involvement in a more innovative type of weaving apprenticeship led to a greater ability in representing novel patterns. There was also a shift from a concrete and detailed representation of the broad stripes in the woven patterns to a more abstract one (Greenfield et al., 2003).

Also, a series of studies by Leung & Cohen (2007) suggest that through repeated and habitual engagement in cultural tasks, the cultural imperatives become "embodied". This happens through the calibration of the individual's cognitive processes. On the one hand, individuals from independent cultures habitually engage in tasks that require to separate the self from its surrounding context and to act on the basis of their own preferences and desires. As a consequence they adopt a first person view when they represent the self in time and space. On the other hand, individuals from interdependent cultures, habitually engage in tasks that require to blend in and take into consideration other peoples perspective. As a consequence they adopt a third person view when they represent the self in time and space (Leung & Cohen, 2007). Furthermore, perspectives taking abilities are shaped by these cultural patterns that determine the development of self: Chinese people seem to be better able to take into consideration another person's perspective in a communication game than North Americans (Wu & Keysar, 2007).

As seen from the previous examples, by habitually engaging in cultural specific tasks, individuals acquire and internalize the psychological tendencies necessary to successfully complete these tasks. Individuals from different cultures might develop differently because they habitually engage in different kind of cultural tasks from birth onwards (Markus & Kitayama, 2010). As a

consequence, they develop habitual, automatic and non self-reflective tendencies way before they develop explicit beliefs about the self (Markus & Kitayama, 2010). These automatic tendencies have also been shown to differentiate people from independent and interdependent contexts better than self-report measures (Kitayama, Park, Servincer, Karasawa & Uskul, 2009). So development might become grounded in culture through the fact that parents frequently engage children in culturally specific tasks. In a recent study, Soliman and Glenberg (2014) investigated if individuals from collectivistic cultures, as compared to individuals from individualistic cultures, make different estimations of the physical distance to an in-group member. The results of the study show that individuals from collectivist cultures, in comparison to individuals from individualistic cultures, estimate the distance to an in-group member as being smaller. This was evident in the fact that they estimated that it would take less (in seconds) to walk to an in-group member. Moreover, as the distance to an in-group member increases, the differences between the estimations made by individuals from collectivistic cultures and those made by individuals from individualistic cultures also increase. This suggests that individuals from collectivistic cultures and individuals from individualistic cultures use different scales to estimate the distance to an in-group members and, moreover, that in collectivistic cultures individuals have a system that is more tuned to interactions with in-group members. Hence, we can further speculate that the way in which tasks are framed in a culture gives shape through parental practices to the cognitive systems of children such that they are able to efficiently navigate the requirements of their culture.

Bodily actions. Development might be grounded in culture through the fact that children are encouraged to use certain culturally specific ways to walk, eat, stand or dance, in other words through the way they learn to make use of their bodies (Barsalou, Barbey, Simmons & Santos, 2005; Cohen & Leung, 2009; Ransom & Alicke, 2013). For instance, in societies where there is a high power distance, individuals of a lower status adopt a head-down and slumped position when interacting with individuals of higher status, a posture which signifies submissiveness. The higher status member adopts a head held up high position which signifies dominance (Schubert, 2005). Furthermore, in an individualistic culture where personal achievement and the expression of emotions are very important, standing with one's head up high might be associated with pride. Also, in a collectivistic culture where group harmony and personal effacement are prized having one's head bowed might be associated with guilt or shame (Oyserman & Lee, 2008). Other cultural differences in bodily postures might be seen in how individuals express emotions. For example, Japanese individuals tend to be more restrained in emotional situations than North

American individuals. They move their hands, arms and bodies to a lower extent than individuals from North America (Scherer, Matsumoto, Wallbott & Kudoh, 1988). Also, when expressing affiliation and liking individuals from America tend to lean forward while individuals from Japan display restrained gestures and straighten their back (Semnani-Azad & Adair, 2011). These examples are in accordance with the fact that in individualistic cultures (e.g., Canada, US) the expression of emotions is valued while in collectivistic cultures (e.g., China, Japan) a greater value is placed on the control of emotions and on personal effacement.

To illustrate how development might be grounded in culture through the bodily postures and actions that are encouraged in a culture let us take the study of Ijzerman and Cohen (2008). This experiment was realized with a sample of individuals from the US in which one group of the participants in the experiment, while completing the tasks had to stand with their head up high to see the items used in the tasks. The other group had to bow their head to see the items. During maintaining this posture, participants first completed the fill-in-the blank task which either primed honor or primed nothing. Half of the participants from the head up high group and half of the participants from the head bowed down group were primed with honor; the other half of participants from both groups were not. After the priming procedure, the participants completed a questionnaire which evaluated their level of honor endorsement. In the case of the unprimed participants, there was no difference regarding honor endorsement between those with their head held up high and those with their head held downwards. This is in accordance with the lack of centrality of honor in American culture (Ijzerman & Cohen, 2008). In the case of those primed with honor, there was a greater endorsement of honor for the participants whose head was held up high than in the case of participants whose head was held downwards. In another study realized by Rotella and Richerson (2013), constraining the participants to adopt an upright position led to feelings of pride, but constraining them to adopt a slumped, head down posture led to feelings of guilt. From these studies it is evident that the same postures can prime different reactions as a function of the meaning system that is made salient to the individual.

As we saw above the body postures and actions encouraged in a culture prime certain affective and cognitive reactions (Cohen & Leung, 2009). For example, for those who are strong believers, a kneeling position in the context of a prayer signifies submission to a deity (Barsalou et al., 2005). To investigate how kneeling influences judgment in the case of religious participants Ransom and Alicke (2013) conducted two studies. These investigated the impact of kneeling on the judgment of various scenarios as being miraculous and on identifying various images as religious objects. The results suggest that kneeling

leads to the judging of events as being significantly more miraculous and to evaluating ambiguous photos significantly more often as depicting religious objects. There is also proof that adopting a slumped position and bowing one's head primes further the basic affective reaction of guilt (Rottela & Richerson, 2013).

There is also evidence that parents shape children's bodily actions in a culture specific way. For example parents employ certain shepherding moves (i.e., body twists, tactile and non-tactile steering) to control, shape and scaffold the child's bodily actions (Cekaite, 2010). Let's consider a situation in which the mother is controlling the child's bodily actions so as to aid him in getting to the bathroom to wash his teeth. She can steer him in a more or less controlled way thus granting him more or less autonomy (Cekaite, 2010). In an individualistic culture the mother will give the child more control of the trajectory. A mother that is controlling and firmly steers the child through the environment encourages ways of bodily acting and poses that prime submission, just like those found in collectivistic cultures.

So as we can see from the examples above, another way through which development might become grounded in culture is through the bodily actions that are encouraged in a culture. Parents might employ certain shepherding moves to shape the children's bodily actions or children might learn bodily actions through observation and imitation (Leung & Cohen, 2009). So, parents enculturate their children not by transmitting explicit values, beliefs or norms but by shaping their bodily actions so as to promote a certain type of acting and being in the world. The fact that parents encourage children to use different bodily actions has important consequences if we look at this fact from a grounded cognition perspective. If mental representations are simulations of the states that the body had when learning then individuals with different bodily characteristics and actions should form fundamentally different mental representations (see the body specificity hypothesis, Casasanto, 2009). Hence, the intercultural differences in the encouragement of different bodily actions will shape the way a child's cognitive system develops.

Conclusions

Everybody agrees that development is determined by the interaction between nature and nurture and that it is not worth it anymore to think about which one is more prevalent (Karmiloff-Smith, 2009; Spencer, Blumberg, McMurray, Robinson, Samuelson & Tomblin, 2009). Beyond this, however, little is known about which factors pertaining to the nurture side are important and how they shape human development. One key factor might be represented by the parental practices children are exposed to. These are known to be influenced

by the social context (Bornstein & Cheah, 2006; Super & Harkness, 1986). The main focus of this paper was to provide a different perspective on the way culture influences child development through the way parents raise their children. As such, we tried to pinpoint some specific mechanisms through which culture is represented and determines development. Specifically, we focused on the tools, tasks, and bodily actions that children interact with or are subjected to everyday. Thus we analyzed them from a cultural perspective, namely by showing that different communities have different tools, tasks, and postures that are transmitted to children and that shape the developmental trajectories of children in different ways.

The ideas sketched in the present paper suggest some modalities through which the embodied cognition paradigm might explain previous results from research on culture and development. Let's go back to the "developmental niche" framework formulated by Super & Harkness (1999). This framework postulates that the caregiver's parental belief system guides the way parents structure the physical and social settings that the child is emerged in. They also influence the parenting practices he is exposed to (Super & Harkness, 1986). Using the embodied cognition framework we can specify the mechanisms through which caregiving customs and the physical and social settings impact the development of children. For instance material tools give rise to an individual's cognitive tools and leads further to specific ways to solve problems. These tools are provided by parents in everyday settings, becoming a mechanism that shapes the cognitive systems of children. The experiences an individual has in a certain developmental period, and the way he interacts with his environment or actively samples information shapes the kind of input he is exposed to. This leads to changes, over time, in brain structure and functioning (Byrge, Sporns & Smith, 2014). For example, studies that investigate the effects of learning to read, write and compute on brain structure and function provide support for the fact that brain networks are shaped by the behavior of children and the cultural tools they engage with (Byrge et al., 2014). Speaking about reading and writing one could envision interesting predictions based on embodiment. For instance, recent studies show that children who use handwriting are better able to recognize letters than children who write on a keyboard (James, 2010). We might predict that using *different* tools will lead to *different types* of developing one and the same ability because of the *different* motor programs that shape representations (i.e., handwriting is based on particular motor movements for each letter while using the keyboard implies the same movement for all the letters). Moreover, the new tool (i.e., the keyboard) might also have beneficial effects due to the different locations that the letters have. This can have the effect of a better hand-eye coordination. Thus the analysis of tools might take us to a deeper comprehension of the causes of

development and to understanding specific developmental trajectories. So, we see that this new approach explains previous results and also makes new insightful predictions.

Moreover, we can think about a connection between the three mechanisms: parents use and put children in certain types of bodily actions (like sitting on the floor or sitting at a table), and then use certain tools (like the abacus or fingers for counting) in certain tasks (like learning to count), and all this chain of objects/situations/actions leads to a certain type of cognitive system ready to solve culture specific problems. To express the interconnections of these mechanisms and the effects they have on the developing system we can borrow the title of a recent paper and say that “it’s all connected” (Smith, 2013, p. 618).

Adopting a grounded perspective about the way culture influences development will also take us a step closer towards a unified psychology. Traditionally, psychology has compartmentalized the study of the human mind in cultural, social and cognitive partitions, each with its own conceptual paradigm and explanations (Soliman, Gibson & Glenberg, 2013). In the cognitive tradition, individuals are considered information processors; in the social tradition they are social agents which are driven by the need to fulfill interpersonal goals; in the cultural tradition individuals are immersed in and guided by their shared set of beliefs, norms and values (Hofstede et al., 2010; Keller, 2013; Soliman et al., 2013). An integration of these segments might take the study of human development, and ultimately the understanding of the human mind, to a more comprehensive picture. Sensory-motor mechanisms might be the key link between them: they embody cognition and they embody culture.

The idea that culture plays a major role on development is not new. The theory of Vygotsky is a prominent example for this (Schaffer, 2010). What is new is thinking about this role from an embodied perspective and finding specific mechanisms that influence development. More specifically development becomes grounded through the culturally specific sensory-motor calibration of the developing child and this might take place during parent-child interactions. The calibration might be achieved through the engagement of the child with culture specific environments, tasks, tools and encouragement of certain bodily activities. And this takes us further to the idea that culture itself is embodied: rather than study the abstract values and norms of a culture it is better to investigate the embodiments of culture. Going back to parents, there are for sure parental beliefs that are generalized or abstracted from repeated practices. What we argued here is that parental practices come first and that beliefs are consequences that are not the key elements in shaping the development of children. It is rather through repeated actions that parents guide development, and these actions are grounded in the concrete aspects of a culture. We do not

intend to say that the classical view on culture is to be dismissed. It may well be that an integration of the two approaches – the classical one and the embodied one – will take us closer to a more complete comprehension of the exact route that leads from culture to development (see for similar ideas for cognition Barsalou, 2010).

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