

# Culture and Biology: The Foundation of Pathways of Development

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## Abstract

This paper develops the argument that the relationship of biology and culture is systematic: evolved predispositions and learning devices allow individuals to acquire contextually relevant information to become competent in particular environments. It is proposed to synthesize evolutionary theory with cultural and indigenous approaches defining cultural contexts on the basis of shared practices and shared beliefs. Human development can be understood as a series of evolved developmental tasks that need to be solved locally to define adaptive life histories. Early parenting strategies are defined for two prototypical sociocultural contexts: rural farmers in traditional non-Western villages and urban Western middle-class families. Parenting strategies are supposed to lay the foundation during the brain imprint period of infancy for different developmental pathways of self-development.

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## Introduction

In this paper, it is argued that development can be understood as the acquisition of cultural knowledge based in universal biological predispositions. Cultural knowledge provides individuals with the contents and the tools to master the challenges of particular environments. Environments are constituted by physical and social structures and processes. Culture can thus be understood as the human medium of adaptation (Keller, 2003, 2007).

This view of development as construction and co-construction of cultural information on the basis of informed hypotheses that are derived from the evolutionary heritage is relatively new (see e.g., Greenfield, 2002; Greenfield, Keller, Fuligni, & Maynard, 2003; Keller, 2002, 2007). It represents a major challenge to the still existing categorical and dichotomous examination of nature and culture. In the following paragraphs, first, the reflection of culture in developmental research of different theoretical traditions will be highlighted. Then the basic components for the proposed integration will be introduced (i.e., the human nature and cultural/contextual variations). The conception of developmental pathways is presented as a new synthesis of the interplay of biology and culture as understood here.

## 1 **The Reflection of Culture in Developmental Sciences**

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3 The study of culture in developmental processes has been – surprisingly  
4 enough – mainly directed at showing its non-existence for a long time.  
5 To put it differently, the inclusion of culture in developmental studies was  
6 mainly aimed at demonstrating pancultural and universal processes con-  
7 stituting the human nature (e.g., Eibl-Eibesfeldt, 1989). As a consequence,  
8 developmental science as represented in textbooks basically still takes for  
9 granted that research that has been conducted with Euro-Americans or  
10 Europeans also applies to the rest (i.e., the majority world). If culture is  
11 mentioned at all, it brings in variability; culture as a systematic informant  
12 of development is hardly recognized.

13 Attachment theory may constitute a prominent example for the claim  
14 of universality in mainstream developmental science (Ainsworth, Blehar,  
15 Waters, & Wall, 1978; Bowlby, 1969). John Bowlby's study of the mental  
16 health problems of British children who had been institutionalized  
17 following separations from their families during World War II (Bowlby,  
18 1969, 1980) led him to synthesize ethological and psychoanalytic perspectives  
19 with his clinical experiences and a systems theory view. As a result, he  
20 formulated a theory that emphasizes phylogenetic preparedness for  
21 attachment to a caregiving person, which is considered equal in importance  
22 to the satisfaction of primary physiological needs. Mary Ainsworth (1969;  
23 Ainsworth et al., 1978) extended Bowlby's attachment theory with conceptual  
24 and methodological contributions. Among other things, she proposed to  
25 assess the attachment quality in a situation, called the Strange Situation  
26 Procedure, where mainly the 1-year-old child experiences different social  
27 settings including encountering a strange person and separating from the  
28 mother. The resulting three (to four) attachment qualities are considered  
29 to represent universal strategies that have the same meaning in very different  
30 cultural environments and the same ontogenetic foundation (for a more  
31 extended view, see Belsky, 1999).

32 Although the first developmental study of attachment was carried out  
33 among the Ganda in Uganda by Mary Ainsworth (1967), attachment  
34 theory and research did not capitalize on these roots. The adaptation of  
35 the Ganda procedures to the East Coast context of Baltimore has become  
36 the basis for the universality claim. For example, the 1-year-old Baltimore  
37 children did not react fearful, when their mothers left the room, as did  
38 the Ganda children. To increase their arousal, the Strange Situation procedure  
39 was created as a laboratory based sequence of separation from the mother  
40 and encountering a strange person. This procedure was then exported  
41 worldwide as the adequate assessment tool for children's attachment  
42 quality. Cross-cultural studies, therefore, are aimed at creating conditions  
43 of variability that allow to validate the universalistic stance. The sometimes-  
44 remarkable differences that were found were neglected or post hoc  
45 attributed to some cultural background without specifying it and without

1 systematically analyzing it (see also LeVine & Norman, 2001; Rothbaum,  
2 **2** Pott, Azuma, Miyake, & Weisz, 2000a).

3 The opposite philosophy guides cultural anthropological and cultural  
4 psychological approaches that emphasize the cultural specificity of human  
5 behaviour and development (e.g., Shweder et al., 1998) and the dialectical  
6 and mutual constitution of culture and psychology. Culture is assumed  
7 to exist inside as well as outside the human psyche (D'Andrade, 1984;  
8 Greenfield, 1996). The participation in everyday contexts and the interaction  
9 with cultural experts is constitutive of developmental processes and the  
10 creation of shared beliefs and behaviours (Bruner, 1993; Greenfield, 2004).  
11 Thus, the cultural psychological perspective implies that research is  
12 conceptualised as a local communication process. Communication with  
13 the people of the study community in their own language is a prerequisite  
14 for cultural analyses of shared activities and shared meanings. Most of the  
15 culture psychological approaches are in depth analyses of one culture  
16 instead of comparing cultures (e.g., the learning of weaving of Zinacantec  
17 Mayan girls: Greenfield, 2004).

18 A different yet related approach emerged from the dissatisfaction of  
19 non-Western scientists with the dominance of Western ideology in under-  
20 standing human behaviour and thought. Indigenous psychologies emerged  
21 with the objective to decolonize the mind (see Sinha, 1996). In fact, most  
22 of the indigenous conceptions were developed by scholars from former  
23 British colonies. Indigenous conceptions share with cultural psychological  
24 approaches the foundation in the everyday psychology and ethnotheories  
25 **3** of humans of the particular culture (Greenfield, 1997). The unique  
26 contribution of indigenous psychology is the notion that psychological  
27 concepts and psychological theory, not just data collection techniques,  
28 should be developed within each culture. The goal of indigenous psychology  
29 is to take informal folk theories of psychological functioning and formalize  
30 them into psychological theories (Greenfield & Keller, 2004).

31 Instead of further differentiating these approaches, we propose to combine  
32 them. The combination, however, does not reflect an eclectic summary.  
33 We rather base the synthesis on the complementarity of evolutionary theory  
34 with cultural and indigenous approaches. The combination of these approaches  
35 seems to offer a new avenue to understand development on the basis of  
36 universal evolved developmental tasks and the predispositions to solve  
37 them as well as the particular solutions in specific cultural contexts on the  
38 basis of the shared beliefs and shared practices that local people have  
39 developed over time including the processes of change.

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### **The Biological and Cultural Nature of Humans**

43 Based on evolutionary theory, the formula 'culture via nature' (Volland, 2000)  
44 expresses the focus on adaptation to different and changing environmental  
45 conditions as the major objective regarding the interplay of culture and

1 biology. The evolution of the brain as rooted in the social complexity of  
2 higher primate's lives is crucial for this understanding. Brain growth  
3 correlates with an extended childhood, stressing learning as the prominent  
4 strategy of adaptation (Bjorklund & Pellegrini, 2002). The human childhood  
5 represents the longest pre-reproductive phase in animal kingdom with  
6 substantial costs in terms of high mortality due to illness and accidents.  
7 Nevertheless, the gains are obviously high enough to take the losses into  
8 account. The prolonged childhood allows to acquire the sociocognitive  
9 and motivational competences that are necessary to navigate successfully  
10 in complex social groups.

11 Infants are not born as a 'tabula rasa' but are equipped with epigenetic  
12 programs that prepare them for an 'inborn environment' (i.e., environmental  
13 conditions to which humans have adapted during phylogeny). Learning is  
14 based on environmentally labile *open genetic programs* (Mayr, 1988). Because  
15 learning is an individual process with an individual outcome, open genetic  
16 programs set the stage for differential effects of environmental influences.  
17 The structure and function of the developing brain are determined by  
18 how experiences, especially within interpersonal relationships, shape the  
19 genetically programmed maturation of the nervous system. Thus, social  
20 experiences influence gene transcription (Schoore, 2000). The important  
21 message is that social interactions among humans shape neural connections  
22 (i.e., the fine-tuning of the brain) as well as the mental representation of  
23 experiences and thus the psychological foundation of the individual.

## 24 25 **Environmental Variation**

26  
27 In the following paragraphs, the environmental variation in which  
28 children grow up and construct and co-construct their psychology will  
29 be summarized. The emphasis is on infancy, which is predictive for later  
30 developmental achievements because it can be regarded as brain imprint  
31 period (Keller, 2007). The reported differences are organized around  
32 two extreme environmental conditions: Western urban middle-class and  
33 rural, traditionally living farmers in the non-Western world. These two  
34 environments differ with respect to sociodemographic characteristics and  
35 in turn cultural models of the self. Infants' socialization environments  
36 will be characterized in terms of the social settings and the nature of  
37 the social exchange.

## 38 39 **Social Settings**

40  
41 Infants participate in social processes actively from birth on and process  
42 information actively and selectively (Keller, 2002). Nevertheless, due to  
43 lack of motor and executive control, they grow up in the 'scripts' of other  
44 people (Nelson, 1981), usually genetically related individuals. The mother  
45 is the primary social agent for an infant during the first months of life;

1 however, there are vast differences among the social realities, in which  
2 mother and infant are embedded. In Western nuclear families, infants and  
3 small children usually spend the day in the company of their mother or  
4 even all alone to a substantial extent (e.g., one third of the day: Whiting,  
5 1981). In the face-to-face system of a traditional village, infants and small  
6 children are never alone, but assemble social experiences with a number  
7 of relatives and neighbours. Tronick, Morelli, and Ivey (1992) observed in  
8 field studies in Zaire that infants and toddlers spent about 50% of the  
9 daytime in social interactions with other caretakers than the mother.  
10 These different settings are associated with different ideas about the  
11 responsibilities for the children's growth and development. The parents are  
12 legally and socially responsible for their children in Western cultures,  
13 whereas a child belongs to the mother only as long as she or he is in the  
14 womb as a Cameroonian proverb expresses, where childcare is a communal  
15 obligation (Yovsi, 2003).

16 Besides the different social matrices during the daytime, also nightly  
17 sleeping arrangements differ across these cultural environments (Greenfield  
18 & Suzuki, 1998). One of the major socialization instructions in Western  
19 middle-class cultures is early independence, especially expressed in sleeping  
20 alone in an own bed or even an own room. It is an unquestioned ideal  
21 that infants are expected to sleep through the night with about 3 months  
22 and thus being able for independent sleeping. These beliefs are rooted  
23 in concerns about spoiling the infant leading to unwanted dependence.  
24 In addition, parental intimacy is considered to be incompatible with  
25 co-sleeping arrangements, a legacy of psychoanalytical thinking. This  
26 attitude is supported by pediatricians who are the main informants  
27 about childcare to the young parents (Keller, Miranda, & Gauda, 1984).  
28 Spock and Rothenberg (1992), authors of a very prominent parent  
29 guide in the United States, instruct US-American parents in this sense  
30 definitely that 'it's a sensible rule not to take a child into a parents bed  
31 for any reason'.

32 In much of the majority world, the idea that infants would sleep  
33 separate from the mother or other family members or, even worth, in  
34 a separate room is regarded as child abuse. Cameroonian Nso farmer did  
35 not believe that German mothers would do something like this (Keller  
36 et al., 2004). In traditional Nso farmer families, children sleep behind  
37 the mother who faces the door to protect her offspring from evil spirits  
38 that may come at night and steal the children. The father sleeps in a  
39 different room (Yovsi & Keller, 2003). It is interesting that with increasing  
40 levels of formal education, mothers and fathers sleep in the same bed,  
41 however, with the small children. Formal education thus seems to influence  
42 the primarity of family subsystems from the mother-child unit to the  
43 marital relationship. In this case, children also leave the parental bed  
44 earlier than in traditional families, however, not to sleep alone but to  
45 sleep with other relatives.

## 1 **The Nature of Social Exchange**

2  
3 The pioneers of cross-cultural socialization research like the Whittings  
4 (Whiting & Whiting, 1975), LeVine (1988), Konner (1977), Super (1976),  
5 the Munros (Munroe & Munroe, 1994) to name just a few, have all  
6 unanimously reported basic differences in socialization strategies between-  
7 mainly African-rural villagers and Euro-American middle-class families.  
8 The African village babies experience substantially more body contact and  
9 body stimulation compared with their Western peers (Konner, 1977; Ochs  
10 & Schieffelin, 1984; Richman et al., 1988). J. W. M. Whiting (1981, 1990)  
11 showed that Gusii children are held on the bodies of their caregivers twice  
12 as much as the US-American babies, whom he characterized as 'packaged'  
13 due to wraps of clothes that prevent direct skin-to-skin contact. Whiting  
14 differentiated 'back and hip cultures', mainly situated in the warmer  
15 regions of this globe from 'crib and cradle' cultures in colder regions.

16 African babies on the other hand experience less distal communication  
17 in terms of eye contact, talking, and object stimulation, which is the major  
18 channel of communication for the Western babies (for a summary, see  
19 Keller, 2007). Western middle-class parents devote their full attention to  
20 their babies when they play with them. They try to engage the baby in  
21 mutual conversations through face-to-face contact and language; they  
22 interest their babies in toys and objects, which also is considered to entertain  
23 them without the mothers' involvement.

## 24 25 **Settings for Learning: Acquiring Competence in** 26 **Sociocultural Context** 27

28 The early socialization environments that were briefly characterized thus  
29 far imply different strategies of information processing. Although evolution  
30 provides all of us with the same tool kit, the tools that are finally used  
31 vary greatly in prominence across sociocultural contexts. The most prominent  
32 mode of learning and information processing in the traditional farming  
33 culture can be captured with an apprenticeship model (Cole, 1996; Keller,  
34 2003; Rogoff, 2003; Vygotski, 1978). The child is regarded as an apprentice  
35 in a sociocultural environment, in which he or she participates in everyday  
36 activities in order to construct local knowledge. The participation of the  
37 novice is guided by adults and older children who raise the capacities of  
38 the novice to a level that could not be achieved on his or her own.  
39 This conception has been introduced by Vygotski (1978) as the 'zone of  
40 proximal development'.

41 The nature of the apprenticeship model highlights learning as mainly  
42 consisting of observation and imitation with language playing a minor  
43 role. Patricia Greenfield has described this learning style comprehensively  
44 with learning to weave of Zinacantec Maya Indian girls (Greenfield, 1996,  
45 2004; Greenfield & Childs, 1977). The learning of the complex and

1 difficult pattern was acquired mainly by long observational units. Asking  
2 questions from the girls' side as well as verbal instructions from the  
3 mothers was considered as inappropriate. This learning style is associated  
4 with a particular pattern of attention regulation, where different attentional  
5 foci co-exist as has been described by Rogoff, Mistry, Göncü, and Mosier  
6 (1991) and Verhoef and Morelli (2007; see also Saraswathi & Pai, 1997).  
7 The child is not the focus of the caregiver's attention but is monitored  
8 constantly while other activities are performed, like doing household  
9 chores or talking to an interviewer. The pattern is eventually adopted by  
10 the children.

11 The major difference to the model of the learner as a quasi-equal  
12 partner prevalent in Western middle-class is that what is considered as  
13 important for the development of competence is outsourced of everyday  
14 interactions in specific and mainly institutionalized learning contexts, like  
15 kindergartens and schools. The major mode of leaning consists of verbal  
16 instruction from the teachers' part and questions as well as participation  
17 in verbal discourses from the learners' part. This learning style is prepared  
18 in family interactions when adults structure playful learning contexts for  
19 their children with exclusive attention and dyadic exchanges. Children  
20 address questions to their mothers, also when these are engaged in con-  
21 versations. Mothers interrupt the conversations and answer the questions  
22 of their children.

23 The two styles as characterized here represent extremes for extremely  
24 different, prototypical, contexts. In reality, many combinations and mixtures  
25 will occur. An interesting facet is that formal education and sociohistorical  
26 changes influence these learning styles to a substantial degree. Patricia  
27 Greenfield observed in the Maya community that Western type of schooling  
28 and economical changes (farmers became entrepreneurs) changed the girl  
29 learners' style from observation and imitation to trial-and-error learning  
30 and increasing verbal instructions from the mothers. In addition, the  
31 century-old weaving patterns were increasingly subject to change, thus  
32 introducing individual creativity (Greenfield, 2004). These changes underline  
33 the adaptational focus of the interplay between culture and biology.

### 34 35 **Developmental Pathways as the Synthesis of the Evolved** 36 **Nature with the Cultural Context** 37

38 The conception of developmental pathways is a consequence of the inter-  
39 play between culture and biology as specified so far. It rests on the  
40 assumption of universal developmental tasks that have evolved during  
41 phylogeny in order to solve recurrent problems of our ancestors. It is also  
42 part of the evolutionary heritage that individuals are prepared for the  
43 solution of the developmental tasks with open genetic programs or  
44 particular learning devices that allow to acquire optimal strategies for coping  
45 with particular environments.

1 Developmental tasks are commonly understood as a combination of  
2 maturational, social, and psychological challenges that need to be mastered  
3 in order to progress on a developmental timeline (Erikson, 1968; Havighurst,  
4 1972). We define developmental tasks as overarching themes that individuals  
5 have to solve during particular life stages, like developing primary  
6 relationships during infancy or becoming a parent during early adulthood.  
7 This conception of developmental tasks stresses the dynamic and interactive  
8 character of development. Developmental tasks can be regarded as flexible  
9 frame-joints connecting different phases of the life history; they organize  
10 the solution of the next developmental tasks on the basis of the prior ones  
11 in terms of timing and mode and quality. Consistency, coherence, and  
12 continuity of life strategies result.

13 The psychological continuity in self-perception is constructed and co-  
14 constructed as a concomitant sociocultural process. Cultural norms and  
15 values are the blueprint for this process. From cross-cultural (e.g., Hofstede,  
16 1997; Triandis, 1995) as well as cultural psychological (Markus & Kitayama,  
17 1991) perspectives, integrative conceptions for value systems have been  
18 proposed that underlie the development of psychological continuity and  
19 thus the self and in broader terms the personality.

20 Cultural value systems and thus self-development are related to socio-  
21 economic and sociodemographic contexts (Kağıtçıbaşı, 2007; Keller,  
22 2007). We have characterized two different socioeconomic contexts  
23 earlier: rural traditional farmers and urban middle-class Western societies.  
24 Rural traditional farmers have a low level of formal schooling; they  
25 usually start reproduction early in their late teens (fathers may be older)  
26 and have many offspring. Children are raised in extended families or  
27 communal networks. Families are hierarchically organized due to gender  
28 and seniority. Western urban families have a high level of formal  
29 education; they usually start reproduction in their late 20th to mid/end  
30 30s. They have one to two children on average who are raised in nuclear  
31 families with the mother usually being the main caretaker during the  
32 early years.

33 Two different prototypes of self-conceptions can be related to these  
34 contexts. The urban life style in the Western world can best be accom-  
35 modated by an independent individual who strives for optimal deployment  
36 of talents and capabilities in clear-cut separation from and competition  
37 with others. The self-perception is based on traits that are stable across  
38 time and situations (Kağıtçıbaşı, 1997; Markus & Kitayama, 1998). The  
39 rural life circumstances can be best accommodated by an interdependent  
40 individual who is basically cross-lined with others and wants to exhaust  
41 his or her resources to support the primary social network, usually the  
42 family: The self perception centres around the conjoint identity with  
43 the significant others and varies with relationships and situations.

44 The cultural models of the self specify socialization instructions to solve  
45 the developmental tasks over the life history. On the most abstract level,

1 they define socialization goals that can be directly transferred from the  
2 cultural models (i.e., becoming independent or interdependent, respectively).  
3 Socialization goals are extrapolated in cultural belief systems or parenting  
4 ethnotheories (Keller, 1996; Super & Harkness, 1996). These ethnotheories  
5 constitute explicit as well as implicit knowledge about parenting, socialization,  
6 and the nature of a child. They constitute the normative framework in  
7 which children develop (Keller, 2007).

8 Parenting behavior finally is the translation of the belief systems into  
9 contexts and patterns of social exchange. The two strategies that we have  
10 presented earlier can now be related to the cultural models of independence  
11 and interdependence.

12 The parenting strategy that supports the cultural model of independence  
13 rests on the interaction of two separate and quasi-equal partners who  
14 spend exclusive time with each other. Face-to-face contact is the central  
15 communicative channel during the early months of life. Babies spend a  
16 considerable amount of time lying on their backs and mother or father  
17 bending over them, looking, talking, and mirroring the baby's signals.  
18 Parents basically respond contingently to infants behavioral cues (i.e., in a  
19 time window faster than a second). This intuitive regulation matches the  
20 memory span of the infant during the first months and allows the baby  
21 to link the own behaviour with that of the interactional partner and thus  
22 experience causality (Keller, Kärtner, Borke, Yovsi, & Kleis, 2005).  
23 Besides face-to-face exchange and eye contact, object play and toys are  
24 the second important domain of parenting. This parenting strategy is  
25 distal, in that the distant senses are the major avenue of building emotional  
26 bonds between caregiver and infant.

27 Early conversations during play interactions further elaborate the  
28 cultural script.

29 Mothers ask questions and give the baby choices. They reflect an image  
30 of the baby as a mental being with needs, preferences, and wishes that  
31 need to be taken serious. The ability to spend time alone is regarded as  
32 the babies desire, as the following example from conversations of a Euro-  
33 American mother from Los Angeles interacting with their 3-month-old  
34 baby demonstrates:

35 'Want to look at mommy for a second or are you busy? Busy huh? Yes ...'

36 'Okay, should I read another little book to you, in Greek?'

37 'What are you looking at? What are you looking at, darling? Do you  
38 need this instead?'

39 'I am going to leave you alone so you can play all by yourself'

40  
41 The parenting strategy that supports the cultural model of interdependence  
42 places major emphasis on their children's physical closeness and emotional  
43 relatedness with their families from birth on. Parenting is parent centered  
44 because parents best know what is good for their children, so that there  
45 is no need to explore their wishes.

1 Parenting during infancy primarily consists of extensive body contact,  
 2 body stimulation, and the continuous monitoring of negative infant signals.  
 3 Cameroonian Nso babies spend most of their earliest weeks wrapped on  
 4 the mothers' body, also when she does household chores or works on the  
 5 farmland. They are nursed when their mother is washing vegetables or  
 6 cooking meals. This parenting strategy does not allow extensive face-to-face  
 7 contact and exclusive dyadic attention. The conversations are brief,  
 8 utilizing vocalizations more than verbal messages. Mainly social topics are  
 9 addressed. Following is a brief excerpt of a transcript from an interactional  
 10 episode between an Nso mother with her 3-month-old baby.

11 Mutiah, Mutiah, Mutiah, Mutiah, Mutiah.

12 Mm.

13 Mm.

14 Muti, Muti, Muti, Muti.

15 Mm, mm.

16 Eeyy, Mutiah, Mutiah, Mutiah.

17 Mutiah, Mutiah, Mutiah, Mutiah.

18 Are you seeing madam (the researcher)?

19 Mutiah, are you seeing her?

20 Are you seeing her?

21 Eehh.

22 Are you seeing madam?

23 Are you seeing her?

24 Mm.

25 Are you seeing madam?

26 Mutiah.

27 Look, look.

28 Are you seeing her?

29 Are you seeing her?

30 Mm.

31 Are you seeing madam?

32 Muti.

33 Mm.

34 Yes, look at madam.

36 Moreover, the conversations often are combining rhythmic language  
 37 with rhythmic movements to bring the infant into synchrony with the  
 38 mother, enmeshing the ego – other boundaries that are so central in the  
 39 independent mode.

## 41 Outlook

43 In the previous paragraphs, we have discussed prototypical environments  
 44 and prototypical cultural models. These models can be regarded as mutually  
 45 exclusive because what is regarded as normative in one model is considered

1 a pathological condition in the other. The close mother infant symbiosis  
 2 in the cultural model of interdependence is regarded as a serious threat to  
 3 the healthy self-development of a child in Western middle-class families  
 4 (Keller, 2007). However, there are many more cultural models than these  
 5 two extremes. Kağitçibaşı (1996) has proposed the model of autonomous  
 6 relatedness, which combines the autonomy from the independent model  
 7 with the relatedness of the interdependent model to a new synthesis, which  
 8 should be adaptive for educated middle-class families in non-Western  
 9 societies, the majority world. However, the model of autonomy-relatedness  
 10 is much more varied than the two prototypical models. Autonomy and  
 11 relatedness may vary in amount, in meaning, and in structure (Keller,  
 12 2007). In any case, however, human development can be understood as  
 13 the interplay of the evolved nature with contextual and cultural contexts.  
 14

### 15 **Short Biography**

16  
 17 Heidi Keller's research is located at the intersection of evolutionary theory  
 18 and cultural/cross-cultural psychology. She has authored and co-authored  
 19 in diverse journals such as *Annual Review of Psychology*, *Child Development*,  
 20 *Developmental Psychology*, *Infancy*, *Journal of Cross-Cultural Psychology* or  
 21 *International Journal of Behavioral Development*, handbooks and encyclopaedias  
 22 like *International Encyclopedia of the Social and Behavioral Sciences* and  
 23 *Encyclopaedia of Applied Psychology* as well as major German language  
 24 handbooks and encyclopaedias. She has published several books, latest  
 25 'Cultures of Infancy', which is a synthesis of her synthesis of evolutionary  
 26 theory and her cultural and cross-cultural research program. Current research  
 27 centres of longitudinal analyses of developmental pathways within and  
 28 across nations. She has been a visiting professor at UCLA, NIH, Universidad  
 29 de Costa Rica and MS University of Baroda. She has held the Nehru chair  
 30 professorship and was a fellow in residence at the Netherlands Institute for  
 31 Advanced Study in the Humanities and Social Sciences. She holds a  
 32 diploma of Psychology and a PhD from the University of Mainz and  
 33 habilitation from the Technical University of Darmstadt.  
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### 35 **Endnote**

36  
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### 41 **References**

- 42  
 43 Ainsworth, M. D. S. (1967). *Infancy in Uganda: Infant Care and the Growth of Love*. Baltimore,  
 44 MD: Johns Hopkins University Press.  
 45 Ainsworth, M. D. S. (1969). Maternal sensitivity scales. Retrieved November 20, 2003, from  
 http://www.psychology.sunysb.edu/ewaters/552/senscoop.htm

- 1 Ainsworth, M. D. S., Blehar, M.C., Waters, E., & Wall, S. (1978). *Patterns of Attachment: A*  
 2 *Psychological Study of the Strange Situation*. Hillsdale, NJ: Erlbaum.
- 3 Belsky, J. (1999). Interactional and contextual determinants of attachment security. In J. Cassidy  
 4 & P. R. Shaver (Eds.), *Handbook of Attachment. Theory, Research, and Clinical Applications* (pp.  
 5 249–264). New York, NY: Guilford Press.
- 6 Bjorklund, D. F., & Pellegrini, A. (2002). *The Origins of Human Nature. Evolutionary Developmental*  
 7 *Psychology*. Washington, DC: American Psychological Association.
- 8 Bowlby, J. (1969). *Attachment and Loss, Vol. 1: Attachment*. New York, NY: Basic Books.
- 9 Bowlby, J. (1980). *Attachment and Loss, Vol. III: Loss: Sadness and Depression*. Harmondsworth:  
 10 Penguin.
- 11 Bruner, J. (1993). Do we 'acquire' culture or vice versa? *Behavioral and Brain Sciences*, **16**, 515–516.
- 12 Cole, M. (1996). *Cultural Psychology: A once and Future Discipline*. Cambridge, MA: Belknap.
- 13 D'Andrade, R. (1984). Some proposition about the relations between culture and human  
 14 cognition. In J. W. Stigler, R. A. Shweder & G. Herdt (Eds.), *Cultural psychology. Essays on*  
 15 *Comparative Human Development* (pp. 65–129). New York, NY: Cambridge University Press.
- 16 Eibl-Eibesfeldt, I. (1989). *Human Ethology*. New York, NY: Aldine de Gruyter.
- 17 Erikson, E. H. (1968). *Identity, Youth, and Crisis*. New York, NY: Norton.
- 18 Greenfield, P. M. (1996). Culture as process: Empirical methods for cultural psychology. In  
 19 J. W. Berry, Y. H. Poortinga & J. Pandey (Eds.), *Handbook of Cross-cultural Psychology* (2nd  
 20 ed, Vol. 1, pp. 301–346). Boston, MA: Allyn & Bacon.
- 21 Greenfield, P. M. (2002). The mutual definition of culture and biology in development. In  
 22 H. Keller, Y. H. Poortinga & A. Schölmerich (Eds.), *Between Culture and Development.*  
 23 *Perspectives on Ontogenetic Development* (pp. 57–76). London: Cambridge University Press.
- 24 Greenfield, P. M. (2004). *Weaving Generations Together. Evolving Creativity in the Maya of Chiapas*.  
 25 Santa Fe, NM: Sar Press.
- 26 Greenfield, P. M., & Childs, C. P. (1977). Weaving, color terms, and pattern representation:  
 27 Cultural influences and cognitive development among the Zinacantecos of Southern Mexico.  
 28 *Inter-American Journal of Psychology*, **11**, 23–48.
- 29 Greenfield, P. M., & Keller, H. (2004). Cultural psychology. In C. Spielberger (Ed.), *Encyclopedia*  
 30 *of Applied Psychology* (pp. 545–553). Oxford, UK: Elsevier.
- 31 Greenfield, P. M., & Suzuki, L. (1998). Culture and human development: Implications for  
 32 parenting, education, pediatrics, and mental health. In I. E. Sigel & K. A. Renninger (Eds.),  
 33 *Handbook of Child Psychology. Vol. 4: Child Psychology in Practice* (5th ed, pp. 1059–1109). New  
 34 York, NY: Wiley.
- 35 Greenfield, P. M., Keller, H., Fuligni, A., & Maynard, A. (2003). Cultural pathways through  
 36 universal development. *Annual Review of Psychology*, **54**, 461–490.
- 37 Havighurst, R. J. (1972). *Developmental Tasks and Education* (3rd ed.), (Original erschienen  
 38 1948). New York, NY: Basic Books.
- 39 Hofstede, G. (1997). *Culture's Consequences: Comparing Values, Behaviors, Institutions and Organizations*  
 40 *across Nations* (2nd ed.). Thousand Oaks, CA: Sage.
- 41 Kağıtçıbaşı, C. (1996). The autonomous-relational self: A new synthesis. *European Psychologist*,  
 42 **1**(3), 180–186.
- 43 Kağıtçıbaşı, C. (1997). Individualism and collectivism. In J. W. Berry, M. H. Segall & C. Kağıtçıbaşı  
 44 (Eds.), *Handbook of Cross-Cultural psychology. Volume 3: Social Behavior and applications* (2nd ed.,  
 45 pp. 1–49). Boston, MA: Allyn, & Bacon.
- 46 Kağıtçıbaşı, C. (2007). *Family and Human Development across Countries: A View from the Other*  
 47 *Side* (2nd ed.). Hove, Sussex, UK: Psychology Press.
- 48 Keller, H. (1996). Evolutionary approaches. In J. W. Berry, Y. H. Poortinga & J. Pandey (Eds.),  
 49 *Handbook of Cross-cultural Psychology, Volume 1: Theory and Method* (2nd ed., pp. 215–255).  
 50 Boston, MA: Allyn & Bacon.
- 51 Keller, H. (2002). Development as the interface between biology and culture: A conceptualization  
 52 of early ontogenetic experiences. In H. Keller, Y. H. Poortinga & A. Schölmerich (Eds.),  
 53 *Between Culture and Development. Perspectives on Ontogenetic Development* (pp. 215–240).  
 54 London: Cambridge University Press.
- 55 Keller, H. (2003). Socialization for competence. Cultural models of infancy. *Human Development*,  
 56 **46**(5), 288–311.

- 1 Keller, H. (2006). Germany: Continuity and change. In J. Georgas, J. Berry, F. Van de Vijver,  
 2 C. Kağitçibaşı & Y. H. Poortinga (Eds.), *Families across Cultures* (pp. 327–335). Cambridge,  
 3 UK: Cambridge University Press.
- 4 Keller, H. (2007). *Cultures of Infancy*. Mahwah, NJ: Erlbaum.
- 5 Keller, H., Abels, M., Lamm, B., Yovsi, R. D., Voelker, S., & Lakhani, A. (2005). Ecocultural  
 6 effects on early infant care: A study in Cameroon, India, and Germany. *Ethos*, *33*(4), 512–541.
- 7 Keller, H., Kärtner, J., Borke, J., Yovsi, R. D., & Kleis, A. (2005). Parenting styles and the  
 8 development of the categorial self. A longitudinal study on mirror self recognition in  
 9 Cameroonian Nso farming and German families. *International Journal of Behavioral Development*,  
 10 *29*(6), 496–504.
- 11 Keller, H., Miranda, D., & Gauda, G. (1984). The naive theory of the infant and some maternal  
 12 attitudes. A two-country study. *Journal of Cross-Cultural Psychology*, *15*(2), 165–179.
- 13 Keller, H., Yovsi, R. D., Borke, J., Kärtner, J., Jensen, H., & Papaligoura, Z. (2004). Developmental  
 14 consequences of early parenting experiences: Self regulation and self recognition in three cultural  
 15 communities. *Child Development*, *75*(6), 1745–1760.
- 16 Konner, M. J. (1977). Infancy among the Kalahari Desert San. In P. H. Leiderman, S. R. Tulkin  
 17 & A. Rosenfeld (Eds.), *Culture and Infancy. Variations in the Human Experience* (pp. 287–328).  
 18 New York, NY: Academic Press.
- 19 LeVine, R. A. (1988). Human parental care: Universal goals, cultural strategies, individual  
 20 behavior. In R. A. LeVine, P. M. Miller & M. M. West (Eds.), *Parental Behavior in Diverse  
 21 Societies. New Directions for Child Development*, No. 40. San Francisco, CA: Jossey-Bass.
- 22 LeVine, R. A., & Norman, K. (2001). The infant's acquisition of culture: Early attachment  
 23 reexamined in anthropological perspective. In C. C. Moore & H. F. Mathews (Eds.), *The  
 24 Psychology of Cultural Experience* (pp. 83–104). Cambridge, UK: Cambridge University Press.
- 25 Markus, H. R., & Kitayama, S. (1991). Culture and the self. Implications for cognition,  
 26 emotion and motivation. *Psychological Review*, *98*, 224–253.
- 27 Markus, H. R., & Kitayama, S. (1998). The cultural psychology of personality. *Journal of Cross-  
 28 Cultural Psychology*, *29*(1), 63–87.
- 29 Mayr, E. (1988). *Towards a New Philosophy of Biology*. Cambridge, MA: Harvard University Press.
- 30 Munroe, R. L., & Munroe, R. H. (1994). *Cross-cultural Human Development*. Prospect Heights,  
 31 IL: Waveland Press.
- 32 Nelson, K. (1981). Social cognition in a script framework. In J. H. Flavell & L. Ross (Eds.),  
 33 *Social Cognitive Development* (pp. 97–118). Cambridge, UK: Cambridge University Press.
- 34 Ochs, E., & Schieffelin, B. B. (1984). Language acquisition and socialization. Three developmental  
 35 stories and their implications. In R. A. Shweder & R. A. LeVine (Eds.), *Culture Theory.  
 36 Essays on Mind, Self, and Emotion* (pp. 276–320). Cambridge, UK: Cambridge University Press.
- 37 Richman, A. L., LeVine, R. A., Staples New, R., Howrigan, G. A., Welles-Nystron, B., &  
 38 LeVine, S. E. (1988). Maternal behavior to infants in five cultures. In R. A. LeVine, P. M. Miller  
 39 & M. Maxwell West (Eds.), *Parenting behavior in diverse societies. New Directions for Child  
 40 Development*, *40*, (pp. 81–98). San Francisco, CA: Jossey-Bass.
- 41 Rogoff, B. (2003). *The Cultural Nature of Human Development*. New York, NY: Oxford  
 42 University Press.
- 43 Rogoff, B., Mistry, J., Göncü, A., & Mosier, C. (1991). Cultural variation in the role relations  
 44 of toddlers and their families. In M. H. Bornstein (Ed.), *Cultural Approaches to Parenting*  
 45 (pp. 173–183). Hillsdale, NJ: Erlbaum.
- Rothbaum, F., Pott, M., Azuma, H., Miyake, K., & Weisz, J. (2000a). The development of  
 close relationships in Japan and the United States: Paths of symbiotic harmony and generative  
 tension. *Child Development*, *71*(5), 1121–1142.
- Saraswathi, T. S., & Pai, S. (1997). Socialization in the Indian context. In H. S. R. Kao & D. Sinha  
 (Eds.), *Asian Perspectives on Psychology* (pp. 74–92). New Dehli, India: Sage.
- Schore, A. N. (2000). Attachment and the regulation of the right brain. *Attachment and Human  
 Development*, *2*, 23–47.
- Shweder, R. A., Goodnow, J., Hatano, G., LeVine, R. A., Markus, H., & Miller, P. (1998).  
 The cultural psychology of development: One mind, many mentalities. In R. M. Lerner  
 (Ed.), *Handbook of Child Psychology, Vol. 1: Theoretical Models of Human Development* (5th ed.,  
 pp. 865–937). New York, NY: Wiley.

- 1 Sinha, D. (1996). Indigenizing psychology. In J. W. Berry, Y. H. Poortinga & J. Pandey (Eds.),  
2 *Handbook of Cross-cultural Psychology, Vol. 1: Theory and Method* (pp. 129–169). Boston, MA:  
3 Allyn & Bacon.
- 4 Spock, B., & Rothenberg, M. B. (1992). *Dr. Spock's Baby and Child Care*. New York, NY:  
5 Pocket Books.
- 6 Super, C. M. (1976). Environmental effects on motor development: A case of African infant  
7 precocity. *Developmental Medicine and Child Neurology*, **18**, 561–567.
- 8 Super, C. M., & Harkness, S. (1996). The cultural structuring of child development. In J. W. Berry,  
9 P. R. Dasen & T. S. Saraswathi (Eds.), *Handbook of Cross-cultural Psychology, Vol. 2: Basic  
10 Processes and Human Development* (2nd ed., pp. 1–39). Boston, MA: Allyn, & Bacon.
- 11 Triandis, H. C. (1995). *Individualism and Collectivism*. Boulder, CO: Westview.
- 12 Tronick, E. Z., Morelli, G. A., & Ivey, P. K. (1992). The Efe forager infant and toddler's pattern  
13 of social relationships: Multiple and simultaneous. *Developmental Psychology*, **28**(4), 568–577.
- 14 Verhoef, H., & Morelli, G. A. (2007). 'A child is a child': Fostering experiences in Northwestern  
15 Cameroon. *Ethos*, **35**(1), 33–64.
- 16 Voland, E. (2000). Natur oder Kultur? – Eine Jahrhundertdebatte entspannt sich [Nature or  
17 culture? – A centennial debate relaxes]. In S. Fröhlich (Ed.), *Kultur – Ein interdisziplinäres  
18 Kolloquium zur Begrifflichkeit* [Culture – an interdisciplinary colloquium for its conception]  
19 (pp. 41–53). Halle/Saale: Landesamt für Archäologie.
- 20 Vygotski, L. S. (1978). *Mind in Society: The Development of Higher Psychological Processes*.  
21 Cambridge, MA: Harvard University Press.
- 22 Whiting, B. B., & Whiting, J. W. M. (1975). *Children of Six Cultures: A Psycho-cultural Analysis*.  
23 Cambridge, MA: Harvard University Press.
- 24 Whiting, J. W. M. (1981). Environmental constraints on infant care practices. In R. H. Munroe,  
25 R. L. Munroe & B. B. Whiting (Eds.), *Handbook of Cross-cultural Human Development* (pp.  
26 155–179). New York, NY: Garland.
- 27 Whiting, J. W. M. (1990). Adolescent rituals and identity conflicts. In J. W. Stigler, R. A. Shweder  
28 & G. Herdt (Eds.), *Cultural Psychology. Essays on Comparative Human Development* (pp. 357–365).  
29 New York, NY: Cambridge University Press.
- 30 Yovsi, R. D. (2003). *An investigation of breastfeeding and mother-infant interactions in the face of  
31 cultural taboos and belief systems. The case of Nso and Fulani mothers and their infants of 3–5 months  
32 of age in Mbvem, Sub-division of the North-west province of Cameroon*. Münster: Lit.
- 33 Yovsi, R. D., & Keller, H. (2003). Breastfeeding. An adaptive process. *Ethos*, **31**(2), 147–171.
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