Neuroethics (2012) 5:145–157
DOI 10.1007/s12152-011-9117-5

ORIGINAL PAPER

Moral Neuroeducation from Early Life Through the Lifespan

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Received: 30 November 2010 / Accepted: 2 May 2011 / Published online: 15 May 2011

Abstract Personality and social development begins before birth in the communication among mother, child and environment, during sensitive periods when the child's brain and body are plastic and epigenetically co-constructed. Triune ethics theory postulates three evolved, neurobiologically-based ethics fostered by early life experience. The security ethic is self-protective. The engagement ethic is relationally attuned. The imagination ethic can abstract from the present moment and imagine alternatives. Climates and cultures can foster one or another ethic. Ancestral environments were more conducive to moral development. Individuals can adopt self-authorship of their moral character through the development of ethical expertise. Recommendations are made for research and policies that study and support optimal moral development.

Keywords Moral development · Ethics · Child development · Expertise · Character education · Neurobiology

The explosion of research in the neurobiological sciences provides a good time for reviewing our understanding of morality and moral development. In this paper I review some of the empirical work that promotes a shift in moral psychology's focus away from phenomenological moral judgment and towards the neurobiological development of emotion and cognitive systems underlying those judgments. Recent research also illuminates the limitations of a genetic focus but at the same time an expanding awareness of epigenetics (the influence of the environment on gene expression). Studies in epigenetics and developmental plasticity show us how humanity's cultural has moved away from its mammalian heritage for childrearing, leaving children vulnerable from less than optimal care [1]. Here the principles of humanity's mammalian heritage are used as a framework for making recommendations in autopoesis and schooling for moral development as well as for structuring cultures that fostering optimal moral functioning.

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The Development of Moral Character

Moral character education typically addresses school-age children [2]. This is not a surprise if one assumes a Cartesian or dualistic paradigm in which reason opposes the body/emotions (explicit reasoning becomes malleable for training around age 6). In Plato's [3] view, reason is assumed to be the charioteer that opposes and controls the wayward steeds of passion. Kant [4] continued this dualism, putting morality itself in a noumenal realm outside of everyday life and subjective interest. Kohlberg [5]

adopted Kant's view as the pinnacle of moral reasoning development he studied empirically in school children [6]. Centuries of moral education have driven down this dualistic road.

We know better now. Empirical work has demonstrated that emotion is intertwined with cognition from the beginning of life [7] and that dualism is an artificial construct. Understanding and reasoning are embodied [8]. The new understanding of embodied cognition is propelled by research in affective and developmental neuroscience [9]. Personality and social development begins before birth in the communication among mother, child and environment, shaping the brain and body systems of the forming child [10].

Although in the attempt to predict human outcomes and alleviate suffering, genes have garnered the most attention for decades, there has been minimal success beyond identifying sources for uncommon diseases [11]. Recently, attention has been turning to the "epigenome" the power of the environment to influence gene expression. Instead of genes being the central players of personality and functioning, it is the epigenome that plays a central role [12]. The epigenome, how gene expression is influenced by experience, has become a causal nexus for evolution [13]. Epigenetics is demonstrating that an organism's physiological and psychological functions are influenced by the environment from conception, if not before in grandparental experience [14]. For example, when mothers are severely anxious during pregnancy, cortisol levels increase in the mother and correspondingly in the fetus, leading to an irritable, stress-reactive child [15], increasing risk for emotional problems at four years of age and hyperactivity in boys at four years [16, 17]. Characteristics that used to be considered related to a gene-based temperament or even moral character are understood to be epigenetic or the results experience during sensitive periods.

Brain development goes into full swing after birth. The baby has 75% of brain capacity yet to grow and early experience, particularly family life, shapes the unique wiring that ensues (Narvaez, in preparation). For example, a child's collaborative communication with caregivers shapes the mind "because the circuits responsible for social perception are the same as or tightly linked to those that integrate the important functions controlling the creation of meaning, the regulation of bodily states, the modulation of emotion, the organization of memory, and the capacity for interpersonal communication" [18]. The relational pattern of what underlies "attachment" is literally forming the structures and circuitry of the child's body and brain [19]. The human-to-human interaction allows the infant to double-code experiences according to physical and emotional properties, allowing cognition and emotion to develop hand in hand [7]. In this way, the early years of life provide the foundation for what is to come in terms of social, intellectual and moral development [20]. A child's capacity to use emotions to think out problems, built from "lived experience," is indicative of social skills, moral reasoning, and intelligence [21]. Human brain plasticity demonstrates the power of experience on the subtlest features of brain functioning, the modification of preexisting structures [22, 23].

The Epigenesis of Moral Functioning

Epigenetics and developmental plasticity are integral to moral development as well. Triune ethics theory (TET) [24, 25] describes the mechanisms for neurobiological and relational influences on moral dispositions in early life. TET builds on the new knowledge of early development and epigenesis, marshaling evidence from the neurobiological sciences regarding optimal human development and linking these with evolutionary science. TET proposes that three types of affectively-rooted moral orientations emerged from human evolution and are influenced by early care and social environments: the ethics of security, engagement and imagination. Each orientation has neurobiological roots that are apparent in the structures and circuitry of the human brain [9, 26]. When the propensities for action in an orientation trump other values, they become an ethic. Each ethic makes normative claims and is primed by the context, in interaction with personality. As a type of motivated cognition [27], each ethic influences what affordances are salient for action, imbuing ongoing experience with particular moral value.

The security ethic is linked to the extrapyramidal action nervous system and lower limbic areas concerned with survival in mammals. These are triggered by perceived threat to the self or ego, activating the stress-response system and fight-or-flight [9]. The *security ethic* is active when a person makes moral decisions or takes moral action from

these instincts—to protect or enhance the status of the self, either a "bunker," (aggressive) orientation or a "wallflower" (withdrawing or freezing) orientation. When the environment is chronically threatening, such as during poor early care, individuals may develop poor attachment or poor prosocial emotional circuitry and self-protection can become a dominant mode of the personality. This increases the likelihood of using aggression or withdrawal as a normal mode of social interaction, including moral interaction [28, 29]. Laboratory studies show that a self-protective orientation is easily primed with evocations of death and other threats, leading to less compassion for others [30]. Priming with a market orientation (i.e., for money) also makes the security ethic more accessible [31]. Security ethic identity is related to insecure attachment in college students [32].

The *engagement* ethic is rooted primarily in the higher limbic system of the mammalian brain where the social emotions lie. It requires co-construction with caregivers in early life through intersubjective mutual attunement and "limbic resonance," mind-to-mind coordination vital for mammalian brain functioning [10, 33]. The pattern of mutual co-regulation facilitates emotional bonding and prosocial emotional circuitry, fostering an endocrinology rich with bonding hormones like oxytocin [34].

The Ethic of Engagement is oriented to face-to-face emotional affiliation with others, particularly through caring relationships and social bonds. With supportive upbringing and lack of trauma, the systems underlying the Engagement Ethic develop fully and facilitate values of compassion, openness and tolerance [28]. In studies with college students, the Engagement Ethic is related to secure attachment and predicts moral action [32].

The *imagination* ethic emerges from the most recently evolved parts of the brain, the frontal and prefrontal cortex (PFC). It allows us to abstract from the present moment and consider alternatives. Highly influenced by early care and affected during other sensitive periods, the PFC is not completely developed until the mid-20s or so. [35] When early care is suboptimal, the orbital frontal cortex, a part of the PFC, may not develop properly and the individual may harbor an underdeveloped prosocial emotionality (leading to the dominance of the security ethic).

The Imagination ethic uses prefrontal capacities to adapt skillfully to ongoing social relationships and to address concerns beyond the immediate. When coupled with a prosocial orientation and using humanity's fullest reasoning capacities, it reflects a *communal imagination*. When completely disassociated from emotion, it becomes a *detached imagination* [36]. When it is coupled with the ego-oriented emotions of the security ethic, *vicious imagination* results. In studies with college students, the imagination ethic broadly conceived is related to integrity (Narvaez, in preparation).

In summary, triune ethics theory underscores the importance of early life in establishing brain structures and interconnections that allow for deep compassionate relational commitment to others and the intellectual capacities for complex reasoning and perspective taking. Triune ethics theory postulates that the emotional circuitry established early in life relates to the brain's architecture for morality and later ethical expression. There appear to be sensitive periods for optimal growth of hormonal systems and brain structures important for prosociality [10, 19]. For example, infants who do not receive assistance with self-regulation are more likely to develop impaired stress response, leading to a personality focus on the self [37]. College student narcissism scores have been rising over decades just as scores on empathy and moral reasoning have been declining [38–40]. How does early life experience specifically influence moral development?

Early Life and Moral Development

If epigenesis is inevitable and if caregivers are shaping the personality, mind and functioning of the child in the future, how should adults be treating children so they develop optimally—with full capacities for sophisticated moral functioning? Let's look at humanity's basic needs and the environment expected by human offspring at birth.

Basic Needs Human nature is comprised of a range of needs, some shared with all animals, some with mammals, some with primates and some unique to humans. Like most animals, humans have a primal need for safety embedded in hardwired systems that respond to threat with "fight or flight". Like other mammals, human biological systems have a need for affection and bonding [9]; neglected mammals can turn into killing machines [33]. With other primates, humans share instincts for reciprocal fairness, empathy

and altruism [41]. Anthropological studies suggest that individual freedom and egalitarianism may also be basic needs, as over 99% of human genus history was spent under such conditions and contemporary foraging hunter-gatherer communities lack authority figures or hierarchy [42–44].

Basic needs have been studied by psychologists in educational and other social settings. [45]. When basic needs for sense of belonging or relatedness, a sense of competence or effectance, and a sense of autonomy or choice are not met in school settings there are detrimental effects on students that lead to misbehavior [46]. Other researchers have identified additional needs related to peaceful coexistence such as understanding [47] and having sense of purpose and self-transcendence [48]. Staub and others show the erosion of goodwill and moral orientation, when needs go unmet in adults [49]. Moral functioning then can be facilitated by the fulfillment of these basic needs.

But what about infants and young children? How do we meet their needs? Incapable of assembling itself, the mammalian brain's emotional circuitry is established by the responsive care received during infancy and early childhood [19, 33]. For their stability and optimal development, mammalian nervous systems depend "on a system of interactive coordination, wherein steadiness comes from synchronization with nearby attachment figures" [1], *limbic regulation* centrally harmonizes and coordinates the various components. Without limbic regulation—with caregivers in early life and with others throughout life—mammals slip towards "physiologic chaos" [2][50]. Neglected mammals end up with erratic systems that are easily thrown off kilter during everyday events, [12], impinging on capabilities for sociality [51].

The "Environment of Evolutionary Adaptedness" for Children One of the most important windows we have on human basic needs is what is often called the "environment of evolutionary adaptedness" (EEA) [52]. The EEA represents the particular conditions or environment to which human morphology, physiology and behavior adapted, based on environmental supports that were consistently available [52]. Hewlett & Lamb [53] infer the type of early supports our biological systems experienced in the EEA by summarizing child care across simple hunter-gatherer communities. The EEA for young children includes being touched, held or kept near others almost constantly, being nursed frequently through the first years of life (3–5 years), experiencing prompt responses to discomforts, having multiple adult "allomothers" (including fathers and grandmothers [54] and participating in multiage play groups. Communities were small, close and cohesive. Separate research programs on each of these aspects of caregiving exist but only recently are brought together as a package [55].

To take one of the EEA features, touch, we know from animal studies that a dearth of touch in the early years is related to an underdevelopment of receptors such as those for serotonin [56]. Offspring shut down their growth (e.g., DNA synthesis) when separated from the mother [57]. In contrast to those with high-nurturing care, rat infants who do not receive high-nurturing care in the first ten days of life do not develop a strong system for dealing with stress (they are unable to switch off glucocorticoid in the hippocampus), resulting in lifelong unrelieved anxiety in the face of novelty [58], alleviated only by drug intervention [59]. In our studies with mothers and three-year-olds, we find that maternal positive touch is related to behavior regulation and social engagement at 18 months, even after controlling for mother's education and income (Narvaez et al., in preparation).

Children with responsive caregivers, fostering secure attachment, develop more agreeable personalities, earlier conscience, and more prosociality than those with less responsive caregivers [60]. In our lab studies too, we show that maternal responsivity, established at 4 months, is related to child cooperation and behavior regulation at 18 months and lack of emotional (internalizing) and behavioral (externalizing) problems at 24 months, even after controlling for mother's education and income/needs ratio (Narvaez et al., in preparation).

Our findings and those of scholars researching each component of the EEA (i.e., breastfeeding, touch, responsivity, co-sleeping, caregivers, social support, play) suggest that we ought to be taking more seriously these components in the lives of children [55]. Sometimes early life deficits cannot be remedied [61].

What I have described for early life represents *passive epigenesis*, which is outside of the individual's control. We can distinguish this from *active epigenesis*

[1] Lewis et al., p. 84
[2] Lewis et al., p. 86

in which the individual does have power to select environments that turn genes on or off and affect the direction of brain plasticity. Structural and functional "connections among neurons are permanently modified by experience" so the brain is best thought of as a "highly dynamic organ in permanent relation with the environment as well as with the psychic facts of the subject or his act" [62]. Although early life has a great impact on brain structures and wiring, it does not "make the man." The rest of life offers a chance to build new skills and capacities for moral behavior. One can build new expertise through extensive practice [63].

Fostering Moral Transformation through Adaptive Ethical Expertise Development

How do we intentionally foster moral virtue in ourselves and the young? Integrative Ethical Education (IEE) [64–66] provides an empirically-derived model for moral virtue development that can be used for personal development or educational intervention. IEE is based on fostering human flourishing and incorporates findings from educational, developmental and cognitive sciences regarding skill development, novice-to-expert instruction, social influences on brain and behavior, personal empowerment, as well as bioecological systems theory. IEE principles are discussed in three sets.

Autopoesis or self-authorship

Are humans governed by their genes? The debates about evolution, genes and development continue, spawning new areas of study. A gene-centric view describes humans as "survival machines" for replicators called genes [67], whereas evolutionary developmental biology (evo-devo) brings back in focus the organism's self-organization [68]; "evolution has resulted in organisms that develop" [69]. Gould [70] contends: "Dawkin's colorful metaphors of selfish genes and manipulated organisms "could not be more misleading, because he has reversed nature's causality: organisms are active units of selection; genes, although lending a helpful hand as architects, remain stuck within." Organisms aim not only for survival, reproduction, and dispersal as Williams [71] pointed out, but also for growth and adaptation—adaptation as an individual and as a collective. Organisms not only develop, they self-develop.

Across biological and social sciences, scholars are converging on the view of organisms as self-developing or autopoetic [72, 73]. This is a particularly important point for moral character education. In contrast to passive epigenesis (what I call) *active epigenesis* (or active plasticity) refers to the ability of the thoughtful individual to choose activities that transform the self. Individuals can modify brain malfunctioning through a change in activities which modify neuronal functioning [74]. Activities influence neuronal generation and integration [62]. Because of the high plasticity of the brain and other systems, individual choices have a great influence on whom the person becomes. The environments in which a person immerses him or herself, the friends and activities that are chosen, contribute to the development of the intuitive mind and to moral character, as Aristotle pointed out so long ago.

Like other kinds of intelligence, moral intelligence is embodied in action [75]. Moral exemplars "know what to do and do it" as a seamless interface between perception and action. What one does is what one becomes. Moral development is a matter of building physiological activation patterns, "knowledge of the structure of social space, and how to navigate it effectively" [76], developing unconscious "somatic markers" [77] for what are good and not-so-good actions in a particular situation. We learn the affordances of environments through action, and we practice those actions to build effectivities—efficacious practices for particular situations [78].

Ethical skill development using a novice to expert approach

The notion of learning as expertise development has gained prominence in education as intellectual abilities are considered forms of expertise [79, 80]. Individuals develop along a continuum from novice to expert in each area of study [81], including moral character. [64, 82]

What kinds of capacities are needed for optimal moral functioning? [83, 84] Ethical expertise [64, 82] involves individual capacities in (1) Ethical Sensitivity (perception, imagination, feeling) [85]; (2) Ethical Judgment (reasoning, reflection) [86]; (3) Ethical Focus (attention, motivation, identity) [87]; (4) Ethical

Action (effectivities, steadfastness). [88] Action schemas in each of these components can be honed to high levels of automaticity [89]. Because cognition is "situated" or contextualized [90] effective ways of thinking and acting must be learned for each context, including the ethical constructs, landscape, and actions for that domain [91].

Like other kinds of intelligence, moral intelligence is embodied in *action* [75]. It is not enough to *feel* empathy or sympathy or to *reason* well and make a good moral judgment or to be *motivated* to take a moral action. In the end, it is the action that counts (but which relies on these other processes of sensitivity, reasoning and motivation [92]). If you want to study a person's morality, study what they *do* over time, not what they say or think or believe in a snapshot.

Ethical effectivities are developed through the process of building adaptive ethical expertise. Adaptive ethical expertise is grounded in "ethical know how" [82, 93] built from a combination of immersed experience and deliberate understanding. *Adaptive* ethical expertise (unlike *routine* expertise) allows flexible, innovative response in the situation [94] as is visible in the innovative moral action of people like Geoffrey Canada [95] with the Harlem Children's Zone [91]

Experts in training, in any field, are educated holistically. Good training fosters *good intuitions* through immersion and appropriate feedback. Perceptions and sensibilities are fine tuned and developed into chronically used constructs and actions [96, 97]. Good training also fosters *deliberative understanding* (theoretical grounding and meta-cognitive guidance). Interpretive frameworks are learned and, with practice, applied automatically for information processing, judging action, taking action.

Expertise development follows a particular pattern of development that includes immersion in experience accompanied by a mentor who guides perception and offers explanation [63]—an apprenticeship model [98]. Examination of how experts become experts shows that practice must be focused, extensive, and coached [89]. Based on Marshall [99], my colleagues and I [64, 100] have parsed the fostering of expertise into four levels:

(1) *Immersion in examples and opportunities* in which the client develops a sense of 'the big picture' in an embodied manner. Individuals can immerse themselves (or adults can immerse children) in the world of the skill or practice they are trying to learn. A person trying to learn mindfulness could read books about it, socialize with people who cultivate it, and so on.
(2) *Attention to facts and skills.* Once the big picture is familiar, the next step is to start to notice detail and practice specific skills (e.g., when I talk to my spouse during dinner, I will practice focusing full attention on what is being said). Different skills are practiced until they become second nature.
(3) *Practice procedures,* After disparate skills are practice, it is time to put them together. So mindfulness practice could involve being mindful for an hour through different tasks.
(4) *Integrate across contexts*. Finally, one can learn to employ the practice or skill set in different contexts—being mindful at work, at home, at play, in public.

These levels can be used by individuals or classroom teachers to develop skills and practices that foster particular emotions and character dispositions.

What kinds of practices might an individual want to make into habits for optimal moral functioning? We return to the ethic of engagement. One of the most important practices is emotional self awareness and mindfulness, necessary for being able to recognize and respond to emotions in others [101]. Individuals can restore and revitalize the emotional parts of the brain, particularly the soft emotions through self-awareness activities such as journaling, artistic and playful activities, paying attention to likes and dislikes and spending more time doing things that bring joy [102]. Like our foraging cousins, who live in the moment like our ancestors [42]. those who focus on the present are happier than those who worry about the past or future [103]. Mindfulness training typically begins with deep breathing and attention to sensory and perceptual input. It means pulling oneself out of automatic responses to familiar contexts and paying attention to the newness in the situation [104]. Learning everyday emotional presence may require not only learning how to pay attention to "now" but also dealing with the past that has frozen emotions in place. It may require uncovering and reconstructing deeply buried emotions or convoluted painful memory through psychotherapy or other transformative experience. It

may also require awakening the right brain systems that were never adequately stimulated for emotion or were shut down by traumatic experiences [102, 105–107].

Caring relationships, group culture and community support

Integrative Ethical Education also identifies the importance of caring relationships, a supportive group culture, or climate, and community support [46]. Transformation often takes place within one or more relationships, whether teacher-student, therapist-client, support group-member, classroom-student. Relationships that foster a secure attachment are most beneficial [102]. Although one can learn from insecure relationships, a caring relationship can release or build up the emotion systems that lead to the ethics of engagement and communal imagination. Marinating the mind in emotional support and encouragement (and the hormones that go with them) is the first step towards modifying old ways into new, or helping the individual grow and change [102].

The group culture includes the expectations for growth and ethical excellence and efforts towards change [91]. Support groups, new friends or revised relationships are important to maintain the habits that come about from transformational change. These habits can fall away if the person returns to old environments and relationships, or becomes isolated. Active, full body experiences such as singing, playing, dancing, laughing are ways to feel an embodied, positive sense of community and reflect the leisure activities of our ancestral environment [108, 109].

The Minnesota Community Voices and Character Education project [100] was a collaboration between researchers and classroom teachers. The framework for moral character development (skills in the four components described above, climate of support) and the novice-to-expert pedagogy was adapted to local needs by teacher teams and adopted in a unique fashion in each school, integrated into academic instruction. In the final year's evaluation we compared effects on students from two sets of schools, high-implementing and low-implementing. High-implementing schools (n=88) fostered ethical skills (as described above) in all of school life (advisory/homeroom, standards-driven curricula, school-wide projects) and most if not all teachers were involved. Low-implementing schools (n=168) used only one or two types of implementation and had half or fewer teachers involved. We compared these school groups to a comparison school (n=125) where there was no implementation. In a new analysis presented here, we used as a covariate a measure of climate (student connectedness to school, perception of teacher connectedness to student, perceptions of teacher attitudes, perceptions of teacher behavior). We compared school sets on student gain scores (post test–pre-test) on measures of ethical sensitivity (concern for others), ethical focus (ethical identity, community bonding, citizenship) and ethical action (ethical assertiveness). We conducted a multivariate analysis of covariance. The multivariate results were as follows: for climate (covariate): Wilk's lambda=. 68, F (5,374)=35.75, p<.001, $\eta 2$=.32; for school group (factor): Wilk's lambda=.89, F (10,748)=4.35, p<.001, $\eta 2$=.06. Univariate analyses for climate showed several significant results: concern for others F (1, 378)=.007, p<.93, $\eta 2$=.00; community bonding F (1, 378)=113.42, p<.001, $\eta 2$=.23; citizenship: F (1, 378)=118.79, p<.001, $\eta 2$=.24; ethical identity: F (1, 378)=45.33, p<.001, $\eta 2$=.11; assertiveness: F (1, 378)=21.38, p<.001, $\eta 2$=.05. Univariate analyses for school group also showed several significant results: concern for others F (2, 378)=14.80, p<.001, $\eta 2$=.07; community bonding F (2, 378)=3.68, p<.03, $\eta 2$=.02; citizenship: F (2, 378)=2.82, p<.06, $\eta 2$=.02; ethical identity: F (2, 378)=3.39, p<.03, $\eta 2$=.02; assertiveness: F (2, 378)=3.38, p<.03, $\eta 2$=.02. In summary, climate positively influenced the development of student ethical focus skills, community bonding, citizenship, and ethical identity. High implementation positively influenced the development of ethical focus: community bonding, ethical identity, and ethical sensitivity (the two high-implementing schools worked on ethical sensitivity specifically). Deep and broad implementation of ethical skill instruction had positive significant effects on students whereas minimal implementation had little positive effect.

The Integrative Ethical Education approach uses a flexible, collaborative model of presenting the research-based framework to local educators who adapt it for local needs and conditions. The framework is intentionally broad and inclusive so that educators have maximal flexibility in their local adaptation. The Minnesota implementation demonstrated that the combination of a research-based framework and local control can lead to an effective intervention for moral character development.

Societies and Moral Functioning

Brain plasticity and social influence mean that moral functioning can shift and change beyond childhood and adolescence, for better or for ill. It is not rocket science to remember that we are mammals and require social engagement and support for optimal functioning [33]. When adult mammals are isolated from others, their well-being suffers [110]. Societies that are peaceful meet the needs of their members, particularly of the young, using principles of human mammalian ancestry [42, 109]. Several recommendations are proposed to focus professional attention on our human mammalian needs, especially in early life.

Recommendations for Research, Policy, and Professionalism

Research Recommendations[3]

Use an evolutionary baseline for determining normality Scientists typically assume that the members of the U.S. population they study are in the range of normality. The evidence is to the contrary as the industrialized, educated, rich, democratic Westerners populating psychological studies represents about 12% of the world's population [112] and college students are a subset of that. I propose that we begin with how close a person's early (and perhaps later) experience and upbringing aligns with the ancestral human mammalian milieu (AHMM) as a baseline for determining degree of normality [113]. The AHMM refers to the upbringing practices of catarrhine mammals (more than 30 million years old) and their unique human form represented in the environment of evolutionary adaptedness (EEA). Because most Westerners are not spending their days well-exposed to the sun like our ancestors, our bodies and brains are deficient in vitamin D leading to multiple health effects [114]. We may be deficient in other ways compared to our ancestors. We need to know which early supports matter and how they matter so we can design interventions to prevent or alleviate long-term detrimental outcomes. Those with early experiences that match the AHMM may provide a better sample for determining the appropriate phenotypic range for evolutionary "normality."

Establish a national database on the relation of early experience to mental health For over half a century, there has been abundant empirical evidence about how powerfully social neglect affects mental health outcomes. Rene Spitz [115] first brought to the world awareness of how child abuse and neglect lead to future mental and physical illness [116, 117]. The database should include mammalian research modeling of brain mechanisms [118] as well as a national database on child neglect and abuse effects [119]. Finally, practices that do and do not match with the AHMM should be studied and included in the database (e.g., birthing practices such as using Pitocin, an oxytocin mimic that may interfere with mother-child relations) [120].

Recommendations for Professional Policy Statements

Professional societies should formulate policy statements on parenting Noted by mental health researchers and confirmed with experimental data, poor parenting deteriorates further across generations, with concomitant effects on child outcomes [58, 121]. Professionals in psychology, psychiatry and those who work with families and children generally must figure out how to mitigate these generational snowballing effects. A precautionary principle regarding parenting practices is preferred. If we take as a baseline for optimization the lifestyles of our ancestors and what we know about the effects of its absence, along with our understanding of prosocial brain development upon which higher human faculties are founded, then we must rethink and reframe some current child-rearing practices as "risky." These include children sleeping in isolation [122], "crying it out" [123], lack of regular skin-to-skin contact [124], formula feeding [125], stranger day care [126], and parenting in isolation [127]. Statements from the American Psychological Association (APA) and the Society for Research in Child Development (SRCD) could explicitly support breastfeeding, safe co-sleeping, caring touch, and responsive caregiving (much along the lines of Attachment Parenting International). Such statements on parenting could also advocate parenting education for all members of a society.

[3] For more suggestions and details, see Narvaez et al. [111]

Formulate a Policy Statement on Structuring Society and Institutions to Support Children and Families Although interventions are helpful and needed, not enough attention has been given to prevention, which requires greater support for children and families. The American Psychological Association, the Society for Research in Child Development and the Association for Psychological Science, among others, can advocate greater societal support for children and families. Advocacy could include revamping social structures and institutions so that parents and families are central in social planning and taxpayer support (e.g., extensive parental leave as in some advanced nations [128]). Neighborhood community and family support systems are essential for new parents along with support for breastfeeding and child care, sensitive workplace daycare and local breast milk banks to ensure that the burden of childcare would not fall on mothers alone.

Every effort should be taken to support mothers and keep them from depression because the effects of having a depressed or overly-stressed mother in early life appear to be lifelong [129] even though it is now viewed as a "relatively common deviation in early experience"[4]. Our ancestors had extensive community support in raising children and an enjoyable social life simultaneously. Too many mothers are isolated with their children. Without support, parents can be inattentive to their children's needs [54]. Too much stress in early life leads to hyperactive stress response systems. For example, children with early deprivation exhibit abnormal stress response [130] and children who live in poverty have a greater likelihood of depression through the life course [131].

Professional Ethical Responsibility

As professionals generally and as recipients of public funding p*sychologists should be advocates for optimal early experience*. Although professional organizations often have position papers on mental health, they typically emphasize intervention, rather than prevention. Across the human and animal sciences, we know enough now about early life effects on adult mental and physical health. To ignore how divergence from ancestral evolutionary standards for early care can devastate individuals and communities is an unethical stance.

Of course all of these recommendations are grounded in the assumption that 30 million years of parenting practices are more meritorious than recently acquired parenting practices. Converging evidence makes it clear that AHMM practices have health enhancing effects and their absence the opposite.

Conclusion

Western societies seem to have forgotten their past and often ignore the mammalian nature of their citizens, leading to systems and practices based on arbitrary belief systems [132]. No matter how satisfying systematizing childrearing may be [133], engineering away our mammalian inheritance is not only illogical it has tragic consequences. We may be creating humans with evolutionarily subnormal capacities at a time in history when we need human capacities to be optimized to meet the challenges of a warming, overpopulated and stressed habitat. A wide-ranging approach to human development that applies a precautionary principle, taking into account the mammalian nature of human beings, would be a wiser course.

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