

Chapter 2

Benchmarks, Developmental Challenges, and Risks During the Prenatal and Infancy Period

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Introduction

The 1989 UN Convention on the Rights of the Child has not yet been signed and put into action by all nations. Nevertheless, the 2000 UN Millennium Declaration and the UN Millennium Goals for 2015 indicate that these initiatives appear to have stimulated a wealth of investigations and research, within nations and among nations, that aim at improving the lives of children, particularly those of very young children (Britto, Yoshikawa, & Boller, 2011; U.N. 1989, 2000, 2010). The foremost goals of the UN initiatives, with regard to young children, are reducing child mortality, improving maternal health, combating highly infectious diseases (such as HIV/AIDS and malaria), eradicating extreme poverty and hunger, achieving universal primary education, and promoting gender equality and empowerment of women particularly by addressing birth rate and children's development. The other major environmental and sociopolitical aims are ensuring environmental sustainability and a global partnership for development.

A Historical Sketch of Prevention in Early Childhood

Preventive public health care became linked to basic human rights already during the 1848 revolutions in Europe (Stöckel, 2007). These revolutions were stimulated by the democratic concepts of the French Revolution of 1789 and instigated by the consequences of rapid industrialization and urbanization with ensuing health problems in cities and disintegration of rural areas.

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In 1870, one in four children in Germany and other industrializing countries did not survive their fifth birthday. Poverty, uncontrolled growth of compact urban areas, long workdays of both parents in factories and the ensuing neglect of the children, and unhygienic conditions contributed to this situation. The last decades of the nineteenth century saw the introduction of preventive measures, some of which continue today.

The first measures of prevention were taken at different system levels. At the local level, they ranged from systematic city planning with parks in residential areas, improved public transportation, municipal sewage systems, indoor plumbing, and community gardens for urban families. Socially committed factory owners improved workplaces and dwellings for their workers. Medical science flourished, and medical care improved, especially with the work of Nobel Prize winners such as Robert Koch and Ignaz Semmelweis. Bacteria of specific diseases were discovered, and vaccinations became possible in the following decades. Puerperal fever, which had led to the death of many women during childbirth especially in research-oriented hospitals, was drastically decreased by strict hygienic barriers between hospital care and pathology units. Prevention was also introduced at a behavioral or lifestyle level. The first books on infant care by Alfred Grotjahn appeared in 1912 (Stöckel, 2007). Auguste Victoria, the socially committed last German empress, founded the first prevention research clinic in Berlin in 1909 (Bergmann, Bergmann, Richter, Finke, & Dudenhausen, 2009) that was primarily devoted to improving and popularizing prenatal and infant care, especially breastfeeding and prevention of chronic illness. One of these preventive measures, originally introduced to combat tuberculosis and rickets, is still part of a typical German lifestyle: the family Sunday walk in the parks and forests.

These preventive measures at national and local levels were largely effective. The childhood mortality rate decreased to fewer than 100 per 1,000 children in 1930, in spite of war, hunger, and a disastrous economic recession; this rate is similar to many countries in Africa today. Currently, the infant mortality rate is below 0.6 % in the United States, below 0.45 % in the European Union, and below 0.25 % in Japan (CIA, 2012). Child and infant mortality rates continue to be major indicators for a country's health situation in underdeveloped and developing countries. Prevention measures in developing countries are generally similar to those in developed countries 100 years ago. UNICEF initiatives and support reduced the child and infant mortality rate worldwide from 1990 to 2006 by 24 % not only through improvements in hygiene (especially safe drinking water), vaccination against infectious illnesses, provision of additional vitamin A, and insecticide-treated mosquito nets but also by supporting breastfeeding efforts and providing community health services (UNICEF, 2012).

The prevention of childhood death continues to be an important goal at all levels: parents, communities, nations, and international organizations. The idea of prevention has, however, changed as the apparent needs and problems of children have changed given the greater diversity in family compositions, the improvements in health care and mental health care, and the advancement of child development research. Whereas prevention originally addressed protecting a young child from

physical dangers or from specific illnesses and diseases, prevention efforts in the 1960s and 1970s focused on preventing or compensating for social and psychological risks of the young child and recognizing early risk indicators of unfavorable outcomes in later childhood and adolescence (e.g., school dropout, juvenile delinquency and risky behavior, mental health problems). Preventive interventions combined physical/medical support with compensatory education, as in the Head Start programs in the United States, or focused on education and stimulation for all young children, as in the Sesame Street television series that was copied and adapted in many countries. While the TV series was available to anyone who was interested, education-oriented prevention was usually restricted to children with specific risks (e.g., children who were born prematurely, are disabled, or are from socially disadvantaged families). Numerous programs were developed and implemented. Well-controlled experimental studies as well as follow-up studies were conducted at research institutions, especially in the United States and Canada. Quasi-experimental longitudinal studies followed risk and comparison infants into later childhood and adolescence. Advancements in medical research and health provision, as well as the expansion of research and academic training in behavioral and social sciences and improvements in international scientific cooperation and exchange, stimulated large-scale studies also in other developed and industrialized countries (e.g., Europe, Australia, and Japan). In recent decades, globalization has accelerated in part due to rapidly changing communication technologies. Research cooperation with developing countries is growing. With support of the World Health Organization (WHO), international classification systems, such as the International Classification of Diseases, have been adopted worldwide. Supported by UNICEF, indices for a country's overall quality of life are being developed, such as the Human Development Index (which comprises gross domestic product, education, and life expectancy), to better compare countries, especially developing countries, and to measure improvements or declines (Bornstein et al., 2012). Improvements and declines may have many causes. Major changes in the living conditions of even the youngest children may offer opportunities but may also pose challenges and new risks, in developing as well as in developed countries. Research-based preventive interventions, even when they have proved to be effective, have to be adapted to these "historical" changes, and transfer of expertise to developing countries has to account for sociocultural and even physical differences.

Issues Related to Risks in Infancy and Early Childhood

After thousands of years of very similar upbringing and care for children in the infancy period, the infant ecology has changed dramatically in the past century and even more rapidly in the last few decades.

Intentional birth control (i.e., the prevention of an unwanted child) has eventually become pharmaceutically and medically accessible and legally accepted in most, except some of the poorest, countries since the 1960s. Birth control has led to

fewer children being born to increasingly older and better educated mothers. Unfertile couples and single women can now have their own biological children through in vitro fertilization, donor sperm, donor egg, and surrogate pregnancy. Although hotly discussed because of the ethical implications, methods of preimplantation genetic diagnostics, embryo selection, and genetic modification will be accessible in the near future.

Close surveillance of fetal gestation increases the number of pregnancies ending in live births, as well as the numbers of premature and multiple births. Adaptive changes in medical and psychological perinatal care have dramatically improved the survival chances of premature newborns and reduced major neurological, sensorimotor, and respiratory birth defects. Because of these advances, more *fragile neonates* and infants with overt or discreet health restrictions survive and have a good chance to live well into adulthood.

Family structures and family values, even within a culture or nation, have become extremely varied, and for many children they are unstable and unpredictable. Many children grow up in single-parent households or in nontraditional patchwork families (McCall, van IJzendoorn, Juffer, Groark, & Groza, 2011). The responsibility for a child can be split between the parents resulting in total setting changes for the infants on a daily or weekly basis, as sometimes in the case of separated parents. In modern urban settings, social and psychological care for the infant has become a complex and demanding task even in traditional families. Many infants may spend hours outside the home and with different caregivers several times per week or even per day. The number of directly accessible people for a young child is often highly restricted, and the contact periods are highly structured and only minimally controllable by the infant. New parents often have limited experience with young children and/or are skeptical about parenting styles of previous generations. They are left with being uncertain about parenting and are coping with parenting helplessness.

Child neglect, child maltreatment, and even child abuse have become public concerns involving children even at very young ages. Primary prevention focuses on introducing new parents to sensitive and secure parenting or on addressing factors that prevent parents from realizing the needs and reactions of their infant (e.g., stress, maternal depression).

Fewer and intentionally conceived children are more precious for their parents and receive more parental investment (Belsky, Steinberg, & Draper, 1991). *Overprotection and overstimulation* can become harmful for the developing child. Some parents feel pressure to start education as early as possible to prepare their children for the demands of a future world. Some children may even suffer under the load of parental expectations. Parents may cognitively overstimulate their babies with an overabundance of toys and introduce even toddlers to using media and electronic communication (e.g., Skype). It is still unknown how new electronic possibilities will influence or change the mental, communicative, and emotional development of preschool children.

Early institutional care is apparently inevitable not only for orphans but also for children of physically, mentally, socially, or emotionally dysfunctional parents

when there is no supportive network of relatives. In most developed countries, childcare institutions have become safe and child-oriented places, but they cannot replace the atmosphere of family upbringing. Therefore, foster care and adoption are generally preferred. In the 1970s, *adoption and foster parenthood* was advocated as being nearly equivalent to biological parenthood. Recent research is less optimistic, especially in the case of international adoption (Grotevant, 2011). Timing of adoption is important. Attachment research has demonstrated the sustaining importance of a first intensive socio-emotional bond between an infant and a primary caregiver. Even in the case of adoption or foster care shortly after birth, the infant's psychobiological system has already been shaped during pregnancy, as recent epigenetic research has shown (Meaney, 2010), for example, with regard to stress reactivity. Epigenetic research findings should be considered in surrogate situations, especially when the surrogate mother lives in poverty.

The following sections present overviews on recent scientific insights into typical development in the prenatal and perinatal periods, infancy, and toddlerhood, along with period-specific risks and vulnerabilities and prevention issues. For the postneonatal periods, and with reference to Bronfenbrenner's ecological model (Bronfenbrenner & Crouter, 1983), vulnerabilities are discussed relative to proximal and distal risks in age-specific environments and settings (i.e., for quality of parenting, quantity and quality of extra-parental care and education, institutional care, and poverty as an overarching impact).

Development, Risks, and Prevention in the Prenatal Period

Advanced methodology in biological, medical, and psychological research has contributed to increased knowledge of regular and deviant prenatal development and positive and detrimental influences during this period.

Throughout the 40 weeks of gestation, from fertilization until birth, the fetal organism develops not only by unfolding a genetic program. Fetal development is constantly stimulated, channeled, and controlled by processes from within the fetal organism, by the biological environment provided by the womb, by maternal metabolism and activity, and even by external influences. These influences interact and change with fetal organic and functional development. At birth, the child is just one of the possible developmental variants given the initial genetic endowment.

Most influences of the interacting prenatal milieu systems have a stimulating, channeling, and shaping effect and can be considered continuous adaptations of the fetal organism to its present situation. From an evolutionary perspective, some of the epigenetic effects could be interpreted as preadaptation to an external world as translated to the fetus by the maternal organism (Bornstein, 1989a; Fox, Levitt, & Nelson, 2010). Recent epigenetic research (Azar, 2011; Meaney, 2010; Zhang & Meaney, 2010) has revealed some of the microbiological mechanisms that produce and change the specifically adapted gene expression and gene transcription, especially during cell specialization. These processes involve triggering or silencing

certain regions of the genome (by methylation) in a manner that is specific for each cell type. Some cell structures are more prone to epigenetic alterations than others (Zhang & Meaney, 2010, p. 447). Cells involved in metabolic functioning and nerve cells appear to be among those that are sensitive to epigenetic reprogramming. These biological microprocesses explain the rather enduring effects of some early influences, although epigenetic reprogramming does not seem to be totally limited to the prenatal period.

For a long period, the embryo and fetus were considered largely protected from external influences except for exposure to alcohol, radiation, and specific maternal infections that had been proved to seriously disturb prenatal organic development especially in the first trimester. Epigenetic understanding will differentiate scientific knowledge of period-specific effects of non-noxious as well as noxious, or damaging, influences (teratogens).

In the *first 3 months* (first trimester) when most of the organic structures are being built, teratogens may cause a severe developmental deviation or even growth cessation of a specific inner organ or limb, as was sadly demonstrated in people prenatally exposed to thalidomide. In the *second trimester*, most of the brain architecture is being differentiated and functionally specialized (Fox et al., 2010). The hormonal milieu, for instance, as produced by the male infant and the mother, stimulates sexual differentiation of the organs but also of brain regions (Berenbaum & Snyder, 1995; Dörner 1989). Additional hormones introduced into the fetal–maternal system externally (e.g., by medication, polluted water, pesticides) can alter the developing neural sexual centers (Dörner et al., 2001). In the *last trimester*, the fetal system becomes more interconnected (e.g., between the sense organs and the brain), more differentiated, and partly adapted to smooth functioning by reduction of superfluous nerve cells and synapses. Infant gross and fine motor activity contributes to this process, and most senses are being tuned to the expected external world. The fetus becomes accustomed to basic melodic and rhythmic features of the mother, to acoustic-endocrine associations of acoustic emotional information, to different kinds of touch, and even to culture-specific tastes (Fox et al., 2010). Major detrimental conditions in this period can trigger premature birth. If born premature, the infant is now usually viable though still immature and highly vulnerable. More subtle stresses for the fetus in this period may affect the neuro-psycho-physiological functioning of the infant and may become apparent only as age-inappropriate imbalance of the physiological and/or the attentional systems of the newborn and the young infant.

The concepts of *sensitive and critical periods* have been frequently applied to obviously time-bound vulnerabilities or susceptibilities in prenatal, perinatal, and postnatal development (Bornstein, 1989a; Fox et al., 2010). These concepts could give the illusion that there is a special time of vulnerability or heightened susceptibility either for a range of functions or for specific types of outcomes. Research has, however, shown that the processes are much more varied, complex, and specific and that these concepts cannot, at present, serve for more than a rough and superficial orientation.

Several research activities have studied specific influences on fetal development that are potentially measureable and amenable to preventive actions. Some prominent examples are prenatal *exposure to external toxicants*, *maternal drug use*, and *maternal stress*.

Air, water, and soil, as well as commercial products, are replete with chemicals from factories, traffic, fertilizers, pesticides, sewage, and food additives not only in industrialized countries but also, and sometimes even more severely, in the developing countries. Free market practices usually allow the introduction of new chemicals without proof of their nontoxic effects on young organisms. Because of the unavoidable mixture of potential *toxicants*, it is difficult to prove the impact of a specific toxicant on the fetus and on the growing child. Koger, Schettler, and Weiss (2005) summarized and interpreted the existing empirical evidence. According to Koger and colleagues, toxicants interfere with brain development in critical periods, thereby affecting sensory, motor, and cognitive development. But they can also increase the propensity for aggression and violence in adolescence and adulthood. The former East Germany was late in prohibiting the use of DDT, giving room for a quasi-experimental design between cohorts from the former East Germany and West Germany. The study found that there was a significant difference in estrogen-sensitive female cancers in East Germany (Dörner, 1989).

In many countries, individuals are considered responsible for their own *drug use*. A partial exception is tobacco exposure that cannot be avoided even by strict nonsmokers. This might have been the reason why nations have been effective in prohibiting smoking in public places. Pregnant women are strongly advised to avoid smoking.

Deciding on the use or restriction of assumed *necessary medication* during pregnancy is much more difficult (e.g., in the case of maternal epilepsy). Even when controlling for maternal education and age, epileptic attacks during pregnancy, maternal postnatal infirmity, prenatal exposure to specific antiepileptic drugs, and combinations of drugs appeared to have a lasting detrimental effect on intelligence and information processing in offspring (Koch et al., 1999; Titze et al., 2008). This effect is exacerbated when postnatal drug exposure is followed by, and combined with, social risks such as low-quality parental care and stimulation. A major challenge to the pharmaceutical industry is, therefore, to test for and acknowledge long-term behavioral consequences of prescribed drugs.

Alcohol is the most common substance used. Its teratogenic effect in the embryonic stage of prenatal development is well documented. The effects range from physical/facial signs and reduced brain volume and brain differentiation with ensuing severe mental retardation to impaired information processing and imbalanced emotional regulation. Elliot and colleagues (2008) reviewed epidemiological studies of prenatal alcohol exposure and fetal alcohol spectrum disorders (FASD) and experimental studies of primary and secondary prevention. They found that the most effective primary prevention of FASD was alcohol prohibition. There was no evidence that warning labels on alcohol containers or mass education campaigns reduce alcohol consumption in pregnant women. Individualized interventions were generally more effective in women who consumed low levels of alcohol at study

entry. High-risk women were less able to change their drinking behavior. The authors complained about the sometimes infrequent, and usually not coordinated, use of assessment instruments, the evaluation criteria or measures, and the study designs. They regretted the lack of evidence-based recommendations for effective prevention.

While toxicants, drugs, and alcohol can be considered objectively definable external influences, *maternal stress* is a subjective reaction to previous and current experiences. When the first studies of stress effects during pregnancy appeared, some women became even more anxious about the possible impact on their child, and others used potential stress effects as an argument for abortion. The effects of different kinds of stress have since been studied more carefully. These effects are generally not comparable with those of external influences, but they can add to the effects of external factors. Schetter (2011) reviewed the available studies. In a population with low socioeconomic status, maternal depressive symptoms and general distress predicted, with other potential influences controlled, growth retardation and low birth weight of the infant.

More *acute forms of stress* (e.g., death of a family member, earthquake, terrorist attack), chronic stress (e.g., general strain, household strain, homelessness), poverty, and neighborhood violence predicted more frequent premature birth. Good and effective partner relationship were positive, protective influences, but social support had varying effects depending on ethnicity, race, cultural values, and type of support. Severe chronic stress in late pregnancy was often associated with heightened infant irritability and emotional and attention-regulation problems in childhood (Schetter, 2011).

Population studies of those in the higher socioeconomic strata differentiate degrees of tolerable, or even *mild, stress* experiences. In a study by DiPietro and colleagues (2010), pregnant women were followed prospectively from 24 weeks gestation until the first weeks after birth. In this population, tolerable to mild stress appeared to have a slight accelerating effect on some infants, especially boys, with regard to motor maturity and neural conduction as a measure of information processing. They were also less irritable as neonates. In a previous study, infants born under similar conditions even had higher developmental test scores at age 2. Although severe and multiple stress can retard development or even terminate the gestational period by premature birth, some light or positive stress may benefit the infant's neural development in the perinatal period.

In the prenatal period, the fetus is not isolated from influences on its organism. These influences normally stimulate and channel the next developmental steps. They interact in a probabilistic way (Meaney, 2010; Rutter, 2000) and in a systemic manner (Sameroff, 2010) to build and form a unique individual, partially pre-adapted via the effects of maternal lifestyle and health status. Single environmental toxicants or noxious influences can usually be tolerated or compensated for by the developing fetus when they impinge in low dose and when there are no additional biological or social adversities, such as maternal drug use or abuse, poor nutrition, poor prenatal care, low maternal education, and poverty (Koger et al., 2005; Rutter, 2000).

When, however, several risks cumulate during gestation over longer periods, an extreme effect on the fetus could be the termination of growth and stillbirth; in less severe circumstances, the effect could be premature birth and low birth weight after intrauterine growth retardation. It is usually the fetus, not the maternal organism, that induces premature birth. The kind and intensity of external influence, the number and variety of additional previous and contemporaneous stressors, the actual developmental status of the fetus, and the specific individual vulnerabilities combine to determine the kind and extent of the effect at the microlevel. The effect will usually be viable, alternative developmental paths with either more or fewer degrees of freedom. The outcomes will usually not be defects but rather variants. In some extreme cases, these variants are not viable and lead to spontaneous abortion. In other cases, as with trisomy 21, the superfluous genetic information of the extra chromosome disturbs the prenatal fine-tuning of the developmental course, resulting in usually viable neonates but with individually very diverse combinations of extra problems (i.e., prenatal organic deviations). It seems that the extra load of genetic information leads to reduced epigenetic resilience (Rauh, 2006).

Prevention during pregnancy usually means primary prevention from the perspective of the child, primary prevention for some women, and secondary prevention for high-risk women. Positive social awareness of pregnancy may be an important factor in introducing preventive interventions when necessary. Pregnancy has become “chic” in Western countries, and young women overtly show their status instead of hiding it in large clothing as was the style in previous times. In many countries, women have regular, free gynecological checkups, take preparatory classes, and/or visit a midwife long before the birth. The expectant father is involved, and pregnancy-specific partner problems are discussed. Special help is offered, or even mandatory, if abortion is being considered, in situations of high stress, or in early diagnosis of a severely handicapped fetus. Some countries offer professional advice and support. All this has contributed to a low incidence of neonatal death rate in these countries. Abortion rate, especially for psychosocial reasons, should be considered a benchmark for a society’s responsibility for its children. However, even in countries with a well-developed health and social system, the most-needy people fall through the net because they seem to be unable or unwilling to use the options available.

Risks and Prevention in the Perinatal Period

Maternal deaths during or shortly after delivery have become extremely rare in countries with high standards of prenatal, medical, and social care, even with increased maternal age at delivery. They are still an important issue in some developing countries. In more affluent countries, the mother–newborn dyad and optimizing early physical and socio-emotional care have come into focus.

The human infant is born immature neurologically and physically, even compared with other primates. Brain development extends well into the second year of

life and is not completed until adolescence. The human newborn's poor motor abilities have long camouflaged its differentiated competencies. Therefore, until recently, the neonate had been considered a brainstem-controlled, immature biological system. Psychological and biological research has since completely altered this image, and accordingly neonatal care.

The *newborn infant* is now considered a human being with typically human, albeit still immature, attributes such as perceptions, feelings, psychological needs, interests, basic knowledge, and social orientation. His or her biopsychosocial behavior is organized in labile systems (physiological, motor, tonus, arousal states, attention) (Als, 1986; Prechtl & Beintema, 1968); he or she shows active efforts of self-regulation, orientation, and interaction (Brazelton, 1973) and has astonishing acoustical and visual perceptual competencies, especially for social stimuli (Bremner & Fogel, 2001; Bremner & Slater, 2004; Fantz, 1961, Schaffer, 1989). *Competent Infant* (Stone, Smith, & Murphy, 1973) has become a catchword for infancy researchers and practitioners. Although being open to, and dependent on, socio-emotional interactions early on (Bowlby, 1958), the infant forms a strong emotional and person-specific tie to the primary caregiver not before the second half of the first year.

In most industrialized countries, it has become standard that the laboring woman can choose among several *delivery modes*, the child's father can participate in birth, the healthy newborn stays with the mother or parents immediately after birth before the general diagnostic procedures are applied, the infant's crib is right next to the mother during most of the day, and lactating and breastfeeding are strongly encouraged. Psychological needs of the baby and parents are respected, or even celebrated. Mutual familiarization of mother and father in the first hour after birth (Klaus & Kennell, 1976/1982) and extensively in the neonatal period appears to facilitate a strong emotional tie, or bond, of the parents to their child and promote sensitive parenting.

Newborn Infants at Risk

As one outcome of improved medical prenatal care, more newborns are considered at risk, or even at high risk, today than in previous decades.

The number of children who are born prematurely and/or with very low birth weight is increasing. This increase is due to older maternal ages at birth, close monitoring of potentially risky pregnancies, and an increasing number of multiple births following artificial facilitation of pregnancies. Maternal chronic diseases (e.g., epilepsy, AIDS, diabetes, kidney problems) or detrimental lifestyles (e.g., drug or alcohol use, poor nutrition) may also result in newborns at risk being underweight or overweight, sick, or addicted.

Neonatal care of at-risk infants has been successful over the past 50 years and a model for early intervention and prevention. Even extremely premature babies with little more than half the full-term gestational age of 40 weeks now have a fair

chance not only to survive but also to have fewer and less severe physical or neurological sequelae than ever before. Technological advances (e.g., incubators, mechanical respiratory support, refined intubations), pharmaceutical innovations (e.g., surfactants for accelerating lung maturation), and surgical refinements contributed to increased premature and neonatal survival, albeit at sometimes high costs of lasting physical and/or neurological functional damages (e.g., lungs, brains, or eyesight). Psychologically based sensitive observations led to suggesting psycho-physiologically better adapted neonatal environments and care (Als, Duffy, McAnulfy, & Badian, 1989; Hess, 2005; Schott, Broghammer, & Poets, 2011). Incubator noise was reduced, alarm beeps were replaced by other means to inform caregivers, a night–day rhythm was introduced, and painful procedures were replaced by less invasive methods; infants are being dressed and placed into nest-like cushions. With very fragile infants, stimulation has been reduced, including stroking the infant in situations of high arousal. Soft stimulation (auditory, visual, tactile), at least partly controllable by the infant (e.g., water beds), is being used with more stable infants. Mothers and fathers are not only allowed to see their child regularly but often included in their infant’s care. “Kangarooing” (i.e., skin-to-skin relaxed contact of mother or father, a method first developed in poverty areas in Colombia) of very premature infants was first ridiculed in the high-tech neonatal intensive care units but has been accepted even in university intensive care wards as an effective way to improve the infant’s breathing and temperature stability (Cattaneo et al., 1998). If positively accepted by parents, kangarooing can help them learn the subtle behavioral signals of their infant and fine-tune their psycho-physical communication with the fragile baby. Parents report higher confidence in infant care and appear to develop more sensitivity in the interaction with their baby (Chwo et al., 2002; WHO, 2003).

The *attitude change of parents and professionals* toward the newborn and premature baby (i.e., realizing the individual even in the neonate) has not only improved and refined neonatal and intensive care but also reduced some of the highly intrusive, and often painful, mechanical supports and monitoring, alleviated the initially strict regulations of care and visiting, and emphasized the parent–infant interaction as important for any newborn, but especially for infants at risk. Pediatric practice and developmental psychological research had participated in these changes.

Perinatal Risks and Long-Term Outcomes

With improved neonatal care, even very premature and sick newborns can survive. As a consequence, the number of people with physical handicaps, chronic illnesses, and physical vulnerability who will reach adulthood has risen significantly (Bergmann et al., 2009). Biological prenatal and perinatal risks continue to be major threats to an infant’s physical, emotional, and social development. Premature birth, low birth weight, and early central nervous system injuries are still the main

risk factors for cognitive, motor, and language development; functional deficiencies; and compromised school achievement. Even when these children are functioning well in familiar and less complex situations, they can activate only reduced resources for complex problems (Evrard et al., 2011) and are more prone to psychosocial problems, psychopathology, and maladaptation.

An overview of longitudinal data confirmed several assumptions. (1) An increased incidence of *functional problems in later life* for children with prenatal risks can only be predicted at the statistical group level, not at the individual child level. Risk is a probabilistic concept based on group statistics (Farran & McKinney, 1986; Rutter, 2000). This is bad news if limited prevention resources are to be allocated to the neediest individuals. It is, however, good news against any early “negative selection,” and it is also good news for parents hoping for good outcomes. (2) The same risk condition can have quite diverse outcomes emerging at different times in the life course. (3) A single risk factor—even a severe one—can often be compensated for or overcome. For all risk groups, this is most probable for children who experience a positive socio-emotional climate and interaction in their families in the early years. Low-quality parenting can aggravate the consequences of even minor risks. (4) Biological risks, such as premature birth and perinatal and postnatal illnesses, appear to affect motor, cognitive, and language development primarily in the first few years of life, whereas social risks (psychopathology of parent, inadequate parenting, inappropriate or lack of stimulation) become increasingly effective in the later years of development (Bornstein, 1989b; Carta et al., 2001; Laucht, Esser, & Schmidt, 2002; O’Connor & Rutter, 1996; Rauh, 1989, 2005). Exposure to chronic risk situations increases the probability of adverse outcome, often even in a curvilinear fashion. A combination of both biological and social risks tends to have an overadditive effect—that is, infants born at biological risks are even more susceptible to psychosocial and social risks and children in highly stressful environments are more prone to encountering biological and social risks (cascading effect; Koger et al., 2005).

In research and in practice, *risk indices* combining biological and social risks focus on perinatal risks. Prechtl (1980) suggested instead an “optimality index” assessing how close to completely healthy a newborn is. This concept and a mixture of risks and optimality seem to have entered indices for older children, as in the Child and Youth Well-Being Index (Foundation of Child Development, 2010).

Risks, Vulnerabilities, and Prevention in Infancy and Toddlerhood

Typical Development Benchmarks

In the *first 2 months*, the human infant is considered by many researchers to be primarily an extrauterine fetus adapting to the new physical and physiological

conditions, stabilizing the basic behavioral systems, practicing the senses, and differentiating the brain structures. A major “milestone” with great impact on the parents is the social smiling at about 6 weeks after expected birth date. The infant becomes increasingly active in social and emotional interaction, intensively studying familiar human faces. Rochat and Striano (1999) characterize the changes between 2 and 3 months as “revolution” or “social birth.” Already within the first few months, infants differentiate between physical and social stimuli and soon tend to react differentially: they smile and babble to even a “still” face of a living human to reactivate it but rarely to a puppet (still-face paradigm), even one that had been moving previously. They habituate to repeated stimuli and prefer a familiar person to a strange person and familiar language, ethnic features, smells, and tastes.

In the *second half of the first year*, infants not only become motorically more independent and explorative (sitting, locomotor activity, grasping) but seem to develop an intuitive understanding of major physical principles (behavior of objects of different sizes and masses, weight, gravity, physical causality, object permanence, local relations) as well as of human intentional, or unintentional, actions. At around 8 months (“second social revolution” according to Tomasello, 1999), they start to enjoy games that involve taking turns, and signal by social referencing to their partner that they associate actions and action results with the actor. They can now not only differentiate between emotional expressions of their adult caregiver but also use his/her encouraging or warning facial expressions as information for their own actions. At approximately their first birthday, they start to actively orient the caregiver to objects or events of their interest, share their own emotional experience with their caregiver, request information or evaluation, or even playfully tease their caregiver. During the second half of the first year, the infant gets tuned to those patterns of stimuli and events that are meaningful and characteristic for his/her culture, and he/she sometimes becomes insensitive to those physical differences that do not carry cultural meaning (e.g., specific language sounds, forms, color shades).

At *18 months*, the infant has grown into a competent toddler, coping well in a here-and-now world at a sensorimotor level. He/she has developed a basic sense of psychophysical self as differentiated from others; can move about and act in a still limited physical world of objects, plants, and animals; can refer his/her actions and success or failure to the self as actor; and can actively participate, interact, and communicate (nonverbally) in a concrete social world of real and familiar people. He/she can infer at least some psychical experiences of others and differentiate them from his/her own experiences (distinguish between own feelings and wishes and those of others, between what the other person can see or has just experienced and what he/she sees and knows).

During the *second year of life*, new cognitive competence emerges and revolutionizes the toddler’s worldview: the ability to represent. The child eventually acquires the ability to represent the objective world in gestures, words, drawings, and somewhat abstract mental representations, as well as the social world in symbolic play, imitation, and role-play, initially using concrete actions then increasingly mental representations. By 18 months, the child discovers the self as

a counterpart, visibly reflected in a mirror and internally represented as a mental object. Via language, even subjective feelings can become reified, controllable, and amenable to cultural influences. These representational worlds seem to be unlimited and may sometimes overwhelm the young child. Logical structuring helps the child to eventually tame the representations of the physical world, starting with prelogical abilities of classification and seriation and turning to concrete and formal operations in school children and adolescents (Piaget, 1952). The represented social worlds will eventually be structured by social and moral rules and values. Toward the end of the second year, children are usually eager to participate in their social setting. They imitate adults and other children, learn social scripts and social rules, and communicate orally. They become susceptible to cultural socialization and even eager to become socialized and participate in enculturation (Pauen & Rauh, 2008).

Attachment, the Infant–Parent Relationship

Infant development is closely linked to parenting. All infants need an *attachment relationship* to grow. Attachment develops over the first year of life from a general openness to social stimuli and interactions to a clear distinction between familiar and unfamiliar people. With the infant's advances in locomotion and with cognitive structuring of the social and physical world, the attachment figure becomes the emotional center for the infant. The intensity of attachment peaks at the end of the first year and continues into the second and third years of life; it protects the child from getting lost and from threats and dangers. Attachment also serves as a secure base for exploration in the physical and social world. The child develops a system of strategies and emotional experiences to cope with novelties and threats. At the representational level, the system of attachment relationships and coping strategies eventually forms an internal working model for social relations in general and the self in these relations (Bowlby, 1969; see Stevenson-Hinde & Verschueren, 2002). Parent–child relationships continue throughout life, and individuals' socio-emotional relationships with friends, partners, and later their own children have general similarities and can even be traced back to those first relationships.

Three *major strategies* characterize infants' primary attachments (Ainsworth, Blehar, Waters, & Wall, 1978; Crittenden, 2008): A securely attached infant will explore his/her surroundings freely in the presence of an "attachment figure," will freely express positive and negative feelings, and will turn to and seek security, comfort, and support from the attachment partner when feeling frightened, unsafe, and endangered. Infants with an insecure–avoidant attachment relationship also have strong emotional attachments, but they balance, or even curb, their need for closeness and comfort on the basis of the caregiver's reaction to the infant's negative emotions. Infants with an insecure–ambivalent attachment relationship intensify their emotional expression of distress to compel their attachment partner's total attention.

All three strategies are basically effective to get, and keep, the caregiver close. A secure strategy is prevalent in most societies and is most typical in affluent and stable families with well-educated mothers. The frequency of insecure strategies varies with cultural history and values and with the infant's early parenting experiences (Crittenden & Claussen, 2000).

A key factor for individual differences in attachment strategies, or attachment quality, in the second year of life is *maternal sensitivity*, especially in the first months of a child's life. Sensitivity to a young infant means prompt and reliable reaction to the infant's distress for establishing emotional security and to the infant's expressions as a basis for communication and for learning regularities; empathic interpretation of, and reaction to, the infant's needs; and emotional warmth in distress as well as in joyful situations. The ingredients of sensitivity may change in later infancy and toddlerhood: promptness becomes less important and emotional tenor and teacher qualities become more important. The concept of sensitivity is closely related to the concept of intuitive parenting (Papousek & Papousek, 1987) and to the concept of scaffolding (Vygotsky, 1978). Maternal sensitivity has proved to be predictive not only for attachment quality. Sensitive parenting appears to be the major protective factor for infants born at early biological risks and for irritable babies. Maternal sensitivity and quality of first attachment were predictive of social competence in preschool and school. Social relations, friendships, and even later romantic relationships seem to build on those early experiences, although direct predictions over long periods of life are moderated by many additional factors (Englund, Kuo, Puig, & Collings, 2011; Grossmann, 1988). Some transgenerational studies (Hautamäki, Hautamäki, Neuvonen, & Maliniemi-Piispanen, 2010) suggest that the parent's own socio-emotional security status translates into parental sensitivity with his/her infant and into infant attachment quality.

Even in the first few years of life, young children present a *wide range of individual differences*, not only in attachment strategies but also in rate of physical, cognitive, language, and social development; gender; temperament; and stress reactivity. Within the normative ranges, rate of development is not yet stable in early childhood, and prediction into school years, adolescence, or even adulthood is limited (Brim & Kagan, 1980; Kagan, Kearsley, & Zelazo, 1980). Nevertheless, rate of cognitive development and level of achievement at a particular age are frequent measures of intervention efficiency. Gender and temperamental differences, including stress reactivity, are considered major mediators and moderators of stressful experiences and coping efforts.

The Risk of Dysfunctional Early Parenting

The concepts of attachment and sensitive care have entered the fields of infant developmental psychopathology and infant psychiatry. Extreme experiences of the

infant in his/her early social relationships (e.g., with an unresponsive caregiver, an emotionally unavailable mother, or an unpredictable caregiver) may induce the child to develop nonnormative strategies to address immediate paramount needs for self-protection and attachment, but these strategies may eventually result in pathological attachment strategies (Crittenden, 2008). The infant stress system appears to be extremely sensitive to *significant caregiving perturbations* early in life resulting in heightened anxious behaviors and in cognitive biases to reinforce anxiety. Pathological strategies usually originate as situationally functional in the early caregiver context, but they limit the child's potential for emotional, social, communicative, and often cognitive development (Goodman, Quas, & Ogle, 2010). Frightening parental behavior, high insecurity in the primary setting, and genetic disposition can be the causes of deviant attachment relationships that predict a host of behavioral problems in childhood and even adolescence (Van IJzendoorn, Schuengel, & Bakermans-Kranenburg, 1999).

Genetic disposition and temperament can act as moderators of differential susceptibility. Infants with a highly negative temperament, usually indicative of future behavior problems, were less self-regulated when they were in unresponsive relationships, but more self-regulated than control children when in responsive relationships (Kim & Kochanska, 2012). Recent epigenetic research with rat puppies (Meaney, 2010) suggests not only that prenatal maternal stress experiences epigenetically program stress vulnerability of the fetus but that sensitive early care (licking in the case of rat mothers) may have a preventive/protective effect on stress vulnerability in the pup.

In extreme cases of dysfunctional parenting, the child has to be secured by communal authorities. *Programs to promote effective parenting* aim at preventing such drastic measures (Sandler, Schoenfelder, Wolchik, & MacKinnon, 2011). In home visiting programs, specially trained nurses guide first-time mothers from low-income homes in how to care for the infant physically and psychosocially. These programs have been established in many countries and usually report positive effects on the infant (developmental indices) and the mother (self-reliance) (Astuto & LaRue, 2009). A well-controlled study of a weekly early intervention for infants at age 6 months and a later intervention at 24–28 months found significant effects on maternal warmth and nurturance after the early intervention and more contingent maternal cognitive responsiveness and language input with the second intervention (Landry, Smith, Swank, & Guttentag, 2008). The toddlers were more cooperative, communicative, and engaged in mother–child interaction and book-reading when their mother had received the intervention during toddlerhood. Response to the intervention of very low-birth-weight infants was similar to those of term infants. The study shows that relatively short, but targeted, interventions at focal developmental times can be quite effective. There are, however, only few methodically sound studies in this field, and the kinds of interventions vary greatly as do the targeted families. Little or no information exists on families that do not volunteer in programs or that resent any intrusion for personal or political reasons.

Maternal Employment and Non-parental Care

Maternal out-of-home employment during the child's infancy has been a concern in many countries, particularly during the child's first year. *In most European countries*, paid maternal leave is generously allotted with 14–16 weeks of full pay, shared by the employer and the state, and partial pay is provided for up to 12 or more months. Reemployment is guaranteed for up to 3 years. In Northern European countries, paternal leave for 2 months is encouraged. Parents tend to enjoy this time and the relative financial security. Accordingly, most day-care provisions are for children older than 12 months.

The situation is very different *in the United States*. Maternity leave of 12 weeks is generally unpaid. Parents are responsible for organizing and financing child care. The variety of solutions found by U.S. parents is, therefore, unparalleled in other countries. Brooks-Gunn, Han, and Waldfogel (2010) analyzed data of the nationwide National Institute of Child Health and Human Development (NICHD) study of early childcare of more than 1,000 children born in 1991, from infancy to school age. They did not find any general effect of first-year maternal employment on children's cognitive, language, social, and emotional development. The most positive child outcomes were found in the group with mothers who were employed part time compared with full-time or unemployed mothers. In the group of children whose mothers were employed full time, teachers observed more externalizing problems when the children were 4, 5, or 7 years old. However, both part- and full-time employed mothers chose day-care provisions for their children that were of higher quality than those selected by stay-at-home mothers. Part-time working mothers tended to be more sensitive with their children and provided a more stimulating home environment than mothers of the other two groups. Finding a socially approved way to cope with both challenges—securing the family income and job and providing secure and stimulating care for the young infant—was a characteristic of U.S. mothers who were employed part time.

Paid maternity leave extends only to 16 weeks *in Switzerland*. There is no tradition of group day care for children younger than 3. A partly retrospective study by Averdijk and colleagues (2011) found more teacher-reported problem behavior in 7-year-old children who had experienced extended group day care.

In the United Kingdom, families get paid maternity leave for the first 3 months (Sylva et al., 2011). A British study on families, children, and childcare analyzed data on more than 1,000 families. Positive effects of nursery care were found for cognition. High-quality care was predictive of more positive cognitive development and of emotional regulation at 18 months. Children from ethnic minorities scored lower on all measures. Positive maternal care was a major predictor of positive infant development and included sensitivity, non-harshness, and opportunities for stimulation. These findings are compatible with those of Landry and colleagues (2011).

A *Norwegian national cohort* study analyzed more than 28,000 families (Bekkhuis, Rutter, Maughan, & Borge, 2011). At 9 months, practically all infants

were still being raised at home. However, at 18 months, two-thirds attended some type of group day care. Higher parental education and family income predicted a higher probability of the toddler attending day care. The strongest predictors of child behavior problems at 36 months (i.e., for distress or aggressiveness) were the child's temperament at 6 months and family risks, with hardly any contribution of group day care. Extended paid maternity leave and high-quality group day care in this Scandinavian country seem to have resulted in positive situations for families and infants relative to 10 years previously, when day-care conditions resembled those in the United States today.

Some children may react to *childcare as a stressful experience*. Children in childcare exhibit higher cortisol levels, as indicators of stress, than at home, especially toddlers attending full day care. Daily schedules with long periods of both provider-directed structured activities and frequent full-group transitions were associated with cortisol increases. Girls tended to react with an increase in anxious–vigilant behavior, and boys reacted with angry–aggressive behavior. Inhibited children exhibited more social fearfulness. Children at the extremes of the temperament spectrum were more sensitive to variations in environmental conditions (Phillips, Fox, & Gunnar, 2011).

Neither in the United States (NICHD, 2001) nor in other countries (Ahnert, 2010; Rauh, Ziegenhain, Müller, & Wijnroks, 2000) did early day care generally affect the quality of the mother–child attachment relationship. However, infants of low-sensitive and low-responsive mothers who spent more than 10 h per week in low-quality multiple childcare arrangements tended to exhibit more frequent insecurity or disorganized attachments to their mothers and were less positively engaged with their mothers over the next 3 years. The way the infant becomes familiarized to the new setting (abruptly or gradually) tended to affect the relationship, but only in infants older than 11 months at day-care entry (i.e., when they are cognitively mature enough to relate two alternating primary settings) (Rauh et al., 2000).

Educational and Compensatory Preschool Experience

The largest study on the pedagogical *effects of day-care and early preschool attendance* has been conducted by the NICHD research group on Early Child Care and Youth Development in the United States. The study assessed cognitive, social, and emotional aspects of child development and controlled for many potential influences. The researchers found, at 54 months, general effects of quality and quantity of day-care and preschool attendance in cognitive and language skills but not in the social or emotional domain. Only the actual quality of childcare was related to child social competence and social behavior (NICHD, 2003a). At 6 years, maternal sensitivity remained the main predictor and influence on children's social skills, even when controlling for child competences at age 54 months (NICHD, 2003b). Early child education experiences can, however, pose risks for some

children (increased social problem behavior). Children with early negative emotionality or difficult temperament appear to be more affected by the quality of day care and preschool than children who are emotionally stable. Children living in poverty also appear to benefit more than others from high-quality day care; low-quality care is more detrimental to them than it is for other children. High-quality preschool experience can ameliorate social, cognitive, and emotional deficiencies in family care and stimulation but has minimal measurable effects in children from homes with positive environments (Phillips & Lowenstein, 2011).

Poverty and sociocultural disadvantage in otherwise well-to-do societies are often combined with dysfunctional parenting. Compensatory educational programs aim at disrupting the circle of disadvantage. Center-based early intervention programs focus primarily on the child, whereas home-based interventions target mainly the parents (the mother) and the parent–child interaction. Blok and colleagues (2005) compared the effectiveness of 19 scientifically controlled compensatory programs with educational orientations that had varying delivery modes in the United States, Europe, Israel, and Turkey. Some had started at or even before birth, and others as late as age 5. Early intervention had a moderate effect on the cognitive domain but not on the socio-emotional domain, and effects more or less faded during the next 10 years. For the cognitive domain, center-based programs were more effective than home-based programs, irrespective of other characteristics, and the combination of both was most effective when they included parenting skill support. No effects were related to the socio-emotional domain. Other variables such as age admitted to the program, program duration and intensity, or forms of parental and family support had no statistically relevant effects.

Evidence-based *early educational interventions with disabled children* and their families have yielded mixed results. They have been less positive than had been hoped for, and their effects have not lasted long (Farran, 2000). They were most effective in less disabled children and in promoting language development in young children with speech problems. A program-specific effect of generalized stimulation of development beyond the effect of attending day care at all could not be verified. Farran complained that many programs had either been developed for other groups of children and were then transferred to disabled children or were solely repair oriented.

Institutional Care, Foster Care, and Adoption

Hardly anybody would have believed that the disastrous experiences with institutionalized infants and young children after the two World Wars could be repeated even 50 years later. The Romanian orphans, victims of an insensitive political “experiment,” presented all symptoms of a major *hospitalization syndrome*: grossly retarded physical and psychological development and depression. The second step of this “experiment” was international adoption of many of these children into very positive home environments with dedicated foster parents. The results are broadly

published (Audet & LeMare, 2011; Beckett et al., 2006; Hawk & McCall, 2011; McCall et al., 2011; McCall, van IJzendoorn, Juffer, Groark, & Groza, 2012; Nelson, 2007; O'Connor, Ruer, Beckett, Kreppner, & English/Romanian Adoptees Study Team, 2000; Rutter et al., 2010; Tarullo, Garvin, & Gunnar, 2011).

The Romanian orphans were physically and mentally underdeveloped when they arrived in their foster or adoptive homes in England, Canada, the Netherlands, and the United States usually independent of the duration of their institutionalization. Many caught up significantly in the first 2 years after adoption. Infants who had been 6 months and younger at arrival in their new families thrived best. Children who were older than 6 months at adoption also thrived but much less than the younger adoptees. After a "spurt" in physical and mental growth until age 4, their developmental impulse weakened and some physical and mental deficits remained in the majority of them.

Four probably *deprivation-related behavioral patterns* were observed and discussed by Rutter and colleagues (2010). They occurred in increased frequency in children with institutional care beyond the first 6 months of life and were usually observed in combinations at age 6 and older: quasi-autistic behavior and inability to relate socially, disinhibited attachment or indiscriminate attachment, inattention/overactivity, and cognitive impairment. There was a vast range of individual differences. Most worrying, however, was an increase of conduct and emotional disorders in the early school years and especially in adolescence. These disorders were most strongly related to inattentiveness/hyperactivity and an increased incidence of peer relationship problems. The researchers assume that the second half of the first year of life and the second year are particularly vulnerable periods for psychic neglect. This is usually the time when socio-emotional attachment culminates, receptive and expressive language start, and the neurological basis for executive control functions differentiates. Van IJzendoorn and colleagues (2011) are reluctant to accept a general post-institutionalization syndrome. They nevertheless state clearly that for young children the institutional setting is pathogenic and should be classified as a type of child maltreatment, particularly in the form of structural neglect (p. 26).

These findings present extremes and cannot be generalized to institutional care or transferred into *foster and adoptive families*, generally. Still, institutional care remains detrimental for infants compared with family care. Audet and LeMare (2011) conclude from existing research that infants with prolonged institutional care and severe deprivation thrive better with highly structured, even authoritarian, parenting as signaled by less frequent occurrence of inattention/overactivity disorders in school age. In contrast, very early adopted children and children with minimal deprivation experience would be even more prone for this disorder under an authoritarian parenting style. Foster and adoptive parents should get support in their parenting efforts to adapt their parenting to the special needs of their adoptive or foster children.

Studies of adopted children originating from ethnic groups other than those in Europe (e.g., East Asia, Middle America) or with less severe institutional deprivation than children in Romania report alternative post-adoptive behavioral problems

(e.g., more internalizing problems in girls adopted from China) (Cohen & Farnia, 2011).

Under extreme conditions of institutionalization, some children are more negatively affected than others. Indiscriminate attachment, or attachment disorganization, in the relation to the “favorite caregiver” was found only in institutionalized children without a *specific genotype* (long variant of the serotonin transporter gene 5HTT). Those with this genotype appeared to be protected from these adverse effects (Bakermans-Kranenburg, Dobrova-Krol, & van IJzendoorn, 2011). Tarullo and colleagues (2011) assume, based on EEG studies, that indiscriminately friendly behavior in internationally post-institutionalized adopted children is the effect of early chronic neural hypoactivation. The lack of social interaction with a primary caregiver may interfere with neural development; increases in one-to-one social interaction may ameliorate the effects.

In many countries, institutional care seems to be unavoidable in some children’s lives, especially in countries stricken by war and epidemics (e.g., HIV). Prevention measures should consider the cultural resources and needs of young children to avoid institutionalized early care. If this is impossible, institutionalized care should be better adapted to the needs of young children.

Poverty and Social–Ecological Risks for the Infant

Poverty is a strong, overarching factor *in the child-rearing context*. According to research reviews reported by Duncan (2012), poverty (defined as low purchasing power) in the United States is strongly related to family stress, compromised parental and child health status, poor nutrition, parental depression, inappropriate socio-emotional and cognitive development of children, poor choices in regard to care and educational settings, inappropriate parenting styles, and so forth. Poverty is usually associated with multiple risks, such as family and housing insecurity, overcrowding, and lack of amenities (Schoon, Cheng, Jones, & Maughan, 2011). Poverty appears to have stronger effects on cognitive development, and family disruption seems to be more salient for emotional/social adjustment. Schoon and colleagues (2011) argue that it is necessary to identify how risks co-occur, to examine the role of their timing and duration, and to determine which risk factors prevail. Evidence from UK longitudinal studies suggests that duration of risk exposure, early risk (indicating cumulative processes), and sensitive periods are all significant.

When comparing developmental periods, *poverty in the prenatal and the infancy periods*—when the brain, stress reactivity, and immune functions develop—appears to be most detrimental (Duncan, 2012). Prenatal *stress* is mediated by the mother’s physiology; postnatal stress is mediated by parental care and cognitive stimulation. According to the biological sensitivity theory (Blair et al., 2011), early experience shapes the stress response system to meet expected environments, with consequences for regulating behavior in those environments. Highly supportive and

unsupportive environments lead to elevated stress physiology. In unsupportive environments, this increase would not be well regulated and stress hormones would remain elevated, facilitating reactive and inflexible forms of behavior and cognition (p. 1980). In supportive environments, regulation of stress hormones would occur and facilitate reflective and flexible forms of behavior and cognition.

According to Cabrera and colleagues (2011), the effects of socioeconomic and educational risk factors on cognitive outcomes in toddlers are mediated mainly through *maternal sensitivity*, and the effects of these risk factors on toddlers' social behaviors are mainly transmitted through maternal sensitivity and father engagement. According to Schoon and colleagues (2011), affective and close parent–child interactions appear to be important factors in reducing the negative effects of family poverty on children's cognitive development and, in particular, on their behavioral outcomes. Therefore, some children show positive adjustment despite exposure to family poverty and/or instability (Schoon et al., 2011).

Mothers' distress influences the level of cognitive stimulation offered, which in turn influences children's development. Maternal distress following persistent hardship with reduced access to economic resources is associated with *reduced investment* in children between ages 9 months and 3 years in terms of cognitive stimulation and parent–child interaction, with negative consequences for these children's further development (Schoon et al., 2011).

Cognitive stimulation may reduce, but will not eliminate, the negative effects of family poverty. Until 1986, *compensatory intervention programs* targeting families in poverty usually focused on the child's cognitive and language stimulation. Families and family interaction were considered part of the child's problem. According to Gershoff and colleagues (2005), even the best programs could not “inoculate” children from the debilitating costs of chronic exposure to poverty-related stressors during later childhood because they did not take a contextual focus (housing conditions, income of families, employment of parents). Therefore, even initial positive effects faded out. Families may have become dependent on the services, and at project termination they were not sufficiently knowledgeable about how to obtain those services to which they and their children were entitled (Farran, 2000). Lowell and colleagues (2011) describe a recent child- and context-oriented intervention with family support services that includes home visiting programs and family resource centers. One of the positive effects was that participant families accessed 91 % of wanted services compared with 33 % in other families.

Child well-being indicators are population-based statistics that provide a sense of whether a group of children can enjoy a good quality of life (O'Hare, 2012). They include key dimensions such as health, education, and economic and material well-being and are used to rank national efforts and to measure global interventions. Most indices were developed in North America and were adapted to other countries. The Child Development Index (Foundation for Child Development, 2010) was expanded to the Child Well-Being Index and is used by UNICEF. The Human Development Index (Health, Education, Economy) is used by WHO.

A group of developmental scholars (Bornstein et al., 2012) analyzed internationally collected data of developing countries and supplemented the information

with more detailed data in subsamples. The researchers studied children up to age 5 in 28 countries on such factors as nutrition, parenting, kinds of discipline, exposure to violence, and quality of home environment to determine each country's socioeconomic environment for its children. Called the *Human Development Index* (HDI), it comprised gross domestic product (GDP, purchasing power parity in US dollars), education factors (literacy rate and school attendance), and life expectancy. According to the researchers, malnutrition was, and still is, a major problem in most underdeveloped countries (Arabi, Frongillo, Avula, & Mangasaryan, 2012). Approximately 35 % of the children younger than 5 suffer from malnutrition, and 11 % of the global disease burden can be attributed to malnutrition. Growth is stunted in 195 million children in these countries. Tackling stunted growth and iron and iodine deficiencies had previously been among the most effective childhood interventions. Therefore, a high-priority UNICEF goal for 2015 is the reduction of hunger and child mortality. However, living in countries with high HDI did not always translate into better nutrition for infants and young children.

GDP was a major predictor for differences in the quality of housing and material resources in homes. GDP and education significantly predicted variation in formal learning resources. There was, however, no correlation of any indices with informal learning resources (Bradley & Putnick, 2012).

In all countries, 29 % of caregivers believed that physical punishment is necessary to rear a child properly. Nonviolent discipline was more frequently found in high-HDI countries, and severe violence was more often evident in low-HDI countries. Level of education was the main predictor of the country differences (Lansford & Deater-Deckard, 2012).

Caregivers in all countries provide more socio-emotional stimulation than cognitive stimulation. The strongest correlation was between GDP and both kinds of stimulation. Cognitive caregiving and stimulation were practiced more by parents in high-HDI countries (Bornstein & Putnick, 2012). High and low socio-emotional caregiving, however, could be found at all levels of HDI. Playing with the child and acknowledging the importance of play were unrelated to any of the subindices and to HDI. No HDI was related to playing.

Living in poverty can have different meanings. Worldwide applicable economic poverty indices can place a whole country into the poverty group, with some in the country living well but with the majority living on few economic resources. Or a country can be placed among the wealthy countries but have subgroups that are relative poor—even if their economic situation is much better than that of the average person in a generally poor country. Except for extreme poverty, relative poverty appears to affect the feelings of self-worth or acceptance in the respected society (Hurrelmann, 2006). Psychological interpretations of one's socioeconomic status appear to influence the upbringing and development of children.

Furthermore, the potentially negative *side effects of an intervention* should be kept in mind (Masten & Narayan, 2012). Interventions may disrupt or undermine naturally occurring resilience and recovery processes. There is a risk of imposing culturally or developmentally inappropriate interventions; families and parents may

experience them as intrusive and as debilitating their parental rights. The problems are particularly relevant in international transference of intervention projects.

From an *evolutionary perspective* on human development, even major deviations from the normative Western pattern are not necessarily pathological. Ellis and Bjorklund (2012) found that the first 5 years of a child's life are a sensitive period for adjusting biobehaviorally to the specific ecological context and developing strategies to cope with expected problems and stresses. In contexts of low stress, mildly stressing experiences may sensitize, or even buffer, a child for future stressful experiences. In contexts of high stress, vigilant, or even unemotional, reactions may be an optimal survival strategy. This perspective does not deny dysfunctional and deviant early parenting but offers a fresh perspective that is amenable to prevention strategies.

Conclusions

The early period of life appears to be particularly vulnerable to, as well as protected from, external influences. The person that the infant will become, is also greatly influenced by the life course he/she takes, his/her social network and cultural frame, and historical events and changes.

There is growing, but not yet sufficient, knowledge on early developmental and risk mechanisms. How, when, and where does environmental input get translated into the individual organism, and what mediates long-term effects (Rutter, 2000)? Recent genome analyses and epigenetic research, hormonal–physiological research in on stress effects, research on brain functioning, and longitudinal developmental studies have opened new venues. Close interdisciplinary cooperation offers great chances to improve our understanding of developmental and risk mechanisms and consequently generate more effective and ethical ways of preventing adverse developmental outcomes.

Predictability of adult's personality of physical and psychological adaptability, of adult productivity, social participation, and happiness from infancy data is extremely low. Nevertheless, early influences can contribute significantly, even when their effects are not immediately evident. Effects of genetic differences, as well as early influences, may appear only in later periods of life as a result of a “sleeping effect” or mediating influences that occur in a “cascading” manner. Noxious influences in this early period may result in specific defects, but more often they lead to only slight alterations of the organism, instigating slightly deviating developmental pathways as a form of adaptation to an environment as signaled by the influence.

In the prenatal and early postnatal periods, the structural and epigenetic basis for the individual is formed. Because brain development in humans extends far into the postnatal period, social and emotional experiences contribute to this process, shaping brain structure and function as well as the reactivity to particular kinds of situations/stimuli and stresses. At least from the second half of the first year, the

child's activities, initiatives, and active learning processes contribute to forming the individual's personality. The developing child is preparing to cope with a wide variety of influences.

Infants depend on reliable personal social-emotional care and on personal social interaction and communication for not only their development but also their survival (Bergmann & Bergmann, 2003). Their enormous learning capacity develops in a setting of familiar caregivers and peers. Social deprivation, especially past the first 6 months of life, can lead to lasting deviations in socio-emotional and cognitive functioning, delimiting their future flexibility in adaptation. Inadequate parenting that could be characterized as neglect, maltreatment, or abuse can lay the groundwork for lifelong problems in psychological and social functioning. Insufficient, or inadequate, cognitive stimulation can cause insufficient neurological and cognitive functioning. Consequently, interventions that support young parents in positive interaction with their infant and supportive or compensatory education from parents and/or in childcare centers have proved to have a long-lasting payoff.

Infants and young children differ in their sensitivity to external positive or negative influences because of genetic differences, health problems, early prenatal and postnatal stressful influences, or early difficult socio-emotional experiences. Young girls seem to be generally less vulnerable than are boys. Infants and young children with a more "difficult" temperament and who are less balanced and less self-regulated in their emotional reactions, as well as children with less reliable life conditions, seem to be more negatively affected by inadequate conditions in their homes or day-care settings and other kinds of problematic life conditions. However, they are also more positively affected by positive conditions and interventions than are emotionally balanced children. Both kinds of children—those who are emotionally stable, well raised, and well educated and those who have had difficult experiences—can grow into healthy and interesting people who have a positive impact during their lifetimes, if they can transform their developmental experiences into positive coping.

The early period of life is an optimal time for effective and economical preventive measures. These measures, however, should be geared to the individual child and his/her conditions. They can improve or stabilize a child's health; they can improve a child's cognitive development for later academic and vocational demands; they can help the child become and remain adaptive for coping with life circumstances and unexpected difficulties. A major task is to globalize early prevention efforts and adapt them to the respective cultures and conditions in a way that parents can raise their children to live in a complex and multifaceted world. The concepts and results presented in studies on early development, on early influences, and on early prevention provide a note of caution that well-off countries should not blindly rely on the hope that they can easily replenish their decreasing populations with children born and raised in poor and underdeveloped countries. Investment in the countries' own children as well as improvements in the developmental conditions of children around the world should be major aims of early prevention.

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Defining Prevention Science

Sloboda, Z.; Petras, H. (Eds.)

2014, XXII, 626 p. 39 illus., Hardcover

ISBN: 978-1-4899-7423-5