

1 CHILD DEVELOPMENT IN CONTEXT

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One of the earliest debates within the field of child development concerned the extent to which children are a product of their genetic makeup or a product of the environment in which they grow up. This is known as the ‘Nature vs Nurture’ debate. Psychologists early in the 20th century asked: do children arrive in the world pre-programmed to look, live and behave in certain ways based on their genetics (‘nature’ or biological determinism)? Or are children sponges, empty vessels ready to absorb the influences of people and places in their lives, to have their characters shaped and their world views influenced by those who raise them (‘nurture’ or social conditioning)? This debate has matured over time and in recent years, researchers and theorists have come to agree that, while children are born with their own innate characteristics, these characteristics and their expression are influenced by the environments in which each child lives (Wexler, 2006). Rather than ‘Nature vs Nurture’, it is more accurate to understand the developing child in terms of ‘Nature *and* Nurture’ or ‘Biology and Environment’.

The purpose of this book is to give particular attention to the role of environment, or context, in children’s development: how do the circumstances and social conditions of a child’s life influence their learning, behaviour, and growth? In this chapter we aim to set the scene for the chapters that follow. We will present the work of Urie Bronfenbrenner, one of the major developmental theorists on the role of context in child development, and discuss the relationship between the expression of genes and environmental contexts. We will then examine the role of neuroscience and brain plasticity, and introduce the concepts of risk and resilience.

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WHY IS CONTEXT IMPORTANT IN CHILD DEVELOPMENT?

The study of the impact of environmental context on child development is important, not only because it enhances understanding of the developing child but also because it points to opportunities for change if a child, or group of children, is not thriving. Even if genes were found to be the major contributing influence on how children develop, there is little we can do to modify genes that are producing undesirable outcomes (although this is not beyond the realms of possibility in the future). As educators, health or welfare practitioners, social workers or policy makers, we are, however, in a position to significantly contribute to providing optimal environments for children that will support their wellbeing, their learning and their healthy development. In addition, we can play a role in the design and implementation of intervention programs, such as early learning programs and health screening, or parenting programs that can be introduced into the lives of children and families when this kind of support is needed. Ideally, the world should be a place in which every child, regardless of their genetic inheritance, has the opportunity to reach their own potential, and we all have a role to play in fulfilling that ideal.

Children in the Australian context

There are many children who benefit from being raised in Australia. Those with supportive families and financial security benefit from living in a country with a well-developed economy, high standards of health, welfare and education services, and a stable political system. Unfortunately, there are stark inequalities between those who are doing well and those whose who are not being provided the same opportunities for optimal development. Hayes (2011) analysed evidence from several large studies to show that there are two worlds of childhood in contemporary Australia: one for the advantaged and another for the disadvantaged, with the gap widening with age and evident from as early as two years old.

The report of the Australian Institute of Health and Welfare (AIHW) on the health and wellbeing of Australia's children (AIHW, 2012) showed some positive trends for children overall. For example, key indicators of health such as lower mortality rates and reduced disease prevalence were improving compared to previous years; the majority of children were read to or told stories (an important precursor to literacy); and most Australians perceived their neighbourhoods as safe. On the other hand, there are challenges that must be addressed. Clear within this report was the inequity experienced by Aboriginal and Torres Strait Islander children, for example, who had mortality rates twice as high as those for non-Indigenous children. Children from socio-economically disadvantaged families also had poorer outcomes, including having more exposure to tobacco smoke, higher rates of

teenage pregnancy and parents with more health problems, as well as being less likely to have stories read to them.

The Australian Early Development Census (AEDC) is a population-based measure of development in the first year of formal schooling. This large data set also demonstrates inequity between groups of children. Overall, 22 per cent of Australian children are vulnerable on one or more of the developmental domains measured. For Aboriginal and Torres Strait Islander children, almost double the number (42 per cent) are vulnerable on at least one developmental domain (Australian Government, 2015).

Across a large body of Australian research, findings are consistent. Australian children enjoy good health, strong levels of achievement in numeracy and literacy, and high-quality service support, unless they are Indigenous or live in disadvantaged communities (Ford, 2012; Gialamas, Mittinty, Sawyer, Zubrick, & Lynch, 2015; Woolfenden et al., 2013). There is still much to be done to address inequity within Australia, a challenge that we share with countries across the globe. Asking questions about why some children do well—and some do not—requires an understanding of the layers of environmental factors that impact on the opportunities available to them.

BRONFENBRENNER'S BIOECOLOGICAL THEORY OF CHILD DEVELOPMENT

While most of the major child development theories include some notion of the importance of environmental context (for example, Bandura, 1977; Piaget, 1971; Skinner, 1969; Vygotsky, 1978; Watson & Rayner, 1920), they mainly focus on a child's most immediate setting. Much of the research designed to test these theories has occurred in laboratory settings in which every attempt is made to control external or environmental influences. Tightly controlled empirical research has been invaluable to our growing understanding of child learning and development, but it did attract criticism. Bronfenbrenner famously described child development research as 'the science of the behaviour of children in strange situations with strange adults' (1974, p.3).

Bronfenbrenner's major contribution to theory was his ecological approach to child development, revised and refined over more than 50 years. The ecological approach is intended to conceptualise the developing child in relation to an ever-changing social, physical and psychological environment (Tudge, Gray, & Hogan, 1997). The idea that the study of child development must include consideration of broad environmental and cultural contexts was not new. Bronfenbrenner was, however, the first to tie together within one theoretical model the complex layers of contextual influence—from immediate

environments through to social policy and culture—and the nature of their interactions with each other in the context of human development. He sought to capture the complexity of the real world and all the various influences on how a child grows and develops.

The social ecology model

Figure 1.1 is a diagrammatic representation of Bronfenbrenner's social ecology model. It is presented as an expanding set of contextual structures with the developing child at its centre, along with that child's particular characteristics such as age and gender. Each surrounding layer is nested within the other 'like a set of Russian dolls' (Bronfenbrenner, 1979, p. 3), and the relationship between child and setting is seen as a dynamic one. Bronfenbrenner explained it thus:

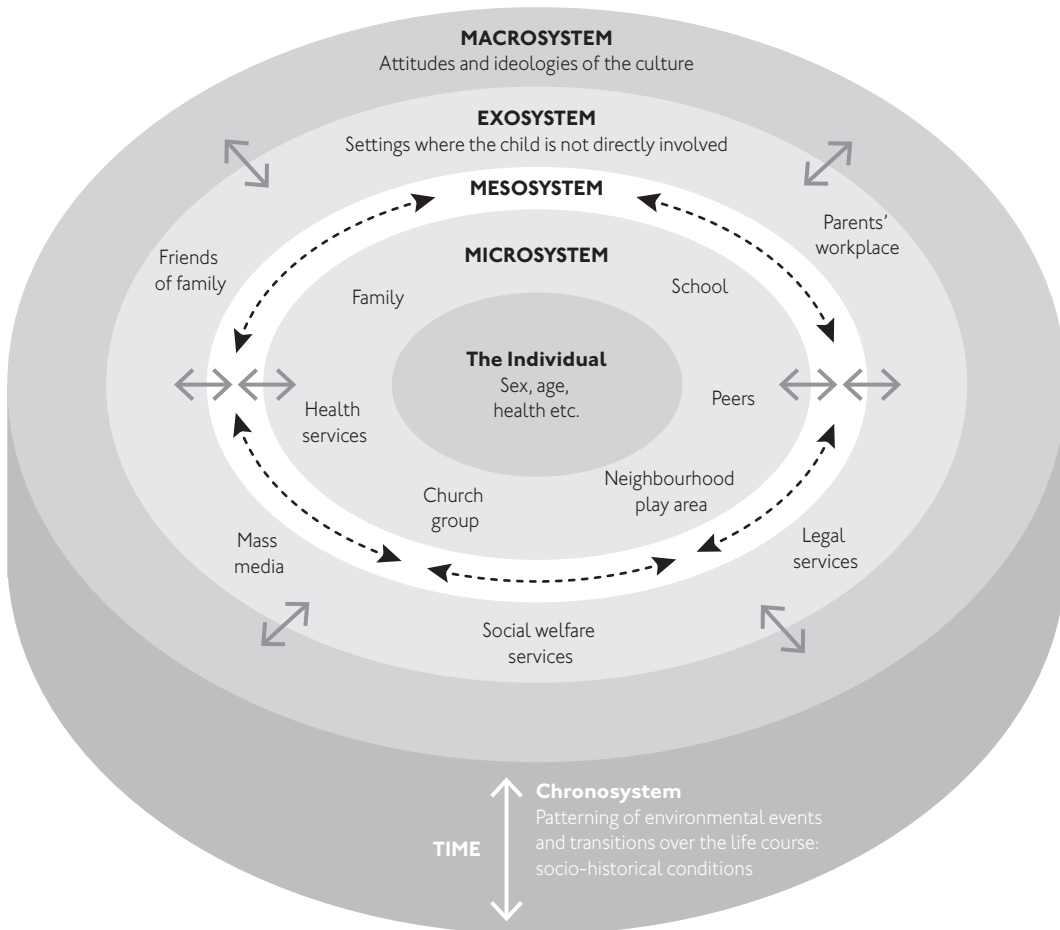


Figure 1.1 Bronfenbrenner's social ecology model

The ecology of human development involves the scientific study of the progressive mutual accommodation between an active, growing human being and the changing properties of the immediate settings in which the developing person lives, as this process is affected by relations between these settings and by the larger contexts in which the settings are embedded (Bronfenbrenner, 1979, p. 21).

The system closest to the child is called the *microsystem*. The microsystem consists of the face-to-face settings in which children are involved, such as the immediate family, the school or early child care setting, the doctor or the family's place of worship. Settings were seen to influence children, not only through their physical features and activities but also through the personality, behaviour and belief systems of the people in those settings. The effect of the settings is, in turn, modified by children's perception of the contexts and the people within them. Bronfenbrenner recognised in his model the importance of emotional attachments with other people as a powerful element in the process by which the microsystem wields its influence on the developing child (Bronfenbrenner, 1979).

The next layer of the model is called the *mesosystem*. The mesosystem refers to the degree of congruence or match between two settings in the microsystem. For example, the microsystem of many children includes home and school. Children's development will be influenced by the extent to which the behaviour, expectations and values of the people in the two environments are similar or different, and also by how they are perceived by the children. If, for example, children experience school values and routines as completely different from home, they may reject school and the learning opportunities it offers. On the other hand, a close match between the values of school and home is likely to lead to smooth transitions between the two settings and improved learning outcomes.

Bronfenbrenner's model contains a further system, the *exosystem*, which refers to the settings in which the child is not directly involved but that, nonetheless, affect the child and are affected by the child. Examples would be parents' workplaces, parents' social networks and local government. To illustrate, a child may not directly participate in a parent's workplace, yet the child may influence parental decisions about work and feel the effects of changes in parental income, parental time at work and family stress levels.

The outermost system shown in Figure 1.1, the *macrosystem*, refers to broad societal or cultural contexts that have impact across all of the other systems. The macrosystem incorporates the sets of values or cultural belief systems around which life in a society is organised. These values are passed on through families, schools, religious institutions, and other social and government institutions. An example of the impact of cultural context might be a society in which females are seen as inferior to males. This cultural belief will

impact at every level of life: denying women the opportunity to participate in public office leading to the prioritising of male agendas; gendered notions of appropriate employment; religious teachings and education policies. These flow right through to how a little girl is spoken to and treated within her family environment.

There are additional key concepts that are essential to an understanding of Bronfenbrenner's theory. The first is the notion of the bidirectional nature of influence. Children do not sit in the centre of the circle as passive beings at the mercy of the environmental influences that swirl around them. They are active in that they also influence the environments in which they participate. For example, a child with a difficult temperament will influence family dynamics and parenting practices, and a child who has a chronic illness may influence parental decisions about employment and choices about family finances. The environment is changed because the child exists within it. A second concept is that of the developmental niche: the idea that individuals will actively seek out a niche in which contexts match their own characteristics. To summarise, children are influenced by, and will influence, their environments and the people in them. In addition, children are active in selecting settings that fit with their own characteristics.

CASE STUDY 1.1

Sam's developmental niche

Sam is a four-year-old boy who loves construction toys. He attends a preschool that has an exciting block corner. Being able to play with these blocks has increased his love of construction and has improved his fine motor skills. Because of Sam's strong interest, the preschool teacher has ordered additional blocks and more sophisticated construction toys. She has also purchased counting books that feature construction images in the hope that this will encourage Sam to take a stronger interest in numbers. In all of these ways, Sam is directly influencing his environment. Whenever Sam has a choice of activity, he heads to the block corner. He likes to play with the other children who also like blocks, and he particularly enjoys being able to demonstrate his skilful and imaginative construction techniques. In so doing, Sam has found a developmental niche.

Another very important concept within the Bronfenbrenner model is the dimension of time, or the chronosystem, as depicted in Figure 1.1. Just as individuals change over time, so do contexts. Developmental and historical changes need to be taken into account in any model of the interrelationships between people and their context. The effects on context

of an individual's development over time can be seen, for example, in changing parenting approaches to behaviour management according to the age of their child. A two year old who throws her dinner onto the floor is likely to get quite a different reaction from her parents compared with an eight year old who does the same thing.

Historical influences also change the environmental context and its impact on children and their families. These are often referred to as 'cohort effects'. For example, public opinion about women's involvement in the paid workforce when their children are very young is rapidly changing in Australia, a cultural change that both influences and is influenced by social policy. While it was once most common that middle-class mothers provided full-time care at home for their young children, it is now widely accepted that many mothers will be engaged in paid employment during their child's prior-to-school years. This shift in cultural norms has meant that a child's day-to-day experience of care may include several formal and informal non-parental care settings, quite a different context for development from what it might have been fifty years previously (Galinsky, Aumann, & Bond, 2011).

The bioecological model

Bronfenbrenner's early model contributed much to the study of child development by highlighting the many layers of context that influence development. His critique of de-contextualised studies of development became widely accepted among mainstream researchers (Darling, 2007), so that in his later work Bronfenbrenner gave significantly more attention to the active role of the child and the inter-relationships among multiple determinants of development. An interest in individual characteristics (for example, temperament, motivations and innate abilities or limitations), along with an interest in the role of genes and their expression, led to a change in the name of the theory to account for the biological elements of development that were now included.

In particular, Bronfenbrenner was interested in the mechanisms for actualising genetic potential and the interactions between the environment and individual characteristics (Bronfenbrenner & Ceci, 1994). Although it was clear that context did influence development, the question became: 'How does this happen?' His thinking became focused on questions of process. In particular, he was interested in the processes in a child's life that directly led to development and growth, which he called proximal processes.

Proximal processes were described as the engines of development, the transfer of energy between individuals and their environments in a bidirectional way (Bronfenbrenner & Evans, 2000). Proximal processes are the activities that individuals engage with as they learn and develop. The effectiveness of proximal processes varies

depending on the following: the person who is engaging with the activity, the context in which the activity is taking place, and the amount of time that is given to the activity. This is known as the process-person-context-time model (PPCT model).

Proximal processes lead to reinforcement of genetic potential and competence (or dysfunction), depending on their form, intensity, timing, duration, frequency and predictability (Bronfenbrenner & Morris, 2006). Ruth's story illustrates the reinforcement of genetic potential. Ruth was born with an innate musical ability. She loved to sing songs as a toddler and started asking her parents if she could have piano lessons from an early age (person). Her parents owned a piano and valued musical ability. Their financial position was stable so they could afford piano lessons for Ruth as soon as she was big enough for her fingers to stretch across the keys (context). She practised every day and by late adolescence was an accomplished pianist (time). Ruth's innate musical potential may not have been recognised or achieved in a different family context. The process of reinforcement of genetic potential can also happen in much more mundane ways. For example, Michael was born with the potential for normal cognitive development (person). His family and other people that he encountered on a daily basis spoke to him in English (context) almost constantly other than when he was asleep (time), and so Michael became a competent speaker of English.

Peter's story illustrates the disruption of genetic potential. Peter was a talkative child who laughed often and loudly. His favourite activity was to make up and perform plays for his family (person), who cheered and encouraged his creativity (context). Peter's family changed when his father was dismissed from his job and began consuming a lot of alcohol. His parents started to have violent arguments (context), and the more this happened on a regular basis (time) the more Peter retreated. He spent all of his free time in his room and became an introverted young man who no longer sought attention or delivered performances. As another example, Laura loved shiny things (person) but was given a smack every time she touched her mother's jewellery (time). Smacking was seen as an acceptable disciplinary response in Laura's family (context). Laura soon started to smack her cousins when they touched her toys without asking.

Cultural practices are passed down and incorporated into a child's personal sense of identity through the proximal processes of everyday life. Culture is embedded within the Context element of the PPCT model, and in this way culture influences the nature of the environment and the responses of the people around the child. According to Bronfenbrenner, expectations about behaviour for children have a cultural and social basis and are constantly reinforced in daily activities and discussions. The internalisation of culture also influences the way the developing child thinks and behaves. Bronfenbrenner

continued to give emphasis to the importance of the relationships between carers and the child and the role of attachment in supporting the learning process (Bronfenbrenner, 1999).

In his later work, Bronfenbrenner developed further his concept of time and introduced the terms *microtime*, *mesotime*, and *macrotime*. Microtime refers to the continuity or discontinuity of episodes of proximal processes. Mesotime refers to the frequency of these episodes across broad time intervals, such as weeks and months. Macrotime refers to the changing expectations and events within the larger society (previously referred to as the chronosystem) (Bronfenbrenner & Morris, 2006). Bronfenbrenner also discussed the concept of important transitions within childhood—the birth of a sibling, starting school, the death of a family member, divorce of parents or commencement of puberty—and the role of appropriate and supportive proximal processes during these pivotal times.

CASE STUDY 1.2

Learning through proximal processes

The first word Holly learnt to say was ‘No’, and she used this word emphatically whenever possible. As Holly grew her parents observed that she was very stubborn, that she refused to share, and threw tantrums whenever she did not get her own way. Her mother, Sue, joked that Holly was just like her grandfather, who had always been a difficult man to get along with. Holly’s parents became worried when teachers at the preschool explained that Holly did not seem to have any friends and that she was often angry with the other children. Sue decided to spend more time playing with Holly—just the two of them—so that Holly could practise turn-taking. For at least half an hour on most days (microtime) they would play together and Sue would show Holly how to take turns. Sue also modelled kind language and problem solving when the game did not go Holly’s way. Sometimes their daily play sessions could not occur because Sue was required to spend longer hours at work, but Sue and Holly were able to play most days over a three-month period (mesotime). When Sue saw that Holly’s skills were improving, she began to invite other children over to play with Holly. Over time Holly’s practice at home, along with her ongoing maturation and increased opportunities for interaction with other children (macrotime), led to improved social skills and the establishment of friendships.

Bronfenbrenner’s proximal processes share some similarity with elements of other theories, such as ‘guided participation’ (Vygotsky, 1978), Wenger’s (1998) model of development through participation in numerous communities of practice, and ecocultural



theory, which argues for daily activities and routines as the critical units of analysis in understanding child development and family wellbeing (Gallimore, Weisner, Kaufman, & Bernheimer, 1989; Weisner, 2002). Barbara Rogoff (2003) framed a theory of how children develop in their cultural context with a similar emphasis on how key cultural messages are learnt through participation in everyday rituals and activities.

Bronfenbrenner's theory is arguably the most comprehensive in capturing the layers of contextual influence on the development of a child and the interrelationships among environmental factors and innate individual characteristics. His work has certainly had a significant and far-reaching impact on thinking about the interactions between people and contexts.

EPIGENETICS: THE RELATIONSHIPS BETWEEN GENES AND ENVIRONMENT

A wide range of influences contributes to the rich tapestry of individual differences in children, their families and the members of their communities. There is still much to be learnt about how genetic and environmental factors interact to create our individuality (Rhee & Waldman, 2011). A landmark early refinement of Bronfenbrenner's social ecology model emphasised the importance of understanding both the person (historically the focus in psychological research) and their context, and the processes that connect person and context and, in turn, shape people and their environments and settings (Bronfenbrenner & Crouter, 1983). Some of the processes reflect social, economic and behavioural circumstances. Others are genetic and, importantly, epigenetic.

Epigenetics (literally 'above the genome') is a rapidly developing field that focuses on the impact of environmental influences on the expression of genes (Lester, Conrath, & Marsit, 2016). Epigenetic research shows how a single genotype (or the set of genes responsible for a particular trait) is far from fixed in its expression (or phenotype) and that gene expression depends on interaction with the environment. As such, a single genotype can result in multiple phenotypes depending on the particular experiences of each individual (Lester et al., 2016). Context is, therefore, the key. It shapes our experience, behaviour and outcomes, and also the ways in which our genes operate and, in turn, are shaped by experiences.

Epigenetic influences start at the very beginning of life. Over recent decades it has been increasingly recognised that prenatal environments can influence development across the

lifespan (Lester et al., 2016). Maternal health and wellbeing, which includes stress levels and lifestyle factors such as smoking and misuse of alcohol and drugs, influence many aspects of human prenatal development, including the risk of prematurity and neuro-developmental differences in children. These influences are in turn moderated by aspects of the postnatal environment (Lester et al., 2016). Breast milk, for example, seems especially protective and a promoter of neurological development that may also lead to epigenetic changes, although this remains to be established (McInerny, 2014). Adversity, neglect, parental stress, harsh and/or inconsistent parenting (including maltreatment, physical and emotional abuse) and the impacts of parental psychological and behavioural disorders can lead to developmental changes in infants and young children. In recent analyses of longitudinal data, African American adolescents' and young adults' perceptions of parental rejection were related to epigenetic changes that affected a wide set of aspects of biological, central nervous system and psychosocial functioning (Naumova et al., 2016). Again, this highlights the interface between genes, environments and experience.

The recognition of the importance of the first 1000 days of life has been underscored by a growing body of research that shows how early experiences shape the epigenome (McInerny, 2014). Montirosso and Provenzi (2015) proposed that early experiences, such as the stresses associated with neonatal intensive care for infants born prematurely, may have epigenetic impacts that can potentially underpin a wide range of developmental outcomes. This has clear implications for the care of pregnant women and vulnerable neonates and infants (Samra, McGrath, Wehbe, & Clapper, 2012). Stress has also been shown to have epigenetic effects that can lead to differential susceptibility to vulnerability and risk (Zannas & West, 2014). Further, these impacts of stress may result in epigenetic changes that are intergenerationally transmitted (Cowan, Callaghan, Kan, & Richardson, 2016; Keating, 2016).

As discussed above, environmental influences on genetics can span generations. Earlier work on epigenetics has shown how famine in one generation can heighten the risk of obesity and heart disease in subsequent generations (Pembrey et al., 2006). For the offspring of those who experienced famine, abundance of food influenced the expression of the genes that underpinned the propensity to store body fat as a protection against scarcity of food. Therefore, to some extent, we are what our grandparents and parents ate, as the experiences of previous generations are written on the genome and act to influence the expression of genes for each subsequent generation. Experience also 'throws the switch'

for each individual. While influenced by the experiences of our forebears, each one of us is still the product of our individual experiences and lifestyle choices.

Susceptibility to interacting genetic and environmental influences is complex, and it varies considerably among children. Children with difficult temperaments, for example, have been shown to exhibit more behaviour problems when experiencing low quality child care, but they are more responsive and exhibit fewer problems when high quality care is available (Pluess & Belsky, 2009, 2010). As such, they are more likely to be influenced for good or ill depending on the quality of their developmental context, which is often referred to as ‘differential susceptibility’. Children with difficult temperaments have also been shown to be more susceptible to negative maternal discipline, but they show fewer aggressive behavioural problems if exposed to positive maternal discipline (van Zeijl et al., 2007). Similar findings regarding differential susceptibility have been reported in relation to the quality of the child’s attachment relationship to their parents. Bakermans-Kranenburg and van Ijzendoorn (2007) reported that children who showed insecurity, distress, and avoidance (characteristic of disorganised attachment) were more susceptible to unfavourable care environments but responded more positively to favourable ones.

A specific gene has been identified that underpins differential susceptibility to childhood maltreatment and the propensity to move from being a victim to a victimiser (Caspi et al., 2002). Children with high levels of expression of the monoamine oxidase A (MAOA) gene were shown to be less likely to victimise others than those with low levels, despite both groups having experienced maltreatment. In part, this illustrates the value of differential susceptibility in explaining why risk is not destiny.

Differential susceptibility underscores why care needs to be taken in terms of the experiences and opportunities available to children and young people. As outlined above, the link between diet in earlier life and overweight and obesity in adulthood has been well established. So too has the link between children’s early experience and their later development, health and wellbeing over the lifespan. Understanding of the biochemical mechanisms that underpin epigenetic changes is growing rapidly (Beach et al., 2016). Importantly, developments in this field also cast light on the factors that result in the human propensity for plasticity and change. Interventions, programs and practices that target the caregiving context—and particularly seek to alleviate maternal stress as well as to strengthen parental sensitivity and positive parenting behaviours—are likely to have wide-ranging developmental benefits, including on children’s brain development and behaviour (Gudsnuik & Champagne, 2011).

EXPERIENCE, ENVIRONMENT AND THE DEVELOPING BRAIN

There is a wealth of research literature pointing to the importance of the early years as pivotal to positive outcomes for children, because these are the years that set a trajectory for the years that follow (Cunha & Heckman, 2010; Shonkoff & Phillips, 2000; Sylva, Melhuish, Sammons, Siraj-Blatchford, & Taggart, 2010). Of course, appropriate support should be provided through all the years of development during childhood; some life challenges don't emerge until middle childhood or adolescence. However, the argument that early childhood provides a very important opportunity to influence developmental pathways is compelling and solidly grounded in neuroscience.

The development of a child's brain architecture occurs over time, from about two weeks after conception until young adulthood. It can be thought of as a series of stages broadly divided into two phases: the first phase, a genetically determined sequence of events *in utero* that can be modulated by maternal environment; and the second phase, which is both pre- and postnatal, when the connectivity or wiring of the brain is very sensitive to the environment and experiences.

Formation and refinement of neural networks

Brain architecture is comprised of neurons: nerve cells that form the basic building blocks of the nervous system. They transmit information throughout the body to and from the brain. Most neurons are formed prenatally and migrate to their genetically predisposed positions in the brain during embryonic and early postnatal life. Babies are born with almost all of the neurons they will ever have already present (Oppenheimer, Milligan, & von Bartheld, 2013). Neurons don't work in isolation, however. The brain forms complex circuits of connections or pathways that are responsible for a specific function (Stiles & Jernigan, 2010), and individual connections or synapses between neurons are essential for information to flow from one neuron to another.

Although genes instruct the basic properties of nerve cells and lay down the basic rules for interconnecting nerve cells within and across circuits, the environment can have a profound influence on how the genetic plan for the brain is expressed. An adverse prenatal environment caused by a variety of influences (for example, poor maternal diet; infections; maternal use of drugs such as alcohol, nicotine, and prescription medications; exposure to environmental chemicals such as lead and mercury) can cause the immature brain to develop abnormally (National Scientific Council on the Developing Child, 2006). Foetal

alcohol spectrum disorder (FASD) is an obvious example of this (Roebuck, Mattson, & Riley, 1998).

The newborn brain has very few synapses. Those that are present primarily govern bodily functions such as heart rate, breathing, eating and sleeping. The formation and refinement of neural networks occurs postnatally. Synapses are overproduced during two phases of life; immediately before birth and just before puberty (age 11 in girls, 12 in boys). When synapses are stimulated over and over, by repeating a particular thought or action, the pattern of neural connections is stabilised and strengthened or ‘hard-wired’ in the brain. It becomes an efficient, permanent pathway that allows signals to be transmitted quickly and accurately. In contrast, those cells and connections that are used less often are removed by cell death and synaptic ‘pruning’—often referred to as a competitive ‘use-it-or-lose-it’ mechanism (Singer, 1995).

There are individual timetables for maturation of the complex interconnections between different areas of the brain, so the environment affects brain architecture at varying time-points. As a rule, circuits that process lower-level information mature earlier than those that process higher-level information. Rich early experience is therefore foundational, though not sufficient, for full potential to be achieved. ‘Sensitive’ periods are defined as a time in development during which the brain is particularly responsive to experiences. This time-point is referred to as a ‘critical’ period if the presence or absence of an experience results in irreversible change (Fox, Levitt, & Nelson, 2010). These sensitive and critical periods explain why there are varied outcomes of experiences depending on timing (Kandel & Jessel, 1991).

Greenough, Black and Wallace (1987) have suggested that different processes govern the formation of synapses in early compared with later brain development. Synapses that form early in life are referred to as ‘expecting’ experiences, as development will not happen unless a particular experience occurs during its critical period. For example, humans have evolved neural circuitry for perceiving, analysing and producing language. When a baby is spoken to, these neural systems receive the necessary stimulation to strengthen the neural circuitry. If, however, they are not exposed to adequate stimulation through exposure to speech during the first years of life, the pathways that have been developed in anticipation of this exposure are discarded. Later synapse formation and loss is more selective and experience-dependent. Experiences change neural networks by both adding and pruning synapses. Here, too, environmental inputs actively contribute to brain structure, but unlike the experience-expectant process, synapses are not anticipating the experiences at any particular stage.

Developmental plasticity

The production and refinement of neural connections through repeated and persistent stimuli of synapses is often referred to as ‘plasticity’. Early sensory experiences have a powerful effect on brain organisation, and changes that occur early in life can be long-lasting. Positive emotional stimuli (for example, baby handling, responsive gaze, talking to the infant and responding sensitively to an infant’s affect, arousal and behaviour) contribute to healthy synaptic connections. However, the brain can also grow atypically as an adaptation to adverse early environments. For this reason, plasticity has been referred to as a ‘double-edged sword’ (Nelson, 1999). The brains of young children who experience chronic and severely stressful conditions are being flooded by cortisol (stress hormone) for an extended period of time, which can have a toxic effect on the brain. There is good evidence that early environmental adversity is associated with neural network abnormalities in areas of the brain responsible for memory, attention, impulsiveness, and behavioural regulation and control. These adaptations then increase vulnerability to a large number of immune and hormonal system–related mental and physical health conditions. Variation in genetic endowment, coping skills and stage of development can moderate these effects (Hart & Rubia, 2012).

Reversing pathological plasticity

Although the human brain is capable of being shaped and reshaped across an entire lifespan, the ability to vary the actual number of connections declines dramatically with age (waning by age five). This has implications for the brain’s ability to recover from prolonged early adverse experiences. Research has indicated that neurons are plastic in response to supportive adult-child relationships and also that children need at least one parent or caregiver who is predictably available and engaged in a caring, supportive relationship in their early years (National Scientific Council on the Developing Child, 2004). In cases of extreme neglect, later interventions have been shown to be less effective, even unsuccessful (Tottenham, 2012).

RISK AND RESILIENCE

So far we have learned in this chapter that environmental context is extremely important to child development; that genes and environments interact to shape a person’s physical, cognitive and psychological functioning; and that a stimulating and nurturing environment during infancy and the early childhood years is crucial to optimal brain development. This section describes the concepts of risk and resilience, or the personal

and environmental characteristics that best support positive life outcomes for children and those that leave children vulnerable to poor life outcomes.

The word 'risk' is used to capture those things that are associated with undesirable developmental outcomes, factors that increase the likelihood of a child experiencing poor health, learning or wellbeing (Little, Axford, & Morpeth, 2003). Risk factors include aspects of children's own characteristics (for example, a difficult temperament, health problems), aspects of their family (for example, unstable income or conflicted family relationships), aspects of their communities (for example, high levels of crime in their neighbourhood or a lack of quality health and education services), and aspects of the wider society (for example, civil war or economic mismanagement by governments) (Benzies & Mychasiuk, 2008).

Sameroff and colleagues were some of the first to talk about cumulative risk, the well-documented observation that the more risk factors children have in their lives, the higher their probability of poor developmental outcomes (Sameroff, Seifer, Barocas, Zax, & Greenspan, 1987). Evidence also shows that risks tend to cluster together. For example, Edwards and colleagues found that children from backgrounds of financial disadvantage were more likely than children from more financially advantaged homes to have multiple risk factors for low school readiness (based on previous research on factors linked to poor school readiness) and to achieve lower scores on tests of pre-literacy and pre-numeracy (Edwards, Baxter, Smart, Sanson, & Hayes, 2009).

It is important to remember that risk does not guarantee poor outcomes (it simply increases the chances), and not all risks have equal impact. It is also important to be aware that a factor that constitutes risk for one person might not be a risk in the life of another, as noted earlier with respect to differential susceptibility. For example, being part of a very large family might leave one child at risk of socially undesirable behaviours but another feeling secure and surrounded by support (Little et al., 2003). It is also important to understand the nature of the risk. Being the child of a single mother, for example, is often viewed as a risk factor. However, we have become aware in recent years that it is not the singleness of the mother that increases risk; risk arises from intimate partner instability, particularly the number of partners coming in and out of the mother's life (Benzies & Mychasiuk, 2008).

Risk can be moderated by protective factors: individual, family, or community factors that can buffer the impact of risk for the child. This might include, for example, a temperament characterised by persistence, having a well-educated mother, experiencing warm and consistent parenting, living in a home with opportunities for reading and

learning, attending a high-quality school and living in a safe neighbourhood with support and resources for families and children (Edwards et al., 2009).

It is inevitable that, at some time in their lives, children will face situations of hardship or challenge—large or small. Resilience, born out of adaptive responses to challenge, has been defined as the capacity to develop positively despite adversity (Little et al., 2003). Like risk, the extent and nature of resilience differs from one person to the next. Personal resilience can be present in some circumstances and not in others, and it can vary across the lifespan (Luthar, Cicchetti, & Becker, 2000). Those who work with children have a responsibility to not only understand the individual circumstances of children's lives that place them at risk but also to understand the protective factors in those children's lives and the nature of their resilience.

There is still much we need to learn about how to foster resilience, particularly for children who grow up in very adverse circumstances. Research on competence and coping promises to broaden our understanding of resilience, as well as point to ways of intervening to assist children in adverse circumstances and set them on a more positive developmental pathway (Rutter, 2007).

STRUCTURE OF THIS BOOK

This first chapter has provided a brief introduction to the theoretical framework of the book and some key terms and concepts used in relation to the role of environment in children's development. The second chapter is also introductory. It reviews major research approaches to the study of context and its effects on child development. Following a structure based on Bronfenbrenner's ecological model, subsequent chapters progress from examination of the effects of individual characteristics through proximal to more distal contextual influences on child development.

Chapters 3, 4, and 5 present characteristics of children that might influence their contexts and interact with the contexts in which they find themselves, to the benefit or detriment of their development. Chapter 6 and subsequent chapters each explore one aspect of context and examine its impacts on, and consequences for, children, their families and the communities in which they live. The aspects and issues chosen for analysis are major contexts for Australian children. In this way we hope to provide readers with an account of many current issues affecting the development of children in Australia and report on some ways forward to ensure that all children experience the best possible contexts for their development.



STUDENT EXERCISES

- 1 Think about a trait you believe you have inherited. It might be a personality trait, a natural aptitude for something, or perhaps a certain physical characteristic. Document the ways in which the expression of that trait has been influenced by elements of your macro-, exo-, meso- and microsystem environments.
- 2 In his most recent writings, Bronfenbrenner expressed concern about the level of chaos and instability that seems to be common in the lives of many children today (for example, as a result of high divorce rates, stressed parents working long hours, a bombardment of media influences, a confused value system). He argued that this level of chaos interferes with helpful proximal processes and, hence, with optimal child outcomes. Divide into two groups and prepare a response to one of the following:
 - a Do you see the lives of young children as more noisy and chaotic than they have been in the past? Think about the potential forms of chaos in each of Bronfenbrenner's ecological systems, and document how contemporary life may have a negative effect on the proximal processes in the lives of children.
 - b Alternatively, you might agree with some of Bronfenbrenner's critics, who see his definition of chaos as reflecting a middle-class value system. If this is your view, document whether you think there are increased levels of chaos in the lives of children, how your definition of chaos would differ from Bronfenbrenner's, and how you think contemporary life may enhance the proximal processes and outcomes for children.
- 3 Many biographies, memoirs, and works of fiction tell the stories of children who begin life with multiple risk factors and overcome a series of challenges to emerge resilient from their experiences. Three examples are characters in *Jane Eyre* by Charlotte Bronte (1847), *The Power of One* by Bryce Courtney (1989), and *Angela's Ashes* by Frank McCourt (1996). Using one of these books or another book or film with a similar storyline, identify the risk factors affecting the child's development at the different levels of context, and the characteristics or factors that enabled the main character to remain resilient against the odds.

Recommended reading

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