Chapter 2
Psychosocial Factors That Influence Children with Immune-Related Health Conditions

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In the context of this chapter, resilience is considered from the perspective of health psychology, a scientific discipline at the interface between biological and psychological factors which, amongst other things, applies psychological theory and knowledge to promote health in physical illness (see APA Division 38 http://www.health-psych.org/ and BPS DHP http://www.bps.org.uk). Within this discipline there is growing interest and attention towards child health and the importance of psychosocial factors that influence health and well-being during childhood as well as across the life span. Central to psychosocial influences are the coping resources and strategies available to deal with difficult or stressful events including illness itself. The driving force behind this approach is the notion that psychosocial factors may be harnessed in order to promote physical health and well-being and to enhance biomedical interventions. This may be via a number of avenues including (1) the promotion of coping techniques to manage the potential daily stress associated with immune-related conditions; (2) the development of supportive social relationships at an individual, family, practitioner, or community level; and (3) the encouragement of appropriate communication to reduce information-related anxiety, increase understanding and uptake of medical advice, and develop good health practices. A central tenet of this chapter is the perspective that resilience is both psychosocial and physiological in nature, that developing psychosocial resilience has the capacity to build physiological resilience, their interplay enabling the promotion of both psychological and physical health. In essence, psychological resilience has the capacity to assist physiological recovery and improve prognosis. Such resilience is therefore

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highly relevant to immune-related conditions, particularly in paediatric populations for whom the capacity for change has the greatest potential.

Central to this health psychology perspective is the biopsychosocial model of health and illness. Pioneered by Engel (1977) it represents a development of the biomedical model to include a more holistic interplay between psychological and social factors in medical conditions. Similarly, fields that overlap with health psychology, such as psychoneuroimmunology (PNI) and behavioural medicine, also adopt this model. Lutgendorf and Costanzo (2003) describe the integration between PNI and health psychology within a biopsychosocial framework in which interactions between psychological processes and neuroendocrine and immune mechanisms influence a number of outcomes including disease vulnerability or resistance, onset, progression, exacerbation or recovery, and even survival. Of particular importance in this integrative model is the embedding of health behaviours and psychosocial interventions to influence these outcomes (Lutgendorf & Costanzo, 2003). The way resilience is viewed as defined in this chapter is as a multidimensional or multifaceted process. We consider the application of the biopsychosocial model to both theory and practice, including interventions and outcomes in resilience in children with immune-related health conditions. Based on the scientific study of resilience and the factors that contribute to this process, it is possible to develop psychosocial interventions that harness resilience to maximise coping ability, health, and well-being, across a range of physical health conditions. The three key themes already mentioned, that of stress and coping, social relationships, and communication, in variant forms underlie much of the content of this chapter, and are relevant across different medical conditions, demographic stratification, and stress status.

Here we focus on evidence linking resilience in children living with atopic conditions including asthma and eczema; infectious diseases such as HIV/AIDS; and autoimmune conditions including diabetes, juvenile arthritis, and systemic lupus.

Defining Resilience from a Biopsychosocial Perspective

The concept of resilience certainly has intuitive appeal. It has generated some imaginative metaphorical descriptions often taken from nature and linked to evolutionary survival. For example: the “dandelion child” (those with “the capacity to survive and even thrive in whatever circumstances they encounter”) vs. the “orchid child” (the “context-sensitive individual, whose survival and flourishing is intimately tied…to the nurturant or neglectful character of the environment”) (Ellis & Boyce, 2008); the “Hawk” vs. “Dove” personality types denoting levels of aggression to explain differences in behavioural responses to stress (Korte, Koolhaas, Wingfield, & McEwen, 2005); the concept of “late bloomers” (Masten & Tellegen, 2012, p. 355) in describing different trajectories of resilience to indicate adolescents who showed adaptation and resilience only as entering adulthood rather than earlier in development; and the notion of “stress inoculation” (Meichenbaum, 2007) which implies the ability to build resilience against future adverse events. More recent and

a particularly useful metaphor of resilience is of tropical palm trees capable of "bending" rather than "breaking" in the face of "violent hurricanes" (Karatsoreos & McEwen, 2013).

Yet despite apparent similarities in conceptualising resilience, defining it is far from straightforward. Resilience not only has different definitions across disciplines, but it also has changed or evolved in meaning over time. A relatively new construct, resilience emerged in the 1970s and had its origins in research which sought to understand why psychopathology was not always the outcome in children exposed to risky environments such as maltreatment, poverty, deprivation, or low socioeconomic status (for review see Curtis & Cicchetti, 2003). That some children thrived despite adversity led to the exploration of psychosocial and behavioural qualities which defined resilience (Curtis & Cicchetti, 2003). Research has distinguished between two closely related but distinct concepts, that of resiliency and resilience. Resiliency relates to a "personality trait" or personal characteristic, and resilience to a "dynamic process" involving "personal, interpersonal, and contextual protective mechanisms" (Smith-Osborne & Whitehill Bolton, 2013, p. 111). Personal qualities (e.g. self-esteem) have also been described as resiliency "assets" and available qualities of the external environment (e.g. parental support) as resiliency "resources" (Fergus and Zimmerman, 2005, in Zimmerman, 2013, p. 381). Zimmerman (2013) provides an excellent synopsis of resiliency theory as that which seeks to understand the characteristics which promote and enable positive adaptation by intercepting negative "developmental trajectories" associated with risky environments and instead redirecting towards healthy mental and physical health outcomes. Summarising three different models of resiliency as "compensatory", "protective", or "inoculation/challenge" (Zimmerman, 2013, p. 382), the third model, proposed by Rutter (2006), emphasised individual differences and the context of person–environment interaction. Rutter (2012) referred to "steeling" effects in which early exposure to adverse experience toughens or "steels" the individual to be able to cope when faced with adverse situations later in life (p. 335).

Although personality characteristics are still viewed as important in childhood risk and resiliency (for example, see Shiner & Masten, 2012), as Cicchetti (2010) describes it, the scientific study of resiliency has moved from protective "personal qualities" of the child and subsequently their family context, to "prevention and intervention strategies" in order to promote resilience in the face of adversity (p. 146). This conceptualisation of resilience research as moving away from individual protective factors towards more of a focus on dynamic multilevel adaptive systems is congruent with the four waves of resilience research suggested by Masten (2007). O'Dougherty Wright, Masten, and Narayan (2013) describe the first wave of resilience research as enabling identification of individual resilience factors (i.e. what makes a person resilient?); the second wave focused on protective factors in the context of risk using a developmental systems approach; the third wave concentrated on interventions to improve resilience particularly by targeting developmental pathways; and the fourth or current wave aims to understand resilience using multiple levels of analysis with an emphasis on neurobiological processes.

Thus recent work over the last 15 years has pointed to this "multilevel" nature of resilience (Cicchetti, 2010) and called for attention to the interplay of biological

factors and brain mechanisms, including genetic, neuroendocrine, immune, and cognitive processes, in examining the concept of resilience and its meaning (Cicchetti, 2010, 2013; Cicchetti & Blender, 2006; Curtis & Cicchetti, 2003). Neuroimaging has identified areas of the brain which are particularly important in developing or providing resilience under stressful conditions, such as the hippocampus, amygdala, anterior cingulate, and prefrontal cortex (van der Werff, Pannekoek, Stein, & van der Wee, 2013; van der Werff, van den Berg, Pannekoek, Elzinga, & van der Wee, 2013) and these authors call for more work in this area to identify specific brain regions involved. Perhaps of even greater importance are biomarkers of resilience in children and adolescents, particularly those that are measurable using relatively non-intrusive methods. For example, assessment of salivary cortisol as a marker of basal stress levels or stress reactivity (for a review of cortisol assessment in children see Jessop & Turner-Cobb, 2008) provides a window on hypothalamic pituitary adrenal (HPA) axis activity. Markers such as salivary immunoglobulin A (sIgA) and other classes of antibodies produced in response to specific pathogens including bacteria or viral antigens enable an assessment of antibody-mediated or humoral immunity (for a review of endocrine and immune markers in children see Turner-Cobb, 2014). Antigen resistance via antibody production (i.e. staying well in the face of exposure to a virus) offers not only a metaphorical parallel of psychosocial resilience but also a biopsychosocial mapping of resilience to psychosocial events at the level of antibody defence. More recent developments have enabled identification of brain-derived neurotrophic factor (BDNF) which link to genes responsible for its expression (Karatsoreos & McEwen, 2013) and salivary nerve growth factor (sNGF) as an adaptive factor in stress resilience (Laurent, Laurent, & Granger, 2014). These markers provide evidence of underlying biological mechanisms driving resilience as well as offering insight into the plasticity of mechanisms and systems involved in resilience. An excellent example of the gene–environment interaction in resilience is provided by Hostinar, Cicchetti, and Rogosch (2014) in their ingenious analysis of interactions between the receptor gene for oxytocin (a social and affiliative hormone), social support, and resilience in maltreated adolescents. They found that those adolescents who had been maltreated and who also had the genetic variant in their oxytocin receptor gene were more vulnerable to the effects of their social environment (Hostinar et al., 2014). Whilst the outcome in this study is related to psychopathology (internalising symptoms) rather than physical health outcomes, the underlying rationale remains the same.

This multidimensional or multifaceted process of resilience, examined in the face of adversity, when that adversity or external stressor or stimuli is a physical health condition, is the context being considered in this chapter. Within this definition of resilience, a biopsychosocial approach incorporating both psychosocial and biological aspects and their interplay is crucial. Immune-related conditions provide the perfect backdrop to examine resilience in physical health due to known interactions between psychosocial factors and neuroendocrine and immune functioning.

Key Theories Linking Psychological Factors and Physical Health to Resilience

An important theory in this respect is that of allostasis and the concept of allostatic load (Sterling & Eyer, 1988), which has revolutionised the psychosocial stress research in the last quarter of a century. Allostasis is defined as the ability of an organism to maintain stability through change and allostatic load as an individual's accumulated lifetime stress (McEwen, 1998a, 1998b, 2012; McEwen & Stellar, 1993; McEwen & Wingfield, 2003). Maintaining stability through change is the very essence of resilience since it encapsulates an individual's dynamic ability to adapt to challenging circumstances. It involves meeting the challenge with the physiological resources available and returning to a more stable, although possibly changed state, once the event has subsided. Similarly, it may involve adapting to repeated or multiple stressors in such a way that the physiological response is not activated to the same extent in future aversive encounters. This physiological adaptation is dependent upon the psychosocial resources and factors that accompany and elicit the responses. Allostatic load is the wear and tear put on the allostatic stress response systems (including immune and neuroendocrine mechanisms) when dealing with life stressors. Three main patterns of allostatic load occur when adaptation fails, either because of a lack of adaptation to (1) repeated or multiple acute stressors; (2) chronic ongoing stressful events; or (3) increased sensitivity following severe stress exposure and each is linked to specific types of ill health conditions. A recent addition to this theory is that of "allostatic overload", a state in which stressful events are of a nature that overcomes an individual's ability to cope at both a physiological and psychological level and is associated with detrimental physical health outcomes (McEwen & Wingfield, 2003; Offidani & Ruini, 2012). A Darwinian concept of stress is centred around the notion that the ability to maximise resilience and adaptability is associated with greater chances of survival (Korte et al., 2005) or better health outcomes. The concept of vulnerability then is seen as the opposing end, or "flipside" of resilience (Karatsoreos & McEwen, 2013) where risk and vulnerability are the unstable factors at one end of the continuum and resilience is the positive outcome associated with stability at the other end of the spectrum. The importance of the age of the individual for immune-related vulnerability has also been highlighted in both animal and human work, which has emphasized particular health impacts at "critical periods" associated with both ends of the life course—in the early years of life as well as in the elderly (Coe & Lubach, 2003).

In sum, borrowing from stress theory, we know that physiological plasticity and psychosocial adaptation is vital in reducing vulnerability and maximizing resilience, that childhood is a critical period for future health effects, and that resilience can be fostered or developed.

Resilience is defined in this chapter as a process, drawing from the biopsychosocial perspective, incorporating the theory of allostasis, in which an individual's

ability to thrive in a given situation or life circumstance, is determined by their adaptive capability. As applied to immune-related conditions, resilience is the ability to cope with the many challenges of the condition, whether psychosocial or physiological in nature, and the interplay of these to affect the outcome of the condition.

Coping Theory

Coping clearly underpins the concept of resilience. Two key theoretical models of relevance in considering the response to illness and associated challenges that it brings are the transactional model of stress and coping (Lazarus & Folkman, 1984) and the stress-control model (Connor-Smith, Compas, Wadsworth, Thomsen, & Saltzman, 2000).

The transactional theory of stress and coping developed by Lazarus and Folkman (1984) views stressful experiences as an interactional process between the person and their environment in which the individual makes both primary appraisals (assessing the stressor as harmful, threatening, or challenging) and secondary appraisals (assessing the resources available to cope with the stressor). Stress occurs when there is a discrepancy between the primary and secondary appraisals. The transactional theory has been applied to a variety of studies of children with immune-related health conditions, including asthma and diabetes (Hocking & Lochman, 2005; Peeters, Boersma, & Koopman, 2008). This model has provided a valuable theoretical framework for studying the influence of diabetes on children's quality of life (QOL) and research has suggested that psychosocial interventions for ill children should be based on the transactional model as it is a good predictor of resilience factors, such as coping skills, that influence health-related QOL (Peeters et al., 2008). It includes key factors such as illness parameters (e.g. type and severity of the illness), demographic parameters (e.g. age, gender, and SES), child adaptational processes (e.g. cognitive processes such as stress appraisal and methods of coping), and child adjustment. The "methods of coping" variable refers to the different coping strategies used by ill children. Disengagement and negative thinking, for example, are highlighted as being associated with poorer child adjustment (Hocking & Lochman, 2005).

However, some researchers have suggested that although the transactional model is useful in guiding interventions and practice it requires updating as the original structure of the model is over 30 years old. For example, the model was updated for use with children with chronic illnesses by Thompson, Gustafson, George, and Spock (1994) and further updated by Hocking and Lochman (2005) who suggested that the variable "maternal functioning" in the model should be replaced with "family functioning", as it is not merely one parent but the whole family who are affected by a child's illness. They also suggest the addition of a new variable, "behavioral competence", to encompass resilience characteristics such as social skills, adaptive behaviors, peer interaction, and age-appropriate activities (Hocking & Lochman,

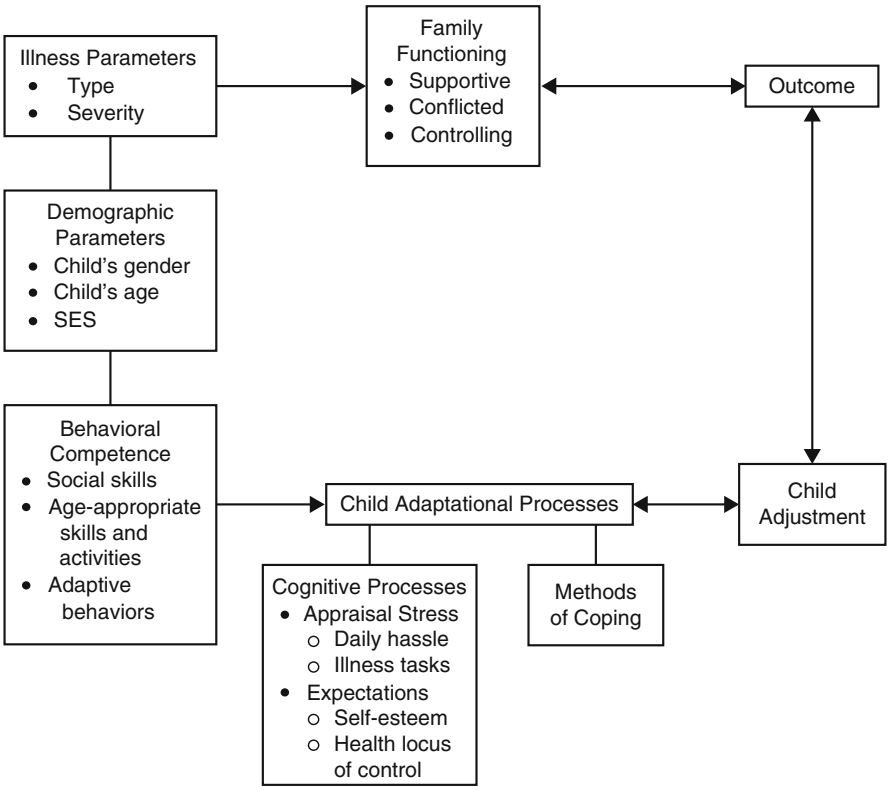

Fig. 2.1 Modified stress and coping transactional model for chronic illness in children (Hocking & Lochman, 2005). Copyright Springer

2005, p. 230). These competency features are important as they can influence the child's ability to adapt to their illness. Figure 2.1 illustrates this updated model as applied to children with a chronic illness.

The stress-control model of coping developed by Connor-Smith et al. (2000) built on the transactional model created by Lazarus and Folkman (1984). This model suggests that there are several types of coping strategies (voluntary vs. involuntary, engagement vs. disengagement, and primary vs. secondary). Findings applying the stress-control model of coping (Connor-Smith et al., 2000) indicate that when faced with uncontrollable stressors, as is frequently the case with chronic illness and medical procedures, secondary control coping styles (such as acceptance and cognitive restructuring) provide the most favorable outcomes. Hence primary coping is about changing the stressor itself, whereas secondary coping is about changes that the individual facing the stressor makes within themselves in order to deal with the stressor. Disengagement styles of coping (emotional numbing, cognitive interference) are associated with the poorest outcomes (Connor-Smith et al.,

2000; Weisz, McCabe, & Dennig, 1994). Weisz et al. (1994) made recommendations for practice based on their findings that secondary control coping was associated with more positive resilience outcomes, for example, better behavioral adjustment and less self-reported distress during medical procedures, in chronically ill children. The researchers explain this finding by suggesting that for uncontrollable stressors, such as medical procedures, adjusting to the stressor is more adaptive than attempting to alter the stressor itself. Although this research was conducted with children with leukemia, some of the medical procedures used were relevant to other conditions and settings (e.g. hospital stay and medication side effects). An awareness of the different types of coping strategies children might use enables clinicians to encourage and develop those associated with the most positive outcomes in immune-related conditions, dependent on the controllability characteristics demanded by the specific situation.

The "shift and persist" strategy proposed by Chen, Miller, Lachman, Gruenewald, and Seeman (2012) combines aspects of both coping theory and allostasis and is a clear example of the need for person–environment concordance. The shift and persist coping strategy appears to promote adaptability and reduce allostatic load in a specific subset of individuals. Chen et al. (2012) introduced this notion of shift and persist in applying the concept of resilience to the physical health arena, identifying it as a protective factor specifically for adults who experienced low socioeconomic circumstances during childhood. Central to this theory of shift-and-persist is the psychological construct of control, a key component of the stress response. Taken from a life span approach, primary control is defined as being able to change the environment or circumstances to the way an individual desires it to be, whereas secondary control is the ability to change oneself to fit within the constraints of that environment or being able to shift and persist within the circumstances imposed (Chen et al., 2012). Being able to adapt via use of secondary control therefore fits better with a low SES environment where changing the circumstances is unlikely but changing oneself to fit within the circumstances is more compatible (Chen et al., 2012). For those from a high SES background, theorized to have more capacity for primary control, the shift and persist strategy was not protective in respect to lowering allostatic load. The notion of "biological embedding" (Hertzman, 1999, p. 89) explains how childhood adversity such as economic hardship can influence health in later life. Adversity can have the effect of accelerating aging and creating susceptibility to age-related illness, via changes in the nervous, endocrine, and immune systems during childhood which continue into adult life and alter the landscape of the allostatic systems (Danese & McEwen, 2012; Miller, Chen, & Parker, 2011). This might include alterations to basal physiological levels as well as to reactivity to stress throughout the life course. The influence of chronic immune-related conditions on allostatic systems in childhood is therefore important not just during the childhood years but beyond to influence subsequent health. How a child reacts to events and is able to make use of resources early in life will influence their chances of successful adaptation later on, particularly if faced with chronic stress in adult life (Eiland & McEwen, 2012) which may in turn influence subsequent potential resilience.

Developmental Considerations

Resilience has been described as a "dynamic developmental construct" which both highlights the critical period of childhood and raising other more specific questions with regard to the timing of interventions (Cicchetti, 2010, p. 152). A child's age and developmental level are crucial to consider in this respect. A number of studies in children up to 11 years of age have found at least some support for staging models of child development as related to understanding of health and illness (e.g. Bibace & Walsh, 1980). More recent work has identified greater complexity in children's understanding of health and illness to include influences from their everyday life experiences (Normandeau, Kalnins, Jutras, & Hanigan, 1998), as well as their own experience of illness, with children having different levels of understanding across different types of illness and variation in their understanding of cause as opposed to recovery (Myant & Williams, 2005). Most strikingly, there is growing evidence that children as young as 4 or 5 years old may have a richer understanding of illness and some concept of the link between stress and illness than developmental stage theories alone would concede (Cheetham, Turner-Cobb, & Gamble, 2015; Myant & Williams, 2005; Valentine, Buchanan, & Knibb, 2010). Children have also been found to use different coping strategies dependent upon their age and cognitive-developmental level. For example, Band and Weisz (1990) found that children with diabetes in the formal operational group (average age of 14.6 years) and pre-formal operational group (average age of 8.8 years) used different coping strategies, with the formal operational group showing more secondary control coping and also more advanced knowledge of diabetes. For more on supporting chronically ill children during the transition to adolescence, see Lennon et al. this volume.

For children that adapt well and flourish under difficult circumstances relating to ill health, there is much to be learnt about the person–environment interaction that may be developed as an intervention to promote resilience in other children for whom the match between person and environment characteristics is less compatible. Zimmerman (2013) emphasizes that resiliency theory provides a "conceptual framework" or "scaffolding" from which to understand and explore how exposure to adverse events can be overcome and interventions developed to improve outcomes (Zimmerman, 2013, p. 382). Figure 2.2 represents a diagrammatic representation of the various components of resilience from the biopsychosocial perspective outlined so far in this chapter. The top row illustrates underlying factors that may influence the outcome of the biopsychosocial interplay and bidirectional pathways are indicated between psychosocial and biological factors, and between these factors and resilience outcomes. Interventions can occur across all levels depending on the particular target for intervention and outcome required.

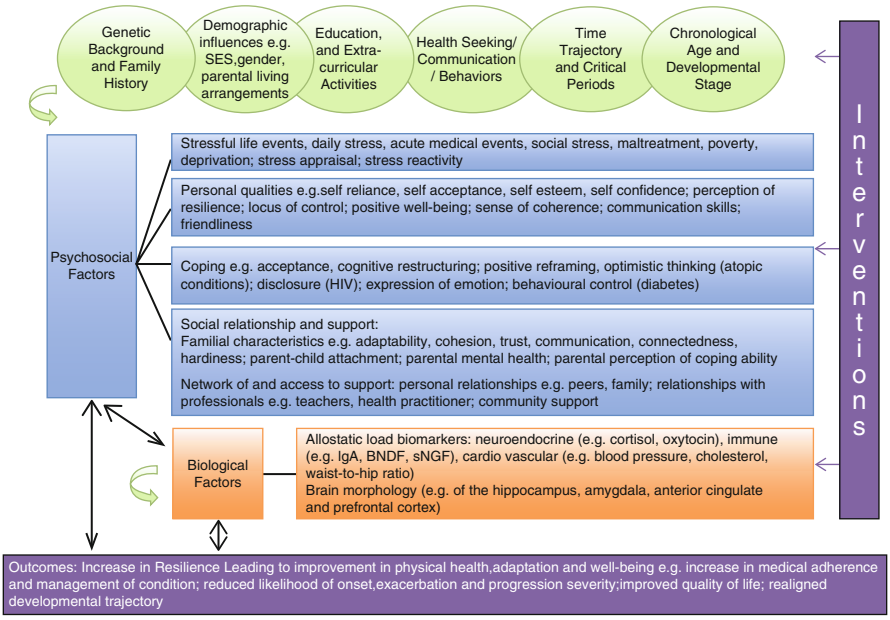

Fig. 2.2 Diagrammatic illustration of biopsychosocial factors associated with resilience in children as applied to immune-related health conditions

Theoretically Informed Practice

A variety of theories and models have been discussed which encompass key aspects of resilience in children and of important validity in respect to considering immune-related health conditions. Models and theories of resilience have much to add in respect to informing practice. A number of factors affect whether children with immune-related health conditions are resilient or vulnerable to stress. The interaction of multiple risk factors, for example, can determine resilience vs. vulnerability (Ebersohn & Ferreira, 2011). From this theoretical perspective, risk factors can be viewed as barriers to resilience. It is recommended that health professionals take into account an individual's risk factors or barriers (e.g. poverty) and protective factors (e.g. social support) when interacting with and treating children. Based on this risk vs. protective factor framework, those with a greater number of barriers and who have less protective factors are more at risk of adverse physical and psychological outcomes (Wallander & Varni, 1989). Similar risk-resistance frameworks of resilience have been used to guide practice in terms of how health professionals such as nurses interact with children with diabetes (Amer, 1999). This develops clearer communication by enhancing knowledge of the challenges experienced by children with diabetes and being better able to judge the level of support they require.

Several recommendations from theory have been made specifically regarding coping with medical stressors, most of which revolve around the topic of communication between children, their families, and health professionals. Children tend to be naturally information-seeking rather than information-avoiding, which is generally linked to better outcomes (Peterson, 1989). As research in this area greatly emphasizes the need for healthcare communication to be age-appropriate (Forsner, Jansson, & Sorlie, 2005a, 2005b; Gultekin & Baran, 2007) and this is especially relevant when trying to address children's fear of medical procedures and hospitalization (Rokach & Matalon, 2007). Health professionals' knowledge of relevant theory is also crucial in order to understand the ill child's perspective and to be able to communicate effectively. Knowledge of mediators (e.g. child characteristics) and moderators (e.g. stress, coping and adjustment) in how children cope with painful medical procedures has been highlighted as highly significant in improving resilience outcomes for children (Rudolph, Dennig, & Weisz, 1995). The role of the family is central to children with chronic illness, as highlighted by autoimmune conditions such as celiac disease and diabetes (Bacigalupe & Polcha, 2013). Illness-related stress has an impact on the whole family (Drotar, 1981). Knowledge of family history, health behavior, how parents communicate health messages, and the social support available to them is essential for health professionals in developing resilience (Bacigalupe & Polcha, 2013). This relationship between the child's illness and the family is not merely unidirectional, but can be viewed instead as a "reciprocal interaction" as the family can impact the illness as much as the illness can affect the family (Sholevar & Perkel, 1990, p. 371). Research suggests that if health professionals have a good working knowledge of the theory underlying a family-centred approach, this will enhance practice and improve outcomes for both the child and their family (Sholevar & Perkel, 1990).

Theories have been used both to inform clinical practice and as a foundation for interventions aimed to enhance children's resilience. The following sections outline some of the key recommendations for practice, drawing on the biopsychosocial model, the theory of allostasis, the transactional theory of stress and coping and the stress-control model, within the context of resilience theory and a family-centred approach.

Psychosocial Resilience Factors and Interventions in Children with Immune-Related Conditions

A range of interventions to increase resilience, as measured by a wealth of outcome variables, exist for children with immune-related health conditions. For a comprehensive review of psychoneuroimmune-related interventions for children with paediatric chronic illness see Nassau, Tien, and Fritz (2008). The interventions discussed in this section have been grouped based on three types of immune-related conditions: atopic conditions (e.g. asthma, eczema, IgE associated allergies); infectious disease (e.g. HIV/AIDS); and autoimmune conditions (e.g. type I diabetes, lupus, juvenile idiopathic arthritis).

Atopic Conditions

Atopic disorders such as asthma, eczema, and IgE associated allergies atopic are predominantly antibody-mediated T-helper 2 (Th2) driven responses associated with interleukin (IL)-4 and IL-5 production. Both onset and acute episodes of these types of chronic conditions have been linked to psychosocial factors such as stress.

Asthma

Asthma is "a disorder of breathing characterized by widespread narrowing of airways within the lung. The main symptom is shortness of breath" (Macpherson, 1999, p. 46). Although asthma can be potentially life threatening, medications can lead to symptom relief and prevention of future symptoms/asthma attacks. Due to these preventative measures the majority of research has focussed on changing children's health behaviors, such as adherence to medication. However some researchers have focussed on the importance of psychosocial factors that can impact the physical health of children with asthma. For example, Bahreinian et al. (2013) examined the association between asthma incidence/prevalence and allostatic load (AL) using a composite measure of AL composing eight biomarkers (including fasting glucose, total cholesterol, cortisol, and blood pressure) in children (7–10 years) followed until adolescence (11–14 years). Adolescent boys with high allostatic load (assessed as a biomarker of chronic stress) were more susceptible to asthma (incident onset or continued prevalence) than in boys with low allostatic load. Similarly, socioeconomic status (SES) has been cited as an important factor in determining the success of a psychosocial intervention. Chen et al. (2006) compared a sample of 37 children aged 9–18 years with asthma with 39 healthy children, and found for the asthmatic children only an association between low SES and higher production of interleukin (IL)-5, IL-13 and eosinophil counts, as well as greater chronic stress and perceived threat. Chen and Miller (2012) and Chen et al. (2012) also report the use of shift and persist strategies (e.g. use of positive reframing and optimistic thinking) to be associated with better asthma outcomes (less asthma inflammation and impairment) in low SES children compared to high SES children.

Parental and familial relationships are important psychosocial resilience factors in asthma and family hardiness has been linked with adaptation and resilience over time. Svavarsdottir and Rayens (2005) found that depression and anxiety *negatively* impacted family hardiness whilst positive well-being and sense of coherence *positively* impacted family hardiness. Equally, poor family relationships can have a negative impact on physical health. In a study of 67 children with asthma and 76 medically healthy children aged 9–18 years, which examined children's perceptions of parental support and assessed immune markers IL-5, IFN-ɣ and eosinophil protein levels; those who reported lower parental support were more resistant to anti-inflammatory effects on IL-5, IFN-ɣ and had higher eosinophil proteins (Miller,

Gaudin, Zysk, & Chen, 2009). For more on the role of the family in promoting resilience, see Hoehn et al. this volume.

Extensive work by Buske-Kirschbaum and colleagues has found consistent evidence for HPA axis disregulation in children with allergic atopic conditions in response to an acute stress challenge; Th2 responses appear over-activated and exacerbated as a result of an inadequate cortisol response (Buske-Kirschbaum et al., 1997, 2003). A predisposition towards developing atopy, as evidenced by altered HPA reactivity, was also observed in 3-day-old neonates with a family history of atopy or elevated umbilical cord IgE (Buske-Kirschbaum, Fischbach, Rauh, Hanker, & Hellhammer, 2004).

Relationship difficulties such as insecure attachment during the first 2 years of life, have also been linked to attenuated cortisol in response to a laboratory stressor (lower cortisol levels 15 and 30 min post stressor) in adolescents aged 17–19 years with a genetic predisposition to asthma (Kelsay, Leung, Mrazek, & Klinnert, 2013). These authors did not find a direct relationship between cortisol and asthma status however. Similarly, in their large scale TRAILS study of over 2000 children aged 11–16 years, Vink, Boezen, Postma, and Rosmalen (2013) found no significant relationship between awakening, diurnal, or laboratory induced cortisol and development of asthma either cross-sectionally or prospectively.

Social support has been found to have a mediating as well as a direct effect on health outcomes. For example, whilst poor maternal mental health has been linked to atopic and non-atopic wheezing, positive perception of social support acts as a protective factor (Marques dos Santos, Neves dos Santos, Rodrigues, & Barreto, 2012). Family interaction and social support have also been found to be beneficial in other atopic conditions such as allergies. Family functionality, defined as adaptability and cohesion, has been linked to recovery from allergies in children aged between 18 months and 3 years (Gustafsson, Kjellman, & Bjorksten, 2002). It is evident from the studies described above that psychosocial factors such as family relationships and social support can have positive or negative effects on health outcomes in atopic conditions, and that this relationship is bidirectional (Chida, Hamer, & Steptoe, 2008). Furthermore, the combined effect of underlying chronic family stress and acute stress events have been reported to induce asthma symptoms in children aged 9–18 years (Marin, Chen, Munch, & Miller, 2009). The authors suggest that the stress response systems become activated over time, resulting in a down-regulated cortisol response that promotes a Th2 cytokine imbalance.

Several behavioral interventions have been directed at the reduction of physiological and psychological stress associated with asthma attacks. These include the use of techniques such as biofeedback (self-regulation based on monitoring physical responses such as heart rate) and relaxation (e.g. progressive muscle relaxation, meditative breathing, and the use of imagery) (Masek, Fentress, & Spirito, 1984). Often relaxation-type breathing exercises can be difficult for children with asthma due to their reduced breathing capacity. One technique that has been found to be effective in overcoming this is the assessment of precursors or triggers for an asthma attack, before attempting to remove or reduce the impact, in order to break the cycle (Creer, 1982; Kotses & Glaus, 1981).

Infectious Disease

Psychosocial factors involved in infectious disease have perhaps been best demonstrated not in immune-related conditions per se but in acute upper respiratory infectious illness which "provides one of the most useful paradigms in which to measure links between stress and illness" (Turner-Cobb, 2014, p. 82). It can provide a brief insight into immune resilience vs. vulnerability in the face of everyday stressors as well as in situations of adversity. A number of studies have reported associations between life event stress, daily hassles, perceived stress, social support, family functioning, coping, and onset and duration of the common cold in adults and in children (for example, Cohen, Doyle, Skoner, Rabin, & Gwaltney, 1997; Cohen, Tyrrell, & Smith, 1991; Meyer & Haggerty, 1962; Turner-Cobb, Rixon, & Jessop, 2011; Turner-Cobb & Steptoe, 1996, 1998; Turner-Cobb, Steptoe, Perry, & Axford, 1998). With this paradigm in mind, we turn to the chronic condition of HIV/AIDS.

HIV and AIDS

Living with the immune conditions human immunodeficiency virus (HIV) or acquired immune deficiency syndrome (AIDS) can have a significant and pervasive impact on children's physical and psychological well-being. In considering this we shift the focus from stress as a causative agent in disease onset or exacerbation to the impact of stress caused from living with the condition itself. Furthermore, some of the research in this area focuses not only on children who have AIDS or HIV themselves, but also those who are affected by AIDS, such as those who have experienced the death of a parent from AIDS. For a thorough review of the research in this area see Betancourt, Meyers-Ohki, Charrow, and Hansen (2013).

A variety of interventions have been developed to increase resilience and promote other positive outcomes in children with HIV/AIDS, many of which draw on the social support provided by friends, family, teachers/schools, and the community. One such intervention study views teachers and schools as "resources to buoy resilience in the face of adversities" (Ebersohn & Ferreira, 2011, p. 596). This research is part of a longitudinal project following the level of psychosocial support 57 teachers provided to students with HIV/AIDS after they had participated in a school-based intervention known as the "Supportive Teachers, Assets and Resilience" (STAR) project. Based on theories of resilience, the intervention involved teachers identifying available resources, barriers, and assets (e.g. protective factors) followed by designing and implementing action plans to address these barriers. Thematic analysis of interviews with these teachers highlighted that social support was a key feature of the themes that emerged, providing support for the use of social support from a range of sources outside the school to help teachers to promote resilience within it.

Other interventions have focussed on the family as a source of social support. For example, Lyon et al. (2011) investigated the impact of a family-centered care

planning intervention based on the transactional stress and coping theory on outcomes such as spirituality and medical adherence in a sample of 40 HIV-positive adolescents (aged 14–21 years) and 40 legal guardians (aged 21 and over). Spirituality was found to be a protective factor for adolescents coping with HIV. Adolescents who did not believe HIV was a punishment from God showed higher spirituality and adherence scores, with "facilitated family conversations" having a particularly strong positive effect on these outcomes (Lyon et al., 2011, p. 633). Another parental intervention used in South Africa aimed to stimulate mother–child interactions based on evidence of strong relationships as a protective feature of resilience. Fifteen mothers and their children (aged 6–10 years) took part in this intervention which reported increased positive maternal mental health and strengthened mothers' capacity to care for children, increasing their self-esteem and survival skills (Visser et al., 2012). This intervention thus aimed to increase child resilience by first increasing maternal resilience.

As is often the case in HIV/AIDS in developing countries, parent mortality has necessitated the provision of care and support for children and adolescents by the wider community. Skovdal and Campbell (2010) suggest that an analytical framework is needed in order for interventions to appropriately support communities who, in turn, support orphaned children. The framework encompasses six psychosocial resources that the community require to facilitate resilience: appropriate knowledge and skills; opportunity for community discussion of barriers and solutions; recognizing local strengths and coping resources; confidence; within-community solidarity; and the ability to access other sources of support. Again, social support is seen as a key feature in enhancing children's resilience through interventions.

Resilience research in children and adolescents with HIV/AIDS is beginning to move away from a paternalistic approach (i.e. children being seen as passive victims rather than active agents) towards a more "strengths-based" family-centered approach and the idea that children often have inbuilt resilience and/or coping skills (Skovdal & Campbell, 2010; Skovdal & Daniel, 2012). Therefore interventions are recommended to target not only the children but also whole families, communities, and institutions, including schools, with the aim of enhancing self-reliance and self-acceptance (Amzel et al., 2013). This approach to resilience builds on Bronfenbrenner's (1986) social ecological theory of human development, blending an ecological resilience approach with a risk reduction paradigm. Other interventions have done just this, by designing and directing interventions at whole families rather than just the child, measuring a variety of outcomes and psychosocial resilience factors. Examples include group sessions led by a community care worker focussed on improving communication and daily living skills for 390 mother–child dyads (161 in the intervention group and 169 in the standard care control group) in which the children with HIV were aged 6–10 years (Eloff et al., 2014); a community program to educate children and parents about HIV prevention and to give long-term social and emotional support leading to decreased high risk sexual and substance abuse behavior (Pivnick & Villegas, 2000); and a family strengthening intervention used to improve family connectedness, social support, and children's

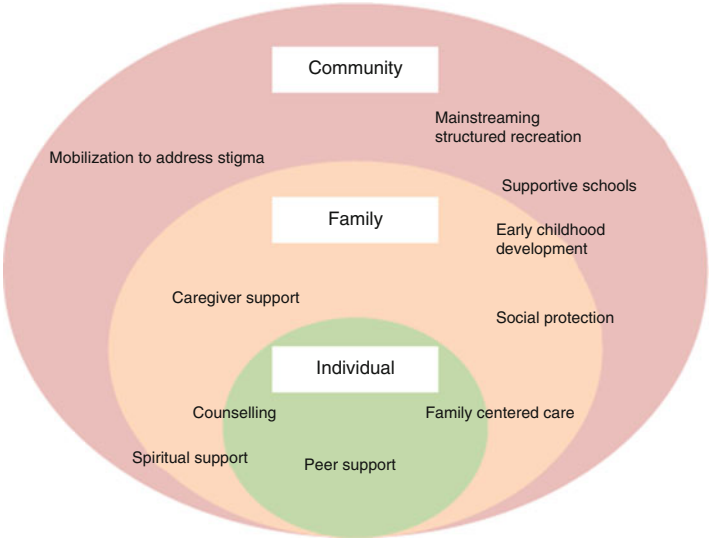

Fig. 2.3 Examples of combination interventions aimed to increase resilience in children and their families (Amzel et al., 2013). Copyright Lippincott Williams & Wilkins

pro-social behavior in 20 families with one child aged 7–17 years and at least one HIV-positive adult (Betancourt et al., 2014).

A thorough review of individual, family, health-care professional and community interventions is provided by Amzel et al. (2013). These levels of intervention are encapsulated in Fig. 2.3 below which highlights the importance of a combination intervention approach at different levels of the ecological model: individual, family, and community (Amzel et al., 2013). The researchers suggest that the interventions that are the most feasible and successful in increasing families' well-being are those which target several levels of the model, i.e. a combination approach.

Autoimmune Conditions

Lupus and Juvenile Idiopathic Arthritis

Rheumatic conditions such as lupus and Juvenile Idiopathic Arthritis (JIA) can exhibit symptoms such as joint pain and fatigue, therefore research into these conditions has frequently focused on the ability to cope with physical symptoms. Using a qualitative approach to identify how illnesses affect psychosocial resilience factors in a sample of 21 children with lupus and 16 parents, Moorthy, Peterson, Onel, Harrison, and Lehman (2005) and Moorthy et al. (2004) found that a variety of

domains of QOL are affected by lupus, particularly coping and locus of control. This research highlighted a bidirectional approach, i.e. that illness can impact resilience factors as well as resilience affecting health outcomes. Although the research suggests several potential resilience factors which could be targeted using interventions, there is a scarcity of interventions reported in the literature which are specifically aimed at increasing resilience in children suffering from JIA and only one intervention for lupus. In this study, a randomized controlled trial (RCT) with three groups (a cognitive-behavioral group, an education only group, and a no contact control group) was trialled in 53 adolescent girls aged 12–18 years with systemic lupus (Brown et al., 2012). The cognitive-behavioral intervention group received a course of CBT which aimed to enhance coping skills and cognitive restructuring techniques. Although no differences were found between the groups for the primary outcomes (pain management, disease adjustment, and quality of life) there was an increase in positive coping skills, social support, and control in the CBT intervention group. Evidently there is a need for more interventions of this kind for lupus and other autoimmune conditions such as JIA.

Diabetes: Insulin-Dependent Diabetes Mellitus/Type 1 Diabetes (IDDM/T1D)

Diabetes is "a condition characterized by a raised concentration of glucose in the blood because of a deficiency in the production and/or action of insulin" and insulin-dependent, T1D "occurs as a result of autoimmune destruction of beta cells within the pancreas" (Macpherson, 1999, p. 141). Numerous interventions have been created to improve both the physical aspects (e.g. metabolic control) and the psychosocial factors relevant to children with T1D. For a review of educational and psychosocial interventions available for adolescents with diabetes, with a particular focus on RCTs, see Hampson et al. (2001).

The stress-control model of coping has been applied within the adolescent diabetic population by Jaser and White (2011). They report that coping skills can have an impact on resilience in adolescents with T1D. Primary and secondary control coping were related to higher competence scores, better QOL, and better metabolic control than disengagement coping techniques (Jaser & White, 2011). Therefore interventions which aim to enhance coping skills could lead to an increase in protective resilience factors. One such intervention was conducted by Grey, Boland, Davidson, Li, and Tamborlane (2000) who allocated adolescents with diabetes to one of two intensive diabetes management (IDM) conditions: with or without coping skills training (CST). Those who had the CST showed better medical self-efficacy and less impact of diabetes on their QOL than those who received only the IDM without the CST. This highlights the importance of children and adolescents with a chronic illness developing the appropriate coping strategies to manage their illness and its impact on their lives.

As discussed in relation to many of the other immune conditions, family can have an impact on health outcomes and resilience. In a descriptive comparative study of adolescents attending a diabetes camp several resilience factors were considered as important: self-efficacy, perception of personal resilience, and parental living situation (Winsett, Stender, Gower, & Burghen, 2010). Interestingly, living with both parents was linked to better glycosylated haemoglobin suggesting that this could be a protective factor. Another family factor which affects resilience is family cohesion and positive affect which have been found to positively correlate with increased metabolic control. Adolescents who rated themselves highly on positive qualities (e.g. honesty, friendliness, helpfulness) had "more cohesive families, better disease management, and, indirectly, better metabolic control" (Mackey et al., 2011, p. 314). Last in this chapter but certainly not least in terms of effectiveness, positive affect has also been shown to be increased by interventions utilizing animal-assisted therapy. The use of animals as a therapeutic tool has become increasingly popular in a variety of physical and psychological health conditions including for children undergoing medical treatment; for a discussion of this topic see Turner-Cobb (2014). Kaminski, Pellino, and Wish (2002) found that pet therapy led to more positive affect than play therapy in a group of chronically ill children, including children with diabetes.

Summary

In this chapter we have examined resilience in children from a biopsychosocial, health psychology perspective. The psychoneuroimmune focus has enabled a thorough investigation of the meaning of resilience, an examination of psychosocial and biological characteristics, and an exploration of psychosocial interventions to develop resilience and facilitate resilient outcomes. That resilience has both psychosocial and physiological characteristics and that an interplay exists between these factors is particularly relevant to immune-related health conditions as exemplified by atopy, infectious disease, and autoimmunity. Coping theory, highlighting the importance of secondary control coping in resilience, has been a key theme throughout this chapter. Similarly, the theory of allostasis and concept of allostatic load provides an important explanatory theory at the core of stress-based resilience as applied to physical health in children. Different perspectives of resilience have been considered throughout, including the perspectives of ecological resilience and that of a risk reduction paradigm. This chapter attempted to integrate these models to offer a more multidimensional approach. It is clear that the characteristics of resilience can be nurtured, developed, and promoted across a range of conditions in ways most effectual for those specific conditions. Resilience is important as both a predictor and an outcome in immune-related health conditions and a valuable characteristic and tool in the fields of health psychology and psychoneuroimmunology.

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