How Stress Affects Tamariki

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Research shows that stress can have both positive and negative impacts on tamariki, influencing their development and overall wellbeing. This article is intended for those supporting tamariki and their whānau, aiming to provide a deeper, more nuanced understanding of stress. By exploring how stress can affect tamariki, it is hoped we can work to prevent tamariki exposure to harmful levels of stress, and offer more effective support for those who need it.

Definition

Stress can be defined as the psychological response that occurs when "an individual perceives themselves to be under threat or challenge."[1]

Tamariki perceive stress differently from adults; situations that adults might not find stressful may be highly stressful for pēpi and tamariki.[2] As a result, it's easy for adults to underestimate how stressful certain experiences can be for tamariki.[3]

Our stress response is largely beneficial and leads to several changes in our physiology and behaviour intended to address the perceived threat and promote our survival. However, when stress is extreme or ongoing the stress response systems remains activated for prolonged periods of time resulting in "dysregulation and negative psychological and behavioural outcomes."[4]

Stress system

Stress causes our bodily systems to respond. For example, our heart rate, blood pressure and cortisol levels increase.[5] Some of the most affected systems are the sympathetic nervous system, the HPA axis and the immune system, which are all highly interconnected.[6]

Understanding how our stress response systems function involves defining the concepts of homeostasis and allostasis. These concepts help explain how the body manages stress.

Homeostasis is the process by which the body maintains internal stability by keeping physiological parameters within a narrow range around a set point. For example, maintaining a stable body temperature or blood pH level. This concept emphasises the body's ability to return to a baseline state after facing disturbances, such as recovering heart rate through the sympathetic nervous system after mild exercise, normalising cortisol levels via the hypothalamic-pituitary-adrenal (HPA) axis or returning to normal immune function after an infection.[7]

Allostasis refers to how the body achieves stability through change. It involves the brain's ability to predict and prepare for future needs by adjusting physiological systems, including the sympathetic nervous system, HPA axis, and immune system, in anticipation of stressors. For example, the brain increases heart rate and energy mobilisation through the sympathetic nervous system and HPA axis before a stressful event, such as a tamaiti performing in a school play or facing a significant life change like moving to a new school.[8]

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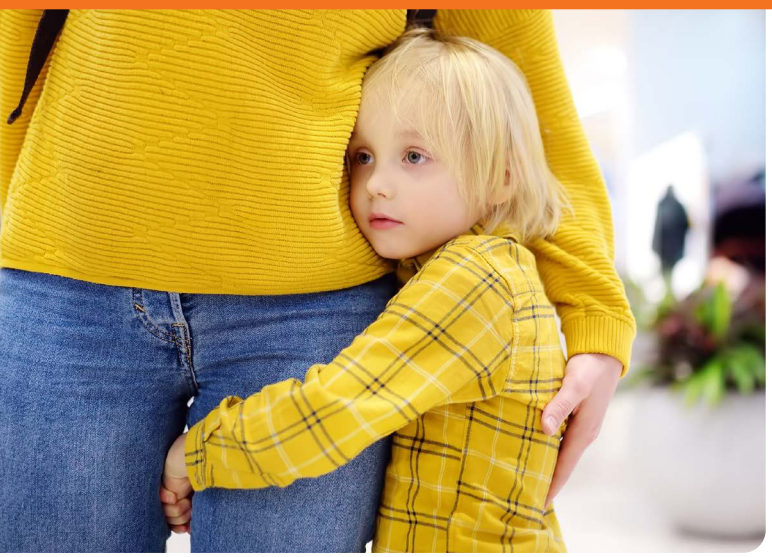

Levels of stress

One way of understanding different levels of stress was developed by The Harvard Center on the Developing Child. They describe three levels of stress – positive, tolerable, and toxic stress.

The impact of stress on tamariki depends upon several things, including:

- how long the stressful event lasted
- how intense the stressful experience was
- timing i.e. when in development the stress occurred
- context "such as whether the experience is controllable"[9]
- previous history of stressful experiences, and
- whether a tamaiti has safe and reliable adult support.[10]

1. Positive stress

Stress can be considered positive when:

- it is moderate
- the body's stress response is short-lived e.g. mild increases in stress hormones, heart rate increasing briefly. In other words, these are "turned on when needed and turned off when not needed"[11]
- the tamaiti has a loving adult available to help them cope with the stress.[12]

Positive stress "is a normal part of life, and learning to adjust to it is an essential feature of healthy development."[13] These types of stressful experiences are ones which tamariki can gradually learn to manage with support from caring adults. This supports their development of resilience and healthy coping skills.[14] Some have described positive stress as the "sweet spot" of stress.[15] This refers to those experiences that fall between neutral or enjoyable experiences at one end and those which are traumatic at the extreme opposite, and they contribute to growth and resilience. It's worth noting that "not all stress is harmful."[16]

Stress that's positive occurs when the stressor is common for their age, such as coping with frustration or finding a new situation scary.[17]

2. Tolerable stress

Tolerable stress refers to stress responses that:

- could potentially harm a child's developing brain and other organ systems[18]
- usually occur for a limited time, allowing for recovery
- are buffered by adult support.

A defining feature of tolerable stress is when a tamaiti has an ongoing relationship with at least one supportive adult who helps them feel safe and secure. This helps the tamaiti return to homeostasis.[19] Supportive care is a powerful buffer against stress and can help a tamaiti learn and recover from their experience.[20]

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3. Toxic Stress

Toxic stress refers to "strong, frequent, or prolonged activation of the body's stress management system. Stressful events that are chronic, uncontrollable, and/or experienced without children having access to support from caring adults tend to provoke these types of toxic stress responses."[21] Whereas in situations of tolerable stress a tamaiti has at least one supportive caregiver, in toxic stress this support is either not available, or the caregiver may be the source of threat.[22]

The concept of toxic stress refers to the strength of response and the length of time the stress system is activated for and not to the source, nature or number of stressors. It is the timing, duration, and level of bodily disturbances that increase the risk of poor health outcomes.[23] A wide range of biological changes can occur in response to toxic stress. These changes occur at many levels, including molecular, cellular, and behavioural. [24]

The body's changes under stress can be seen as adaptive and helpful, at least in the short term, and work to promote survival. For example, hypersensitivity to threatening cues might help survival in a hostile environment but over time become maladaptive and harmful to wellbeing.[25]

Chronic stress can disrupt the body's ability to maintain stable internal conditions (i.e. homeostasis). For example, consistent stress can prevent the body from effectively returning to baseline levels after a disturbance, such as failing to normalise blood pressure or heart rate. This means that ongoing stress can disrupt homeostasis, contributing to poorer health.[26]

A wide range of biological changes can occur in response to toxic stress.

When exposure to stress is ongoing its impacts on the body "can result in an allostatic load or overload condition, in which neural circuit and cardiometabolic changes have lasting costs in dysfunction and disease."[27] Allostatic load is the cumulative physiological burden imposed on the body by chronic stress. Repeated activation of the stress response system can lead to wear and tear – and consequent changes – in the neural, cardiovascular, metabolic, and immune systems. In other words, the mechanisms meant to protect the body from acute stress become detrimental due to overuse.[28]

These changes reflect the body's adaptation to a constant state of stress, with long-term health implications, for example, blood pressure changes which increase risk for poorer cardiovascular health.[29] This can lead to both specific conditions (e.g. anxiety disorders, depression, heart disease, diabetes, and autoimmune diseases) and overall physiological dysregulation, which makes tamariki more vulnerable to stressors later in life.[30]

Models of stress

There are two main ways in which researchers have tried to understand the effects of early stress. These have been described as:

1. General or "lumping" models

2. Specific or "splitting" models.[31]

Lumping models include many types of stress in one broad category, sometimes called childood adversity or early life stress. In contrast, splitting models are based on the understanding that specific types of adversity lead to different types of impacts on tamariki, including on their brain.[32]

It's complicated to study as different types of stress often occur together making it harder to determine the specific effects of any one type of stress.[33]

Within the models looking at effects of specific stressors, it's becoming common to view potential stressors as either – a lack of expected inputs or deprivation, or, as a direct threat to the tamaiti. Examples of deprivation include neglect or insufficient food; examples of threat include physical or sexual abuse, being exposed to violence.[34] Some have argued that for infants this distinction is less clear as being deprived of care is "a significant threat to survival and activates many of the stress-mediating systems activated by threat."[35]

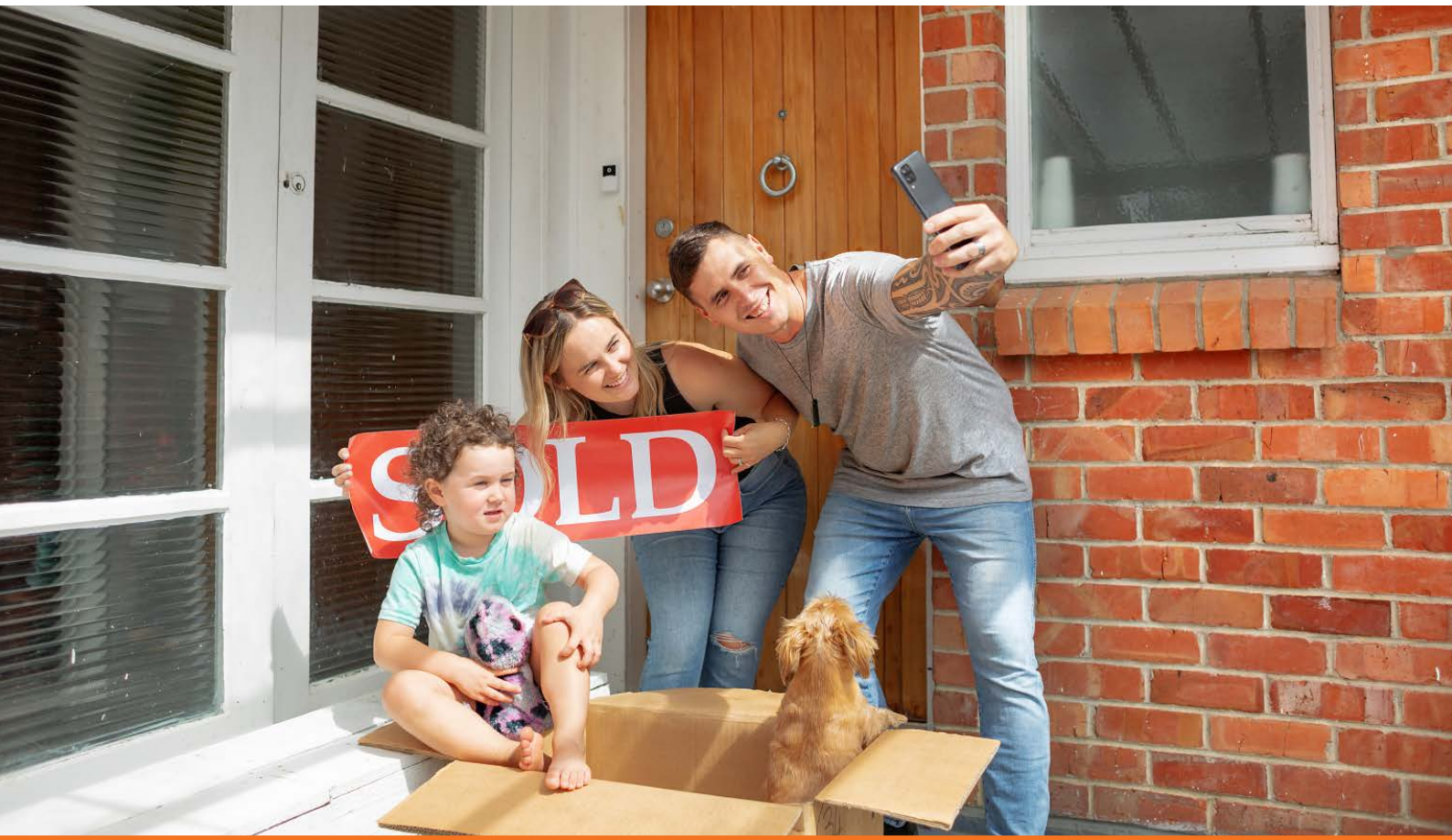
Considering both general and specific models helps us to better understand how early life stress shapes neurobiological systems.[36] There are commonalities across different types of stress and their physiological effects, such as on the HPA axis, autonomic nervous system, and immune system – crucial for adaptive responses to environmental threats. This highlights the interconnected nature of bodily systems, suggesting that both cumulative stress (lumping) and specific stressors (splitting) need to be considered to fully understand the broad and distinct impacts of stress on neurodevelopmental outcomes.[37]

Effects of toxic stress

High levels of early life stress are associated with changes potentially affecting many areas of health, development and wellbeing.

1. Effects on the body

Recent years have seen a focus on the effects of early life stress on the brain. Further research now makes it clear that the impacts of stress are widespread throughout the body; the brain, whilst important, is



only one element of this. Given the highly interconnected nature of our bodily systems, change in one area tends to lead to changes in other areas as well. These changes include to the immune system and levels of inflammation throughout the body.[38]

In the short-term, bodily responses to stress are adaptive and help tamariki to respond to threats. However, when stress continues or is frequent these heightened responses are no longer adaptive and contribute to poorer mental and physical health throughout life.[39] In addition, bodily and behavioural responses that serve to protect tamariki in stressful or threatening environments can create difficulties in other social environments.[40]

High levels of early life stress change how the hypothalamic pituitary adrenal (HPA) axis and the autonomic nervous system function.[41] HPA axis reactivity can be either hypo-reactive or hyper-reactive, with each occurring at similar rates.[42] A dysregulated stress response system increases risk for poorer mental and physical health.[43]

2. Effects on the brain

The effects of stress on children's brains are hugely varied and complex. They depend upon many factors including age, gender, timing, and the type/s of stress. Examples are given here to enhance understanding; however, these are just some of the many ways the brain can be impacted.

Early life stress can lead to both structural and functional changes in the circuits connecting the prefrontal cortex, hippocampus and amygdala. These changes play a role in the impact stress has on development. This is partially due to ongoing exposure to corticotrophin reducing hormone and glucocorticoids which are associated with changes to memory, learning, processing emotions, self-regulation and behaviour. Tamariki who have difficulty recognising, expressing and regulating their emotions are at higher risk for a wide range of poorer outcomes.[44]

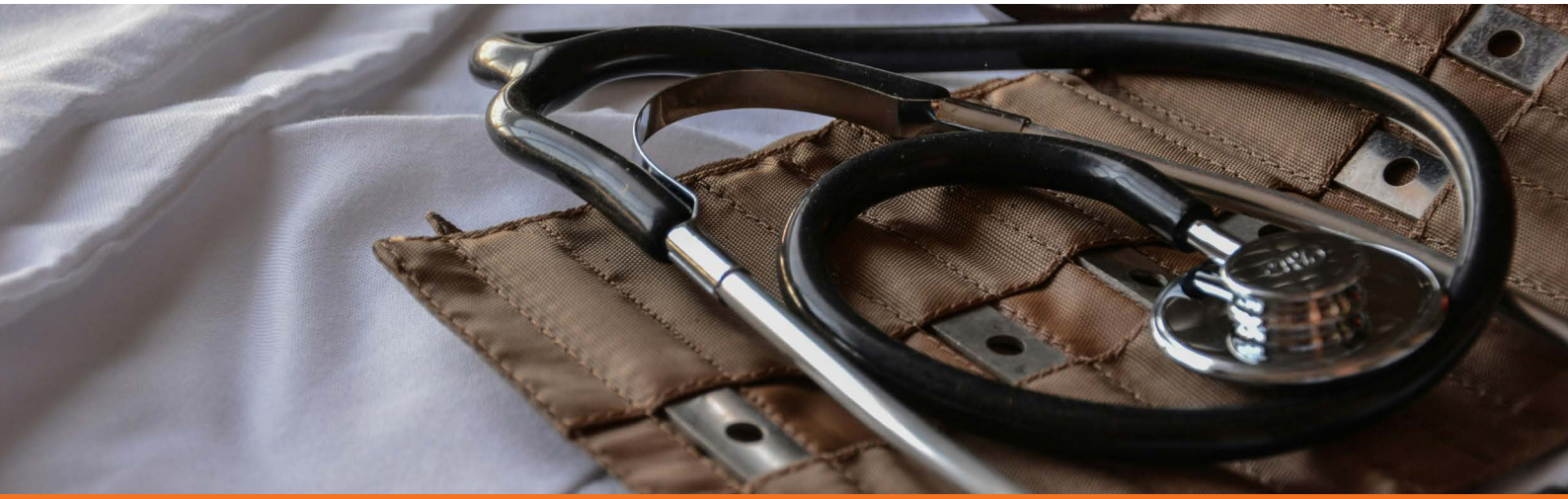
Many studies have found reduced hippocampal volume among tamariki who have experienced early life stress, such as poverty, abuse or neglect. This change to the hippocampus is associated with poorer mental health and increased learning difficulty.[45]

Toxic stress, such as that arising from ongoing abuse, may lead to stronger neural connections related to fear, anxiety and impulsive behaviour with the connections for thinking, planning and impulse control being fewer and less developed.[46] Knowing this may help us to better understand tamariki and provide effective supports.

3. Impacts on wellbeing and behaviour

"Exposure to increased levels of potential threat alters children's perceptual processes such that they become more likely to perceive situations others may not find threatening as threat."[47] This heightened state of vigilance and stress response can have far-reaching impacts on children's cognitive and emotional development. For instance, tamariki constantly scanning their environment for potential threats may struggle to focus and learn in academic settings. Other examples include heightened startle responses, marked reactions to sudden noises or movements, or avoidance behaviours, steering clear of unfamiliar situations due to an overactive fear response.

Understanding these differential impacts can help tailor support to enhance positive outcomes for tamariki. For instance, predictable environments with stable caregivers can reduce the negative impacts of stress.[48] Additionally, access to educational resources and community support networks can bolster resilience, helping tamariki develop healthy coping mechanisms and improve behavioural outcomes.[49]



Timing is one of the reasons why two tamariki with similar experiences can be impacted very differently.

Deepening our understanding of stress

Continuing research on how and why stress impacts tamariki has increased our understanding. Some aspects of this are highlighted below.

1. Integrated bodies

One of the strongest learnings about child development in recent times is how integrated our many biological systems are, working together to enhance our survival. This includes "neural, immune, metabolic, and other developing systems."[50]

Although the effects of adversity on children's brains have received the most attention, we now know that the impacts extend much further, including on their immune system, microbiome and metabolism. This means that highly stressful experiences in childhood can affect any biological system. In addition, multiple biological changes following early adversity seem to make tamariki more vulnerable to stresses occurring later.[51]

> "All biological systems are inextricably integrated, continuously "reading" and adapting to the environment and "talking back" to the brain and each other through highly regulated channels of cross-system communication."[52]

2. Timing makes a difference

As our knowledge about the impact of stress on tamariki grows it's become apparent that timing matters. When toxic stress occurs during sensitive developmental periods it is more likely to lead to lasting changes to brain structure and physiological dysregulation of other biological systems. These in turn contribute to ongoing physical and mental health issues as well as challenges with learning and behaviour.[53]

Pēpi are developing at an amazing pace. As far as their brain is concerned structures and circuits are forming which will lay the foundations for their future development.[54] Experiences influence which neural connections are strengthened and kept, and which are removed. Increasingly it seems that several brain functions and associated behaviours have sensitive periods, during which the experiences a tamaiti has can have greater impact than a similar experience occurring outside a sensitive period.[55]

Sensitive periods:

- Provide "windows of opportunity" during which both positive and negative experiences have a greater influence on various aspects of development[56]
- Exist for many biological systems, organs and functions[57]
- Occur at different times for different functions, including cognitive and socioemotional skills[58]
- Influence the impact of stress occurring during this time.[59]

There is a growing awareness that timing is a "third critical variable" alongside genes and environment to influence the impacts of toxic stress on an individual's health across all organs and biological systems including the brain.[60] Timing is one of the reasons why two tamariki with similar experiences can be impacted very differently.

On the other hand, some highly stressful experiences can have a significant impact, regardless of when they occur. Sexual abuse, for example, has been associated with a range of health issues, regardless of when it occurs.[61]

3. Individual differences

Tamariki vary markedly in their sensitivity to their environment and experiences, including stressful ones. Their differing responses are influenced by a few things, including:

- their genes, with many genes collectively influencing both susceptibility and resilience[62]
- varied sensitivity of their neural, metabolic and immune systems to physiological challenges[63]
- family and community environments
- developmental timing
- previous experiences of stress
- interactions between their genes, environment and timing.[64]

Thus, the consequences of childhood stress can vary considerably, even when the stressors appear similar. This means that the specific supports tamariki need and will benefit from will also differ.

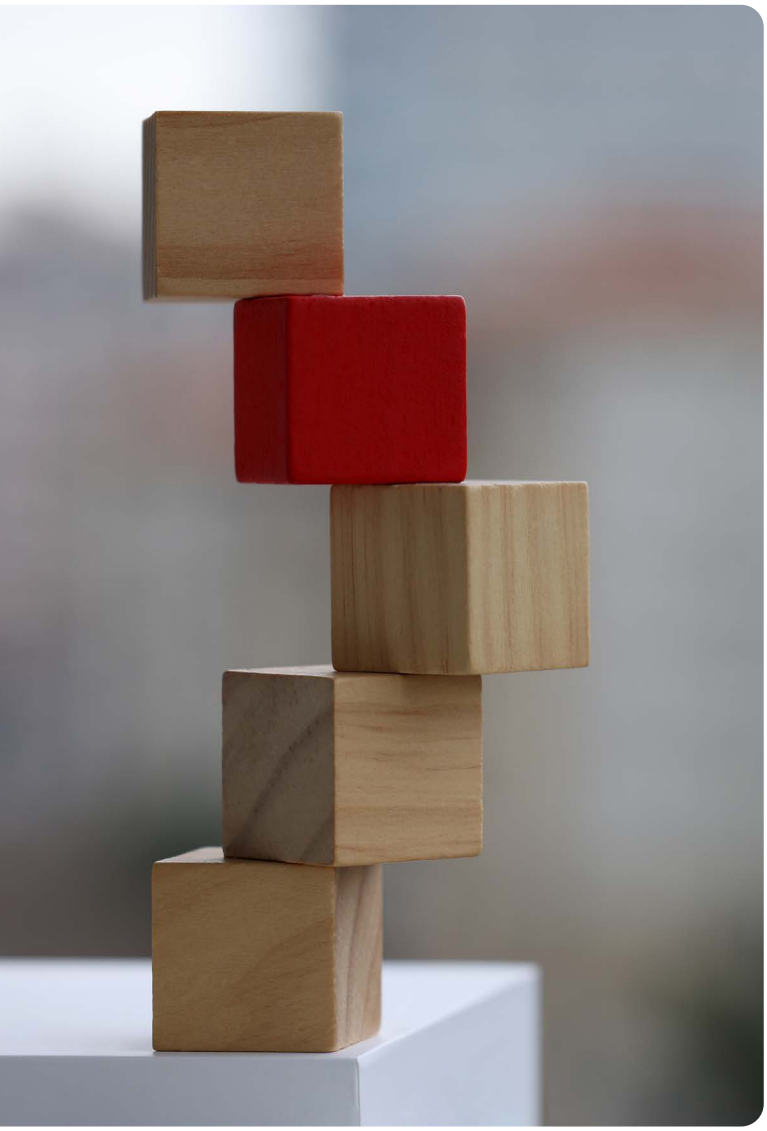
This variation in responses has led some to suggest that how an individual perceives and interprets

what happens to them can affect their neurobiological response. Perceived adversity, and the body's response, can also occur when thinking about previous experiences or worrying about future stressors.[65]

4. Co-occurring stressors

For some tamariki many different sources of stress may impact their lives; this is particularly the case for tamariki who are part of communities that have been marginalised.[66] These stressors may continue beyond early childhood.[67]

"When adversity is extreme and protective relationships are not available (or when the burdens of structural inequities related to poverty or systemic racism are beyond the ability of families to control), multiorgan functional and structural remodeling can alter major regulatory processes, such as systemic inflammation and insulin responsivity".[68]



Conclusions

Understanding the impact of stress on tamariki is crucial for those supporting them and their whānau. Stress can have both positive and negative effects on development and overall wellbeing. Positive stress, which is short-lived and manageable with support, can promote resilience and healthy coping skills. Tolerable stress, while potentially harmful, allows for recovery and learning when supportive relationships are present. Toxic stress, characterised by prolonged activation of the stress response system without adequate support, can lead to serious physiological and psychological effects, including anxiety, depression, and chronic health issues.

The stress response involves multiple bodily systems and processes. Chronic stress can disrupt the body's ability to maintain stable internal conditions, leading to a state of allostatic overload with significant health implications. Individual differences in genetic makeup, sensitivity to stress, and environmental context also play a critical role in how tamariki respond to stress, necessitating tailored support to meet each child's specific needs.

It's important to consider both general (lumping) and specific (splitting) models to understand early life stress. General models view stress broadly, while specific models focus on distinct impacts of various stressors. This comprehensive approach acknowledges both the cumulative burden of chronic stress and the specific effects of different types of adversity, providing a nuanced understanding of how stress shapes tamariki outcomes. Additionally, stressors often co-occur, especially in marginalised communities, compounding their effects on wellbeing and behaviour.

Ongoing research on the timing, nature and support systems involved in stress responses is deepening our understanding of how to best support the healthy development and wellbeing of tamariki. Supportive adults play a vital role in protecting tamariki from the varied and potentially lasting ill effects of toxic stress.

Glossary of Māori words:

pēpi – *baby, infant*

tamaiti – *child*

tamariki – *children*

Endnotes

1 Smith & Pollak, 2020, p. 1
2 Ryan-Wenger et al., 2012, cited by Davis & Soistmann, 2022
3 Allwood et al., 2007, and Rodriguez et al., 2012, cited by Davis & Soistmann, 2022
4 Smith & Pollak, 2020, p. 1
5 National Scientific Council on the Developing Child, 2005/2014
6 Chrousos, 2009, cited by Fogelman & Canli, 2019
7 National Scientific Council on the Developing Child, 2020
8 Barrett, 2017; Pfaltz & Schnyder, 2023; Shonkoff et al., 2021
9 National Scientific Council on the Developing Child, 2005/2014, p. 1
10 National Scientific Council on the Developing Child, 2005/2014
11 Shonkoff, Boyce, Levitt, Martinez, & McEwen, 2021, p.2
12 Shonkoff et al., 2021
13 National Scientific Council on the Developing Child, 2005/2014, p.1
14 National Scientific Council on the Developing Child, 2005/2014; Shonkoff et al., 2021
15 Bonner & Roberts, 2023, p.869
16 National Scientific Council on the Developing Child, 2005/2014, p. 1
17 National Scientific Council on the Developing Child, 2005/2014; Shonkoff et al., 2021
18 Shonkoff et al., 2021; National Scientific Council on the Developing Child, 2005/2014
19 National Scientific Council on the Developing Child, 2005/2014; Shonkoff et al., 2021
20 Engel & Gunnar, 2020; National Scientific Council on the Developing Child, 2005/2014
21 National Scientific Council on the Developing Child, 2005/2014, p. 2
22 Shonkoff et al., 2021
23 Shonkoff et al., 2021
24 Garner, Yogman, Committee on Psychosocial Aspects of Child and Family Health, Section on Developmental and Behavioural Pediatrics, Council on Early Childhood, 2021
25 Garner et al., 2021
26 Shonkoff et al. 2021
27 Boyce, Levitt, Martinez, McEwen, & Shonkoff, 2021, p.5
28 Boyce et al., 2021
29 Boyce et al., 2021
30 Boyce et al., 2021; Shonkoff et al., 2021
31 Smith & Pollak, 2020, p. 2
32 Smith & Pollak, 2020
33 Smith & Pollak, 2020
34 Smith & Pollak, 2020
35 Leneman & Gunnar, 2018, cited by Engel & Gunnar, 2020, p. 42
36 Smith & Pollak, 2020
37 Smith & Pollak, 2020
38 Davis & Soistmann, 2022; Smith & Pollak, 2020
39 Smith & Pollak, 2020
40 Smith & Pollak, 2020
41 Smith & Pollak, 2020
42 Engel & Gunnar, 2020
43 Smith & Pollak, 2020
44 Smith & Pollak, 2020
45 Smith & Pollak, 2020
46 National Scientific Council on the Developing Child, 2005/2014
47 Smith & Pollak, 2020, p.5
48 Davis & Glynn, 2024
49 Garner et al., 2021
50 Shonkoff et al., 2021, p.1
51 Boyce et al., 2021
52 Boyce et al., 2021, p.1
53 Shonkoff et al., 2021
54 Demers et al., 2021, 2022, cited by Davis & Glynn, 2024
55 Nelson III & Gabard-Durnam, 2020
56 Boyce et al., 2021, p.1
57 Boyce et al., 2021
58 Boyce et al., 2021
59 Boyce et al., 2021
60 Boyce et al., 2021, p.2
61 Paras et al., 2009, cited by Fogelman & Canli, 2019
62 Boyce et al., 2021
63 Shonkoff et al., 2021
64 Boyce et al., 2021; Engel & Gunnar, 2020; Shonkoff et al., 2021; Smith & Pollak, 2020
65 Smith & Pollak, 2020
66 Boyce et al., 2021
67 Fogelman & Canli, 2019
68 Shonkoff et al., 2021, p.3

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