

**Socio-Emotional Competence of New Zealand Children During the Early Years:  
Its Facilitators/Inhibitors and Outcomes**

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## Abstract

Socio-emotional competence is increasingly being identified as an essential life skill. Its importance is often contextualised in terms of better academic achievement and future employability, and it has also been documented to have positive effects on overall well-being. There is growing emphasis on assessing, monitoring and developing socio-emotional competence as early as possible, especially by educators and policy makers. This thesis was interested in three areas. The first was assessing the levels of socio-emotional competence across the first 5 years of a child's life in a demographically-diverse, population-based sample. Secondly, it focused on understanding how early socio-emotional competence relates to early cognitive outcomes. Finally, drawing on the bioecological model proposed by Bronfenbrenner (1995), predictors of socio-emotional competence both within family and broader contexts were explored.

Using data from the Growing Up in New Zealand longitudinal study, the thesis assessed socio-emotional competence at 9 months, 2 years and 4.5 years by developing a composite index that drew on various measures of socio-emotional strengths and weaknesses mostly based on mothers' reports (at these data collection waves (DCWs)). Results showed around two-thirds of children in our sample maintained an average or high socio-emotional competence across early childhood. The stability in levels of socio-emotional competence increased beyond the 2-year mark. In addition, a high degree of flux in the levels of early socio-emotional competence was noted especially when its levels were low during infancy. If children had low socio-emotional competence across 9 months and 2 years, then a little more than two-fifths of them were found to also be low in socio-emotional competence at 4.5 years of age.

The results revealed that, on average, children who had persistently low socio-emotional competence across all time points or across the 2- and 4.5-year DCWs were more likely to experience delays in executive function at 4.5 years relative to children with persistent average or high socio-emotional competence. Further, socio-emotional competence at 4.5 years mattered

more for emergent academic skills in comparison to socio-emotional competence at 2 years; attention and language at 4.5 years also mediated this relationship. On the other hand, socio-emotional competence at 9 months was not related to emergent academic skills at 4.5 years of age (directly), while it was negatively associated with attention and language at 4.5 years.

In terms of family factors, findings showed that higher mother- and partner-reported parental relationship warmth and engagement with the child was associated with higher socio-emotional competence longitudinally. Generally more and stronger associations were observed for mother-reported, as opposed to partner-reported, data. The thesis also identified a few specific maternal behaviours that positively related to socio-emotional competence such as reading books, singing and talking to the child, etc. In addition to familial factors noted, attending childcare and living in neighbourhoods that were perceived negatively, adversely affected socio-emotional competence. We noted that, in general, concurrent contextual factors and proximal processes had more and stronger relationships with socio-emotional competence.

Overall, the thesis has several implications for calls to assess and improve socio-emotional competence through prevention and intervention. It suggests that assessing children too early may lead to false positives. Also, that socio-emotional competence close to when a child is about to start school matters more. The thesis provides evidence that simple behaviours, if practised consistently, can enhance socio-emotional competence, and improvement in contextual factors may also lead to improvement in socio-emotional competence.

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I cannot shake the memories of Dadu calling me a doctor. I would repeatedly ask her how that could it be, I had not even studied Biology in my high school. To which she would reply, "I just know." Her words came true. Mention of my family will not be complete without mention of Uncle Riaz for communicating in no unclear terms that nothing is impossible for girls, and Aba Jee (maternal great grandfather), who left a legacy of kindness and love.

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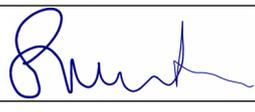
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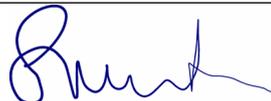
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### Certification by Co-Authors

The undersigned hereby certify that:

- ❖ the above statement correctly reflects the nature and extent of the PhD candidate's contribution to this work, and the nature of the contribution of each of the co-authors; and
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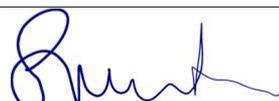
Please indicate the chapter/section/pages of this thesis that are extracted from a co-authored work and give the title and publication details or details of submission of the co-authored work. Ahmad, S., Waldie, K. E., Morton, S. M. B., & Peterson, E. R. (2020). Do patterns of levels of socio-emotional competence during early childhood predict executive function at 4.5 years? <i>Child Psychiatry &amp; Human Development</i> , 1-10. <a href="https://doi.org/10.1007/s10578-021-01128-3">https://doi.org/10.1007/s10578-021-01128-3</a>	
Nature of contribution by PhD candidate	Analytic plan, data analyses, write up and revisions
Extent of contribution by PhD candidate (%)	80

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Study 3: Ahmad, S., Meissel, K., Waldie, K. E., Morton, S., & Peterson, E. R. (2020). Socio-emotional competence and emergent academic skills in preschoolers: The mediating role of attention and language skills. Manuscript submitted for publication

Nature of contribution by PhD candidate	Analytic plan, data analyses, write up and revisions	
Extent of contribution by PhD candidate (%)	75	

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Study 4: Ahmad, S., Waldie, K. E., Morton, S. M. B., & Peterson, E. R. (2020). Longitudinal influence of parental relationship warmth and parent-child engagement on early socio-emotional competence. Manuscript submitted for publication	
Nature of contribution by PhD candidate	Analytic plan, data analyses, write up and revisions
Extent of contribution by PhD candidate (%)	80

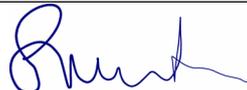
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Study 5: Ahmad, S., Waldie, K. E., Morton, S. M. B., & Peterson, E. R. (2020). Proximal processes and contextual factors associated with early socio-emotional competence development. Manuscript submitted for publication	
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Extent of contribution by PhD candidate (%)	85

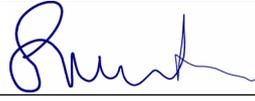
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## Chapter 1. Introduction

In the past two decades, there has been increased interest and focus on the development of socio-emotional competence. Interest in socio-emotional competence spans across parents, educators, employers and policy makers. Indeed, increasingly in Western countries (e.g. New Zealand, Australia, USA, UK, etc.) the development of socio-emotional competences is being enshrined within early childhood education curricula, underlining a now widely held belief amongst those countries' policy makers that socio-emotional competence is an essential life skill that is important to identify, monitor and develop (Bierman & Motamedi, 2015). Broadly stated, socio-emotional competence is the ability to form secure and close relationships with peers and others, understand and manage emotions in line with social and cultural contexts, and learning to explore the environment (Denham, 2006).

Within education this represents a significant shift away from focusing primarily on the development of cognitive abilities to recognising the importance of developing so-called 'soft' skills. This broadened educational focus has in part been fuelled by a growing body of research that points to the importance of these softer skills for later employability, academic achievement, mental health and overall well-being (e.g. Denham & Burton, 2003; Jones et al., 2015; McClelland et al., 2013). All these areas are of considerable interest and concern for parents, educators and policy makers. Formal school settings (from ages 5-18 years) are often viewed as ideal settings through which to uniformly target and monitor socio-emotional skill development. There is now also a growing interest in their development even before children enter school, with some seeing this as a way of helping children transition smoothly to school and helping to level the playing field on school entry by giving them skills that will help them settle, engage with other (peers and teachers) and learn (Bierman & Motamedi, 2015; Gershon & Pellitteri, 2018). Socio-emotional skills are seen as ways of reducing the chance of a negative cascade of interpersonal, behavioural and academic failures which can happen when a child enters school with underdeveloped socio-emotional skills (Bierman, 2004). Indeed, some

emphasise developing socio-emotional competence as soon as possible arguing that improvement beyond early childhood is not possible (Williams, 2014).

Consequently, over the past 20 years we have seen a growing number of early childhood interventions and programmes (such as the Enhancing Neurobehavioral Gains with the Aid of Games and Exercise (ENGAGE) programme in New Zealand) seeking to target the development of socio-emotional skills within kindergartens and early childhood education settings (Bierman & Motamedi, 2015). However, early childhood (birth to 5 years) is also the site of rapid development in socio-emotional skills, with children developing at vastly different rates making it potentially difficult to distinguish between natural developmental changes in social and emotional competence versus the effectiveness of socio-emotional competence interventions designed to increase these skills. With age, new competencies start to develop (Carter et al., 2004; Carter et al., 2003); for instance, in toddlerhood emotional self-regulation starts to take precedence over co-regulation (reaching a regulated state when interacting with another e.g. parent or caregiver), which contributes to the child's overall socio-emotional competence (Kopp, 1989; Shatz, 1994).

Research is therefore needed to better understand: (i) what are the starting levels and patterns of socio-emotional competence development across the first 5 years of a child's life; (ii) what general every day factors (including children's learning environments and experiences) may facilitate early socio-emotional competence development across a diverse population; and (iii) whether early socio-emotional competence can be used to meaningfully predict a range of valued outcomes (e.g. executive function and emergent academic skills) by the time children enter school around the age of 5. The gap in understanding of how socio-emotional competence develops within a population over the first 5 years forms the basis of this thesis.

To provide further context for this thesis, the literature below discusses the renewed interest in socio-emotional competence, both internationally and in New Zealand. I then

discuss the benefits of socio-emotional competence in terms of academic achievement and mental and physical health. Further, I explain the model of socio-emotional competence used in the thesis and the development of socio-emotional competence across early childhood. Following that, I describe Bronfenbrenner's bioecological model of development (1995) to highlight the factors that influence socio-emotional competence. Finally, I describe the Growing Up in New Zealand (GUiNZ) study, from which the data for this thesis is drawn, and present the thesis rationale.

### **1.1 A Renewed Focus on Socio-emotional Competence**

The term "renewed" is used here because the focus on developing the softer skills of a child is not new. During the mid-eighteenth to mid-nineteenth centuries, focus was on ensuring a child's morality (Newson & Newson, 1974; Hardyment, 1983). Given the high child mortality rates and religious inclinations of the time, parents and society were concerned about making sure children fared well after they passed on. Towards the end of the nineteenth century and the early part of the twentieth century, the focus shifted towards cultivating the "character" of the child so that they became productive members of the workforce. People with a good character were the ones who did not give in easily to their impulses, persevered and were prepared for the future that was uncertain (Taylor, 2018).

During the period 1930 to 1950, emphasis on a child's needs increased, and the recognition of the importance of emotional needs grew. Burman (2016) argues that the focus on needs, however, positioned children as passive, to be protected and provided for. After World War II, individualism became more dominant. Currently, the focus is argued to be more on self-determination with emphasis of intensive parenting, where parents are encouraged to stimulate their children's brain to promote cognitive and emotional development (Burman, 2016).

Within the field of child development, cognitive development has traditionally been prioritised over socio-emotional development (Burman, 2016). For instance, in textbooks on

developmental psychology, chapters are typically divided into age-graded intervals and then, within these sections, we find further sections on physical, cognitive and psychosocial development (usually in this order). In some cases, physical and cognitive development are placed together, which Burman (2009) suggests indicates that cognitive development is generally seen as more important than emotional development.

Therefore, the focus on the development of socio-emotional development in the past 20 years or so is argued by some to be a welcome shift away from thinking that academic skills and content knowledge are the only factors that are important for success in life. Politically, interest in developing socio-emotional competence is still often couched in terms of enhancing social mobility and employability. This is reminiscent of focus on developing “character” during the late nineteenth and early twentieth centuries to develop productive members of the workforce. According to these political discourses, social mobility and employability are linked with self-governance and, as such, governments should push their citizens to develop their socio-emotional skills early on (Taylor, 2018).

In 1997, the Organisation for Economic Co-operation and Development (OECD), of which New Zealand is one of 37 member states, initiated the Programme for International Student Assessment (PISA). The objective was to monitor the extent to which students have been able to acquire skills needed to fully participate in the society by the end of their schooling. It assessed knowledge and skills in the areas of science, reading, mathematics and problem solving. The assessments were, however, based on an understanding that a student’s success in life is based on a broader range of competencies, albeit those were not measured (OECD, 2005).

In 2003, the OECD introduced the DeSeCo (Definition and Selection of Competencies) project which brought together a team of international experts from various disciplines to help identify and define key competencies that were considered core to living “successful lives” in “well-functioning societies” (OECD, 2005, p.4). This initiative was taken in response to

concerns about helping citizens to navigate increasing global economic and social changes (Rychen, 2001).

The DeSeCo project culminated with the description of three broad overlapping competency categories. The categories included: the ability to use tools interactively (e.g. use of language, technology, and text); interacting in heterogeneous groups; and acting autonomously (OECD, 2005). According to Hipkins (2018) these competencies were argued to be “key” because “every student would need them, regardless of their life circumstances; they were relevant across cultures and continents; and they were interdisciplinary and hence relevant to all learning areas of the curriculum” (p.2). This led to an OECD recommendation that they be included in international curricula in order to ensure “continued economic development” and “social cohesion” (OECD, 2005, p. 4).

To date, numerous countries have now integrated the key competencies into their curricula in some form including New Zealand, Australia, UK, and the US (Trier, 2001). The names of the competencies differ from the original three proposed by the OECD yet are conceptually related. For example, in New Zealand the three broad competencies have been split into five key competencies that are now embedded in the 2015 New Zealand Curriculum (Years 1-13). These are: using language symbols and text; managing self; relating to others; participating and contributing; and thinking. While the first key competency refers to the more traditional focus on numeracy and literacy, the managing self and relating to others competencies include skills that correspond with socio-emotional competencies such as the ability to manage self, understand others, cooperate and resolve interpersonal conflicts.

This international shift in wanting some form of socially oriented competencies integrated into early childhood education and school curricula, with a view of preparing students for the “new global economy” (OECD, 2001), continues to be seen across a range of international initiatives and working groups that all have the stated intention of improving socio-emotional skills in order to ultimately improve outcomes for all. For example, the US

California Department of Education has created an assessment system (Desired Results Access Project 2015) that measures children's progress towards these desired outcomes from infancy to 12 years of age. The assessment system includes measures that tap into socio-emotional skills such as socio-emotional understanding, relationships and social interactions with family and peers, self-control of feelings and behaviours, etc. (California Department of Education, 2020). In addition, many socio-emotional learning initiatives/programmes have been developed in the USA (Gershon & Pellitteri, 2018) such as the Collaborative for Social and Emotional Learning (CASEL), Character Lab National Commission Social, Emotional, and Academic Development, Comer School Development Program, etc (Ryerse, 2016).

In 2014, the UK's All Party Parliamentary Group (APPG) on social mobility developed the *Character and Resilience Manifesto*. Their mission was to improve social mobility by working on soft skills based on hard evidence provided by research. Their report argues that character is the factor that differentiates between children who realise their full potential and those who do not. If character is developed, children can overcome limitations associated with their disadvantaged backgrounds. Character is used as an umbrella term, comprising of different traits and attitudes including application (the ability to stick to tasks), self-direction (the ability to see life in one's control), self-control (ability to regulate emotions and behaviours) and empathy (understand others' experiences and being sensitive to their needs) (Paterson et al., 2014).

The APPG working group proposed a draft of initiatives to be integrated into the UK curriculum from the early years through to school and into employment. Starting with 0-5 years, they recommended a number of initiatives including: "development of a best practice tool-kit for the early years focussing on interventions that aid development of the crucial non-cognitive base in early child development" (p.20); a nationwide parenting initiative that supports parents to develop their children's socio-emotional competence; and a school readiness measure that can give "clarity and accountability in relation to 'soft' skills: parents,

teachers and early childhood providers are supplied with a shared vocabulary regarding non-cognitive child development” (Paterson et al., 2014, p.31). These individual traits or skills are said to ensure educational and career success. In addition, individuals and those involved in bringing them up are deemed responsible for social and financial disparity (Arthur et al., 2016). Critiques of this approach argue that this rhetoric shifts focus and responsibility away from politicians having to address the structural causes of social mobility and unemployment, such as unequal distribution of wealth and instability in the job market, to the individual and their parents and school systems (Taylor, 2018).

### ***1.1.1 New Zealand Curricula and Socio-emotional Competence Skills***

As noted above, based on the recommendations made by the OECD in the DeSECo report (2005), New Zealand incorporated the key competencies in the *New Zealand Curriculum*. The two main competencies related to socio-emotional competence included are managing self and relating to others (Ministry of Education, 2007). According to the curriculum, the competency of *managing self* relates to self-motivation with students being able to perceive themselves as self-sufficient. Students who can manage themselves also set high goals and make and execute plans to achieve them. They know when to take initiative or step back. The competency of *relating to others* includes the ability to effectively interact with people belonging to diverse backgrounds. It entails being able to listen attentively, respect differing points of views, and share and negotiate ideas. Students who have this competency are also aware of the impact their words and actions have on others (Ministry of Education, 2007).

Socio-emotional development is also a part of the New Zealand early childhood curriculum, *Te Whāriki*. According to the Ministry of Education (2017), almost all New Zealand children attend early learning services (which are diverse in nature) for a significant amount of time. New Zealand also supports 20 hours of free early childhood education care for children aged from 3 years, which contributes to the large uptake, although participation for

many starts earlier in the first couple of years of their lives. The early education curriculum has holistic development as one of its principles, which requires early learning services to encourage development in all domains including cognitive, cultural, social and emotional. In addition, it identifies: nurturing emotional well-being (allowing children to manage and express their feelings and needs); making connection with others; showing respect for rules and rights of others; treating others fairly and including them in play as goals and competencies that need to be developed during early childhood. The curriculum also details how these skills can be developed in infants, toddlers and young children (Ministry of Education, 2017).

Recently, similar to the UK APPG working groups recommendation to develop a school entry assessment, in New Zealand a working group has been set up by the Ministry of Education led by Dr Sonia Glogowski and Dr Angela Millar to develop a new school entry assessment which includes assessment of early socio-emotional skills (Personal communication, 2020). This is, in part, a response to the Office of the Prime Minister's Chief Scientific Advisor Professor Gluckman's Briefing paper to the Secretary of Education, which outlines skills, including self-control and interpersonal skills, associated with early childhood "to serve as a basis for developing measures of development appropriate to the early childhood education years and specifically from ages 3 to 5 years" (p. 9). The briefing paper emphasises the need for:

A deliberate well-designed national approach to measuring in these areas of development is urgently needed. This is because we need to have evidence that, as a nation, we are:

- meeting the needs of all children and optimising their development;
- addressing substantial challenges, namely the structures and forces that currently inhibit equitable outcomes that begin in the early childhood years and persist throughout life;
- providing, through early preventive and intervention approaches, the necessary environment and systems to optimise positive mental health;

- and effectively contributing to valued personal and collective outcomes through early childhood education. (McNaughton & Gluckman, n.d., p. 9)

### ***1.1.2 Early Interventions***

In addition to the increased calls, such as those from Professor Gluckman (McNaughton & Gluckman, n.d.) to act fast to measure socio-emotional development in the early years, there is growing interest in ensuring its proper development through interventions (Bierman & Motamedi, 2015). Research has indeed shown that early interventions are helpful in dealing with problems in social and emotional development. Early interventions have shown to improve social behaviour, social problem solving and emotional understanding (Bierman et al., 2008) and self-regulation (Diamond et al., 2007), as well as a decrease negative emotion (Denham & Burton, 1996), internalising and externalising problems (Han et al., 2005; Herbert et al., 2013). Further, a meta-analysis of 26 studies (most from the past 10 years) targeting social problem solving in children between the ages of 3 to 5 years found that interventions (regardless of their lengths and informants) improved social competence and reduced externalising behaviours (Barnes et al., 2018).

Many of the programs have been developed in USA and quite a few have been exported to other countries to target socio-emotional skills, especially in children with disadvantaged backgrounds. Examples include the Promoting Alternative Thinking Strategies curriculum (PATHS), Incredible Years, AI's Pals and Preschooler RULER (Gershon & Pellitteri, 2018). Greshon and Pellitteri (2018) evaluated these socio-emotional learning curriculums and reported that all four improved socio-emotional learning and three reduced conduct problems. With recent technological progress, internet-based interventions are also growing in popularity making interventions potentially easier to implement (Baggett et al., 2010).

The ENGAGE is one New Zealand based programme aimed at improving internal self-regulation skills of preschool and primary school children with the hopes of reducing societal costs, burden on taxpayer money and promote prosperity (Healey & Halperin, 2015). It

supports the development of self-regulation (at cognitive and emotional level) through play and is currently being delivered in primary school settings while Methodist Mission Southern is planning a large-scale roll-out of ENGAGE to selected ECE (Early Childhood Education) centres (Methodist Mission Southern, 2020, p. 2). It has been found to be effective in clinical trials (in home-based contexts) with preschool children-parent dyads presenting with high levels of hyperactivity problems and attention deficit (Healey & Halperin, 2014; Healey D., & Healey M., 2019).

It is important to remind readers that ENGAGE does not cater to all aspects of socio-emotional competence as outlined by Denham (2006). It caters to emotional regulation within the model and involves intervening to improve cognitive aspects of regulation. A universal roll-out is being considered in ECE settings.

Perhaps more specific to socio-emotional development is the Triple P program, which works with parents to ensure children's positive socio-emotional development across early and middle childhood and adolescence. The programme promotes positive parenting practises (e.g. talking to children, setting a spending quality time together, setting a good example, physical affection) and strategies for managing misbehaviour (e.g. setting rules, ignoring unwanted behaviours, time-out) through weekly sessions (D. Healey & M. Healey, 2019). Similarly, the Incredible Years Program intervenes to address conduct problems in children and is based on the premise that giving parents insight into their own behaviours towards their children contributes towards the modification in their interactions with their children, which eventually reduced problem behaviours in them (Webster-Stratton & Reid, 2010).

Some supporters of early interventions also draw on neuroscientific evidence that the brain loses its plasticity beyond a certain age, leading some to suggest that interventions after 3 years (some argue 18 months) is even too late (Williams, 2014). Gillies (2014) argues that this neuroscientific evidence is based on extreme cases. Particularly popular interventions are individualistic and parent-based interventions (Butler, 2014), which often target "at-risk"

families, who normally belong to lower socioeconomic status. These at-risk families are often framed as “problem” families who need help to bring up their children. In these circumstances the state is often encouraged to intervene early (Bae, 2017; Butler, 2014). The rhetoric is that, otherwise, these children will be less likely to form the right neural connection leading to poor performance in schools, a lack of empathy and high risk of psychopathology and criminality (Williams, 2014). Policy makers are further warned against missing a “tipping point” beyond which it becomes impossible to prevent complete societal and financial crisis, which will be orchestrated by problematic families bringing up problematic children (Butler, 2014). The ENGAGE also subscribes to the idea of a window for optimal development during early childhood between 3 to 6 years of age approximately, when the brain is argued to be especially malleable and dramatic leaps are possible (Methodist Mission Southern, 2020, p. 3). The researchers engaged in the programme, however, also acknowledge self-regulation skills can be continually developed throughout life (Healey & Halperin, 2014). Similarly, New Zealand’s Ministry of Social Development has emphasised focusing on 3- to 7-year-olds for universal and targeted interventions to reduce conduct problems, stating early interventions are likely to have greater benefits than interventions with older children considering evidence. They supported starting as early as 3 years (Blissett et al., 2009). This emphasis on early childhood is echoed by the Prime Chief Science Advisory Committee which states that childhood education “quality in these years has life-long effects on our valued outcomes for children and adolescents, extending even to areas such as suicidality” (p. 9), and national policies can change the patterns of development through preventive and intervention approaches (McNaughton & Gluckman, n.d., p. 9). While this thesis does not conduct an intervention, it does seek to inform the growing trend to intervene in this space by providing some background population level data on early socio-emotional competence.

## **1.2 Benefits of Socio-emotional Competence**

Research has documented several short-term and long-term benefits of early socio-emotional competence. Hence, there is an emphasis on developing it. This section briefly describes them in the context of academic skills and mental and physical health.

### ***1.2.1 Socio-emotional Competence and Academic Skills***

Evidence exists for both concurrent and long-term influence of socio-emotional competence on academic skills. For example, results from the Longitudinal Study of Australian Children (LSAC) showed that approach and cooperativeness was positively associated with prelinguistic skills in infants (Sanson et al., 2010). Likewise, consistently positive associations between domains of socio-emotional competence and language, writing and numeracy abilities in 4- to 5-year-olds (Sanson et al., 2010) and 9-year-old (Cheevers & O'Connell, 2012) children have been reported. Longitudinally, socio-emotional competence in kindergarten positively predicted educational outcomes 13 to 19 years later in a sample of 753 children (Jones et al., 2015). A measure corresponding to the regulation domain of socio-emotional competence and attention span persistence measured at 4 years using items such as: "Plays with a single toy for a long periods of time;" "Child gives up easily when difficulties are encountered (reversed);" and "Child persists at a task until successful," predicted mathematic and reading ability at 21 years after controlling for initial achievement levels, gender, maternal educational levels and child's adaptation status. Higher score on attention span persistence also improved the likelihood of completing college by 25 years in a sample of 431 individuals (McClelland et al., 2013).

### ***1.2.2 Socio-emotional Competence and Psychopathology***

Research has also shown lower scores in social and emotional assessments in children aged 12 to 36 months to be significantly associated with higher incidence of psychiatric symptoms and disorders in early elementary school (Briggs-Gowan & Carter, 2008). Similarly, a study reported a significant relationship between high socio-emotional competence during

kindergarten and reduced risks of substance abuse and better mental health 13 to 19 years later (Jones et al., 2015). Research examining children's social competence (aged 8 to 12 years) has found it to be negatively associated with internalising problems 7 years later in a sample of 205 individuals belonging to diverse urban neighbourhoods (Burt et al., 2008). In a three-wave longitudinal study, negative associations were reported between social competence at 4 years and internalising and externalising behaviours at 10 and 14 years (Bornstein, Hahn & Haynes, 2010).

### ***1.2.3 Socio-emotional Competence and Physical Health***

Evidence suggests that early socio-emotional competence has more influence on physical health relative to cognitive skills. For instance, data from LSAC showed that social-emotional domains of approach, cooperativeness and low irritability had stronger correlations with global health relative to prelinguistic skills in infants. Similarly, in children aged 4 to 5 years, stronger correlations were observed between aspects of socio-emotional competence (such as prosocial, less negative emotions, low hyperactivity, conduct and peer problems) and health in comparison to language, writing and numeracy abilities (Sanson et al., 2010). One study using data of eight thousand 9-year-olds from Growing Up in Ireland also showed that emotional problems, conduct problems, hyperactivity and peer approval had mostly stronger associations with a child's health status ( $r_s = .03$  to  $.20$ ,  $p_s < .01$ ) than vocabulary, reading, literacy and mathematic skills ( $r_s = .05$  to  $.07$ ,  $p_s < .001$ ) (Cheevers & O'Connell, 2012). It is clear from studies such as these that socio-emotional competence has benefits for outcomes later in life, and this is a contributing factor for increased emphasis on it in policy. Therefore, drives to develop socio-emotional competence as early as possible to some extent seem reasonable.

The fast-growing perceived importance of early socio-emotional development raises several questions/issues such as: what the facilitators of early socio-emotional competence are; whether there is much flux or natural change in socio-emotional competence during the early

years of a child's life or not; lastly, when socio-emotional competence and its dimensions starts to matter in early life in relation to the numerous proposed positive outcomes. Therefore, this research seeks to examine socio-emotional competence in the first 5 years of a child's life using data from a population-based longitudinal study.

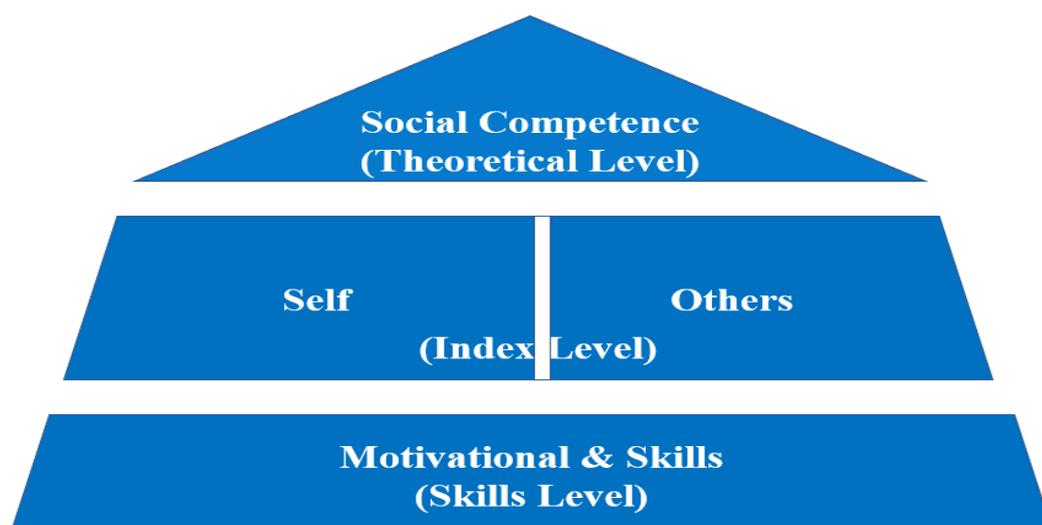
Due to the lack of availability of a battery of socio-emotional competence, and drawing on the work of both Denham (2006) and Rose-Krasnor (1997), a range of different socio-emotional measures used within three data collection waves (DCWs: 9 months, 2 years and 4.5 years) were identified and utilised to develop an index of socio-emotional competence (Study 1a).

### **1.3 Model of Socio-emotional Competence**

Denham (2006) used Rose-Krasnor's prism model of social competence (1997) to develop a working definition of socio-emotional competence for its assessment. The top-most level of Rose-Krasnor model (see Figure 1.1) is social competence which they describe as the overarching ability of an individual to interact effectively with others to meet their short- and long-term developmental needs. These needs/goals may include having positive interactions with others and, in the long run, developing positive relationships. According to Rose-Krasnor (1997), social interactions are a result of an on-going balancing act between priorities of self and others. Therefore, in the middle level of the model, they include success in goals that a young person has in terms of their relationships with others as well as personal goals. This level includes the human needs of closeness with others and of self-sufficiency (Bakan, 1966), both of which are important for social adjustment. Competence is the ability to maintain a balance between the goals of self and others (Ford & Ford, 2019). Therefore, for a proper assessment of socio-emotional competence it is also crucial to consider both the child's and others view of their competence. For instance, a child may consider themselves effective in social interactions if they get their way through bullying, but their teachers and/or parents may hold a different view of their socio-emotional competencies.

**Figure 1.1**

*Pictorial Representation of Rose-Krasnor Model of Social Competence (1997)*



According to Denham (2006), the lowest level of the prism model (Rose-Krasnor, 1997) includes specific and measurable emotional, social and sociocognitive skills and motivations. Denham categorised these skills at the lowest level of Rose-Krasnor prism as following:

1. Emotional expressiveness
2. Understanding of emotion
3. Regulation of emotion and behaviour
4. Social problem solving
5. Social relationship skills

These components are affected by changes in social partners and different cultural contexts (Denham, 2006). The following account describes each of these domains of socio-emotional competence in detail. It is this model of socio-emotional competence that was used for the development of the composite index used throughout this thesis as it delineates the model into measurable skills.

### ***1.3.1 Emotional Expressiveness***

Socio-emotional competence includes expression of emotions in ways that are helpful in daily interactions as well as in maintaining relationships over time. Children who are emotionally competent know that they need to express their emotions in a given situation. Given that the success of effective communication depends on using the contextually appropriate valence, intensity, timing and mode, children with this competency also have an insight into what kind of emotion will help them achieve the conversation goals they might have, and how to do this in a convincing and contextually appropriate manner (Denham et al., 2003). Children competent in this domain also keep in mind the characteristics of their communication partners such as their age, temperament and level of understanding. Since positive emotions typically encourage social interactions, a competent child is argued to be able to express relatively more positive emotions (Denham, 2006).

### ***1.3.2 Understanding of Emotions***

The first step in understanding emotions is their identification. Not only does a socially and emotionally competent child need to understand that an emotion is being experienced by self or others, but they also need to understand its valence. Accurate identification of emotions and their valence is important for positive social interactions (Denham et al., 2003). In addition, children who are able to apply their emotional knowledge in emotionally charged situations are able to maintain better relationships. For example, if a child sees their friend complain to another after a rough day, and they take it to mean that their friend is feeling exhausted and frightened, they are more likely to extend support toward their friend. However, if they take it to mean that their friend is enraged, then they may retreat (Denham, 2006). It is also important to comprehend the emotions within the social and emotional contexts. Children who are socially and emotionally competent are also able to use their knowledge of feelings to decide on what aspects of their emotional experience to focus on and communicate to others, and which to modulate (Denham, 2006).

### ***1.3.3 Regulation of Emotions and Behaviours***

It is important to manage or regulate emotions as the inability to do so may interfere with achieving personal, social and academic goals. Children experience a range of emotions including those that are distressing, positive or positive but overwhelming. Sometimes some emotions need to be amplified while some need to be suppressed in order to meet intra- and/or interpersonal goals. A child competent in this domain is aware of what to express and what not to in order to meet their goals. They can retain and/or enhance helpful emotions to soothe relevant but unhelpful emotions and to reduce emotions that are not relevant and/or helpful (Denham et al., 2003). Emotional regulation may be overt or covert; regulatory responses maybe emotional, cognitive or behavioural. For example, a child may refocus his attention to regulate his emotions or they may attempt to diminish the emotion or even transform it to something that is contextually beneficial or appropriate. For example, if a child is feeling sad because their younger sibling ate their sweets, the child may smile instead to try and convince themselves that what happened was fine and to communicate to others that they are a good older sibling (Denham et al., 2003).

### ***1.3.4 Social Problem Solving***

Social problem solving is a domain situated at the intersection of thinking and emotions. It is important to assess how children think about social interactions beyond their experience, regulation and experience of emotions. The ability to make responsible decisions becomes more important as children are exposed to more complex and frequent social interactions; this is especially true for when children go to early education settings and interact with peers who have maturing socio-emotional skills unlike adults in their homes (Denham, 2006). This domain includes skills in thinking about interpersonal situations and involves encoding and analysing social situations, setting social goals, coming up with satisfactory solutions to interpersonal conflicts and executing them (Crick & Dodge, 1994). In order to

identify and enact social solutions, the child needs to be able to regulate their emotions and have prosocial reactions to others' emotions and behaviours (Denham, 2006).

Children who are competent in this domain are able to encode social cues accurately (Coy et al., 2001). In addition, they make accurate estimates of their own ability to perform competently in social situations and, on average, do not tend to misattribute other actions as hostile (Webster-Stratton & Lindsay, 1990). They also use non-intrusive strategies and have enhancement of social relationships as their goals (Capage & Watson, 2001). In the context of age-appropriate developmental tasks during the preschool period, researchers call for focus on encoding accurately while others call for addressing interpreting, goal-setting and responding as well during this period (Denham, 2006).

### ***1.3.5 Social Relationship Skills***

This domain includes a broad range of skills. There is contention between the disciplines of developmental and education psychology in terms of what is included in this domain. The latter focuses on skills that facilitate learning primarily such as attending, focusing, working collaboratively with others and following instructions (Brigman & Webb, 2003). On the other hand, within the developmental domain the focus is on skills that improve relationships with peers and others (Warden & Mackinnon, 2003). This domain includes: showing positive affect to others including smiling, touching and using polite words; prosocial behaviours such as helping, comforting and sharing; taking initiative with peers such as suggesting activities, addressing them and showing them something; positive interactions such as engaging in play, conversations or tasks; being responsive to others including listening with intent, answering and joining them; less engagement in solitary play and evidence of leadership including peers accepting directions, listening and following (Rydell et al., 1997; Denham, 2006). It is evident that a number of other aspects of socio-emotional competence enables children to exhibit these skills, highlighting the importance of measuring socio-emotional competence skills “in concert” (Denham, 2006, p.78)

## **1.4 Development of Socio-emotional Competence**

Theorists have held different views about how socio-emotional competence develops during childhood (Brownell & Kopp, 2007). At one end some assert that socio-emotional competencies are fundamentally similar in children and adults with core competencies maturing to different levels with age. Within this principal belief, some theorise that children are born with set skills (Onishi & Baillargoen, 2005), which mature based on a set timetable (Leslie, 1994). Others purport that socio-emotional development is related to an early-appearing ability to mentally mimic psychological and physiological responses of others, which leads to the development of socio-emotional skills (Tomasello, 1999). At the opposite end, some theorise that socio-emotional development is fundamentally different in infants and adults with different mechanisms contributing towards it (Brownell & Kopp, 2007). Finally, there are also those who argue that we can neither equate children's skills with that of adults nor can we assume that their skills are fundamentally different from that of adults. Instead, they argue that socio-emotional competence develops as a result of continuing interaction between different social, emotional and cognitive processes. These competencies grow in complexity and functionality resulting from interactions of earlier structures (e.g. Nelson & Fivush, 2004). There is relatively more endorsement of this view (Brownell & Kopp, 2007), and this thesis broadly aligns with this assumption and is supported by research that shows that young children exhibit a number of developing social and emotional skills (Brownell & Kopp, 2007) which manifest differently at different stages of a child's early life.

### **1.4.1 Infancy**

Newborns can exhibit basic emotional states (Halberstadt et al., 2001). Within 2 months of their birth, infants are able to exhibit social initiatives such as smiling socially (Fox & Davidson, 1988). Within the first year these emotions are only partly provoked by internal physical needs, and babies start to express uncertainty, contentment and surprise (Lindon, 2010).

Infants are fascinated by others and their behaviours (Dunn et al., 1987) and soon develop the ability to perceive and respond to adults emotions and social behaviours, which could be directed towards the infant or the outside world. By 7 months they are able to identify emotions by integrating visual (facial) and auditory information (Grossmann et al., 2006). With each passing month infants become more involved in social interactions as they start to develop control over their body and, hence, some of their behaviours. Within the first 10 months infants also begin to use emotions to influence their surroundings (Denham, 2006), and communicate their feelings, wishes and intentions. By 12 months infants can share attention (Howes & Lee, 2006) and have formed relationships which drive them to understand the world more (Dunn, Bretherton, and Munn 1987).

#### ***1.4.2 Toddlerhood***

During toddlerhood, we see children start to express their emotions increasingly through facial expressions and body movements. They also start to show embarrassment and pride in their achievements, and they feel uneasy with strong emotions such as fear and anger (Lindon, 2010). By 2 to 3 years of age, children are typically able to use language to describe emotions in self and others and talk about present and past feelings (Keubli, 1994). However, this also seems to vary with experience; for example, children with mothers who comment on emotions are more likely to learn and use emotional vocabulary (Dunn, 1993) helping them with their emotional development.

Toddlerhood is also associated with learning to understand self-other relations including learning that they and others can have similar or different mental states at the same time. Toddlers start to be able to see things from other people's perspectives leading to engagement in more moral evaluations (Brownell & Kopp, 2007) and prosocial tendencies. While during infancy, child and parents tend to engage in mutual regulation; self-regulation starts to take precedence during late toddlerhood (Kopp, 1989; Shatz, 1994), and with the help of responsive adults and on their own, they become better at regulating their emotions

(Eisenberg et al., 2004; Fox & Calkins 2003). Toddlers start using social referencing skills to help them understand situations. For example, they start developing an ability to understand others' intentions and the causes of their feelings (Camras & Sachs 1991; Mumme & Fernald 2003), and they start to understand what may help in easing others distress (Zahn-Waxler et al. 1992).

In addition, Toddlerhood is marked by an increase in autonomy owing in part to increased mobility. They are now able to choose their social partners to an extent, and at this age we see children start to show an interest in developing relationships with peers (Goldschmied, 1986). It is also an age where children frequently enter disputes and have conflicts requiring negotiations when their wishes do not match those of others (Alink et al. 2006). It is these growing social interactions, and the fact that children are developing skills and strategies to join others in play, that helps set and maintain the boundaries of the play group (Corsaro, 2003; Rubin et al., 2006).

### ***1.4.3 Preschool Years***

Preschool children are typically aware when there is a need to send an emotional message and can express basic emotions clearly. There is also improvement in their emotional language skills making it easier for others to understand their wishes and desires (Denham et al., 1992). During the preschool years, children often start to exhibit new social emotions such as hatred, shame, guilt, and empathy (Barrett, 1995; Denham, 1998). Preschoolers also start to show blended emotions and understand that more than one emotion could be experienced by them or communicated to them, and these emotions could even be at odds with each other (Kuebli, 1994; Denham, 1998; Kestenbaum & Gelman, 1995). For instance, they understand it is possible to love your younger siblings but feel sad when they get more attention.

Preschoolers between the ages of 3 to 4 years can comprehend that adults have feelings (Lindon, 2010). They are also typically more able to identify basic emotions and comprehend

the emotional consequences of common situations. For example, they can understand losing something important will cause sadness.

During later preschool years, they start to include causes and consequences of emotions in their conversations (Denham, 2006; Pons & Harris, 2005). Children are now able to understand that there are sometimes differences in emotional experience and expression of people (Gnepp, 1989). Children's socio-emotional skills at this age are still developing, and they often remain preoccupied with outward expression of emotions and the situations leading up to them, which can hamper their ability to understand emotions adequately (Hoffner & Badzinski, 1989).

While toddlers are likely to express their internal emotional state as it is, preschoolers on the other hand start to use rules showing awareness of which messages to send and which not to. At around 3 to 4 years of age children typically develop a set of coping strategies (Fabes & Eisenberg, 1992). For example, they may make attempts to regulate themselves by orienting their attention towards or away from a stimulus, self-soothing, engaging in a situation or withdrawing from it and/or symbolic manipulation of a situation through play (Grolnick et al., 1996). Their awareness of the importance of regulatory efforts increases when they see the positive results of their attempts to regulate their feelings. Through trial and error, they are able to identify which regulatory strategies work best for them. As a result of this, there is often a marked decrease in behavioural disorganisation, at least temporarily. This helps form the basis of positive social interactions as these require children to hold back their emotions sometimes and express them in a way that does not alienate friends (Eisenberg, 1992; Lindon, 2010).

The section above has described what would typically be described as normative development. It is important to be mindful that the normalcy of the development and expression of these socio-emotional competencies are taken for granted. Manifestations of these skills that differ from what is deemed as normal emotions and responses are often deemed pathological. This belief of a single developmental trajectory leading to optimal socio-

emotional growth has been challenged (James & Prout, 2015; Burman, 2016). It can be argued that this developmental trajectory is constructed based on evidence gathered from children growing up in well-functioning, nuclear and stable families (mostly white and middle-class). By describing such trajectories as normative, this can abnormalise trajectories that are different or followed by children who grow in different environments (Callaghan et al., 2016). For example, some research has suggested that children who have experienced domestic violence are more likely to have problems in emotional recognition and regulation (e.g. Logan & Graham-Bermann, 1999; Maughan & Cicchetti, 2002; Katz et al., 2007). Ugazio (2013), however, has argued that the measures used in such research often decontextualises children's experiences, discounting that children develop skills that are helpful in dealing with their immediate environments. In fact, research has shown that children who experience domestic violence often have a nuanced awareness of their own and others' emotions. They have been shown to engage in complex emotional processing and regulate their emotions effectively, but in ways that are different from what is considered a norm (Callaghan et al., 2016).

In addition to socio-emotional competence developing rapidly through the early years, domains of socio-emotional competence also interact with each other facilitating expression of higher competencies. Hence, competencies can be seen to grow in complexity and functionality building upon old structures (Nelson & Fivush, 2004). Despite the skills developing across early childhood, the past two decades have witnessed an increase in emphasis on early intervention to promote "proper" development.

Not denying the effectiveness of early interventions, one needs to ask when it is too early to intervene, as socio-emotional competencies may improve naturally with the course of development (respecting that this could look very different for different children). It is thus important to get a sense of natural flux in and out of the levels of socio-emotional competence during early childhood. It may be that most children with initially low levels of early socio-emotional competence are able to make up for these "deficits" in their development naturally

as new socio-emotional skills emerge overriding the old system; indicating that ‘deficits’ in socio-emotional competence for some children is in fact maybe a natural part of development, or a different developmental trajectory that does not require early intervention. Hence as a part of Study 1a, the aim was to assess levels of and patterns of socio-emotional development during the early childhood in a large population-based sample from New Zealand, in an attempt to start to understand the degree of natural flux and change in socio-emotional competence across the early years.

Since the importance of early socio-emotional skills are frequently contextualised in terms of getting children ready for schools, Studies 2 and 3 examined the influence of early socio-emotional competence on executive function (Study 2) and emergent academic skills (Study 3). The goal was to understand when in early life, levels of socio-emotional competence start to matter for these outcomes. The final two studies examined immediate and broader environmental factors that influence early socio-emotional competence, first in reference to family (Study 4), and then by including broader contextual factors (Study 5). To understand the factors, the Bronfenbrenner (1979, 1995) bioecological model was used as a framework for this thesis research.

## **1.5 Bronfenbrenner Bioecological Model of Development**

Bronfenbrenner (1979), in his seminal work *Ecology of Human Development*, provided a framework of human development which can be applied to many areas of development - including socio-emotional development. It explains systems of interaction within which a child’s development is embedded (see Figure 1.2). Each system is based on the contextual nature of a child’s life and provides resources for, and barriers to, development. Closest to the individual in the centre, the framework includes a microsystem which incorporates a child’s immediate physical, psychological, and social environment including, for example, a child’s family, peers and school (Swick & Williams, 2006). Parents primarily shape the environment of the child during the early years. They do that by interacting with their children. The quality

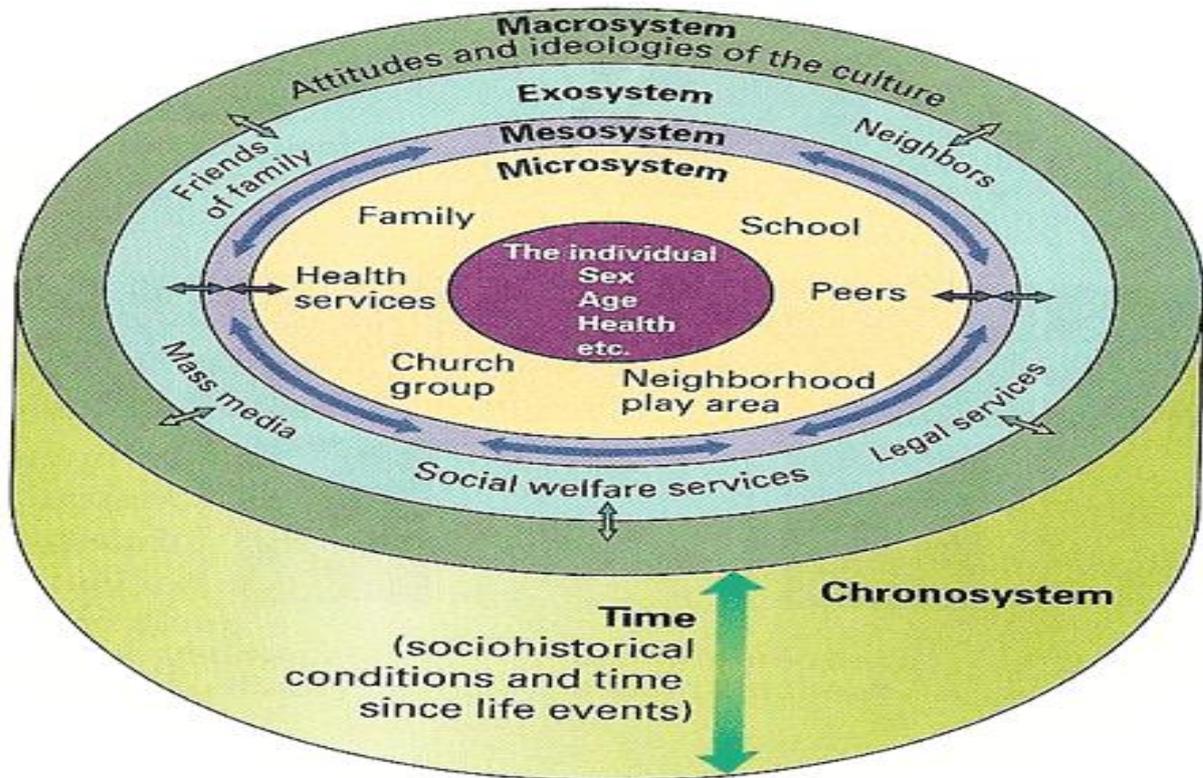
of a child's environment is also a function of quality of parents' interactions with each other. That is a part of the mesosystem which links the different microsystems together. Frequent and high-quality parent-child interaction and a positive parental relationship are related to positive socio-emotional competence outcomes (e.g. Fishman & Meyers, 2000; Forsch & Mangelsdorf, 2001; Sarkadi et al., 2008; Parfitt et al., 2014; Berger & McLanahan, 2015). Another example of the influence of the mesosystem on a child's socio-emotional development could be that parents who have positive interactions with their children's peers may help the child in forming and maintaining friendships.

Mesosystem is followed by the exosystem which include systems a child experiences indirectly. For example, it could include parents' work environment and their social networks (Swick & Williams, 2006). For instance, if parents work in stressful environments, the stress may spill-over in their interactions with the child affecting their socio-emotional development. Exosystems are followed by macrosystem involving cultural beliefs, social norms, economic situations and political trends. A young child may be physically removed from these systems but they have a far-reaching impact on their interactions and relationships (Bronfenbrenner, 2005). For instance, Swick (2004) argues that policies that are mother-friendly may provide better opportunity for mothers to care for their young children. Without the support of family-friendly services and policies, families are at a greater risk of harm (Grabirino, 1992). Family-friendly policies may increase opportunities for positive parent-child engagement leading to positive social and emotional outcomes.

Last but not the least comes the chronosystem which is the historical context in which these systems are embedded (Bronfenbrenner, 1979). One example of how history influences families and individuals is how families respond to historical stressors. For example, during recession the priorities of affected families shift to only being able to provide food and shelter to their children rather than also focus on their socio-emotional growth.

**Figure 1.2**

*Bronfenbrenner's (1979) Ecological Model of Development*



In 1995, Bronfenbrenner revised the model to underline the importance of proximal processes for human development. He argued that proximal processes influence development (including socio-emotional development) more than contextual factors (environment both immediate and remote). Proximal processes are the mutual interactions that happen between an individual, who is evolving, and other people, objects and symbols in the immediate environment. These processes may include parent-child interactions, interactions with peers, reading, watching television, etc. In order to have an impact on development, these proximal processes should take place over an extended period, and they are said to be more influential during the early phases of an individual's life. Bronfenbrenner further proposed that the effect of these processes on development is a function of "biopsychological characteristics of the developing person; of the environment, both immediate and more remote, in which the processes are taking place; and the nature of the developmental outcomes under consideration" (p. 621).

## **1.6 Growing Up in New Zealand**

This thesis used data from the longitudinal and prospective population-based study GUiNZ. The study was launched in April 2008 after getting approval from the Ministry of Health Northern Y Regional Ethics Committee (Morton et al., 2014). In the past, there have been several longitudinal studies within New Zealand including the Dunedin Multidisciplinary and Christchurch Health and Development Studies. They have made important contribution to understanding development (Fergusson et al., 2015; Poulton et al., 2015). However, they investigated individuals who were born in the 1970s. Given that the New Zealand ethnic landscape, familial and cultural contexts have changed since then (Morton et al., 2012; Smeith & Dunstan, 2004; Statistics New Zealand, 2014, 2018), a need for up-to-date information was increasingly being felt. The GUiNZ study, therefore, was designed in response to these calls to provide contemporary developmental information regarding the increasingly diverse population of New Zealand (Morton et al., 2010).

Before its launch the study went through an extensive peer-reviewed developmental phase between the years 2005 to 2007. From its onset it was designed to focus on children following them until young adulthood to understand what helps them develop. It is multidisciplinary in nature as it investigates multiple pathways that influence multiple developmental domains including growth, health, behaviours and cognitive development. It is designed to examine the interactions between children and their environment both immediate - such as family, childcare, etc. and remote - such as social contexts with assessment beginning before birth. The study focused on collecting detailed information during the first 2 years unlike previous longitudinal studies (Morton et al., 2010).

Recruitment was carried out using non-probability sampling. Participants (mothers) were recruited from a geographical area covering three District Health Boards: Auckland, Counties Manukau and Waikato, which accounts for around one-third of New Zealand live births (Morton et al., 2013). There were no exclusion or inclusion criteria. Initially, 6822

mothers agreed to participate in the study till their children turned 21 years of age. Recruited mothers had their expected delivery dates between 25<sup>th</sup> of April 2009 to 25<sup>th</sup> of March 2010. Growing Up in New Zealand also recruited 4401 partners, who were in socially significant relationships with the mothers (Pryor et al., 2014).

In terms of the demographics, maternal age, deprivation, and parity of the sample were comparable to all New Zealand parents based on data available from the Statistics New Zealand for the years 2006 to 2008 (Morton et al., 2013). However, the sample was more ethnically diverse than the population. Given that diversity in New Zealand is growing, this will hopefully keep the sample relevant in future (Morton et al., 2014).

The children cohort consisted of 6846 children who survived to at least six weeks after expected delivery date. They accounted for around 11 percent of all births in New Zealand during the recruitment period. The sex of the babies was not statistically different from the national data (2006-2010). However, the proportion of babies born preterm was lower in comparison to the national data (Morton et al., 2014). Methods of face-to-face computer assisted interviews were employed to collect data (Morton et al., 2013). Major data collection waves occurred 6 weeks before expected delivery and when the child was 9 months, 2 years, 4.5 years and 8 years of age. For this thesis, data from four DCWs - antenatal, 9 months, 2 years and 4.5 years - were used. The study has been able to retain a remarkable 90 percent of the sample till 4.5 years. Further details related to design and recruitment of the study's participants are available in Morton et al. (2017).

## **1.7 Thesis Rationale**

The broad aims of this thesis were: to investigate the level and patterns of socio-emotional competence development during the first 5 years of a child's life; how they influence cognitive outcomes such as executive function (EF) and emergent academic skills; and how proximal and contextual factors influence socio-emotional competence across these early years.

The following research questions were specifically of interest:

1. What is the level and patterns of socio-emotional competence development across early childhood?
2. How do different patterns of socio-emotional competence development relate to EF at 4.5 years?
3. How and via what paths socio-emotional competence across early childhood influence emergent academic skills?
4. How parental factors such as parental warmth and parent-child engagement influence socio-emotional competence during early childhood?
5. What are different contextual factors and proximal processes that predict socio-emotional competence across early childhood?

#### ***1.7.1 Study 1: What is the Level and Patterns of Socio-emotional Competence Development Across Early Childhood?***

As noted earlier, there was no single measure of socio-emotional competence available for use in the GUiNZ study. Measures that tapped into different domains of socio-emotional competence proposed by Denham (2006) were, however, used in major DCWs of the study. The research used these measures to develop a single index of socio-emotional competence at three time points and one over-arching index across the first 5 preschool years. The latter was developed with hopes of capturing the state of socio-emotional competence across early childhood (from 9 months to 4.5 years) in a single measure. As socio-emotional competence is a multifaceted concept (Denhan, 2006), the creation of an index seeks to capture the complexity of the construct in a relatively simple way helping to communicate with the public, media and policy makers about its development (Booyesen, 2002; Joint Research Centre-European Commission, 2008).

In addition, as socio-emotional competence is an integrated system of different domains (Denham, 1998; Saarni, 1999), the creation of a single index is arguably better able to capture the integrated nature of the construct compared to single domain-specific social-competence

measures. After explaining the creation of the index in Study 1a, I describe the level and patterns of early socio-emotional competence development (at 9 months, 2 years and 4.5 years) in Study 1b. To the best of my knowledge, no study in the past has examined the level of socio-emotional competence during the early childhood at a population-based level in New Zealand, which is a country with a unique bicultural landscape.

Of note, the Dunedin Multidisciplinary Health and Development Study, which is also a longitudinal study, did create a composite index of one aspect of socio-emotional competence that is self-control, collapsing across measures employed from 3 to 11 years of age. They also created a self-control index using observational data from 3 and 5 years (Moffitt et al., 2011; Moffitt et al., 2013) although most of its research has focused on the index created from the wider age range (3-11 years), which may not be as parsimonious as an index that summarises data across a narrower timeframe.

Where research has examined children's socio-emotional development across the first few years of life, it has typically assessed problem behaviours rather than competencies in both at-risk and community populations (e.g. Briggs-Gowan et al., 2006; Bub et al., 2007; Meunier et al., 2011; D'Souza et al., 2019). When socio-emotional strengths have been assessed, it has been typically restricted to one domain (e.g. Dunn et al., 1991; Hughes & Dunn, 1998; Kårstad et al., 2015).

As mentioned, there is an increase in focus on developing socio-emotional competence through intervention, especially during the preschool period. This is to help reduce the chance of a negative cascade of emotional, behavioural and academic problems as children enter school, which increases the demands on societal resources (Bierman, 2004). However, literature also suggests that socio-emotional competence develops rapidly during early childhood with new skills coming on board with passing time. These newly developed skills add to the old system and may be able to make up for any perceived lags in socio-emotional competence (Carter et al., 2003, 2004). If interventions are implemented too early there is a

risk of investing in potentially costly interventions for children at a stage where they do not need them and attaching an early and potentially unhelpful label to them. As such, it is important to examine the natural flux in and out of different levels of global socio-emotional competence across early childhood in community samples to create a potential baseline, which can be informative in terms of early universal interventions.

### ***1.7.2 Study 2: How Do Different Patterns of Socio-emotional Competence Development Relate to EF at 4.5 Years?***

Using patterns of early socio-emotional competence development calculated in Study 1b, Study 2 aimed to examine their influence on executive function (EF) at 4.5 years. Social origins are argued for the development of EF. For example, symbol systems such as language, which help a child distance themselves from something they desire (inhibiting being a component of EF), is argued to be a skill developed through social interactions (Vygotsky, 1978; Carlson, 2009). Specifically, children may be able to distract themselves by singing, talking to others or themselves, etc. Multiple studies have also shown that the use of symbols helps children in inhibiting their responses (e.g. Carlson et al., 2005). Social interactions are reciprocal in nature and their effectiveness depends on caregivers and the child's socio-emotional skills (Sameroff, 2009). Research shows that in response to a stressor with cognitive demands, parts of the brain associated with EF and emotions are activated at the same time (Peterson & Welsh, 2014), suggesting a link between them. In line with these findings, it was hypothesised that children with persistently low and recent low socio-emotional competence will have lower EF at 4.5 years of age relative to the group with persistently average or high socio-emotional competence.

Multiple studies have looked into associations between EF and domains of socio-emotional competence, most of them have examined the predictive effect of EF on socio-emotional competence (not the other way around) in atypical populations such as children with Attention Deficit Hyperactivity Disorder, Autism, Oppositional Defiant Disorder, etc. (e.g. Kiley-Brabeck & Sorbin, 2006; Pauli-Pott et al., 2013). A study by D'Souza et al. (2018) using

data from the GUiNZ study found that persistent behavioural difficulties between 2 to 4.5 years increased the odds of delays in inhibitory control. This research, however, only considered problem behaviours rather than emotions and strengths different from what Study 2 aimed to do. Study 2 also examined the predictive associations using a composite measure of socio-emotional competence, which is expected to give a more holistic picture of socio-emotional competence because it is an integrated system of different skills and may have different associations compared to specific domains of socio-emotional competence.

Theorists have further differentiated between two types of EF: “cool” and “hot”. The former includes cognitive processes that are based on logic and do not have much emotional context to them (Grafman & Litvan, 1999). Hot EF are goal-directed processes that involve emotions and motivation (Zelazo & Muller, 2002). This study also investigated whether socio-emotional competence was differentially associated with hot and cool EF expecting socio-emotional competence development to be more closely related to hot EF.

### ***1.7.3 Study 3: How and Via What Paths Socio-emotional Competence Across Early Childhood Influences Emergent Academic Skills?***

In this study the objective was to assess how and via what paths early levels of socio-emotional competence and its dimensions (an aggregate of more than one domain of socio-emotional competence) influence emergent academic skills. There is evidence for the effect of domains of socio-emotional competence on pre-literacy, language and mathematics (Dobbs et al., 2006; Arnold et al., 2012; Girard & Girolametto, 2013).

Review of the literature suggested two potential pathways through which socio-emotional competence may influence emergent academic skills, namely attention and language. Support exists for the mediating role of attention in the relationship between different domains and dimensions of socio-emotional competence and academic skills in at-risk populations (Trentacosta & Izard, 2007; Rhoades et al., 2011; Vitiello & Williford, 2016). As for language, research has documented socio-emotional skills aid in the development of language skills (e.g. Slomkowski et al., 1992; Dixon & Shore, 1997; Fish & Pinkerman, 2003;

Karrass et al., 2006; Sharkins et al., 2017), and language difficulties are associated with academic difficulties (Nelson et al., 2011). Nonetheless, no evidence exists for the mediating role of language in the relationship between socio-emotional competence and academic skills to the best of my knowledge.

Since most studies mentioned above have worked on specific domains of socio-emotional competence in at-risk populations, this study adds to the literature as it explored the mediating role of attention and language in the relationship between global measure of socio-emotional competence at the three DCWs of 9 months, 2 years and 4.5 years and emergent academic skills at 4.5 years in a community sample. It was hypothesised that attention and language will mediate the relationship across early childhood. Since the importance of earlier socio-emotional competence is often contextualised in relation to school readiness, this study also sought to explore at what time point during the early childhood socio-emotional competence seems to have a downstream influence on emergent academic skills.

#### ***1.7.4 Study 4: How Parental Factors Such as Parental Warmth and Parent-Child Engagement Influence Socio-emotional Competence During the Early Childhood***

According to the bioecological model (Bronfenbrenner, 1979), a child's immediate environment exerts most influence on their development. During early childhood, the immediate environment is shaped not only by parent/caregiver interactions with the child (microsystem) but also the environment created by the interactions between the parents (mesosystem). A large body of research has provided evidence for the influence of marital satisfaction on a child's socio-emotional outcomes (e.g. Harrist & Ainslie, 1998; Fishman & Meyers, 2000; Forsch & Mangelsdorf, 2001; Berger & McLanahan, 2015). The influence of warm marital relationships on socio-emotional development may be direct as children witness socio-emotional skills modelled in front of them (Bandura, 1978) and/or indirect via *spillover* or *compensatory* effects whereby marital problems influence parent-child interactions (Harrist & Ainslie, 1998; Almeida et al., 1999; Buehler et al., 2006; Kouros et al., 2014).

This study adds to the literature as it examines the influence of mother- and partner-reported parental relationship warmth (starting from before the child is born) and parent-child engagement on socio-emotional competence across three DCWs of longitudinal data. It was hypothesised that parental relationship warmth would influence socio-emotional competence directly via parental engagement with the child. Further expectation was that socio-emotional competence will positively predict parental relationship warmth and parental engagement. Also, it was hypothesised that there will be change in parental warmth following the birth of a child.

The study also examined how the degree of change in parental relationship warmth, experienced from antenatal to 2 years, relates to their child's socio-emotional competence, expecting to see an effect. As the birth of a child is well known to have an impact on parental relationships (Belsky et al., 1983; O'Brien & Peyton, 2002), this study uniquely seeks to capture the potential impact of this change in relation to a child's early socio-emotional outcomes.

#### ***1.7.5 Study 5: What Are Different Contextual Factors and Proximal Processes That Predict Socio-emotional Competence Across Early Childhood?***

The last study, study 5, also drew on Bronfenbrenner's (1995) revised model of development. It aimed to assess the proximal and contextual factors (belonging to different systems of the model) that influence socio-emotional competence development during the early years. The information gathered may be of interest to parents and policy-makers who are looking for ways to support the development of these competencies in young children.

One of the strengths of a large-scale longitudinal study like GUiNZ is that it has data available about a wide range of factors that may influence socio-emotional development. This allowed for the assessment of a range of contextual factors (such as deprivation, maternal depression, parental relationship warmth, family stress, mother employment status, siblings living in the same house, childcare attendance, neighbourhood liveability, etc.) and proximal processes (such as maternal closeness and confidence, activities done with the child (e.g.

reading to them, playing with them, singing to them), parenting styles, etc). Given the importance of structures in which development takes place, deprivation was included as a contextual factor not as a covariate that the analyses controlled for. The analyses also included biopsychological factors, given that the model states the effects of proximal processes on development (socio-emotional competence in this case) depend on the biopsychological characteristics of the child (Bronfenbrenner, 1995).

Finally, it is important to remind the readers that this thesis is being submitted as a thesis with publication. As such, each of its chapters, with the exception of the general introduction and general discussion, is written in the format of a journal article. Each article starts with a bridge that links the chapters. Due to specific requirements of journals, there may be some differences in terms of sectioning and headings between the chapters that were formatted as journal articles. In addition, there will be some repetition of content especially related to model of socio-emotional competence, its development during the early childhood, background information and participants description between them.

## **Chapter 2. Development of an Index of Socio-emotional Competence for Preschool Children for the Study Growing Up in New Zealand (Study 1)**

### **2.1 Introduction**

Chapters 2 and 3 consist of the first two related studies (Study 1a and Study 1b) that were designed to assess and explore socio-emotional competence during early childhood within a population. Together they address the first research question of this thesis: *What is the Level and Patterns of Socio-emotional Competence Across Early Childhood?*

There is no single measure of socio-emotional competence used in GUiNZ and, to the best of my knowledge, there is no single measure available in the field. Given the multifaceted nature of socio-emotional competence, an index of socio-emotional competence was developed in Study 1a. The overarching aim was to develop a measure that related to other outcomes of growing international interest (e.g. school readiness and cognitive outcomes) and, later in the thesis, explore what predicted socio-emotional competence itself, with a view to informing how it might be developed.

This chapter describes the methods used to construct the socio-emotional competence indices step-by-step. That is, it describes how variables were chosen and aggregated to develop the indices and their dimensions. Further, it describes how the index and dimensions scores relate to pragmatic language (at 4.5 years or age) and school readiness (at 6 years of age). This chapter concludes with strengths and limitations of the indices developed.

The following account is a version of the Study 1a manuscript published by Frontiers in *Frontiers in Education*. There are some differences between what is in this chapter and what has been published. These changes were made to keep the formatting consistent in the thesis and to add more detail where needed, which was not given in the published article owing to the word limit. Please see Ahmad et al. (2019). Development of an Index of Socio-emotional Competence for Preschool Children in the Growing Up in New Zealand Study. In *Frontiers in Education*. *Frontiers*, 4(2). <https://doi.org/10.3389/feduc.2019.00002>.

The aim of this chapter is to describe the development of an index of socio-emotional competence, using data from a large national New Zealand prospective longitudinal study. The index draws on data collected during the first 5 years of a child's life and includes key components of social-emotional development: emotional expression and understanding; regulation of emotions and behaviour; social problem solving and social relationship skills (Rose-Krosnor, 1997; Denham, 2006).

Socio-emotional competence is important not only because it helps children to learn (Denham, 2006; Britto, 2012) but also because it helps individuals establish and maintain healthy and meaningful relationships (Cohen et al., 2005). As the concept of socio-emotional competence is multifaceted, a single index that draws on different components of socio-emotional competence provides an opportunity to try and summarise complex data for the ease of public, media, policy-makers and researchers (Booyesen, 2002; Joint Research Centre – European Commission, 2008). Our index seeks not only to identify an overall level of preschool socio-emotional competence, but also allows for the identification of groups of children with low, average and high socio-emotional competence at three data collection waves (DCWs: 9 months, 2 years and 4.5 years). This offers an opportunity to potentially track movement in and out of high and low levels of socio-emotional competence across the early childhood.

### ***2.1.1 Growing Up in New Zealand Study***

The index was created using Growing Up in New Zealand (GUiNZ) data. The GUiNZ study began in 2008 and has been following the lives of approximately 7000 children from the antenatal period (6 weeks before birth) and plans to study them until their 21st year. Written informed consent was taken from all participating parents, and parents also provided consent on behalf of their participating child. The sample is representative of the New Zealand population in terms of key sociodemographic and ethnic characteristics. Recruitment was designed to ensure ethnic and socioeconomic diversity of the sample. At the 4.5-year

assessment, the retention rate was 90 percent of the baseline (Morton et al., 2017). Full details about the design of the study can be found in Morton et al. (2014; 2017). The current paper details the conceptual framework that was used to guide the development of the socio-emotional competence measure, methodological considerations in constructing an index, and how the index was calculated. Finally, how the index scores relate to pragmatic language and school readiness is briefly explored.

### ***2.1.2 Conceptual Framework of our Socio-emotional Competence Index***

Socio-emotional competence involves an individual's ability to express, receive and manage emotions (Halberstadt et al., 2001; Denham, 2006; Clarke-Stewart & Parke, 2014) as well as their effectiveness in forming and maintaining relationships, and in general interactions (Rose-Krasnor, 1997; Han & Kemple, 2006). It also extends to include knowledge and abilities that individuals need to make good life choices and deal with challenges (Leffert et al., 1997; Denham, 2006; Calaguas & Dizon, 2011).

As for the components of socio-emotional competence, Denham (2006) describes its core aspects as emotional expressiveness, understanding of emotions, regulation of emotion and behaviour, social problem solving and social relationship skills. These components correspond to the lowest level of a prism model of social competence described by Rose-Krosnor (1997), and each is reported to develop and operate interactively (Denham, 1998; Denham et al., 2012).

In creating our index, we aimed to tap into each one of these five aspects of socio-emotional competence to provide age-appropriate coverage. However, it is important to note that socio-emotional competence does not emerge all at once; developing as the child becomes more able to express themselves and interact socially. For example, newborns are sensitive to correct facial stimuli (Beauchamp & Anderson, 2010) and can express their basic emotional states (Halberstadt et al., 2001). Later during the first year of their lives, infants also learn to use emotions instrumentally to influence their social environments (Denham, 2006). In

toddlerhood, children start to develop the ability to regulate their emotions (Kopp, 1989; Shatz, 1994), while late preschool years witness further improvement in emotional expression (Denham et al., 1992); emergence of ability to understand the complexity of emotions (Denham, 1998; Harris, 1989; Kestenbaum & Gelman, 1995); and to assign meanings to emotions (Baron-Cohen, et al., 1999; Denham, 2006).

### **2.1.3 Composite Indices of Children Development**

Composite indicators of child development combine data on singular indicators to give comprehensive information on children's functioning. While there are numerous measures available for particular aspects of children's development, they do not help us gain a holistic picture of it which is needed to: calculate the level of development in different populations; evaluate the impact of any policies designed to promote development and monitor progress towards any desired societal goals (Land et al., 2007). Composite indices also potentially allow for easier interpretation of the data and facilitate communication with the public as they allow users to compare diverse information in an effective manner (Joint Research Centre – European Commission, 2008).

While composite indices have numerous advantages, they are not without their problems such as the selection of the indicators and weights can be disputed. In addition, the composite index may oversimplify a complex phenomenon resulting in information being lost or wasted. For example, it may disguise deficiency in a domain giving misleading information and leading the policy makers to draw incorrect conclusions. In addition, inappropriate policies may also result if difficult to measure domains are ignored (Joint Research Centre – European Commission, 2008). As a result, care is always needed when interpreting a composite index.

## **2.2 Approaches to Measurement**

There are numerous ways of developing a composite index. Typically, creating a composite index involves four steps: variable selection, scaling, weighting and aggregation (Booyesen, 2002). These steps are not necessarily undertaken in sequential order as the

researcher might go back to change or re-scale the selected variables or readjust the assigned weights. Any decisions made when constructing an index should be based on both the available data and the literature (Booyesen, 2002; Joint Research Centre – European Commission, 2008; Cowan et al., 2012).

### **2.2.1 Variable Selection**

Booyesen (2002) in his review of 20 developmental indices argued that selection is a two-level process. The first step concerns how many and what domains make up the index. This selection of domains for the model should be guided by theory, evidence (gained through empirical analysis), practicality and/or intuitive appeal (Diener & Suh, 1997). With respect to empirical evidence, variables associated with each other should be picked from the pool of applicable variables as the components are expected to be interdependent because they represent the same underlying developmental phenomena (McGranahan et al., 1972; Field, 2013). Field (2013) also states that the magnitude of the correlation does not need to be taken into account.

With regard to variable selection in psychology-related developmental indices, different criteria have been employed. For example, Sanson et al. (2005) and Misson et al. (2011) developed an index of well-being (including the domain of social and emotional understanding) using data from the Longitudinal Study of Australian Children (LSAC). They included variables providing: good conceptual coverage without redundancy; high response rates; ability to discriminate among good, average and poor performers (with 5 to 20 percent of the sample identified as good or poor); and adequate internal consistency for the variables included in the index. Williams et al. (2014), using data from the Growing Up in Ireland study, developed an index of deprivation, which also included emotional well-being. They, however, prioritised keeping one variable in each domain while also trying to ensure that the selected variables provided sufficient conceptual coverage for their multi-dimensional deprivation index for 9-year-olds.

### **2.2.2 *Scaling***

After variable selection, the variables need to be scaled. According to Booyesen (2002), already scaled data can be left untouched. Some studies use standardised variables while others use ordinal or conventional linear scaling. Booyesen (2002) also raises the concern that standardising a distribution with outliers may give biased results, however, with large samples, the impact of (much less frequent) outliers is minimal. Several large-scale studies have scaled individual scores to z-scores to combine variables across the domains. For example, Blakemore and Gibbings (2006) developed a measure of socioeconomic position of family by merging standardised data from the LSAC study and the Income and Labour Dynamics in Australia Survey (HILDA); and Sanson et al. (2005) and Misson et al. (2011) transformed variables for developing the LSAC outcome index of well-being.

### **2.2.3 *Weighting and Aggregation***

Weighting should be reflective of the relative importance of each variable (Drewnowski, 1974). There is support for equal weighting with burden of proof falling on the use of differential weighting (Booyesen, 2002). For example, for large-scale studies like Sanson et al. (2005), Misson et al. (2011), and Blakemore and Gibbings (2006), equal weighting was carried out. This seems to be the most common approach with 14 out of 20 development indices reviewed by Booyesen also employing equal weighting.

Differential weighting can be carried out by consulting with experts, which has been the conventional practice, or guided by principal component analysis/factor analysis in which variables and/or the components/factors are weighted in accordance with the variance they explain (Hollingstead, 1975; Ram, 1982; Slottje, 1991; Nicoletti et al., 1999; Joint Research Centre – European Commission, 2008; Booyesen, 2002). While weighting based on experts' opinions can be biased, use of empirical methods can also be too stringent although methodologically defensible. Wish (1986) calls for a balance between subjective and objective weighting.

After the assignment of weights, aggregation begins, which can be functional or additive (Booyesen, 2002). The former entails combining the variables together based on their functional relationships with each other. Composite indices also require validation, which can be internal (item-analysis) or external (regression against a theory-supported outcome variable). Validation can also lead to the need to make subsequent adjustments in selection, scaling, weighting and aggregation (Ul Haq, 1995; Booyesen, 2002).

## **2.3 Calculation of the Socio-emotional Competence Index**

### **2.3.1 Statistical Analysis**

The analyses for the present study were performed using IBM Statistical Package for Social Sciences (SPSS; Version 22 and IBM SPSS AMOS, Version 25). Exploratory Factor Analysis (EFA) and bivariate analyses were conducted on SPSS while Confirmatory Factor Analysis (CFA) were carried out on AMOS.

### **2.3.2 Selection of Variables**

This study included data collected on children when they were 9 months (N = 6476), 2 years (N = 6327) and 4.5 years (N = 6156) of age. In keeping with literature cited, I initially identified all the variables across the data set that provided good conceptual coverage (age-appropriate) to socio-emotional competence. This index was theorised to include domains of emotional expression, understanding, regulation of emotions and behaviour, social problem solving and social relationship skills (Rose-Krosnor, 1999; Denham, 2006). In addition, internal consistency of the tools and discriminatory power (ability to differentiate between poor and good performers) of the variables was considered, with poor and good performers each accounting for 6 to 29 percent of the sample.

One criterion for variable selection is that they must be interdependent (Field, 2013). For the present study, the variables that were included in the index were all significantly associated with all, or at least most, of the other variables. In our study the variable that correlated with the least number was still associated with 65% of the other variables. The

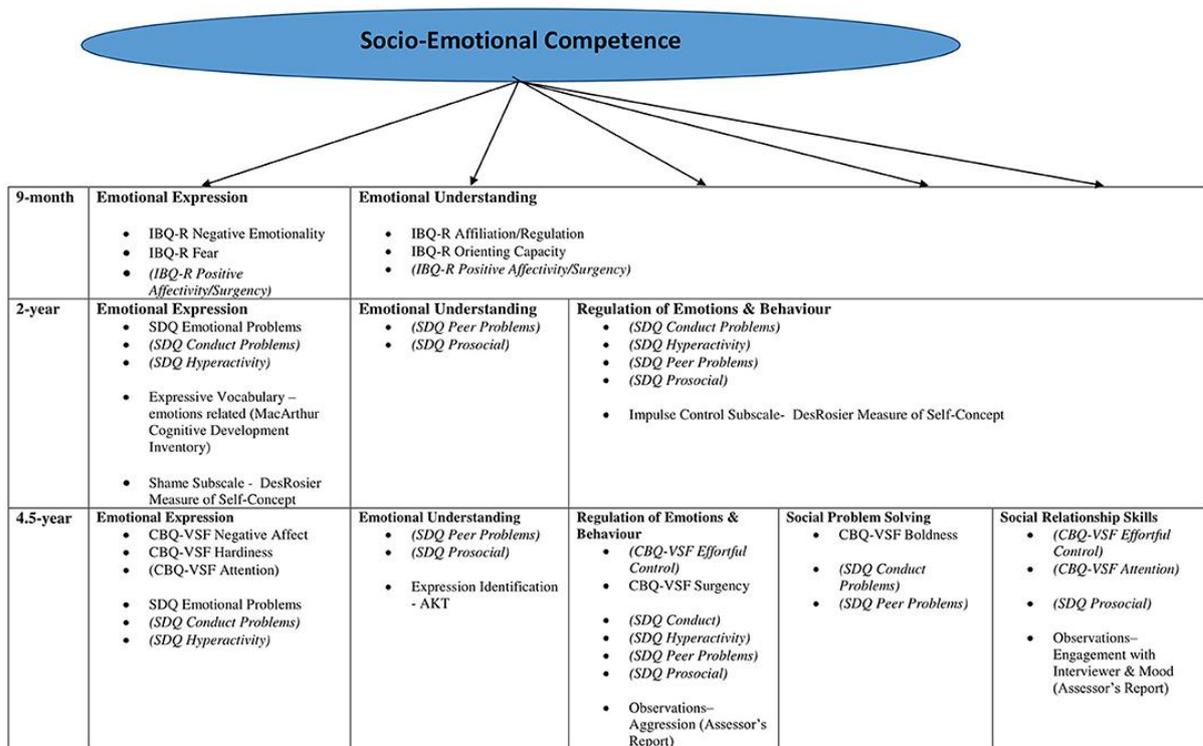
criterion of only including variables that were all correlated could not be fully met as it would have caused several to be dropped. In addition, as our variables were measured at three different DCWs spanning a 4-year period of rapid child development, it is arguably unrealistic to expect the variables measured early to correlate with all the others in the pool across time. Hence, in this study, the variables that correlated with most, if not all, were kept.

Many of the socio-emotional competence related measures selected comprised of scales which have multiple items. As components of socio-emotional development are expected to operate in an integrated manner, many of the variables were expected to measure more than one aspect of socio-emotional competence. Figure 2.1 shows the expected categorisation of the selected variables based on how they are usually treated in the literature. In some case, the variables could be argued to fall under more than one component of socio-emotional competence; these are italicised and in parentheses.

The final index of socio-emotional competence was derived from the following measures administered to the GUiNZ cohort. These are listed below, in time order (see also Figure 2.1).

**Figure 2.1**

*Variables Selected for the Index of Socio-Emotional Competence and Their Expected Categorisation*



*Note.* Variables that could be argued to fall under more than one component of socio-emotional competence are italicised and in parentheses.

### 2.3.2.1 Infant Behavior Questionnaire – Revised Very Short Form (IBQ-R VSF)

The IBQ-R VSF (Putnam et al., 2014) measures temperament in infants between the ages of 3 to 12 months. Temperament is argued to be a relatively stable and largely biological aspect of an individual’s early personality, which involves individual differences in reactivity and self-regulation. Reactivity refers to the ‘arousability’ of emotional, attentional, and motor responses, while self-regulation involves modulation of reactivity (Rothbart, 1981). These two components of temperament relate to emotional expression and regulation of emotions and behaviours, which are core parts of Denham’s socio-emotional competence model (2006). Campbell (2015) suggest that problems in socio-emotional competence during the first 2 years of a child’s life normally manifests fussiness, irritability, high levels of fear, difficulty in soothing and lack of social engagement. These can be captured under the rubric of infant temperament.

The IBQ-R VSF is a 36-item scale which asks parents to comment on the frequency of certain behaviours, with responses ranging from “1 = *Never*” to “7 = *Always*” on a seven-point Likert scale. The additional responses of “*Does not apply,*” “*Don’t know,*” and “*Refused*” included in GUiNZ were coded as missing. The responses are later averaged to calculate scores across each temperament factor.

The original IBQ- R VSF was designed to identify three temperament factors: Negative Emotionality, Positive Affect/Surgency and Orienting/Regulatory Capacity (Putnam et al., 2014). However, Peterson et al. (2017a), using the current study’s cohort, found that the three-factor structure of the IBQ-R-VSF had poor model fit when administered to 5639 mothers of infants aged 23 to 54 weeks. Instead, they found evidence for a five-factor structure including broadly the original three factors: Negative Emotionality, Positive Affect/Surgency and Orienting Capacity (revised from Orienting/Regulatory Capacity), and two new factors: Affiliation/Regulation and Fear. The five-factor model demonstrated acceptable model fit on two randomly created samples of more than 2300 participants: Sample 1,  $\chi^2(619) = 6384$ ;  $\chi^2/df = 10.31$ ,  $p < .001$ ; RMSEA = .06; CFI = .77; gamma hat = .99; SRMR = .06; Sample 2,  $\chi^2(619) = 6355$ ;  $\chi^2/df = 10.27$ ,  $p < .001$ ; RMSEA = .06; CFI = .77; gamma hat = .99; SRMR = .06 (Peterson et al., 2017a). While the CFI was low for both samples, this is not surprising as the CFI is sensitive to complex models (Fan & Sivo, 2007). In addition, since both gamma hat and SRMR (model fit indices considered to be the most stable (Fan & Sivo, 2007)) were both good, the overall model fit was deemed good. In accordance with Tabachnick and Fidell (2001), the Cronbach’s alpha reliabilities of the five temperament factors were also found to be acceptable (range = .63-.89). The measure was also reported to be similarly precise across the four major ethnic groups included in the GUiNZ cohort (Peterson et al., 2017b). In the current study the Peterson et al. (2017a) revised five-factor structure was used.

### 2.3.2.2 Strengths and Difficulties Questionnaire

Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997) is widely used for assessing mental health problems and psychological adjustment in children and adolescents. It consists of five scales: emotional problems, behavioural problems, hyperactivity, peer problems and prosocial behaviour (Goodman, 1997), which relate to all aspects of socio-emotional competence as outlined by Denham (2006). It is a 25-item long measure, which can be completed by parents and teachers of children aged 2-16 years with responses including: “0 = *Not True*,” “1 = *Somewhat True*” and “2 = *Certainly True*.” The GUiNZ study included other response options of “*Don't Know*” and “*Refused*,” which were coded as missing. Scores for each factor are summed (Goodman, 1997; Youth in Mind, 2014). Pre-school SDQ was used for GUiNZ (Youth in Mind, 2014) at 2 years and the standard version at 4.5-year DCWs.

The SDQ has been successfully used across diverse populations with varying socioeconomic levels (Woerner et al., 2004; Achenbach et al., 2008). Furthermore, satisfactory reliability with Cronbach's Alpha range of .71-.84 (according to the standard given by Nunnally et al., 1967) for all scales has been reported. The exception to this was the peer problems scale which had a lower Cronbach's alpha reliability  $\alpha = .54$  at 2 years in the GUiNZ cohort. This may reflect the social developmental stage of the children, and the difference in the interpretation of its underlying construct by the raters for the 2-year-olds. Note also, the preschool version of SDQ has not been used much in comparison to the standard SDQ version (D'Souza et al., 2017).

The factor structure of the SDQ has also been a subject of discussion. The original five factor structure has been supported for a representative sample of adolescents (13 to 18 years old) in the US (He et al., 2013) and young children (3, 5 and 7 years old) in the UK (Croft et al., 2015). There has also been support for using a three-factor structure with internalising subscale (comprising emotional and peer problems scales), externalising subscale (comprising behavioural problems and hyperactivity scales) and a prosocial subscale, for a representative

low risk sample of children (5 to 16 years old) in the UK (Goodman et al., 2010) and for a large sample of children (5 to 7 and 10 to 12 years old) in Denmark (Nielsen et al., 2013). For GUiNZ, D'Souza et al., (2017) found support for a modified five-factor model in 2-year-olds, in which the prosocial factor extended into a positive construal factor by including cross-loadings of reverse-coded items. However, D'Souza and colleagues (2017) suggested the need for their findings to be replicated with other children within the age group, and for the SDQ scoring structure to be modified if results consistent with their findings are found. In the meantime, in the absence of procedures for computing an index or composite scores with cross-loading variables, I used the original five-factor structure (Goodman, 1997) in the present study.

#### 2.3.2.3 DesRosier's Measure of Self-Concept (1990)

DesRosier's measure of self-concept is a multidimensional tool that gives scores on perceptual self-recognition, cognitive self-representation, linguistic self-description, motivational self-assertion, emotional self-evaluation and social self-regulation (DesRosiers & Busch-Rossnagel, 1997). It has a four-point response set ranging from "1 = *Not at all typical of my child*" to "4 = *Very typical of my child*," with additional options of "*Don't know*" and "*Refused*" coded as missing.

The self-regulation scale was included in the present study as it relates to the regulation of behaviour and emotions aspects of socio-emotional competence. However, inspection of the seven items of the scale showed that they grouped conceptually under two themes. Four items are linked to the experience of guilt and shame before and after doing something wrong: "Is upset, ashamed or sorry when [he/she] shows you [he/she] has done something bad;" "Is upset, ashamed or sorry when you find [him/her] doing something [he/she] should not;" "Calls your attention to things [he/she] did that [he/she] was not supposed to do;" and "Tries to hide something [he/she] was not supposed to do," are examples of this. The remaining three items relate to controlling impulses: "Stops [himself/herself] from doing something [he/she] wanted

to do because you were watching;” “Stops [himself/herself] from doing things you have said may hurt;” and “Waits for things [he/she] has been told to wait for.” Therefore, this scale was partitioned into two groups with Confirmatory Factor Analysis showing the following acceptable model fit:  $\chi^2 = 401.443$ ;  $\chi^2/df = 30.88$ ,  $p < .001$ ; RMSEA = .079; CFI = .93; gamma hat = .97; SRMR = .05. While a borderline value was observed for RMSEA (Fan and Sivo, 2007), Fan and Sivo advocate for greater emphasis being placed on gamma hat and SRMR values as they are not sensitive to model complexity. For this study, these values provided support for excellent model fit (Hooper et al., 2008).

#### 2.3.2.4 Emotion Words from the MacArthur Cognitive Development Inventory.

To assess expressive vocabulary, the MacArthur Cognitive Development Inventory - Toddler Short Form (Fenson et al., 2000) was used at the 2-year DCW with a yes or no response. The tool asks parents to report on whether a child uses particular words that are age appropriate, such as dog, mother etc., to gauge language development in infants and toddlers. The shorter form used in GUiNZ consists of 101 items evaluating their use in six languages: English, Māori, Samoan, Tongan, Cantonese and Mandarin. For the current study, words such as uh-oh, ouch, friend, like, hug, gentle, wish and happy were extracted to provide an indication of knowledge/understanding of emotions both internal and external. Since these words are adopted for Samoan, Tongan and Mandarin, and directly translated for Māori; I only used scores for English and Māori. Children were able to attain a maximum score of 1 for usage of each word (that is, they were not given a score of 2 if they knew the word in both the languages). The scores were then summed. This is an internationally recognised, reliable, valid, cost and time efficient tool (Fenson et al., 2000). however, our extraction of items related to emotions is novel.

#### 2.3.2.5 Child Behavior Questionnaire – Very Short Form (CBQ-VSF)

The CBQ-VSF (Putnam & Rothbart, 2006) is a measure of temperament in children aged between 3 and 7 years. It was used to assess temperament of children when they were

approximately 4.5-years old. The CBQ-VSF consists of 36 items across three broad scales of surgency (defined by activity level, high intensity pleasure and impulsivity), negative affect (defined by sadness, fear, discomfort and anger/frustration) and effortful control (defined by low intensity pleasure, inhibitory control and attentional control). It taps into emotional expressiveness, regulation of emotions and behaviours, social problem solving and social relations skills components of socio-emotional competence (Denham, 2006) used in this study. CBQ's scale of negative affect and surgency has been described as particularly useful in assessing emotional expressiveness, while effortful control can be used to measure emotional and social competence. However, it is not a direct measure so caveats need to be explained (Campbell et al., 2016).

The inventory asks caregivers to report on the level of different child behaviours using a seven-point Likert scale range from "1 = *Extremely untrue*" to "7 = *Extremely true*." The GUiNZ study also included additional response options of "*Not applicable*," "*Don't know*," and "*Refused*" which were coded as missing. Reliability of CBQ-VSF does not vary by ethnicity, location, socioeconomic status and age, and shows adequate validity levels (Hughes et al., 2008; de la Osa et al., 2013). When applied to GUiNZ data, Stubbings et al. (2017) found that a three-factor structure was not the best fit of the data, and that a six-factor structure (adding hardiness, boldness and attention to the original three factors) was the most parsimonious and context-sensitive. Confirmatory Factor Analysis found that the six factors had an acceptable fit:  $\chi^2 = 11670.911$ ;  $\chi^2/df = 21.42$ ,  $p < .001$ ; RMSEA = .06; CFI = .71; gamma hat = .90; SRMR = .07. Again, CFI value was arguably low. However, since CFI is sensitive to complex models, and gamma hat and SRMR (which are stable model fit indices) were within acceptable ranges for the model (Fan & Sivo, 2007), this model fit was accepted. The Cronbach alpha reliabilities of five of the six factors (Negative Affect, Fear, Effortful Control, Surgency and Attention) were found to be acceptable (range = .61 - .72). The Cronbach alpha reliability for Hardiness was just below the acceptable range with value of .58

(Tabachnick & Fidell, 2001). This six-factor structure was used for the current study. Also, the factor of boldness (with items such as: “Sometimes turns away shyly from new acquaintances,” “Seems to be at ease with almost any person,” and “Is sometimes shy even around people s/he has known a long time”) was labelled as fear for sake of consistency in this study as it matched the content of IBQ-Rs factor of fear (with items such as: “When introduced to an unfamiliar adult, how often did the baby cling to a parent?” and “When introduced to an unfamiliar adult, how often did the baby refuse to go to the unfamiliar person?” (Peterson et al. (2017a).

#### 2.3.2.6 Affective Knowledge Task (AKT)

The AKT (Denham, 1986) is a widely used measure tapping into knowledge/understanding of emotions (Morgan et al., 2009), which is essential to socio-emotional competence in preschoolers. In the GUiNZ study, only the expression identification task was used due to time constraints at 4.5-year DCW. A few other modifications were also made. Cards with simple cartoon faces were used (in place of puppets) showing different emotions. To avoid potential ceiling effect, which starts to appear at around 4.5 years (Denham, 2006), two more emotions of surprise and disgust were added to the original four emotions tested. In addition, eyebrows were removed from the faces to make them more gender-neutral. In the current study, a score of “2” was given when the child named the correct emotion or its appropriate synonym; “1” when the child named the incorrect emotion, but it had the same emotional valence as the correct response, and “0” for when the child gave the incorrect emotion, and it was of the opposite emotional valence.

The AKT has been found to have good internal consistency and test-retest stability over a 1-year period (Denham, 2006; Denham et al., 2012). It is also argued to be ecologically valid owing to the small amount of verbalisation required during the administration and the fact that it can be performed during play (Denham, 2006). For GUiNZ data, it shows good variability

(Morton et al., 2017) signifying that the addition of emotions of surprise and disgust resolved the problem of a potential ceiling effect in the cohort.

### 2.3.2.7 Assessor Report from Preschool Self-Regulation Assessment (PSRA)

The PSRA (Smith-Donald et al., 2007) consists of tasks administered individually to children to assess their self-regulatory skills in emotional, attentional and behavioural domains (Roid & Miller, 1997; Wakschlag et al., 2005). The Assessor Report, which comprises 28 items, is part of this battery. The report consists of an observer describing the child's emotions and behaviours during the PRSA assessment. Aside from that, these items provide an indication of issues that may have influenced the child's performance during data collection, as well as an avenue for comparison between parental reports and observations. The GUiNZ used 13 items from the Assessor Report. For the present study, I focused on questions related to the child's attempt to engage with the interviewer ("Actively attempts to engage interviewer"); mood observed ("Child shows intense apprehensive, sad or worried feelings during session"); and aggression (verbal, physical and towards objects). Items related to child engagement with the interviewer and mood had four response options and the three questions related to aggression were dichotomous. The later three items were summed together to give a single score of aggression. Further scoring of these items is described below in the scaling section.

### 2.3.3 *Missing Data*

Out of the 6156 participants, who had data across all three DCWs, some had incomplete data on the selected socio-emotional competence related measures. Therefore, entries for participants having more than 10 percent of the data missing ( $N = 1317$ , 21.4%) on one or more selected measures were deleted except for IBQ-R VSF. For IBQ-R VSF, 10.8 percent was used as a cut off as a 10 percent cut-off would have resulted in the deletion of 336 (5.5%) more cases.

Participants with more than 10 percent missing data (10.8% in the case of IBQ-R VSF) did not differ significantly from the remaining participants in terms of gender, parity and

mother's age. However, there was a significant difference between both groups of participants in terms of mother's ethnicity and socioeconomic status (with mothers with European ethnicity and higher socioeconomic status overrepresented in the imputed sample). The difference was, however, not large: Cramer's  $V < .07$  (Cohen, 1988). See Table 2.1 for demographics of the full (before deletion) and restricted sample (after deletion).

Expectation Maximization (EM) was used to impute the missing values that remained after deletion of cases with more than 10 to 10.8% percent missing values. This missing data procedure was used as it runs the model till no possibility of statistically significant improvement in model fit remains. It is based on the premise that the observed data is the best estimation of the missing data. It uses the available (observed) data to calculate a value (estimation) of the missing value using formulae that are meant to predict the variables the best (Dempster et al., 1977), and then checks if the value is most likely. If it is not, then values are re-imputed. EM is not biased like mean substitution or regression substitution. It does not affect the correlation values between variables, making it an optimal procedure for regression or factor analysis (Schaefer & Olson, 1998).

An important assumption of EM is that the data is missing completely at random or missing at random. Little's MCAR test was provided by the EM procedure for scales: IBQ-R-VSF ( $\chi^2 = 34909.20$ ,  $df = 30219$ ,  $p < .001$ ); SDQ at 2 years ( $\chi^2 = 2588.30$ ,  $df = 2025$ ,  $p < .001$ ); DesRosier self-concept measure ( $\chi^2 = 6301.10$ ,  $df = 5050$ ,  $p < .001$ ); SDQ at 4.5 years ( $\chi^2 = 1210$ ,  $df = 855$ ,  $p < .001$ ) and CBQ-VSF ( $\chi^2 = 3310.19$ ,  $df = 2572$ ,  $p < .001$ ). However, this chi-square test is extremely sensitive to large sample sizes (Tanaka, 1987). Therefore, chi square ratios to  $df$  were calculated for each scale: IBQ-R VSF ( $\chi^2/df = 1.16$ ,  $p = .281$ ); SDQ at 2 years ( $\chi^2/df = 1.28$ ,  $p = .258$ ); DesRosier self-concept measure ( $\chi^2/df = 1.25$ ,  $p = .264$ ); SDQ at 4.5 years ( $\chi^2/df = 1.42$ ,  $p = .233$ ) and CBQ-VSF ( $\chi^2/df = 1.29$ ,  $p = .256$ ). These were all non-significant, suggesting that the missing values are missing completely at random; thus, lending further support to the use of the EM method of imputation to estimate the missing data.

The imputed sample comprised of 4839 participants, which did not differ significantly from the original representative sample with regards to children's gender, parity (at the antenatal DCW), mother's age and socioeconomic status (at the antenatal DCW). Significantly more children with mothers of European ethnicity (self-prioritised) were included in the imputed sample than in the original sample at the antenatal period. However, the difference, though significant, was not large: Cramer's  $V < .04$  (Cohen, 1988).

**Table 2.1***Characteristics of the Sample Before and After Deletion and Missing Value Analysis*

Characteristics	Full Data ( <i>N</i> = 6156)		Restricted Dataset ( <i>N</i> = 4839)	
	<i>n</i>	%	<i>N</i>	%
Child's Gender				
Boy	3165	51.4	2459	50.8
Girl	2986	48.5	2378	49.1
Child's Parity				
0	2170	35.3	1740	36.0
1-5	3328	54.1	2567	53.0
6-10	79	1.3	59	1.2
≥11	14	.2	11	.2
Mother's Age				
<20	250	4.1	199	4.1
20-24 years	829	13.5	657	13.6
25-29 years	1495	24.3	1131	23.4
30-34 years	1972	32.0	1587	32.8
35-39 years	1338	21.7	1058	21.9
≥ 40 years	271	4.4	207	4.3
Mother's Ethnicity <sup>1</sup>				
European	3491	56.7	2927	60.5
Māori	813	13.2	622	12.9
Pacific	785	12.8	558	11.5
Asian	845	13.7	571	11.8
MELAA	115	1.9	79	1.6
Other	89	1.4	70	1.4
Household deprivation quintile index 2013 <sup>2,3</sup>				
NZ Dep Q1 (least deprived)	1227	19.9	1048	21.7

NZ Dep Q2	1119	18.2	948	19.6
NZ Dep Q3	1033	16.8	887	18.3
NZ Dep Q4	996	16.2	832	17.2
NZ Dep Q5 (most deprived)	1436	23.3	1095	22.6

*Note.* <sup>1,2</sup> 18 (.3%) and 345 (5.6%) participants had data missing on mother’s ethnicity and household deprivation in the full dataset.

<sup>3</sup> The New Zealand Deprivation Index combines nine socioeconomic variables from the 2006 census capturing eight dimensions of deprivation at the small area level. In this table the original deprivation scores (measured in deciles) have been collapsed into quintiles. Quintile 1 (Q1: Deciles 1 and 2) represents the households in the least deprived 20% areas, whereas Quintile 5 (Q5: Deciles 9 and 10) represents the households in the most deprived 20% areas (Salmond et al., 2007).

### 2.3.4 *Scaling*

To scale scores for the composite index, scores must be on an interval scale (Field, 2013). Scores for the vocabulary task (2-year DCW) and AKT (4.5-year DCW) were already on an interval scale. The IBQ-R VSF, SDQ and CBQ-VSF with Likert scales were also treated as interval scales. Scaling observation related items was not straightforward. There were two Likert-like items used to measure engagement and mood observed in the Assessor’s Report at 4.5-years, with four possible response options and three dichotomous items related to aggression.

While Likert items have rank order, the difference between the values cannot be presumed to be equal (Sullivan & Artino, 2013). For example, the distance between the response options “Child frequently initiates conversation by asking questions, sharing information”, “Child initiates conversation on occasion and is responsive to interviewer through eye-contact, talking, or smiling”, and “Child does not initiate conversation, is slow to warm up,” cannot be stated to be equal. Therefore, consideration of Likert-item or scale as an interval scale has been controversial (Knapp, 1990; Jamieson, 2004). Norman (2010) and Brown (2011) also highlighted the difference between a Likert-item, which is usually a single statement/question with a response-set consisting of four or more points, and Likert-scale, which is an aggregate of responses on Likert-items. They noted that researchers have often used the terms Likert scale and Likert item interchangeably; however, their meanings are discrete, and they provided evidence that Likert scales can be considered continuous.

Given support for considering Likert scales as continuous (Brown, 2011; Norman, 2010), attempts were made to calculate composite score for the five items from the Assessor's Report, which included two Likert-items assessing mood and engagement during the assessment to derive Likert scale scores. Exploratory factor analysis with Direct Oblimin rotation using Principal Axis Factoring (PAF), however, showed that these items loaded well on two factors with loadings ranging from .52 to .53 for two items related to mood and engagement, and loadings ranging from .39 to .67 for three items related to aggression. These items grouped into two factors: observations related to mood and engagement of the child ( $\alpha = .36$ ), and aggression ( $\alpha = .55$ ). The low alpha values of these factors could be attributed to the short length of the scales. These variables were included in the analyses despite the low reliability as observations-based data adds breadth to the data (Carter et al., 2004). Finally, z-scores were calculated to scale all variables used in the analysis.

### ***2.3.5 Weighting and Aggregation***

Following the selection and scaling of the variables, EFA with Direct Oblimin (Oblique) rotation was performed with variables at each DCW to see how the variables grouped together (Table 2.2). It was decided to keep variables that have a minimum factor loading of .162 (Field, 2013; Stevens, 2002). According to Stevens, with larger data sets (as is the case with GUiNZ), adequate factor loading can be set at the minimum of .162. In addition, it was decided to use Principal Axis Factoring (PAF) rather than Maximum Likelihood (ML) and Principal Component Analysis (PCA), as the former is better for data which is not normally distributed (and our variables were not all normally distributed, see Table 2.3). Unlike PCA, it also takes into account individual variance. Oblique rotation (which assumes at least some correlations between factors) was chosen because, in keeping with our selection criteria, the socio-emotional variables making up the index were required to be correlated with each other (Costello & Osborne, 2005). Costello and Osborne (2005) note that if the factors are uncorrelated, both Orthogonal and Oblique rotations give almost identical results.

Following EFA, three dimensions emerged: easy-going, regulation and exuberance. The aggression observations scale did not load on any of the three dimensions generated in the EFA so it was dropped from the analysis. The third factor (exuberance) only emerged at the 4.5-year DCW (refer to Table 2.3 for how the variables were grouped) potentially as the children's' behaviour starts to become more developmentally complex (Campbell et al., 2016; Rothbart, 2011).

Of note, the three dimensions that emerged did not correspond directly with the five components of socio-emotional competence theorised by Denham (2006). This reflects the measurement tools that were selected for the index. In selecting them, the aim was to get age-appropriate coverage of the five aspects/domains of socio-emotional competence described by Denham (2006). However, most of the measures that were used tapped into more than one of the five components of socio-emotional competence. Hence, while the index covered the model, it did not individually assess its components. For example, the peer problems scale of SDQ at the 4.5-year DCW assessed emotional understanding, emotion regulation and social relationship skills, while the conduct problems scale tapped into emotional expression, social problem solving and regulation. Similarly, attention from CBQ VSF assessed emotional expression and social relationships. As the measures generally assessed more than one component of socio-emotional competence, rather than identifying separate discrete components of socio-emotional competence, the EFA recovered higher-order dimensions (comprising of more than one domain given in the socio-emotional competence model). It is also worth mentioning that the components of socio-emotional competence do not operate discretely in the real world. They are constantly interacting with each other, and what we see or assess in the real world is a dynamic combination of these components (Denham, 1998; Denham et al., 2012).

As mentioned, the dimensions that emerged from the EFA can best be described as a combination of two or more domains of socio-emotional competence as described by Denham

(2006). The easy-going dimension signified the ability to express more positive emotions. Children who score high on this dimension are likely to experience less anger, sadness and fear. They are also less likely to be low in energy. This requires a combination of emotional expressiveness and regulation of emotions and behaviours. The second dimension, regulation, largely relates to the ability to soothe, show empathy and engage in different social and cognitive activities. This dimension can be argued to combine the socio-emotional components of understanding of emotions and regulation of emotions and behaviours. The third and final dimension, exuberance, related to the ability to be confident and comfortable in new situations and with new people. This can be dependent on ability to manage one's emotions, especially anxiety and social relationship skills. Measures did not tap specifically into the social problem solving domain so it did not emerge from the EFA. To assess socio-emotional competence, emotions and behaviours need to be considered from a developmental perspective (Campbell, 2015). Perhaps this domain of socio-emotional competence has not started to emerge or become fully differentiated in preschool children. On the other hand, it could be a result of the measures used to calculate the index, which did not adequately cover this domain of socio-emotional competence.

The three dimensions that were identified (easy-going, regulation and exuberance) share some similarity with the child behaviour profiles of "difficult," "easy/regulated" and "slow to warm up," respectively, given by Thomas et al. (1970). Thomas and colleagues (1970) longitudinally assessed 141 children from infancy to preschool and elementary school years using parental ratings complimented by observations. The difficult profile was characterised by a child who cries a lot, withdraws from new situations, has irregularities in bodily functions and throws tantrums. The easy profile included positive mood, adaptability, regularity in bodily functions and low to moderate reactions. Lastly, the slow to warm up profile encompassed low activity level, slow adaptability, low intensity of, and negativity in emotions. Note also, similar dimensions have been suggested by other temperament

researchers such as Rothbart (1981): negative affectivity, effortful control and positive affectivity surgency; and Caspi (2000): under controlled children, well-adjusted children and inhibited children.

As can be seen in Table 2.2, the EFA results identified multiple cross-loads. Cross-loads were expected, as the scales included in the analysis did not comprise of a single item and often covered multiple domains of socio-emotional competence and hence were interlinked. To maintain conceptual integrity and ensure adequate coverage of each factor, the cross-loading variables were not dropped. The exception was the prosocial scale at the 2-year DCW. While this variable loaded on the easy-going dimension slightly more (.039) than the regulation dimension, since this scale at 4.5-year DCW loaded exclusively on the regulation dimension, it was kept under the regulation dimension at 2 years to ensure consistency of the procedure (see Table 2.3 for descriptive statistics of variables retained).

**Table 2.2**

*Summary of Exploratory Factor Analysis Results for Variables at the Three Data Collection Waves*

Variables	Factor Loadings		
	Factor 1 (Easy-going-low)	Factor 2 (Regulation)	Factor 3 (Exuberance)
<b>9 Months</b>			
Negative emotionality – IBQ-R VSF	<b>.840</b>		
Fear – IBQ-R VSF	<b>.443</b>		
Orienting capacity – IBQ-R VSF		<b>.617</b>	
Affiliation/Regulation – IBQ-R VSF		<b>.612</b>	
Positive affectivity/Surgency – IBQ-R VSF	.220	<b>.422</b>	
Eigenvalues	1.59	1.45	
% of variance	31.84	28.93	
<b>2 Years</b>			
Conduct problems – SDQ	<b>.676</b>		
Emotional problems – SDQ	<b>.548</b>	.257	
Hyperactivity problems – SDQ	<b>.521</b>		
Peer problems – SDQ	<b>.511</b>		
Prosocial – SDQ	-.361	<b>.322</b>	
Expressive Vocabulary – emotions related	<b>-.277</b>		
Impulse Control Scale – DesRosier’s Measure		<b>.642</b>	
Shame Scale – DesRosier’s Measure		<b>.596</b>	
Eigenvalues	2.25	1.56	
% of variance	28.08	19.51	
<b>4.5 Years</b>			
Negative Affect – CBQ VSF	<b>.767</b>	1.65	
Emotional problems – SDQ	<b>.620</b>		-.357
Hyperactivity problems – SDQ	<b>.581</b>	-.314	-.389
Conduct problems – SDQ	<b>.577</b>	-.238	
Peer problems – SDQ	<b>.396</b>		-1.85
Hardiness – CBQ VSF	<b>.264</b>		
Effortful control – CBQ VSF		<b>.705</b>	
Attention – CBQ VSF		<b>.523</b>	
Prosocial – SDQ		<b>.492</b>	
Surgency – CBQ VSF			<b>.616</b>
Fear – CBQ VSF			<b>.546</b>
Observations– engagement with interviewer and mood (Assessor’s Report)			<b>.381</b>
Expression identification			<b>.184</b>
Eigenvalues	2.78	1.52	1.95
% of variance	21.40	11.68	15.03

*Note:* Factor Loadings < .162 are not shown; Factor 1 recovers a low easy-going dimension, this is subsequently inverted in future analysis so that each dimension has a positive valence.

**Table 2.3**

*Showing the Grouping of Socio-emotional Variables after Exploratory Factor Analysis at each DCW and Related Descriptive Statistics*

Cohorts	Easy-Going	Regulation	Exuberance
9-month	<ul style="list-style-type: none"> <li>● IBQ-R VSF Negative Emotionality (<math>M = 3.38</math>, <math>SD = 1.06</math>, Skew = .33, Kurt = -.43)</li> <li>● IBQ-R VSF Fear (<math>M = 3.29</math>, <math>SD = 1.80</math>, Skew = .53, Kurt = .92)</li> </ul>	<ul style="list-style-type: none"> <li>● IBQ-R VSF Orienting Capacity (<math>M = 4.49</math>, <math>SD = 1.05</math>, Skew = .04, Kurt = -.48)</li> <li>● IBQ-R VSF Affiliation/Regulation (<math>M = 5.70</math>, <math>SD = .77</math>, Skew = -.74, Kurt = .85)</li> <li>● IBQ-R VSF Positive Affectivity/Surgency Regulation (<math>M = 5.17</math>, <math>SD = .71</math>, Skew = -.32, Kurt = .22)</li> </ul>	
2-year	<ul style="list-style-type: none"> <li>● SDQ Conduct Problems (<math>M = 3.09</math>, <math>SD = 1.97</math>, Skew = .54, Kurt = -.08)</li> <li>● SDQ Emotional Problems (<math>M = 1.77</math>, <math>SD = 1.58</math>, Skew = 1.24, Kurt = 1.83)</li> <li>● SDQ Hyperactivity (<math>M = 4.31</math>, <math>SD = 2.11</math>, Skew = .20, Kurt = -.31)</li> <li>● SDQ Peer Problems (<math>M = 2.12</math>, <math>SD = 1.63</math>, Skew = .65, Kurt = .00)</li> <li>● Expressive Vocabulary – emotions related (MacArthur Cognitive Development Inventory) (<math>M = 4.18</math>, <math>SD = 2.30</math>, Skew = -.09, Kurt = -1.00)</li> </ul>	<ul style="list-style-type: none"> <li>● Impulse Control Scale- DesRosier's Measure (<math>M = 3.38</math>, <math>SD = 1.06</math>, Skew = -.20, Kurt = -.15)</li> <li>● Shame Scale - DesRosier's Measure of Self-Concept Regulation (<math>M = 3.38</math>, <math>SD = 1.06</math>, Skew = .00, Kurt = -.40)</li> <li>● SDQ Prosocial<sup>2</sup> (<math>M = 3.38</math>, <math>SD = 1.06</math>, Skew = -.41, Kurt = -.17)</li> </ul>	
4.5-year	<ul style="list-style-type: none"> <li>● CBQ-VSF Negative Affect (<math>M = 4.37</math>, <math>SD = .89</math>, Skew = -.09, Kurt = -.06)</li> <li>● SDQ Emotional (<math>M = 1.94</math>, <math>SD = 1.77</math>, Skew = 1.11, Kurt = 1.08)</li> <li>● SDQ Hyperactivity<sup>1</sup> (<math>M = 3.89</math>, <math>SD = 2.27</math>, Skew = .38, Kurt = -.34)</li> <li>● SDQ Conduct Problems (<math>M = 2.23</math>, <math>SD = 1.70</math>, Skew = .63, Kurt = .21)</li> <li>● SDQ Peer Problems (<math>M = 2.27</math>, <math>SD = 1.56</math>, Skew = 1.06, Kurt = .81)</li> <li>● CBQ-VSF Hardiness (<math>M = 3.96</math>, <math>SD = 1.14</math>, Skew = -.02, Kurt = -.38)</li> </ul>	<ul style="list-style-type: none"> <li>● CBQ-VSF Effortful Control (<math>M = 5.44</math>, <math>SD = .66</math>, Skew = -.48, Kurt = .78)</li> <li>● SDQ Prosocial (<math>M = 5.73</math>, <math>SD = 1.01</math>, Skew = -.61, Kurt = -.17)</li> <li>● CBQ-VSF Attention (<math>M = 7.83</math>, <math>SD = 1.75</math>, Skew = -1.16, Kurt = 1.76)</li> </ul>	<ul style="list-style-type: none"> <li>● CBQ-VSF Fear (<math>M = 3.92</math>, <math>SD = 1.11</math>, Skew = .12, Kurt = -.15)</li> <li>● CBQ-VSF Surgency (<math>M = 5.21</math>, <math>SD = .81</math>, Skew = -.56, Kurt = .42)</li> <li>● Observations– Engagement with Interviewer &amp; Mood (Assessor's Report) (<math>M = 6.94</math>, <math>SD = 7.95</math>, Skew = -1.17, Kurt = 1.99)</li> <li>● Expression Identification - AKT (<math>M = 1.02</math>, <math>SD = 2.140</math>, Skew = -1.00, Kurt = 2.05)</li> </ul>

Note. <sup>1,2</sup> Prosocial scale (2-year DCW) and Hyperactivity scale (4.5-year DCW) cross-loaded on two dimensions: easy-going and regulation child.

Interestingly, hyperactivity scale at 2 years (which included items related to restlessness, constantly fidgeting, easily distracted, stopping to think things through before acting and seeing tasks through to the end) loaded on easy-going dimension with no cross-loads on the regulation dimension. A degree of restlessness, distractibility and fidgeting is expected from toddlers. Perhaps that is why absence of these loaded on dimension (factor) associated with a child's level of difficulty. Two-year-olds are also unlikely to have developed higher-order cognitive abilities such as reflective thinking and persistence on tasks (D'Souza et al., 2017). Indeed, items tapping into reflective thinking and persistence on tasks had lower factor loadings (.34 - .49) than the other three items of the hyperactivity scale (.69 - .73; D'Souza et al., 2017). In terms of measurement, there are limited studies on validation of SDQ in 2-year-olds. As mentioned, D'Souza (2017) used data from GUiNZ and found the data did not support the usual five-factor structure. Instead, support was found for a modified five-factor structure with a positive construal factor suggesting a tendency to endorse all the positive items on the SDQ in a similar way at this age. This adds further support to our conjecture that at 2 years of age people differentiate behaviour less and perhaps are more likely to interpret behaviour as easy going or not.

While the loading of hyperactivity at 2 years onto easy-going rather than regulated makes some sense developmentally, our finding that the hyperactivity scale at 4.5 years also had higher loadings on the easy-going grouping than it did on the regulation dimension is perhaps harder to explain. It may be that because the hyperactivity items at 2 years loaded on the easy-going dimension created a greater pull on the hyperactivity items at 4.5 years on to this dimension.

Fear at 4.5 years loaded onto the exuberance dimension. It is important to remind readers that fear at 4.5 years was in fact boldness (Stubbing et al., 2017). It was named as such for consistency as it has items similar to the fear scale at 9 months. The factor boldness had separated from surgency factor (Stubbing et al., 2017) of the original CBQ-VSF (Putnam &

Rothbart, 2006). That is why it loaded on the same dimension as surgency in this study. In another surprising finding, AKT (a task that involves recognition of emotions) loaded on the exuberance dimension alongside fear (boldness), surgency, and engagement (with the interviewer) and mood during observations. One of the reasons for this somewhat unexpected factor loading could be that performance on the AKT task (a task which involves interacting with the interviewer) possibly also depended on how confident and comfortable children were in new situations which the observations involved.

The variables were scaled after grouping. Variables that had negative connotations were multiplied by -1, so that a higher score meant more adaptive emotions or behaviours. This was also necessary to allow later aggregation of the scales for the index (and is why Factor 1 in the EFA was ultimately labelled easy-going, despite the original factor loading structure in the EFA suggesting a more “difficult” child). After scaling and inverting (where necessary), the variables were averaged to calculate dimension scores of the index (easy-going, regulation and exuberance). The dimensions were then aggregated additively, after standardisation, to calculate the overall index at each DCW separately and also taken together. I then calculated two versions of dimension scores. In the first version, variables at each time point were weighted equally, while for the second version weighting of the variables was done according to variance estimates based on factor analysis (FA). Since the socio-emotional index at the previous two DCWs did not comprise of variables based on observations, for the 4.5-year DCW, dimension scores were calculated with and without observation scores in order to see if observations complimented the scores based on parental ratings.

Next, factors calculated by aggregating variables (weighted according to FA variance estimates) were aggregated to give a socio-emotional competence score for each DCW, weighted according to the variance explained by that factor in comparison to the other(s). Hence, this process led to two versions of the socio-emotional competence index (one with equal and one with factor analysis-based weighting) for the 9-month and 2-year DCWs, and

four index versions at the 4.5-year DCW (as this included a version with and without observation data).

Socio-emotional competence at each DCW were further added together using two weighting methods to give overall index scores across all data collection waves: equal weighting and time-based weighting. For the latter, the variables were weighted according to the distance of the wave from the 4.5-year DCW. This was done as it is both logical and intuitive to give scores at distant time-points less weight. Weights of 1,  $1.33 (1 + 15/45)^1$  and  $2 (1+45/45)^2$  were assigned to 9-month, 2-year and 4.5-year DCWs respectively. Eight indices resulted from the analyses (see Figure 2.2):

1. Index with *equally* weighted socio-emotional competence scores at each DCW consisting of equally weighted dimension and variable scores *without* observations.
2. Index with *equally* weighted socio-emotional competence scores at each DCW consisting of equally weighted dimension and variable scores *with* observations.
3. Index with *equally* weighted socio-emotional competence scores at each DCW with FA variance estimates-based weighted dimension and variable scores *without* observations.
4. Index with *equally* weighted socio-emotional competence scores at each DCW with FA variance estimates-based weighted dimension and variable scores *with* observations.
5. Index with *time*-weighted socio-emotional competence scores at each DCW consisting of equally weighted dimension and variable scores *without* observations.
6. Index with *time*-weighted socio-emotional competence scores at each DCW consisting of equally weighted dimension and variable scores *with* observations.

7. Index with *time*-weighted socio-emotional competence scores at each DCW using FA variance estimates-based weighted dimensions and variable scores *without* observations.
8. Index with *time*-weighted socio-emotional competence scores at each DCW with FA variance estimates-based weighted dimension and variable scores *with* observations.

**Figure 2.2**

*Showing Approaches Taken to Calculate the Index of Socio-emotional Competence.*

DCWs	Types of Weighting for Variables		Dimensions	Types of Weighting for Dimensions	Indices at Each DCW
9 months	Variables with Equal Weighting	→	Dimension 1 (Easy-Going)	Dimensions Weighed Equally	1. SEC Index (EW_9months)
	Variables with FA variance estimates-based Weighting	→	Dimension 2 (Regulation)		
2 years	Variables with Equal Weighting	→	Dimension 1 (Easy-Going)	Dimensions Weighed Equally	3. SEC Index (EW_2years)
	Variables with FA variance estimates-based Weighting	→	Dimension 2 (Regulation)		
4.5 years	Variables with Equal Weighting	→	Dimension 1 (Easy-Going)	Dimensions Weighed Equally	5. SEC Index without observations (EW_4.5years)
			Dimension 2 (Regulation)		
			Dimension 3 (Exuberance) without observations		
			Dimension 1 (Easy-Going)		
	Variables with FA variance estimates-based Weighting	→	Dimension 2 (Regulation)	Dimensions Weighed Based on FA Variance	6. SEC Index with Observations (EW_4.5years)
			Dimension 3 (Exuberance) with observations		
			Dimension 1 (Easy-Going)		
			Dimension 2 (Regulation)		
Variables with FA variance estimates-based Weighting	→	Dimension 3 (Exuberance) without observations	Dimensions Weighed Based on FA Variance	7. SEC Index without Observations (FA_4.5years)	
		Dimension 1 (Easy-Going)			
		Dimension 2 (Regulation)			
		Dimension 3 (Exuberance) with observations			
Variables with FA variance estimates-based Weighting	→	Dimension 1 (Easy-Going)	Dimensions Weighed Based on FA Variance	8. SEC Index with Observations (FA_4.5years)	
		Dimension 2 (Regulation)			
		Dimension 3 (Exuberance) with observations			
		Dimension 2 (Regulation)			
					↓
				Equal Weighting	<ul style="list-style-type: none"> <li>• Overall SEC Index including 1,3 &amp; 5 (Index 1)</li> <li>• Overall SEC Index including 1,3 &amp; 6 (Index 2)</li> <li>• Overall SEC Index including 2,4 &amp; 7 (Index 3)</li> <li>• Overall SEC Index including 2, 4 &amp; 8 (Index 4)</li> </ul>
				Time Weighting	<ul style="list-style-type: none"> <li>• Overall SEC Index including 1,3 &amp; 5 (Index 5)</li> <li>• Overall SEC Index including 1,3 &amp; 6 (Index 6)</li> <li>• Overall SEC Index including 2,4 &amp; 7 (Index 7)</li> <li>• Overall SEC Index including 2, 4 &amp; 8 (Index 8)</li> </ul>

*Note.* SEC = Socio-emotional Competence; EW = Equal Weighting; FA = Factor Analysis.

## 2.1 Testing of the Index

To briefly test each derived index and help select the most empirically sound, I examined the relationship between these eight versions of the socio-emotional competence index with three other relevant outcome variables in the GUiNZ data set. These variables included: (1) handclap task at 4.5-year DCW (a measure of inhibitory control and executive memory functioning, which are aspects of cognitive functioning); (2) pragmatic language at 4.5 year DCW (measures the ability to communicate to others in more than just the vocabulary

itself); and, (3) parental perceived school readiness and difficulties experienced while starting school, which came from the 6 year DCW and allowed us to look at predictions over time. These outcome variables are described in Appendix A.

Executive functioning was chosen because affective processes are purported to interact dynamically with attentive EF and communication (Beauchamp & Anderson, 2009). For example, Schonert-Reichl et al., (2015) found that an intervention to improve socio-emotional development in children resulted in improvements in cognitive control in children aged 9 to 11.16 years. Regarding language, Horwitz et al. (2003) found language delays in children aged 12 to 39 months were associated with poor social competence. Similarly, Irwin et al. (2002) reported poor socio-emotional adjustment in late-talking toddlers. When interventions were carried out to improve early language, a reduction in internalising, externalising and overall problematic behaviours of preschool children was seen one year after the intervention (Curtis et al., 2017).

As for school readiness, pre-literacy skills such as phonological awareness, and alphabet and print knowledge, which many argue signify academic preparedness, have been found to be predicted by emotional expressiveness, regulation and knowledge in preschool children (Curby et al., 2015). Denham et al. (2015) found that emotional knowledge enhanced early classroom adjustment via social competence while Izard et al. (2001) reported that children from economically disadvantaged backgrounds tended to do better academically if they had adequate emotional knowledge.

As expected, all eight indices were positively associated with the all three outcome variables (see Table 2.4), but Index 6 with time-weighted socio-emotional competence scores (at each DCW), and equally weighted dimensions and variable scores including observations, were found to be the most empirically sound (with relatively better associations). As per the guidelines of Evans (1996), Index 6 had weak to moderate levels of correlation with the three outcome variables. The strongest correlation was with pragmatic language.

There are several reasons as to why Index 6 emerged as the most parsimonious one. It included variables related to observations such as expression identification on the AKT measure and observations related to a child's mood and engagement with the assessor (at 4.5 year DCW). Observations are considered to add breadth to the assessment and are advised to be used in conjunction with parental reports (Carter et al., 2003; Rothbart, 2011). In addition, as mentioned above, Index 6 also comprised of time-weighted socio-emotional competence scores at each DCW, with variables and the dimensions weighted equally as opposed to using empirical weighting. Equal weighting is generally the preferred mode of weighting variables as it gives better predictive results (Babbie, 1995; Blakemore & Gibbings, 2006; Booyson, 2002; Misson et al., 2011; Sanson et al., 2005). In addition, it also makes intuitive sense for the time weighted overall index to be most sound statistically, as relatively less weight should be given to socio-emotional competence scores at distant time points especially in a fast changing and developing child.

Based on the findings above, I calculated socio-emotional competence scores at each DCW using equal weighting at variable and dimension level and included scores based on observations at 4.5 years. These socio-emotional competence scores at and across the three DCWs were transformed to have a mean of 100 and SD of 15. Following which, the transformed scores were categorised by using 1 *SD* as the cut off to form three categories of socio-emotional competence: low, average and high. This categorical data can be used to calculate patterns of change or stability in levels of socio-emotional competence across the three DCWs, further allowing later exploration of demographical, familial and other environmental factors that contribute towards these patterns of stability or change. In addition, these patterns can be used to estimate their influence on other related developmental outcomes.

**Table 2.1**

*Correlations Between the Eight Different Indices and Handclap Total Score (4.5 years), Pragmatic Language (4.5 years) and School Readiness (6 years)*

Indices	Hand Clap Task (4.5 years; <i>n</i> = 4668)	Pragmatic Language (4.5 years; <i>n</i> = 4837)	School Readiness (6 years; <i>n</i> = 4464)
1. Overall socio-emotional competence equal weighting	.118***	.336***	.194***
2. Overall socio-emotional competence equal weighting with observations	.143***	.368***	.210***
3. Overall socio-emotional competence equal weighting (FA based)	.131***	.289***	.158***
4. Overall socio-emotional competence equal weighting with observations (FA based)	.149***	.310***	.169***
5. Overall socio-emotional competence time weighting	.157***	.363***	.195***
6. Overall socio-emotional competence time weighting with observations	.195***	.402***	.209***
7. Overall socio-emotional competence time weighting (FA based)	.169***	.355***	.194***
8. Overall socio-emotional competence time weighting with observations (FA based)	.179***	.366***	.199***

*Note.* \**p* < .05, \*\**p* < .01, \*\*\**p* < .001

Below, I briefly explore the relationships between the index at each DCW and pragmatic language and maternal perceived school readiness. I do not explore the relationship between the index and EF as this is explored in greater detail Chapter 4.

## **2.2 The Socio-emotional Competence Index, Pragmatic Language and School Readiness**

Overall, I found that socio-emotional competence at each DCW related to pragmatic language and school readiness (maternal perceived) and that this association grew stronger with time (see Table 2.5). The associations between socio-emotional competence at 4.5 years and pragmatic language and school readiness compared with their associations with overall socio-emotional competence index (See Index 6 in Table 2.4) show that an index capturing

level of socio-emotional competence across the early childhood period (from 9 months to 4.5 years) does not provide more information than an index at 4.5 years.

Also, relatively stronger correlations were observed between socio-emotional competence scores at 2 years and 4.5 years compared to their score at 9 months (see Table 2.6). This probably reflects the fact that the first year of a child’s life is marked by rapid changes in their development and their ability to express themselves. These changes tend to become relatively less rapid beyond infancy (Carter et al., 2003; 2004). In addition, socio-emotional competence at the 9-month DCW was measured by using scales measuring different aspects of temperament, which is only moderately stable in the first 2 years of a child’s life (Bates & Pettit, 2007; Rothbart, 2011); thereby explaining stronger relationships of socio-emotional competence scores at the later DCWs with each other, and the outcome variables.

**Table 2.2**

*Pearson Correlations Between Dimensions (Easy-Going, Regulation and Exuberance) and Overall Scores of Socio-emotional Competence Scores at each DCW with Pragmatic Language (4.5 years) and School Readiness (6 years)*

Dimensions	Pragmatic Language (4.5 years; <i>n</i> = 4837)	School Readiness (6 years; <i>n</i> = 4402)
9 months		
Easy-going	.08***	.05***
Regulation	.13***	.10***
Socio-emotional competence score	.15***	.10***
2 years		
Easy-going	.28***	.13***
Regulation	.14***	.06***
Socio-emotional competence score	.24***	.11***
4.5 years		
Easy-going	.25***	.16***
Regulation	.33***	.17***
Exuberance	.13***	.06***
Socio-emotional competence score	.42***	.21***

Note. \**p* < .05, \*\**p* < .01, \*\*\**p* < .001

**Table 2.3**

*Showing Pearson Correlations Between Socio-emotional Competence Index Score at each DCW (N = 4839)*

Socio-emotional Competence Index Score at each DCW	1	2
9 months		
2 years	.27***	
4.5 years	.27***	.41***

Note: \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

With respect to the three socio-emotional dimensions correlating with the outcome measures, relatively stronger correlations were found with pragmatic language compared to school readiness (see Table 2.5). The strongest relationship was observed for pragmatic language with the regulation dimension at the 4.5-year DCW. This is perhaps not surprising given that, even in early development, words are considered to be important tools for self-regulation as they are believed to be a means through which children can positively express their needs and dissatisfaction or frustration, rather than doing something impulsive (Cournoyer et al., 1998; Vallotton & Ayoub, 2011). The second highest correlation was observed between the easy-going dimension at 2 years and pragmatic language at 4.5 years (see Table 2.5). The easy-going dimension at the 2-year DCW included a vocabulary variable (words related to emotions), which may have enhanced the association; however, a similarly strong relationship was observed between pragmatic language and the easy-going dimension at 4.5 years, which did not contain a language related variable in the index. This suggests that the association between an easy-going dimension and pragmatic language is probably not just a method effect and that easy-going children may be better at communicating. There is some support for the association between the easy-going dimension and pragmatic language in the literature. Children with pragmatic language competence can typically use language in context, and the ability to do this has been strongly associated with decreased behavioural problems in a community sample (Ketelaars et al., 2010; Rints et al., 2014).

The relationships between socio-emotional competence dimensions at each DCW are shown in Table 2.7. Associations were generally stronger between the same dimensions at each DCW. The dimensions that did not significantly overlap all involved either the 9-month or 2-year regulation dimension. The lack of statistically significant associations could be because

the first few years of a child's life are marked by rapid development and this development may not be uniform across all the socio-emotional domains, perhaps particularly regulation (Sanson et al., 2010). The lack of associations with regulation may also be because what is generally considered dysregulated behaviour (tantrums, non-compliance and aggression towards peers), and therefore maladaptive, may in fact be a hallmark of normal development during the early years, reflecting in particular the development of independence around the age of two (Dunn et al., 1996).

**Table 2.4**

*Showing Pearson Correlations Between Socio-emotional Competence Dimensions (Easy-Going, Regulation and Exuberance) at Each DCW (N = 4839)*

Child Dimensions	1	2	3	4	5	6
9 months						
Easy-going						
Regulation	-.02					
2 years						
Easy-going	.30***	.06***				
Regulation	-.02	.24***	.16***			
4.5 years						
Easy-going	.26***	.01	.53***	.01		
Regulation	.03***	.26***	.18***	.33***	.16***	
Exuberance	.14***	.04***	.17***	.01	.15***	.04***

*Note.* \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Overall, the correlations between the dimensions were not high over time and this may be because parental reports were exclusively relied on to assess socio-emotional development at the 9-month and 2-year DCWs. Parents may not have had the experience to discern between problematic and non-problematic dysregulation (Carter et al., 2004) as their child's behaviour was interpreted based on their history of interaction with children, as well as cultural values and beliefs (Clark et al., 2004; Rothbart, 2011). Notably, at the 4.5-year DCW, no correlation was observed between the regulation and the exuberance dimensions. While this could be because these dimensions measure different aspects of socio-emotional competence, it may also be a method effect as the exuberance dimension included observations, which may differ

from parental ratings (Carter et al., 2004), which were exclusively relied upon to calculate the regulation child dimension.

### **2.3 Strengths and Limitations**

The strengths of this index are that the measures used to construct it are easily accessible and unproblematic to administer to different populations and in different settings making it possible to repeat this measure to look for change if required. In addition, different versions of the index (using different types of weighting) were calculated and assessed, which adds to its validity. Finally, the index uses measures that tap into emotional and social strengths as well maladaptive behaviours, allowing for a more comprehensive assessment which may, over time be helpful to those looking to identify children at potential risk of poor socio-emotional development (Campbell et al., 2016).

A limitation of this study is that factors/dimensions that emerged from the analyses did not map onto the theoretical model of socio-emotional competence proposed by Denham (2006) that guided this study. One of the reasons is that measures that exclusively assessed one domain of socio-emotional competence were not available. Still, we should keep this in mind while interpreting results of analyses using this index. Another drawback was that, for developmental reasons, different variables were used to measure emotions and behaviours at each DCW. Therefore, the meaning of dimensions and the socio-emotional index at each DCW may differ from one another. However, as mentioned before, consistently stronger relationships were found between the same dimensions at each DCW (Table 2.7), which indicates they are likely to be measuring a similar, if not the same, basic concept. It is important to keep in mind that the cut-off of 1SD used to categorise socio-emotional development into high and low categories was arbitrary, which means it cannot be considered clinically significant. Therefore, although it still provides an avenue to compare children's socio-emotional competence scores relative to one another, researchers need to treat such data sensitively.

Another potential limitation is that the index was mostly constructed using maternal ratings, apart from the observations included in the 4.5-year DCW. Paternal ratings were not included. This singular reliance on parental report is not ideal (Carter et al., 2004) as there may be biases involved in their ratings (Meisel & Wasik, 1990; Campbell et al., 2016). However, the measures used were mostly focused on factual information regarding specific situations, which decreased the reliance on parental interpretation (Campbell et al., 2016). Furthermore, parents' views about their children affect their parental practices, ultimately influencing children's behaviours and vice versa, potentially resulting in a feedback loop (Sameroff & Chandler, 1975; Thomas & Chess, 1977; Sameroff, 2009). Therefore, parental reports are important to capture when trying to create a picture of a child's socio-emotional development.

The study used a mix of scales that tapped into problems and skills. At the 2-year DCW there was an over-representation of negatively worded scales. It may be argued that absence of a problem does not signal competency. However, skills are developing during the early childhood. In that respect, absence of problematic behaviours may later mature into competency. In addition, young children are limited in their ability to express their competency cognitively, emotionally and physically.

At a more general level, it is important to acknowledge that there is continued debate about the value of index formation as it is argued to simplify a complex concept and thereby lose information. Despite this, I believe that the index is potentially useful. But, how important a child's score on this index is in the long-term is yet to be determined. Caution should be exercised when using the index and interpreting the results. It is important to remember that early childhood is a dynamic phase of a child's life. Changes are taking place in the child's mind and body at a greater rate than any other life-stage. Therefore, while our index can provide a snapshot of a preschool child's life at a particular moment, it is important to remember their socio-emotional strengths are likely to change. Secondly, we need to be mindful that the variables included in this index assess emotions and behaviours within a

largely Western framework. That is, the variables used reward emotions and behaviours considered generally “adaptive” in the Western world, which may be viewed differently under different cultural frameworks. Therefore, I believe that while this index provides a potentially useful early measure of “socio-emotional competence” of a child in this cohort, researchers and policy makers need to be aware that changes may be needed when applying the index to other contexts.

## **2.4 Conclusion**

An Index of socio-emotional competence was developed using data from the GUiNZ study for children aged 9 months to 4.5 years approximately. The Index was calculated following the methods described by Booyesen (2002) and the Joint Research Centre – European Commission (2008). This paper initially aimed to develop an index of socio-emotional development based on the model of socio-emotional competence given by Denham (2006), which drew on the Rose-Krosnor (1990) model of social competence, comprising of: emotional expressiveness, understanding of emotions, regulation of emotions and behaviour, social problem solving and social relationship skills. However, factor analysis led to the emergence of three child dimensions: easy-going, regulation and exuberance (the latter emerged at the 4.5-year DCW only as a child’s emotions and behaviours become more complex with development). The emergence of dimensions rather than domains/components of socio-emotional competence (given by Denham, 2006) was in part expected because the variables used to construct the index each concerned more than one aspect of socio-emotional competence. The variables included provided good conceptual coverage of the socio-emotional competence model and had adequate internal consistency and discriminatory power. However, variables at each DCW were not the same suggesting that the meaning of the index and its dimensions is not the same at each DCW. On the other hand, it also reflects the changing nature of developmental tasks during early childhood.

The index gives both a score of socio-emotional competence at each DCW and an overall score, taking into account data from each DCW. However, results showed that the across-time index was not a better predictor of outcomes than the index using measures at 4.5 years only. It also gives a score of each of the socio-emotional competence dimensions (easy-going, regulation and exuberance), which allows for analysis of weakness or strength in each dimension – adding breadth to the data. I also calculated both continuous and categorical index scores for socio-emotional competence at each DCW and across all DCWs, which allow for flexibility in further analytical use of the index.

Our socio-emotional competence index at each DCW also gives us access to contemporary and localised information about the relative patterns of stability and change in socio-emotional competence in New Zealand children across the first five years of a child's life (this is explored in another article by Ahmad et al. (under review). Future research can then explore the demographical, familial and environmental basis of the patterns of change or stability in socio-emotional competence. The knowledge gained from this research can potentially be used to identify children at risk of poor socio-emotional competence development as early as possible and to explore which factors may help to mitigate persistently low levels of socio-emotional competence, and which factors promote improvements. In addition, the index could be used to provide a way of potentially tracking change in socio-emotional competence over early childhood if an intervention (whether it be targeted or universal) was undertaken.

This index can potentially also be used to assess how different patterns of early socio-emotional development effect other outcomes. Ultimately, I hope that the use of this index will help us to better understand the development of children's socio-emotional competence over time, with a view to later helping children, families and communities to reap the lifelong benefits that socio-emotional competence can bring.

## **Chapter 3. What Does Socio-emotional Development Look Like in New Zealand Children Under the Age of Five? Findings from a New Zealand Cohort Study (Study 1b)**

### **3.1 Introduction**

The previous chapter described the development of socio-emotional competence indices for the early childhood period and their dimensions. This chapter describes the study (Study 1b), which assessed the level and patterns of early socio-emotional competence development using the indices developed in Study 1b. In this study, the sample was subdivided into children with *no* low socio-emotional competence and *at least one* low socio-emotional competence (relative to the sample) to assess for the stability in the levels of early socio-emotional competence. This is likely to be of interest to those looking to understand base levels and change in early socio-emotional competence development.

The following account is a copy of the Study 1b manuscript that being revised for resubmission to *New Zealand Journal of Psychology*. Supplementary material referred to in the study has been included in Appendix B.

Over the past three decades, within education and policy, there has been an increasing shift away from prioritising only the development of children's intellectual competence (e.g. literacy and numeracy skills) to developing so-called softer socio-emotional skills and competencies. This shift was in part spurred by the Organization for Economic Co-operation and Development (OECD), when it recommended that member countries incorporate into their curricula three broad categories of key competencies to help promote the development of good citizens that are successful, socially responsible and capable of solving complex problems in an increasingly diverse and interconnected world. One of the key competencies identified by the panel of experts was the ability to work in heterogenous groups (OECD, 2005). In the current New Zealand school curriculum this key competency was translated into two competencies: relating to others, and participating and contributing (Ministry of Education, 2007).

Currently, the Ministry of Education in New Zealand is exploring the development of a new school entry assessment which includes the assessment of early socio-emotional skills.

This is in part response to the Office of the Prime Minister’s Chief Scientific Advisor Professor Gluckman’s Briefing paper to the Secretary of Education which states: “A deliberate well-designed national approach to measuring in these areas of development is urgently needed” (McNaughton & Gluckman, n.d., p.9). Similarly, Professor McNaughton (the Chief Scientific Advisor to the Ministry of Education) at a recent hui on the *School Entry Assessment: Social Emotional Learning* (2020) argued that we need to assess socio-emotional competency on entry to school in order to: better understand developmental needs; get a better picture of the whole child; know that we are actually promoting these competencies within the New Zealand educational system; and develop digital citizenship (including literacy, thinking, relating to others and managing self).

This growing focus on the measurement and development of socio-emotional key competencies aligns with research on socio-emotional competence within the developmental psychology literature. That is, research on socio-emotional competence is increasingly reflecting the growing awareness of the importance of socio-emotional development for a range of outcomes including readiness to learn (Denham, 2006; Raver, 2002; Britto, 2012; Raver, 2014; United Nations Children’s Emergency Fund., 2012), having more healthy and meaningful relationships (Parker & Gottman, 1989; Parke, 1994; Saarni, 1990), and having sound mental and overall health (Cheevers & O’ Connel, 2012; Sanson et al., 2010; Shonkoff & Phillips, 2000).

Given these broad benefits, it is not surprising that amongst policy makers, educationalists and child development experts internationally there is an increase in drives to understand: (1) the levels and patterns of early socio-emotional competence development; (2) the facilitators of those patterns and shifts in those patterns, and (3) the outcomes associated with different levels and patterns of early socio-emotional competence development (Carter et al., 2004).

In the present study I seek to investigate the first of these within a New Zealand context. That is, I seek to describe the level and patterns of early socio-emotional competence development across the preschool years using data from a large representative sample of New Zealand children participating in the *Growing Up in New Zealand (GUiNZ)* study. This provides important baseline information about the natural stability of socio-emotional competence across early childhood within a New Zealand cohort, before initiatives are introduced seeking to intervene to create change in children with low level of skills. This research also helps create an important backdrop from which subsequent research can seek to understand the facilitators of early socio-emotional competence development, and the outcomes of different levels of socio-emotional competence and patterns of its development over time.

### **3.1.1 Socio-emotional Competence**

As the name implies, socio-emotional competence from a developmental psychology perspective consists of emotional competence and social competence. Emotional competence relates to one's ability to express, understand and manage emotions (Halberstadt et al., 2001; Denham, 2006; Clarke-Stewart & Parke, 2014). Social competence relates to an individual's ability to have effective and appropriate relationships and interactions with other humans (Rose-Krasnor, 1997; Han & Kemple, 2006), and includes the skills and knowledge needed to make appropriate and adaptive life choices, and deal with challenges (Leffert et al., 1997; Denham, 2006; Calaguaz & Dizon, 2011).

#### **3.1.1.1 Development of Socio-emotional Competence**

Emotional competence and social competence develop and operate interactively - becoming more intimately linked with development (Denham, 1998; Saarni, 1999; Denham et al., 2011). For example, emotions govern the flow and results of social interactions, while expression and experience of emotions is governed by the interpersonal consequence of emotions (Halberstadt et al., 2001). Children's ever-developing ability to express, and

subsequently understand and discern their emotional states from others is used by them to navigate their interactions with others (Saarni, 1990; Denham, 1998; Thomas & Meyers, 2007).

The manifestations of socio-emotional competence differ at different stages of a child's early life. Starting from birth, newborns are able to effectively express basic emotional states (Halberstadt et al., 2001). Approximately 2 months after birth, they start to exhibit social initiatives such as smiling socially (Fox & Davidson, 1988). Around 7 months, most infants are able to recognise affect in faces and voice by integrating emotional cues received through senses (Grossmann et al., 2006). During the first 10 months, infants also increasingly start to use emotions instrumentally to influence their social surroundings (Denham, 2006).

By 2 to 3 years of age, children also start to use language to describe their and other people's emotions as well as talk about past and present emotions (Kuebli, 1994). Emotional regulation is also argued to emerge during toddlerhood. For example, toddlers learn to express their anger through words rather than throwing a tantrum (Kopp, 1989; Shatz, 1994), and very young children can wait until a parent or caregiver is nearby before expressing their emotions (Blurton, 1967). By 3 to 5 years, children have typically developed a set of coping behaviours to manage their emotions (Fabes & Eisenberg, 1992).

During late preschool years, at 4 to 5 years, children usually begin to understand meaning behind others' emotions (Baron-Cohen & Ring, 1994; Denham, 2006; Pons & Harris, 2005) with improvements in the use of emotional language (Denham et al., 1992). At this age, they also start to better understand the intricacies of emotional experience. They can, for instance, comprehend that more than one emotional message could be experienced by them or communicated to them at the same time; which could even be contrasting (Kuebli, 1994; Denham, 1998; Kestenbaum & Gelman, 1995). For example, a young child can understand that he may love his younger brother but, at the same time, can be angry with him as well.

As can be seen, in the first few years, children go through rapid development with new socio-emotional competencies coming online and overriding/upgrading the old ones (Carter et al., 2004; Carter et al., 2003; Pons & Harris, 2005); owing to which, it is expected that children will exhibit shifts in the levels of socio-emotional competence (low, average and high) during this period. To the best of our knowledge, the patterns of shifts in the levels of socio-emotional competence (assessed as an integrated system of competencies) in the early life has not been tracked before across multiple time points in a population-based sample.

While there have been studies aimed at assessing the longitudinal patterns of some aspects of children's social and emotional development across the first few years of life, they have been mostly restricted to problem behaviours assessed across two (e.g. Briggs-Gowan, Carter et al., 2006; Mathiesen & Sanson, 2000; Meunier et al., 2011) and three time points (Bub et al., 2007; Egeland et al., 1990) in both risk-diverse (broadly representative) and at-risk samples. While it is important to study problem behaviours, it is also important to assess strengths as well to gain better understanding of socio-emotional development (Darling-Churchill & Lippman, 2016).

Studies focused on socio-emotional competency have typically been restricted to one component (Brown & Dunn, 1996; Dunn et al., 1991; Hughes & Dunn, 1998; Kårstad et al., 2015; Pons & Harris, 2005). As different domains of socio-emotional competence interact with each other, it is important to longitudinally explore socio-emotional competence as a unified system of abilities. The sum of these abilities is expected to be more than the sum of their parts. Hence, assessing domains of socio-emotional competence separately is arguably not sufficient. The Longitudinal Study of Australian Children has measured socio-emotional well-being every 2 years starting from infancy (Sanson et al., 2010; Hancock et al., 2018). However, it has not evaluated the patterns of levels of early socio-emotional well-being specifically. This study, therefore, aims to assess global socio-emotional competence across the early life to

investigate how the levels of socio-emotional competence shift (within a nationally representative population-based sample) when new competencies come on board with age.

Examining the degree of natural flux in and out of different levels of early socio-emotional competence within a normal population is also important to understand and has not been explored. Having some sense of a baseline, and the stability of that baseline, is important before seeking to intervene to create change in children with low levels of socio-emotional competence. While with hindsight, we can track back and identify children who were persistently low in their socio-emotional competence across the preschool years and say we should have intervened, it may not have been possible to single out those children who would go on to have persistently low socio-emotional competence from others with initially low socio-emotional competence but which improved with the course of natural development. If we assess and intervene too early we run the risk of rolling out potentially costly interventions for children that do not need them. In addition, without some sense of the natural flux in these levels, programmes may show gains or losses when, in fact, what they are observing is natural developmental shifts.

Research on early interventions has shown that socio-emotional competence can be developed. For example, interventions have been found to be successful in: decreasing negative emotions (Denham & Burton, 1996); internalising and externalising problems (Han et al., 2005; Herbert et al., 2013); improving social problem solving, social behaviour, emotional understanding (Bierman et al., 2008); and self-regulation (Diamond et al., 2007). However, if there is a high degree of natural flux such interventions may appear effective when they may just[ be reflecting natural shifts as children develop. It is therefore crucial to assess the stability of socio-emotional competence during the early childhood years to create a baseline against which interventions seeking to create change can compare. Therefore, this study aimed to examine the developmental stability of socio-emotional competence in early years in a large normal New Zealand population to give us an overview of these natural shifts within a

population. Having said that, this research was particularly interested in exploring the patterns of levels of socio-emotional competence for children with an early low, to understand if the relative lag persists or if it changes with development.

## **3.2 Method**

### **3.2.1 Participants**

The present study utilised data from the Growing Up in New Zealand (GUiNZ) study, which is following the life course of 6853 children, born between 25<sup>th</sup> April 2009 and 25<sup>th</sup> March 2010, from the Waikato, Auckland and Counties Manukau District Health Boards in New Zealand from approximately 6 weeks before their births. The cohort is a representative of New Zealand births between 2007 and 2010 based on a child's sex and other birth characteristics and matches NZ parents on characteristics such as mother's age, ethnicity, socioeconomic status and parity (Morton et al., 2014).

### **3.2.2 Procedure**

The data was collected through face-to-face, online and phone interviews from mothers and partners, and through direct observations of children and their parents. Each data collection phase was initiated after getting permission from the New Zealand Ministry of Health Northern Y Regional Ethics Committee (NTY/08/06/055). Further information regarding the study's design and recruitment can be found in Morton et al. (2014; 2017).

### **3.2.3 Measure**

To assess the level of socio-emotional competence, I developed an index using a total of 26 variables (from seven measures tapping into socio-emotional strengths and difficulties; see Table 3.1) taken from three GUiNZ data collection waves (DCWs): 9 months, 2 years and 4.5 years (Ahmad et al., 2019). I used data of 6156 participants who participated in the 4.5 years DCW. The index gives socio-emotional competency scores for each DCW (using age-specific measures of socio-emotional competencies) and an overall score of socio-emotional

competence across all DCWs. Please see Table 3.2 for a summary of the process used to develop the index.

**Table 3.1**

*Showing Variables Included in the Index at Each Data Collection Wave*

Data Collection Waves	Variables Selected
9 months	Infant Behavior Questionnaire – Revised Very Short Form (IBQ-R VSF; Putnam et al., 2014) <sup>1</sup> Negative Emotionality Positive Affectivity/Surgency Fear Affiliation Regulation Orienting Capacity
2 years	Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997; Youth in Mind, 2014) Emotional Problems Conduct Problems Hyperactivity Peer Problems Prosocial MacArthur Cognitive Development Inventory – Toddler Short Form (Fensen et al., 2000) Only words related to emotions were included: DesRosiers Measure of Self Concept (DesRosiers & Busch-Rossnagel, 1997) Self-Regulation Scale
4.5 years	Child Behavior Questionnaire – Very Short Form (CBQ-VSF; Putnam & Rothbart, 2006) <sup>2</sup> Negative Affect Effortful Control Surgency Hardiness Boldness <sup>3</sup> Attention Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997) Emotional Problems Conduct Problems Hyperactivity Peer Problems Prosocial Expression Identification – Affective Knowledge Task (AKT; Denham, 1986) Assessor Report from Preschool Self-Regulation Assessment (PSRA; Smith-Donald et al., 2007) Questions related to child’s attempt to engage with the interviewer and mood observed

<sup>1</sup>Five factor structure based on the work of Peterson et al. (2017) was used.

<sup>2</sup>Six factor structure based on the work of Stubbing et al., (2017) was used.

<sup>3</sup>Labelled as fear in the research.

**Table 3.2**

*Description of Method Used to Calculate Socio-emotional Index.*

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**Stage 1: Selection of variables**

- Measures corresponding to Denham’s model of socio-emotional competence were selected.
- Selected measures provided good conceptual coverage (age-appropriate) and had adequate internal consistency and discriminatory power (the ability to discriminate between poor and good performers).
  - For the present study, good and bad performers, with scores below and above 1SD respectively accounted for 6 to 29 percent of the sample for the selected variables.
- Only variables that correlated with all or most (more than 50%) of the variables were selected; strength of the correlation was not a criterion (Field, 2014).

---

**Stage 2: Scaling of variables**

- Cases having more than 10 percent of the values missing were deleted and Missing Value Analysis was carried out for the remaining cases with fewer than 10 percent missing data.
- Variables were standardised to z-score.
  - Vocabulary task (2-year DCW) and Affective Knowledge Task (4.5-year DCW) were already on interval scale, so they were standardised to z-score.
  - IBQ-R-VSF, SDQ, Self-Regulation scale from DesRosiers Measure of Self Concept and CBQ-VSF with Likert scales were treated as continuous, so they were also standardised to z-score.
  - Two Likert-like items measuring engagement with observer and mood during observations at 4.5-year DCW were aggregated to form a Likert scale as Exploratory Factor Analysis (EFA) showed them loading onto a single factor. They were then standardised. Three dichotomous items related to observed aggression were aggregated to form a Likert scale, as EFA showed them loading onto a single factor. They were then standardised.
- Z-scores of variables with negative connotation were multiplied by -1 so that higher score showed better functioning.

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**Stage 3: Weighing and Aggregation**

- Exploratory Factor Analysis with Direct Oblimin rotation was carried out at each DCW to see how variables grouped together. Adequate factor loading was set at 1.62 (Steven, 2002).
  - Variable related to observed aggression did not load well so it was dropped.
  - Cross-loading variables were not dropped as cross-loading was expected due to conceptual overlap between the variables.
- Equal and factor analysis variance estimate based weighting was done to calculate domain scores at each DCW.
- At 4.5-year DCW, domain scores were calculated with and without observation scores.
- The domain scores were aggregated together after being weighed equally and based on factor analysis variance estimates to give socio-emotional competence index scores at each DCW.
- The index scores at each DCW were aggregated based on equal and time-based weighting to give a series of overall socio-emotional competence score – eight in total.
- These eight socio-emotional competence scores were checked to examine their relationship with three outcome variables that were expected to be related such as scores on: handclap task, pragmatic language and school readiness, to pinpoint the most empirically sound index. Overall index comprising of time-weighted socio-emotional competence scores (at each DCW) with equally weighted domain and variables scores was found to be the most empirically sound.

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**Stage 4: After index creation**

- An overall index score and index scores at each DCW were standardised to have a mean of 100 and SD of 15.
-

Please note that in Stage 3, three factors emerged from the Exploratory Factor Analysis: easy-going, regulation and exuberance. They did not correspond to domains of socio-emotional competence listed in the Denham's model (2006) including emotional expressiveness, understanding of emotions, regulation of emotions and behaviours, social problems solving and social relationship skills. This was partly expected as measures used to develop the index assessed more than one domain of socio-emotional competence. The emergence of these factors could be a method effect, which is a limitation of the index. It could also mean, however, that it is difficult for domains of socio-emotional competence to differentiate cleanly as these domains operate interactively with advanced socio-emotional abilities developing from basic skills (Jones & Bouffard, 2012).

The index of socio-emotional competence is available in both categorical and continuous form. Scores less than 1SD below the mean were categorised as Low, while scores within 1SD of the mean as Average. Finally, scores 1SD above the mean were assigned to the level of High. Sufficient data regarding socio-emotional competence at each DCW was available for 4839 participants (after missing value analysis, see Chapter 2; Ahmad et al., 2019), which did not significantly differ from the full sample ( $n = 6156$ ) at 4.5 years in terms of key demographics of child's gender, parity (antenatal) and mother's age. However, there was overrepresentation of mothers with a European ethnicity and higher socioeconomic status in the reduced sample (Table 3.3). The difference, however, was small, Cramer's  $V < 0.07$  (Cohen, 1988). This suggests that the sample can be considered broadly representative of New Zealand children at 4.5 years.

**Table 3.3***Characteristics of the Sample Before and After Deletion and Missing Value Analysis*

Characteristics	Full Data ( <i>n</i> = 6156)		Reduced Dataset ( <i>n</i> = 4839)	
	<i>N</i>	%	<i>N</i>	%
Child's Gender				
Boy	3165	51.4	2459	50.8
Girl	2986	48.5	2378	49.1
Child's Parity (antenatal)				
0	2170	35.3	1740	36.0
1-5	3328	54.1	2567	53.0
6-10	79	1.3	59	1.2
≥11	14	.2	11	.2
Mother's Age				
<20	250	4.1	199	4.1
20-24 years	829	13.5	657	13.6
25-29 years	1495	24.3	1131	23.4
30-34 years	1972	32.0	1587	32.8
35-39 years	1338	21.7	1058	21.9
≥ 40 years	271	4.4	207	4.3
Mother's Ethnicity <sup>1</sup>				
European	3491	56.7	2927	60.5
Māori	813	13.2	622	12.9
Pacific	785	12.8	558	11.5
Asian	845	13.7	571	11.8
MELAA	115	1.9	79	1.6
Other	11	.2	<10	.2
New Zealander	78	1.3	61	1.3
Household deprivation quintile index 2013 <sup>2,3</sup>				
NZ Dep Q1 (least deprived)	1227	19.9	1048	21.7
NZ Dep Q2	1119	18.2	948	19.6
NZ Dep Q3	1033	16.8	887	18.3
NZ Dep Q4	996	16.2	832	17.2
NZ Dep Q5 (most deprived)	1436	23.3	1095	22.6

*Note.* MELAA = Middle Eastern, Latin America, or African.

<sup>1,2</sup> 18 (.3%) and 345 (5.6%) participants had data missing data on mother's ethnicity and household deprivation in the full dataset.

<sup>3</sup>The New Zealand Deprivation Index combines nine socioeconomic variables from the 2006 census capturing eight dimensions of deprivation at the small area level. In this table the original deprivation scores (measured in deciles) have been collapsed into quintiles. Quintile 1 (Q1: Deciles 1 and 2) represents the households in the least deprived 20% areas, whereas Quintile 5 (Q5: Deciles 9 and 10) represents the households in the most deprived 20% areas (Salmond, Crampton, & Atkinson, 2007).

### 3.2.4 Data Analyses

All analyses were conducted using IBM Statistical Package for Social Sciences (SPSS; Version 24). Pearson correlations were calculated to assess relationship between scores of socio-emotional competence at each DCW, while chi square and Somers' *D* were calculated to examine the stability of the classifications into low, average and high levels of socio-emotional competence (relative to the sample) across the DCWs. It was also of interest to assess stability in the groups with at least one instance of low socio-emotional competence across the three DCWs. Therefore, I divided the whole sample into subgroups with at least one and no instance of low socio-emotional competence and calculated Pearson correlations, chi square and Somers' *D* for these subgroups.

As Average to High levels of socio-emotional competence in general are perceived as positive, to assess the shift in the levels of socio-emotional competence I combined Average and High levels to give us an AvgHigh level, and this was contrasted with low level of socio-emotional competence. This resulted in eight patterns of socio-emotional competence across the three DCWS. For ease of understanding, these were further categorised into groups: *Persistent Lows* with two or more recently low periods (Low-Low-Low; AvgHigh-Low-Low); *Recent Low* (Low-AvgHigh-Low; AvgHigh-AvgHigh-Low); *Improved* (Low-Low-AvgHigh; AvgHigh-Low-AvgHigh; Low-AvgHigh-AvgHigh); and finally, *No Lows* (AvgHigh-AvgHigh- AvgHigh). The group *Persistent Lows* also included the pattern AvgHigh-Low-Low, which seems counter-intuitive. However, this was done on purpose because socio-emotional competence goes through rapid development during infancy, the expectation is persistence in low levels of socio-emotional competence later in early childhood can be more problematic. That is why the pattern AvgHigh-Low-Low was included in the group alongside Low-Low-Low, which signalled more deficits relative to other groups.

To allow for variance in the *No Lows* group, which contained the bulk of the respondents, it was further divided into patterns (of shifts in levels of socio-emotional

competence) containing Average socio-emotional competence (within 1SD of the mean) and High socio-emotional competence (1SD above the mean), which were considered separately across the three time points. Hence, the following developmental patterns were also explored: two Highs across the three DCWs: High-High-Avg; High-Avg-High; Avg-High-High; three Highs across the three DCWs: High-High-High), and a pattern named Mostly Average including Avg-Avg-High; Avg-High-Avg; High-Avg-Avg; Avg-Avg-Avg combined. In all, these 12 developmental patterns accounted for all patterns of shifts in the levels of socio-emotional competence in the participants across the three DCWs.

### **3.3 Results**

The aim of the present study was to assess the level of and patterns of socio-emotional competence development across three DCWs of 9 months, 2 years and 4.5 years. I was interested in understanding the extent to which the membership of Low, Average and High levels changed over time (the stability) as this gives us an indication of natural flux in and out of these levels relative to the rest of the sample.

Table 3.4 shows the stability of socio-emotional scores using Pearson's correlations between scores of socio-emotional competence index at each DCW for the whole sample ( $n = 4839$ ), and the correlation between the index scores for the subgroups of children with no instance ( $n = 3133$ ) and at least one instance of Low socio-emotional competence ( $n = 1706$ ) across the three DCWs. For the whole sample, a moderate correlation was reported between scores of socio-emotional competence at 2 years and 4.5 years,  $r(4837) = .41, p < .001$  suggesting some overall stability between 2 and 4.5 year socio-emotional competence. In contrast, overall scores of socio-emotional competence at 9 months had a weak correlation with scores at 2 years and 4.5 years,  $r(4837) = .27, p < .001$  (according to the standards given by Evans, 1996). Broadly this suggests that 9 months socio-emotional competence changes more over the preschool years but becomes more stable between the ages of 2 and 4.5 years. For the subgroup of children with no instance of Low socio-emotional competence, relatively weaker positive relationships (relative to the whole sample) were observed but the patterns remained the same as they did for the whole sample.

**Table 3.4**

*Pearson Correlations Between Socio-emotional Competence Index Score at each DCW (N = 4839)*

Socio-emotional Competence Index Score at each DCW	9-month DCW	2-year DCW
Whole sample		
2 years	.27***	
4.5 years	.27***	.41***
Subgroup with no instance of Low SEC		
2 years	.20***	
4.5 years	.23***	.32***
Subgroup with at least one instance of Low SEC		
2 years	-.15***	
4.5 years	-.19***	.08***

*Note:* SEC = Socio-emotional Competence

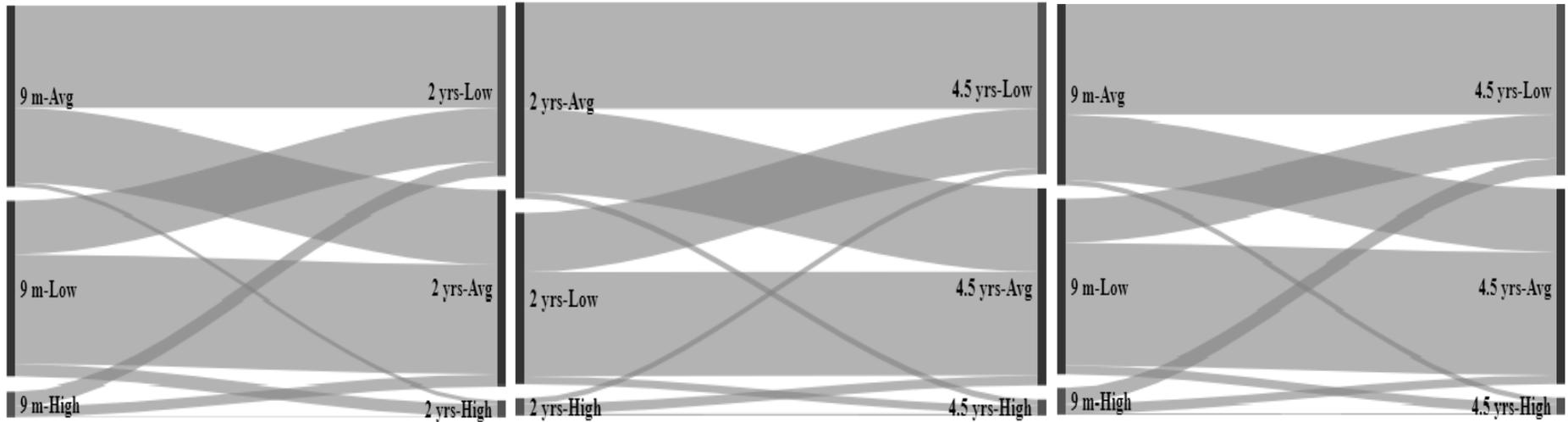
\*\*\* $p < 0.001$

However, for the subgroup with at least one instance of Low socio-emotional competence, negative associations (of relatively lesser magnitude) were observed between scores at 9 months, and 2 years DCWs,  $r(4837) = -.15, p < .001$  and 4.5 years,  $r(1704) = -.19, p < .001$ . Since the associations were negative, it suggests there was a pattern of movement in the opposite direction. However, based on the size of effect (Evans, 1996), this pattern was weak. The negative strength of the correlations suggests some movement within this subgroup especially in the opposite direction. To further explore this movement, Sankey charts were constructed to help show the patterns of shift in the levels of socio-emotional competence across the three DCWs for the subgroups with at least one instance of Low socio-emotional competence (Figures 3.1 – 3.3) and with no instance of Low socio-emotional competence (Figure 3.4 – 3.6). Sankey charts show that there was movement across different groups.

I also calculated chi-squares to test the overall stability of classifications of socio-emotional competence scores at the three DCWs into the levels of Low, Average and High, and used Somers' *D* to assess the direction of these associations (see Table 3.5). For the whole sample, stability of classifications into the three levels of socio-emotional competence across the three DCWs (9 months to 2 years; 9 months to 4.5 years; and 2 years to 4.5 years) were found to be statistically significant, and associations were in the same direction (all  $\chi^2/df = 63.79 - 131.1$ , all  $ps < .001$ ; Somers' *D* = .20 - .29) with higher stability from 2 years to 4.5 years (medium effect size; Cramer's *V* = 0.16) relative to 9 months to 2 years (small effect size; Cramer's *V* = 0.12) and 4.5 years (small effect size; Cramer's *V* = 0.11).

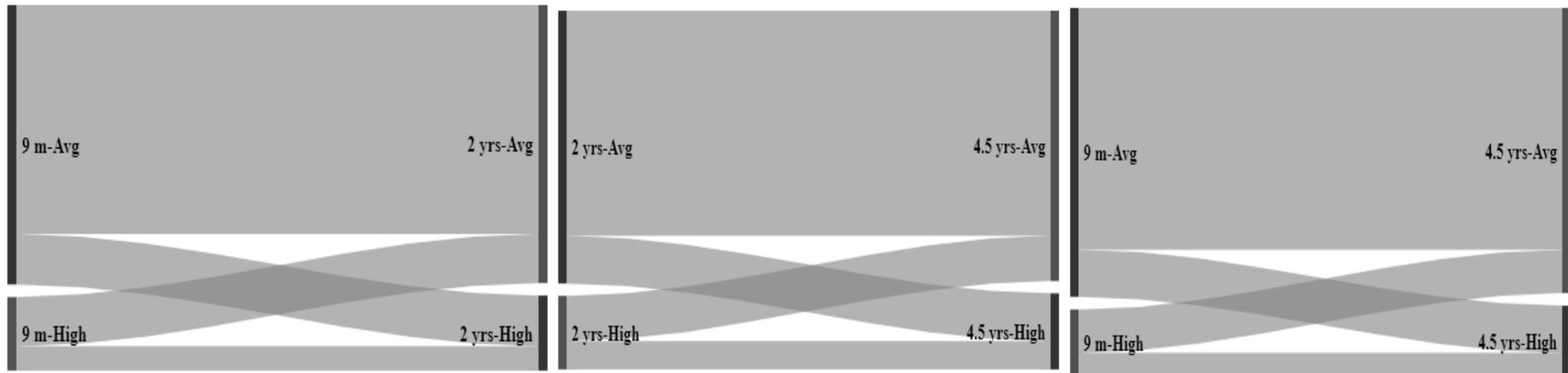
**Figures 3.1–3.3**

*Sankey Charts for the Subgroup with At Least One Instance of Low Socio-emotional Competence Showing Movements In and Out of the Levels of Socio-emotional Competence (Low, Average & High) Across the Three DCWs (9 months, 2 years & 4.5 years) (n = 1706).*



**Figures 3.4–3.6**

*Sankey Charts for the Subgroup with No Instance of Low Socio-emotional Competence Showing Movements In and Out of the Levels of Socio-emotional Competence (Average & High) Across the Three DCWs (9 months, 2 years & 4.5 years) (n = 3133).*



**Table 3.5***Results of Chi-Square and Somers' D Showing Change/Stability in Classifications of Socio-emotional Competence Across the Three DCWs.*

Movement	9 Months to 2 Years					9 Months to 4.5 Years					2 Years to 4.5 Years				
	L	Avg	H	$\chi^2$ ( $\chi^2/df$ )	Somers' <i>D</i>	L	Avg	H	$\chi^2$ ( $\chi^2/df$ )	Somers' <i>D</i>	L	Avg	H	$\chi^2$ ( $\chi^2/df$ )	Somers' <i>D</i>
Whole sample (N = 4839)															
L	236	490	56	270.56***	.20***	195	546	41	255.16***	.20***	264	460	35	524.4***	.29***
Avg	457	2364	468	(67.64)		496	2317	476	(63.79)		472	2406	460	(131.1)	
H	66	484	218			71	455	242			26	452	264		
Subgroup with no instance of low SEC (n = 3133)															
Avg	-	2032	449	69.77***	.15***	-	2320	451	99.48***	.18***	-	2036	432	134.70***	.21***
H	-	436	216	(69.77)		-	415	237	(99.48)		-	409	256	(134.70)	
Subgroup with at least one instance of low SEC (n = 1706)															
L	236	490	56	127.5***	-.25***	195	546	41	228.39***	-.32***	264	460	35	72.18***	-.14***
Avg	457	332	19	(31.88)		496	287	25	(57.10)		472	370	28	(18.05)	
H	66	48	<10			71	40	<10			26	43	<10		

Note. L = Low; Avg = Average; H = High; SEC = Socio-emotional Competence;  $\chi^2$  = Chi-Square; *df* = Degrees of Freedom.

The subgroup with no instance of low socio-emotional competence had significant associations between the socio-emotional competence's classifications between all the DCWs (all  $\chi^2/df = 69.77 - 134.7$ , all  $ps < .001$ ) with small effect sizes (Cramer's  $Vs < .20$ ) and were also in the same direction (Somers'  $D = .15 - .21$ ; all  $ps < .001$ ). Small effect size and Somers'  $D$  values suggest that levels of socio-emotional competence depended on earlier levels of socio-emotional competence but only weakly so. Hence, there was some movement from Avg to High and vice versa. This is visually depicted in Figure 3.4 to 3.6.

For the subgroup with at least one instance of Low socio-emotional competence, significant associations were also observed between the classifications (all  $\chi^2/df = 18.05 - 57.10$ , all  $ps < .001$ ) with small effect sizes (Cramer's  $Vs < .11-.14$ ). In contrast to the findings for the other subgroup, the Somers'  $D$  values were negative (Somers'  $D = -.14 - -.32$ ; all  $ps < .001$ ) and relatively high when they included the 9-month DCW, suggesting that the socio-emotional competence scores were relatively more likely to move in opposite directions, for example, either from High to Low, or Low to High from DCWs of 9 months to 2 years and 4.5 years (see Table 3.6). These results are discussed below.

### ***3.3.1 Patterns of Early Socio-emotional Competence Development***

Finally, a visual depiction of the patterns that children followed across the three DCWS can be seen in Figure 3.7. Around 64.8% of the total participants experienced no Lows in terms of socio-emotional competence across the three DCWS and only 2% of the sample had Lows at all three time points. An additional 3.4% of the sample had persistent Lows across the latter two time points (that is 2 years and 4.5 years) but not at 9 months (see Table 3.6).

Importantly, of those who were identified as having low socio-emotional competence at 9 months, the vast majority (70%) showed improvement by the age of 2. However, if those low in socio-emotional competence at 9 months remained low at 2 years, 42% of them in this sample continued to be low at 4.5 years of age. Finally, of the 15% of children that presented with low socio-emotional competence at 2 years (irrespective of their 9 months score) about

35% of those children (low at 2 years) continued to experience low socio-emotional competence at 4.5 years (see Figure 3.6).

**Table 3.6**

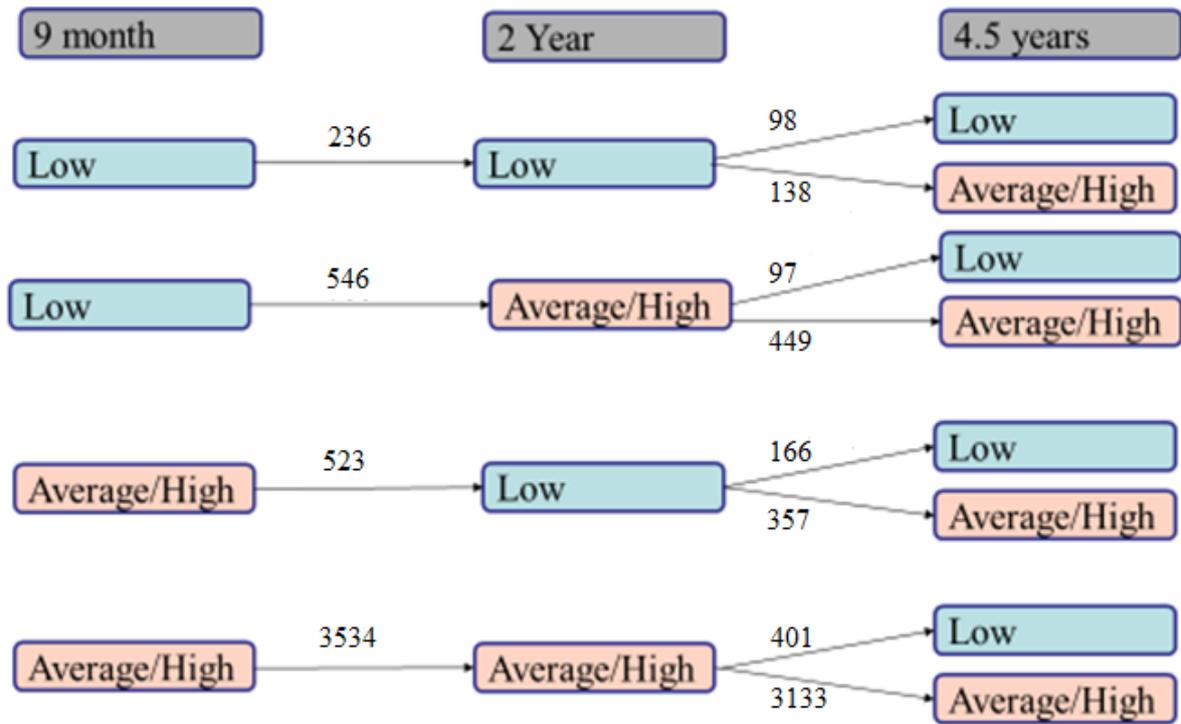
*Number and Percentage of children that followed Different Patterns of Shift in the Levels of Socio-emotional Competence Across the Three Data Collection Waves (N = 4839)*

Groups	Data Collection Wave (DCW)			n	%
	9 months	2 years	4.5 years		
Persistent Lows (5.4%)	Low	Low	Low	98	2.0
	AvgHigh	Low	Low	166	3.4
Recently Low (10.3%)	AvgHigh	AvgHigh	Low	401	8.3
	Low	AvgHigh	Low	97	2.0
Improved (19.6%)	Low	Low	AvgHigh	138	2.9
	AvgHigh	Low	AvgHigh	357	7.4
	Low	AvgHigh	AvgHigh	449	9.3
No Lows (64.8%)	High	Avg	High	129	2.7
	Avg	High	High	148	3.1
	High	High	Avg	108	2.2
	High	High	High	108	2.2
	Mostly Average <sup>1</sup>			2640	54.6

Note: <sup>1</sup>Mostly Average consisted of Avg-Avg-High; Avg-High-Avg; High-Avg-Avg; Avg-Avg-Avg

**Figure 3.7**

*Patterns of Socio-emotional Competence Development During Early Childhood (N = 4839).*



### 3.4 Discussion

This study examined the level of socio-emotional competence and its patterns of development across three time points (9 months, 2 years and 4.5 years) in a large and diverse New Zealand cohort. The cases used in this study was a subset of the original sample, but it was still broadly representative of New Zealand children at 4.5 years. Stronger correlations between socio-emotional scores at 2 and 4.5 years relative to those at 9 months and 2 years reflect an increase in stability of the levels of socio-emotional competence over time. The values of these associations, however, were weak to moderate suggesting there is still movement. The increased level of stability from 2 years to 4.5 years is not surprising given the developmental dynamics that occur in the early months. A child experiences rapid changes in their mind and body during the first year of life (Bub et al., 2007; Pons & Harris, 2005). These changes become less rapid as the child moves beyond the first two years of his/her life (Carter et al., 2003; 2004). This degree of stability is in keeping with temperament research. For example, a major component of temperament, effortful control, is argued to start to show consistency after 30 months (Kochanska et al., 2000).

With regards to patterns of early socio-emotional competence development, a majority of the children (65 percent) exhibited Average or High levels of socio-emotional competence across all three DCWs, and around one-fifth of them indicated improving socio-emotional competence (relative to each other). Perhaps most importantly, our findings showed that the proportion of children with persistently low levels of socio-emotional competence at all three or latter two time points was low (only 5.4 percent; see Table 3.6). This together paints an encouraging picture of the status of socio-emotional development in New Zealand children.

In our study I also divided the sample into two subgroups based on whether children experienced at least one instance of low or no instance of low socio-emotional competence, to measure stability in these subgroups. Within the subgroup of children with at least one instance of low socio-emotional competence, negative, albeit weak, associations were reported. This

highlights that there was at least some movement in the levels of socio-emotional competence within this group, and the movement was in opposite directions. That is, children with low socio-emotional competence moved into Average or High levels of socio-emotional competence, and children also moved from higher socio-emotional competence levels into lower socio-emotional competence levels (approximately 15 percent in total). Notwithstanding this, around 61 percent of the children in this Low subgroup showed improvement in socio-emotional competence at some point across the three DCWs, which suggests that as new socio-emotional competencies develop with age, they can override and/or make better, earlier systems of socio-emotional competence.

Importantly, based on the patterns that children with Low socio-emotional competence at 9 months followed (see Figure 3.6), there seems to be less value in intervening during infancy as a high proportion of them (70 percent) experience improvement in socio-emotional competence during early childhood as they develop further skills. However, if children are found to have two early Lows (9 months and 2 years), this may serve as early warning system as 42 percent of those children seem to continue to be Low at 4.5 years on our index. Hence, while being Low in socio-emotional competence at 9 months on the index does not seem to warrant concern (as there is considerable flux at this age), there may be value in identifying children with repeated low socio-emotional competence at 9 months and 2 years as two or more Lows is more likely to signal an early emerging pattern.

Alternatively, the data suggest that if no measure was taken at 9 months, and only 2 years socio-emotional competence was measured, roughly 35 percent of those children identified as Low in socio-emotional competence at 2 years are likely to remain Low at 4.5. Hence while adding in the 9 months socio-emotional competence index may increase the accuracy of who will remain Low at 4.5 from 35 percent to 42 percent, this may not be worth the extra effort to collect and record this data over time. However, there is a need to be cautious

when considering these interpretation as they were based on a composite index of socio-emotional competence.

It is important to note that a majority of children followed the pattern of no Lows across these early years signifying greater stability. This finding, however, does not mean there was no movement in this no Lows group. It is important to keep in mind that the pattern of Mostly Average (within the group of No Lows) was a combination of patterns of Avg-Avg-Avg, Avg-Avg-High, Avg-High-Avg and High-Avg-Avg, which means that there was certain amount of variability within this category as well, which was hidden by the grouping. Therefore, while most of the children may have followed a “Mostly Average” pattern; within this group, they may have moved in and out of High level of socio-emotional competence, which might have contributed towards the lower values of stability between socio-emotional competences (continuous scores) at the three DCWs. In addition, the categorisation of values into levels also resulted in loss of variability.

### ***3.4.1 Strengths & Limitations***

The present study provides us with new information regarding the level and patterns of early socio-emotional competence development across three time points in the early years of a child’s life using data from a large and broadly representative sample of New Zealand children. Previously, studies have only investigated socio-emotional difficulties or one component of socio-emotional competence longitudinally while others have focused on interventions designed to raise levels of socio-emotional competence particularly amongst kids at risk (e.g. Han et al., 2005; Herbert et al., 2013) with little knowledge of what the natural level of flux in socio-emotional competence is over this time.

At the same time, others have warned against the instrumentalisation of children, of moving from descriptions of how children behave at a population level to individual prescription and early intervention (Burman, 2016). Such challenges do not necessarily argue against the use of large-scale longitudinal studies to try to understand broad patterns of

development, but they do remind us of the importance of not decontextualising the child from the social and institutional conditions in which they develop, their relationships with others and the child itself. While the patterns and shifts highlighted provide a snapshot of movement in socio-emotional competence across early childhood, they need to be validated over time by assessing their effect on related life outcomes.

One limitation of the study is that the pattern of Mostly Average contained a number of sub-patterns (Avg-Avg-High; Avg-High-Avg; High-Avg-Avg; Avg-Avg-Avg; (see Table 3.7) but this movement is masked due to this categorisation procedure used. Moreover, Average and High levels of socio-emotional competence were combined to give the AvgHigh category. While these groupings were done to keep the number of patterns being investigated manageable, this prevented the study from tapping into the movement between the categories of Average and High. Having said that, I was more interested in understanding movement in and out of Low levels of socio-emotional competence.

Secondly, as is necessary with many early developmental assessments (Hancock & Beuhl, 2008), different age-appropriate measures were used to construct an index at each of the three time points. The relationship between the index at each time point was moderate to strong ( $r_s = .27 - .41$ ) showing that each index seemed to measure a similar basic concept albeit using different tools appropriate for a child's age. However, a benefit of this approach is the notion that the sum may be also greater than the parts. By using multiple tools as part of our index at each time point there is potentially an increased chance that I was capturing more aspects of socio-emotional competence as well as the interactive nature of the socio-emotional components. Still, since the concept being measured was not the *same*, these low associations between socio-emotional competence scores at each time point may also be a method effect.

Finally, care must be taken when interpreting the different levels (Low, Average or High) of socio-emotional competence, as each level is defined relative to the sample in each DCW and not some eternal norm. However, being persistently Low relative to a large diverse

sample in each DCW is still potentially of interest to those looking to understand patterns and movement within a population.

### **3.5 Conclusion**

The present study assessed levels and patterns of early socio-emotional competence development, employing the longitudinal data collected across the first 5 years of a child's life. Socio-emotional competence is becoming increasingly relevant to today's child development experts, policy makers and the general public (Carter, Briggs-Gowan & Davis, 2004), due to an increasing recognition of its importance for children's learning (Britto, 2012; Denham, 2006; Raver, 2014), their formation of healthy relationships (Charles & Carstensen, 2007; Parke, 1994; Saarni, 1990) and their overall well-being – both physical and psychological (Cheevers & O'Connell, 2012; Sanson et al., 2010; Shonkoff & Phillips, 2000). This is leading to a growing number of interventions targeting its development across the early childhood period (before the child enters school). Owing to this, assessment and a description of the levels and stability of early socio-emotional competence within a diverse population is of practical, academic and potentially economic importance and is currently a key area of interest to New Zealand's Ministry of Education. The focus is particularly on children exhibiting lower levels of competence.

I found that most (65 percent) of the children in this cohort had no instance of Low socio-emotional competence across their early childhood painting an encouraging picture of the socio-emotional development in New Zealand children in the early years. In addition, the subgroup of children with at least one instance of Low socio-emotional competence showed more movement, with movement in the direction of Low to Average or High socio-emotional competence more common.

There was low stability in the levels of socio-emotional competence during the first 2 years in comparison to between 2 and 4.5 years. However, if a child continued to be low at 9 months and 2 years then 42 percent of those stayed low on our index at 4.5 years, while 35

percent of children (regardless of their earlier level) with a Low at 2 years continue to experience a low at 4.5 years. From an intervention standpoint, assessing at both 9 months and 2 years may give us a better hit rate (45 percent vs 35 percent). However, we need to also consider the efforts and costs of assessing at 9 months. The information from the assessment would need to be stored and parents would need to be informed, which may affect their parenting confidence and how they interact with the child both positively and negatively.

More research is needed to explore the factors that predict various socio-emotional competence across early childhood, and how different patterns of stability and change in socio-emotional competence relate to other developmental outcomes, which can help in further establishing the meaningfulness of these patterns, and can also help inform the design of future intervention strategies (both at preventive and management levels) if they are deemed necessary and appropriate.

As with all research that seeks to understand early development, care needs to be taken to ensure that children and parents are not labelled or stigmatised if their child is identified as being in the group with persistently low socio-emotional competence. Rather, this should trigger service providers to examine what can be done individually and systemically to better support those children and families to reduce any gap and encourage shifts in a positive direction, while being ever mindful of the potential of young children to develop at an astounding rate and in miraculous ways.

## **Chapter 4. Do Patterns of Levels of Socio-emotional Competence During Early Childhood Predict Executive Function at 4.5 Years? (Study 2)**

### **4.1 Introduction**

The following study addressed the second research question: *How do different patterns of socio-emotional competence development relate to Executive Function (EF) at 4.5 years?* This study was the first step in evaluating how early socio-emotional competence relates to later cognitive outcomes.

During the early planning phase, it was decided to conduct a single study to assess how socio-emotional competence related to cognitive abilities including EF and literacy skills. However, given the conceptual differences between EF and literacy skills, it was deemed appropriate to divide it into two studies with one addressing EF (Study 2) and the other assessing socio-emotional competence's effect on emergent academic skills (Study 3). It was of interest to assess the effects that persistently low socio-emotional competence and a recent low in socio-emotional competence have on later EF in comparison to persistently average or high early socio-emotional competence.

The present study also evaluated how socio-emotional competence relates to cool and hot EF. The scores on the cool and hot EF tasks were, however, negatively skewed. That is, most children did well; hence they were dichotomised into average and below average. While this categorisation allows us to make inferences about potentially clinically significant delays, there is also a concern of loss of variability associated with such dichotomisation of EF scores. Further, categorisation of socio-emotional competence scores also limits variability.

In addition, due to lack of a common variable between socio-emotional competence at 9 months and 2 years, it was not possible to model change directly, so instead how their scores moved relative to the rest of the sample at each DCW was explored. Similarly, it was not possible to control for the earlier levels of EF because different types of tasks were used. The analyses controlled for variables related to mother, child and birth that were likely to be associated to EF or socio-emotional competence.

The following account is a version of Study 2's manuscript published in *Child Psychiatry & Human Development*. Supplementary material referred to in the study has been included in Appendix B. Please see: Ahmad, S., Waldie, K. E., Morton, S. M., & Peterson, E. R. (2021). Do Patterns of Levels of Socio-emotional Competence During Early Childhood Predict Executive Function at 4.5 Years? *Child Psychiatry & Human Development*, 1-10. <https://doi.org/10.1007/s10578-021-01128-3>

#### **4.1.1 Executive Function**

Executive function (EF) comprises a variety of cognitive processes and behavioural skills (Chan et al., 2008). It is argued to include the ability to organise behavior, to undertake goal-directed activities, and is said to include cognitive skills of working memory, response inhibition (also known as inhibitory control) and set shifting (Miyake et al., 2000).

There is strong theoretical support for the social origins of EF. Vygotsky (1978) purported that EF develops through social interactions; social interactions promote the development of symbol systems (such as language), which can then help an individual to psychologically distance themselves from a desired outcome. For example, a child may be better able to restrict their desire to have a candy (showing response inhibition - a component of EF) by using mental symbols (e.g. a "bear") in place of a concrete stimulus (e.g. candies) (Beck & Carlson, 2007). This has been illustrated in numerous task such as in a *Less is More* task (in which children need to point to fewer candies to get more). For example, Carlson et al. (2005) found that substituting more candies with elephant and less candies with a mouse (both elephant and mouse were used as mental symbols) helped 3-year-olds in resisting the proponent response of pointing towards the larger pile of candies (that they wanted).

As noted, the development of mental symbols is argued to be a product of social interactions. For example, we learn words or mental symbols from others when they point and name objects (Vygotsky, 1978; Carlson, 2009). Given that social interactions are transactional in nature - executed by two or more parties: child and the caregiver (in this case), the

effectiveness of the transactions is likely to be a function of both the caregiver's and child's socio-emotional competence (Sameroff, 2009). That, in turn, will affect the amount of learning that occurs (Carlson, 2009). Perhaps a more social link to EF concerns motivation. Children who are more socio-emotionally competent, may value social relationships more and be motivated to attain control over their behaviour to develop and maintain their attachment relationships (Sroufe, 1996). Broadly speaking, socio-emotional competence is argued to include the ability to express and understand emotions, regulate emotions and behaviour, solve social problems and use social relationship skills (Denham, 2006). The aim of the study was to assess the influence of early socio-emotional competence on EF.

Further evidence that EF and socio-emotional competence work together can be found in neurobiological studies. Research has shown that in the face of a stressor with cognitive demands, children engage both their prefrontal cortex systems (associated with EF; Hughes, 1998; Peterson & Welsh, 2014) and their limbic systems (implicated in emotions) (Nater et al., 2007) to complete the task or respond aptly to the situation (Peterson & Welsh, 2014).

#### ***4.1.2 Development of EF and the Potential Role of Socio-emotional Competence***

The first 5 years of a child's life sets the stage for the development of executive functions, which underpin the later development of complex and interconnected EF systems. The individual components of EF are said to emerge before the age of 3 years: with working memory emerging during the first 6 months of life; simple response inhibition developing in the second 6 months of life, and coordination between them appearing by the age of 2 years (Garon et al., 2008).

At 2 to 3 years of age, children are typically able to hold a rule in mind to stop a dominant response in favour of subdominant responses, with this ability increasing with age. For example, children are able to refuse an immediate treat and wait for the larger one (Carlson, 2005). Between 3 and 5 years of age, there is further fine tuning of these components

and/or the development of an attention system, which facilitates further EF development (Garon et al., 2008).

During the first 5 years of a child's life, EF goes through rapid development. It also seems to be neurobiologically and psychosocially linked with socio-emotional competence. Hence, it is possible that changes in the levels of socio-emotional competence across these early years will influence EF development. For example, an infant with low socio-emotional competence that later improves, may develop higher EF compared to a child with persistently low socio-emotional competence. This argument is in line with that of D'Souza et al. (2018), who investigated the influence of persistence and change in behavioural difficulties (which have a socio-emotional component) on cognitive abilities, including inhibitory control. They found that persistent behavioural difficulties (between 2 and 4.5 years of age) resulted in increased odds of having delays in an aspect of executive control that was measured using the hand clap task (a modified version of pencil tap task from Luria-Nebraska Neuropsychological Battery; Golden et al., 1979), relative to children with no behavioural difficulties during early childhood.

Interestingly, while there have been numerous studies investigating the association between EF and social and emotional competence, most of them have focused on how EF predicts various domains of socio-emotional competence, rather than the inverse (e.g. Kiley-Brabeck & Sorbin, 2006; Pauli-Pott et al., 2013). Some have found support for cross-sectional associations between EF and social function (Gilotty et al., 2002; McEvoy et al., 1993) but again, they have tended to explore EF's influence on domains of socio-emotional competence. In addition, most of these studies have considered atypical populations (such as Attention Deficit Hyperactivity Disorder, Oppositional Defiant Disorder, Autism and 22q11 Deletion Syndrome), and where normal populations have been considered (e.g. Kim et al., 2013), EF has been used as a predictor of problem behaviours.

Therefore, in this study, using an ethnically and socioeconomically diverse sample from the longitudinal study Growing Up in New Zealand (GUiNZ), I aimed to examine whether early developmental patterns of socio-emotional competence across three data collection waves (DCWs; 9 months, 2 years and 4.5 years) predict EF at age 4.5 years. I hypothesised that children with persistently low (with no improvement) and recent low socio-emotional competence will have lower EF at 4.5 years relative to the group with persistently average or high socio-emotional competence.

#### ***4.1.3 Types of Executive Function***

Some theorists have further differentiated EF into two components, cool and hot. The former involves cold cognitive processes that are logic-based and do not have much emotional arousal or context associated with them (Grafman & Litvan, 1999). On the other hand, hot EF is implicated in goal-directed processes that involve emotions, motivation and conflict between immediate and long-term gratification (Zelazo & Muller, 2002). Given these definitions, it is likely that socio-emotional competence development will be more strongly associated with the development of hot EF than cool EF.

While some researchers have found support for this hot and cool differentiation (e.g. Brock et al., 2009; Hongwansishkul et al., 2005; Kim et al., 2013), others have not (e.g. Duckworth & Seligman, 2005; Mischel et al., 1988; Shamosh & Grey, 2008). However, the sample sizes for these hot and cool EF studies were all less than 200 with the exception of Shamosh and Grey (2008), which was based on a meta-analysis (24 studies with total sample size of 2490). The current study provides an opportunity to further contribute to this divergent literature by examining whether early socio-emotional competence development differentially predicts preschoolers' hot and cool EF.

## **4.2 Methods**

### ***4.2.1 Participants and General Procedure***

This study used data from the longitudinal GUiNZ study, which aims to follow the lives of around 6000 children from approximately 6 weeks before their birth until early adulthood. The GUiNZ includes a broadly representative sample of New Zealand population births in terms of demographics (Morton et al., 2015). Full details about the design of the study can be found in Morton et al. (2015 & 2017). The current study employed data from 4839 participants, who had socio-emotional competence scores that could be computed at each DCW. This sample was not significantly different from the full sample of 6156 children at 4.5 years DCW (see Supplementary Table 2) with respect to child's gender, parity (antenatal) and mother's age. However, there was overrepresentation of mothers with European ethnicity and higher socioeconomic status in the sample used for this study, but the value of the difference was small: Cramer's  $V < 0.07$  (Cohen, 1988).

### ***4.2.2 Measures***

#### **4.2.2.1 Cool Executive Function**

The hand clap task was used to measure working memory, inhibitory control and attention at 4.5 years of age. It has little or no emotional context; therefore, it is generally considered a measure of cool EF (Raver et al., 2010). This task was adapted from the pencil tapping task included in Luria Nebraska Battery (Golden et al., 1979) because some children may not have the same amount of exposure to using and holding pencils and pens at 4.5 years of age. The task is developmentally sensitive and has been implemented in diverse samples of children (Diamond & Tylor, 1996). Similar to the original Luria task, the hand clap task requires reverse imitation with children expected to clap twice if the examiner claps once, and once if the examiner claps twice. There are 16 trials in the tasks with "1" score assigned for every correct response, and "0" for every incorrect one. These scores are summed to give a

final score on the task. The task showed good reliability (Cronbach's alpha = .93) in the present study.

A total of 4668 children had scores on the hand clap task. The present sample showed strongly skewed (negative) distribution with a median of 13 and scores ranging from 0 to 16. Around 52 percent of children had scores equal to or less than 13. Due to this distribution of responses, the score on this task was dichotomised based on the median with children scoring more than 13 categorised as having average or above average cool EF.

#### 4.2.2.2 Hot Executive Function

The Gift Wrap Task (Kochanska et al., 2000) was used to measure ability to inhibit reaction to an emotionally arousing situation at 4.5 years DCW. In the current study, the interviewer informed children they had a gift for them but had forgotten to wrap it. Therefore, they were requested to look away while the interviewer noisily wrapped the gift for a minute. Observations regarding whether the child peeked or not; time elapsed before the first peek (latency); and frequency of peeking were made. Due to its emotional context, as children had to resist the temptation to look at a gift, it is considered a measure of hot EF (Metcalf & Mischel, 1989). It is a validated and widely used tool in research (Carlson, 2005).

A total of 4809 children had scores on the gift wrap task. In the current study, the distribution of these scores was also strongly skewed (negative) because the majority of the children did not peek. The scores were therefore dichotomised as average (if they did not peak), or below average (relative to the sample) if the child peaked. This also made the score comparable with that of hand clap task.

#### 4.2.2.3 Patterns of Early Socio-emotional Competence Development

Using data from 26 variables (from 7 measures; see Table 4.1) related to socio-emotional competence, Ahmad et al., (2019) developed an index of socio-emotional competence of children participating in GUiNZ at and across three DCWs: 9 months, 2 years and 4.5 years. The variables were selected to provide age-appropriate coverage to one or more

domains of socio-emotional competence, namely: emotional expressiveness, emotional understanding, emotional regulation, social problem solving and social relationship skills (Denham, 2006). They also considered variables' internal consistency, discriminatory power and interdependence (correlation with all or most of the variables).

All selected variables were based on mother reports except for two observation-based variables (engagement and mood during the interview, and aggression). Variables were grouped based on the results of an Exploratory Factor Analysis (EFA) using Direct Oblimin rotation carried out at each DCW resulting in three factors or dimensions (see Table 4.1; Ahmad et al., 2019).

Variables and dimension scores were weighed equally and according to their variance estimates based on factor analysis to give different versions of socio-emotional competence scores at each DCW. Two weighting methods - equally weighting and time-based weighting (in terms of time from 4.5-year DCW) - were then used to calculate socio-emotional competence scores across the three DCWs. Testing different versions of the index against possible outcomes showed equal weighting and time-based weighting to be the most parsimonious method. In this study, I used the socio-emotional competence scores at each DCW. Complete details of the index development can be found in Chapter 2.

**Table 4.1**

*Showing Variables Belonging to Socio-emotional Competence Indices at each Data Collection Wave (DCW).*

Indices/Dimensions	Easy-Going	Regulation	Exuberance
9-month SEC	Negative emotionality – IBQ-R VSF Fear – IBQ-R VSF	Orienting capacity – IBQ-R VSF Affiliation/Regulation – IBQ-R VSF Positive affectivity/Surgency – IBQ-R VSF	
2-year SEC	Conduct problems – SDQ Emotional problems – SDQ Hyperactivity problems – SDQ Peer problems – SDQ Expressive Vocabulary – emotions related	Prosocial – SDQ Impulse Control Scale – DesRosier’s Measure Shame Scale – DesRosier’s Measure	
4.5-year SEC	Negative Affect – CBQ VSF Emotional problems – SDQ Hyperactivity problems – SDQ Conduct problems – SDQ Peer problems – SDQ Hardiness – CBQ VSF	Effortful control – CBQ VSF Attention – CBQ VSF Prosocial – SDQ	Surgency – CBQ VSF Boldness – CBQ VSF Observations– engagement with interviewer and mood (Assessor’s Report, PSRA) Expression identification (AKT)

*Note.* SEC= Socio-emotional Competence; IBQ-R VSF= Infant Behavior Questionnaire – Revised Very Short Form (Gartstein et al., 2014); SDQ=Strengths and Difficulties Questionnaire (Goodman, 1997); CBQ VSF= Child Behavior Questionnaire – Very Short Form (Putnam & Rothbart, 2006); PSRA= Preschool Self-Regulation Assessment (Smith-Donald et al., 2007); AKT = Affective Knowledge Task (Denham, 1986).

Please read the table horizontally to see what variables were included in the index at each DCW.

The index gives both continuous and categorical scores (Avg/High = -1SD & above; and Low = below 1SD) of socio-emotional competence. Using the categorical scores of socio-emotional competence at each DCW, patterns of socio-emotional competence development across these three DCWs were calculated (details can be found in Chapter 3). The following patterns of competence were used in the analysis: persistent lows (Low-Low-Low; AvgHigh-Low-Low); recent low (Low-AvgHigh-Low; AvgHigh-AvgHigh-Low); improved (Low-Low-AvgHigh; AvgHigh-Low-AvgHigh; Low-AvgHigh-AvgHigh); and finally, no lows (AvgHigh-AvgHigh- AvgHigh). Please note that somewhat contrary to its name, the persistent lows group consisted of children who had persistent Lows across all three or latter two DCWs.

#### 4.2.2.4 Covariates

In the current study I controlled for variables likely to be associated with socio-emotional competence or EF. For children, these were largely demographic variables and included gestation age, birth weight, age at 4.5-year assessment, sex and antenatal parity (first born or subsequent birth). I also included maternal age (less than 20 years, 20 to 29 years, 30 years or more), maternal education at the antenatal DCW (no secondary education, secondary education, diploma/trade certificate/Bachelor's degree or higher), ethnicity (European, Māori, Pacific Peoples, Asian, Middle Eastern, Latin American or African – MELAA - and other), area-level deprivation measured by household deprivation quintile index 2013 (at 4.5-year DCW), alcohol consumption during 1<sup>st</sup> trimester and after 1<sup>st</sup> trimester and, finally, whether the pregnancy was planned or not.

#### 4.2.3 *Data Analyses*

All analyses were conducted using IBM Statistical Package for Social Sciences (SPSS; Version 24). Pearson's chi-square and correlation was used to determine which of the aforementioned covariates had univariate relationship with cool and hot EF separately. Only variables that had significant correlation with cool and hot EF (regardless of their effect sizes) were retained for multivariate analyses performed for each separately. Binary logistic

regression was carried out to examine if and how patterns of socio-emotional competence development across the three DCWs predicted cool and hot EF at 4.5 years after controlling for the retained covariates. Both no lows and persistent lows were specified as the reference category for Binary logistic regression. Statistical significance was set at  $p < 0.05$  to test the significance of odds ratio. Odds ratio refers to the likelihood of an outcome occurring given a scenario relative to its likelihood of occurring in the absence of that scenario; scenarios in this study included having persistently low socio-emotional competence or a recent low, etc. The effect sizes for significant odds ratios were also interpreted with odds ratio of 1.47, 2.74 and 4.25 representing small, medium and large effect sized (Cohen, 1988; Chinn, 2010).

### **4.3 Results**

Table 4.2 gives an overview of how the covariates relate to participants' below and above average scores on the cool and hot EF tasks. All covariates, with the exception of child's age at 4.5 years assessment and mother's alcohol consumption during the 1<sup>st</sup> trimester, were associated with cool EF. All covariates, with exception of mother's age, ethnicity, household deprivation and alcohol consumption during and after the 1<sup>st</sup> trimester, were associated with hot EF.

**Table 4.2**

*Descriptive Statistics Showing How the Demographic Control Variables and Patterns of Socio-emotional Competence Development Relate to “Cool” and “Hot” Executive Function. Pearson’s Correlations and Chi-Squares Between the Control Variables and “Cool” and “Hot” Executive Function are also given.*

Variables	Overall	“Cool” EF		$r^a$ or $\chi^{2b}$	“Hot” EF		$r^a$ or $\chi^{2b}$
	N (%) or M(SD)	Below Average n (%) or M(SD)	Average n (%) or M(SD)		Peaked n (%) or M(SD)	Didn’t Peak n (%) or M(SD)	
“Cool” EF							94.34***
Below average	2421(50.0)	-	-		787(63.88)	1619(47.52)	
Above average	2247(46.4)	-	-		450(36.38)	1788(52.48)	
Stability/change in socio-emotional competence				86.0***			44.9***
Persistent Lows	264(5.5)	155 (6.40)	73 (3.25)		112 (8.55)	149 (4.26)	
Recent Low	498(10.3)	304 (12.56)	139 (6.19)		158 (12.6)	328 (9.37)	
Improved	944 (19.5)	461 (19.04)	470 (20.92)		247 (18.85)	694 (19.83)	
No Lows	3133 (64.7)	1501 (62.0)	1565 (69.65)		793 (60.53)	2328 (66.53)	
Child’s gestation age (weeks)	39.19 (1.72)	39.12 (1.86)	39.28 (1.55)	0.05**	39.11 (1.86)	39.22 (1.65)	0.04*
Child’s birth weight (grams)	3528.04 (552.23)	3511.58 (575.09)	3551.43 (527.44)	0.04*	3498.67 (589.42)	3540.91 (535.37)	0.03*
Child’s sex				24.76***			87.9***
Boy	2459 (50.8)	1311 (54.15)	1054 (46.91)		811 (61.91)	1634 (46.70)	
Girl	2378 (49.1)	1108 (45.77)	1193 (53.09)		499 (38.09)	1863 (53.24)	
Child’s parity				4.10*			6.87**
First born	1750 (36.2)	905 (37.38)	776 (34.53)		510 (38.93)	1233 (35.24)	
Subsequent birth	2656 (54.9)	1300 (53.7)	1266 (56.34)		683 (52.14)	1962 (55.04)	
Child’s age at 4.5 years’ assessment (days)	1656.77 (44.76)	1656.31 (44.64)	1657.54 (45.32)	0.01	1659.34 (47.22)	1655.89 (43.9)	-0.03*
Mother’s age				23.44***			3.1
<20	199 (4.1)	119 (4.92)	69 (3.07)		56 (4.27)	141 (4.03)	
20-29 years	1788 (36.9)	934 (38.6)	769 (34.22)		509 (38.85)	1270 (36.29)	
≥ 30 years	2852 (58.9)	1368 (56.51)	1409 (62.71)		745 (56.87)	2088 (59.67)	
Mother’s education				26.53***			0.6
No secondary education	274 (5.7)	147 (6.07)	104 (46.28)		77 (5.88)	196 (5.60)	

Variables	Overall	“Cool” EF		$r^a$ or $\chi^{2b}$	“Hot” EF		$r^a$ or $\chi^{2b}$
	N (%) or M(SD)	Below Average n (%) or M(SD)	Average n (%) or M(SD)		Peaked n (%) or M(SD)	Didn't Peak n (%) or M(SD)	
Secondary education	1031 (21.3)	577 (23.83)	422 (18.78)		284 (21.70)	738 (21.09)	
Diploma/trade certificate/bachelor's degree or higher	3493 (72.2)	1670 (69.0)	1710 (76.10)		930 (70.99)	2543 (72.68)	
Mother's ethnicity				64.86***			53.58***
European	2927 (60.5)	1415 (58.45)	1426 (63.46)		692 (52.82)	2218 (63.39)	
Māori	622 (12.9)	340 (14.04)	247 (10.99)		195 (15.89)	425 (12.15)	
Pacific	558 (11.5)	345 (14.25)	190 (8.46)		183 (13.97)	367(10.49)	
Asian	571 (11.8)	246 (10.16)	303 (13.48)		195 (14.89)	373 (10.66)	
MELAA	79 (1.6)	41 (1.69)	35 (1.56)		29 (2.21)	50 (1.43)	
Other	70 (1.4)	25 (1.03)	43 (19.14)		13 (0.99)	57 (1.63)	
Household deprivation quintile index 2013 <sup>c</sup>				63.12***			8.62
NZ Dep Q1 (least deprived)	1048 (21.7)	465 (19.21)	562 (25.01)		269 (20.53)	775 (22.15)	
NZ Dep Q2	948 (19.6)	462 (19.08)	457 (20.34)		239 (18.24)	703 (20.09)	
NZ Dep Q3	887 (18.3)	406 (16.8)	455 (20.25)		229 (17.48)	652 (18.63)	
NZ Dep Q4	832 (17.2)	447 (18.46)	351 (15.62)		241 (18.4)	582 (16.63)	
NZ Dep Q5 (most deprived)	1095 (22.6)	626 (25.86)	408 (18.16)		324 (24.73)	766 (21.89)	
Planned pregnancy				18.1***			21.71***
Yes	2968 (61.3)	1414 (58.40)	1462 (65.06)		737 (56.26)	2216 (63.33)	
No	1740 (36.0)	926 (38.25)	736 (32.75)		539 (41.15)	1186 (33.90)	
Alcohol consumption during 1 <sup>st</sup> trimester				.89			1.57
0-3 drinks per week	4509(93.2)	2244(92.69)	2104(93.64)		1211(92.44)	3268(93.4)	
≥4 drinks per week	317(6.6)	167(6.9)	140(6.23)		36(2.75)	221(63.16)	
Alcohol consumption after 1 <sup>st</sup> trimester				4.52*			2.91
0-3 drinks per week	4731(99.0)	2389(98.68)	2234(99.42)		1291(98.55)	3470(99.17)	
≥4 drinks per week	38(0.8)	25(1.03)	11(0.49)		15(1.15)	23(0.66)	

Note. MELAA = Middle Eastern, Latin America, or African.

<sup>a, b</sup>Showing Pearson correlation or Chi-square.

<sup>c</sup>The New Zealand Deprivation Index combines nine socioeconomic variables from the 2006 census capturing eight dimensions of deprivation at the small area level. In this table the original deprivation scores (measured in deciles) have been collapsed into quintiles. Quintile 1 (Q1: Deciles 1 and 2) represents the households in the least deprived 20% areas, whereas Quintile 5 (Q5: Deciles 9 and 10) represents the households in the most deprived 20% areas (Salmond, Crampton, & Atkinson, 2007).

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

The analysis showed that cool and hot EF were significantly associated with each other ( $\chi^2 (1, N = 4644) = 94.34$ ) with a small effect size (Cramer's  $V = .14$ ). In addition, the patterns of socio-emotional competence development were significantly associated with cool ( $\chi^2 (3, N = 4668) = 86.0$ ) and hot EF ( $\chi^2 (3, N = 4809) = 44.9$ ) with a slightly stronger relationship noted with cool EF. The effect sizes for these associations were, however, small (Cramer's  $V$ s < 0.08; Cohen, 1988).

Results from binary logistic regression showing the associations between patterns of early socio-emotional competence development and cool and hot EF are shown in Table 4.3 and 4.4 respectively. Results from full regression with the covariates are presented in Supplementary Table 3. Children who showed persistently low socio-emotional competence across the three DCWs (9 months, 2 years and 4.5 years) were 1.54 times more likely to be below average in cool EF relative to the group following no low pattern of socio-emotional competence across the three DCWs. Furthermore, children following recent low pattern (that is with a low at 4.5 years DCW) were 1.79 times more likely to be below average in this domain as compared to children following no lows pattern. When the group with persistent low was taken as the reference group, results were in the opposite direction. Children following improved and no lows patterns had 1.65 and 1.55 times respectively greater odds of having average cool EF respectively compared to those with persistent lows.

With regards to hot EF (See Table 4.4), children who had persistently low socio-emotional competence were 2.27 times more likely of having below-average hot EF relative to the group of children following the no lows pattern. There were no significant effects of a recent socio-emotional competence low on hot EF. However, when the reference group was persistent lows, unlike with cool EF, even having a recent low in socio-emotional competence was better than having persistent lows. That is, having a recent low socio-emotional competence resulted in 1.41 better odds of having average hot EF compared to those with persistent lows. Similar to cool EF, children with improved levels of socio-emotional

competence, and those with persistently high socio-emotional scores across all three DCWs, showed better odds of having average hot EF by 1.77 and 1.17 correspondingly compared to those with persistent lows. The effect sizes were generally small across all analyses with the exception of effect of persistently low socio-emotional competence on hot EF, which bordered close to medium effect size.

**Table 4.3**

*Results from Binary Logistic Regression Showing the Associations between Socio-emotional Competence in Early Years and Cool Executive Function at 4.5 Years (N = 4668)*

Stability/Change in Socio-emotional competence	n (%)	Cool EF <sup>a</sup> n (%)	No Lows as Reference			Persistent Lows as Reference		
			B (SE)	OR	(95% CI)	B (SE)	OR	(95% CI)
Persistent lows	228(4.88)	73 (32.02)	-.44 (.17)	.65**	.47-.90	REF		
Recent low	443(9.49)	139 (31.38)	-.59 (.12)	.56***	.44-.70	-.15(.19)	.86	.59-1.26
Improved	931 (19.94)	470 (50.48)	.06 (.08)	1.06	.90-1.25	.50(.18)	1.65**	1.17-2.32
No lows	3066 (65.68)	1565 (51.04)	REF			.44 (.17)	1.55**	1.12-2.15
Total sample	228(4.88)	2247 (48.14)						

Note: EF = Executive Function; OR = Odds Ratio; REF = Reference Category

<sup>a</sup> Child's performance on the hand clap task: achieving a score of greater than 13 (Median)

\**p* <.05; \*\**p* <.01; \*\*\**p* <.001

Analysis controlled for mother's age, education and ethnicity, household deprivation, planned pregnancy, alcohol consumption after 1<sup>st</sup> trimester, and child's birth weight, gestational age, parity (at birth) and sex. See Supplementary Table 3 for logistic regression results relating to covariates.

**Table 4.4**

*Results from Binary Logistic Regression Showing the Associations between Socio-emotional Competence in Early Years and Hot Executive Function at 4.5 Years*

Stability/Change in Socio-emotional competence	n (%)	Hot EF <sup>a</sup> n (%)	No Lows as Reference			Persistent Lows as Reference		
			B (SE)	OR	(95% CI)	B (SE)	OR	(95% CI)
Persistent Lows	261(5.23)	149 (57.09)	-.54 (.15)	.44***	.44-.78	REF		
Recent Low	498(10.36)	328 (65.86)	-.2 (.12)	.82	.66-1.03	.34(.17)	1.77***	1.00-1.98
Improved	941(19.57)	694 (73.75)	.03 (.09)	1.03	.86-1.24	.57 (.16)	1.17***	1.30-2.43
No Lows	3121 (64.9)	2328 (74.59)	REF			.54 (.15)	1.41*	1.28-2.29
Total sample	261(5.23)	3499 (72.76)						

Note: EF = Executive Function; OR = Odds Ratio; REF = Reference Category

<sup>a</sup> Child's performance on the gift wrap task: managing not to peak.

\**p* <.05; \*\**p* <.01; \*\*\**p* <.001

Analysis controlled for mother's ethnicity, planned pregnancy, and child's age at assessment, birth weight, gestational age, parity (at birth) and sex. See Supplementary Table 3 for logistic regression results relating to control variables.

#### 4.4 Discussion

The objectives of the present study were to examine how early cool and hot EF is predicted by patterns of early socio-emotional competence development. Our hypotheses were broadly supported, in that children with persistently low socio-emotional competence had lower than average hot and cool EF scores at 4.5 years in comparison to children with no lows in socio-emotional competence scores. Alternatively, children with improved or no low in early socio-emotional competence development had above average cool and hot EF. This research results are in line with previous research (D'Souza et al., 2020; Hobson et al., 2011). It is important to note here, effect sizes for these results were small across all analyses. However, effect size for persistently low socio-emotional competence influence on EF (relative to consistently average or high socio-emotional competence) bordered close to moderate (Cohen, 1988; Chinn, 2010).

The findings differed slightly from what was hypothesised with respect to how patterns of socio-emotional competence development with a recent low would relate to EF. I found that while having a recent low (compared to no lows) was associated with an increased chance of having lower than average cool and hot EF scores, this was only statistically significant for cool EF. I also found that having a recent low in socio-emotional competence scores, relative to having a persistently low socio-emotional competence score, was associated with greater odds of having improved hot EF. This suggests that even having a fluctuating socio-emotional competence pattern of development with a recent low socio-emotional competence score may be better for the development of hot EF compared to persistently low socio-emotional competence.

There may be numerous reasons for these associations between socio-emotional competence patterns of development and EF. Within the domain of neurobiology, systems supporting socio-emotional competence and EF are said to work collaboratively to meet the demands of the outside world (Nater et al., 2007). Glaser's (2000) suggested neurobiologically

socio-emotional competence is important for developing EF as the development of the frontal lobe regions (associated with EF) depends on the quality of interactions with the primary caregiver as this is a function of socio-emotional competencies of both the child and primary caregiver (Sameroff, 2009). The primary and early caregivers facilitate learning and language development. The development of these language abilities helps children in guiding their own behaviour. In support of this, Landry and colleagues (2002) found that mother's verbal scaffolding when their child was 3 years of age predicted EF at 6 years via language development at 4 years. In contrast, Hammond et al., (2011) reported a direct effect of parental scaffolding at age 3 on EF at age 4.

The frequency of parental scaffolding is related to the extent to which a child has a secure and good quality relationship with the caregiver (Carlson, 2009), and the quality of early parent-child interactions may in turn depend on the socio-emotional competency of children (Sameroff, 2009). It is possible that children with low socio-emotional competence (who may have difficulty in forming and maintaining relationships with caregivers), may experience reduced parental scaffolding and the subsequent development of EF. This chain of events may also lie behind these findings that social competence seems to be important for the development of EF. Furthermore, EF depends on frontal lobe development specifically the prefrontal cortex, which is a slow-developing area and therefore, reasonably plastic (Huttenlocher, 2002). Perhaps that is why it took deficits in socio-emotional competence to be persistently low to have a negative effect on EF. More research is needed to unpack, contextualise and verify these paths through which socio-emotional competence affects EF.

Further support for our findings that socio-emotional competence development is important for EF can be found on a purely psychological level. The level of socio-emotional competence may decide the importance a child attaches to their social relationships, which may motivate them to exert more control over their behaviours (Sroufe, 1996). It is also well known that children who have difficulty regulating their emotions can have difficulty paying attention

and focusing on cognitive tasks. Studies have shown that children with better emotional regulation skills are able to perform better on measures of academic performance (Howse et al., 2003; Graziano et al., 2007). Undertaking new cognitive tasks may arouse emotions in children, which could range from anxiety to frustration to extreme excitement. Children who are able to deal with these emotions may have more mental resources available to meet the demands of the cognitive tasks.

I also hypothesised that associations between socio-emotional competence and hot EF would be stronger in comparison to cool EF because of the emotional context of hot EF. Our results did not support this hypothesis and instead contribute to the research which suggests the distinction between hot and cool EF is not clear or conclusive. For instance, Hongwanishkul et al.'s, (2005) findings suggest the distinction between hot and cool EF is not clear. They employed two tasks each to measure cool (dimensional card sorting and self-ordered pointing task) and hot EF (children's gambling task and delay of gratification) in children aged 3 to 5 years. While scores on the cool EF tasks were correlated with each other, scores on hot EF were not. Instead, scores on the Children's Gambling Task (the hot EF task) were associated with the two cool EF tasks. In addition, they found that hot EF was not associated with any measure of temperament: negative emotionality, surgency or effortful control. This was surprising as hot EF is expected to correlate with negative emotionality and surgency, but instead they found that a negative correlation between cool EF and surgency. Together, these findings, along with ours, highlight that cool and hot EF do not seem to be distinct constructs.

Our hypothesis that socio-emotional competence would be more strongly associated with hot than cool EF was also based on the assumption that the hand clap task does not invoke emotions in children. However, Peterson and Welch (2014) argue that cool EF tasks can still evoke strong affective response. Children can also be emotionally driven by a desire to do well on any given task and gain approval/praise from those around them, which could, thereby, add an emotional component to a task without any attractive tangible reward. Relatedly, Duckworth

and Seligman (2005) found that a composite measure of “self-discipline” tapping into impulsivity (hot EF) with a delay of gratification task (also included in our study), predicted academic grades in adolescence, and explained twice as much variance as IQ; perhaps highlighting that seemingly logic-based academic tasks may have emotional content to them. It is also argued that cool EF tends to mature earlier than hot EF (Prencipe et al., 2011). Therefore it is possible that hot EF may not have matured as much as cool EF in our sample of preschoolers, making it harder to differentiate between them.

#### **4.4.1 Limitations**

It is also possible that one reason stronger associations between socio-emotional competence and hot EF, compared to cool EF, were not found is due to the nature of the items in our socio-emotional competence index. Our index included measures of the temperament traits orienting capacity and effortful control at both 9 months and 4.5 years; both of which have a cognitive component to them. Hence, this may have dimmed the expected stronger relationship between socio-emotional competence and hot EF, and attenuated the relationship between socio-emotional competence and cool EF. Also, the effect sizes were generally weak. The analyses did not control for earlier levels of EF, which limits the ability to make assertions about causal directions in the study.

A further limitation is that only one task was used to measure cool and hot EF: in larger scale studies like GUiNZ inclusion of lengthy batteries is not feasible. Although previous researchers have also used a single task to measure both cool and hot EF (e.g. Casey et al., 2011; Eigsti et al., 2006) and found significant results, it is possible that our single tasks may not have been able to fully capture these EF constructs. In addition, both measures of cool and hot EF had a strong ceiling effect, which meant that these measures were not able to adequately differentiate between good and poor performers in terms of EF. This may have reduced the sensitivity of analysis to pick up effects, perhaps contributing towards the weak size of effects. Some researchers have also opposed the use of different tasks to compare hot and cool EF

arguing that it is only an assumption that these tasks are specifically tapping into cool and hot EF (Carlson et al., 2005; Garon et al., 2008; Peterson & Welch, 2014). Instead, they have suggested increasing the hotness of the same task, arguing that enhancing the emotional context in the same task is a more viable way of differentiating between hot and cool EF.

On another cautionary note, scores of socio-emotional competence were categorised relative to each other rather than based on normative data. In addition, average and high socio-emotional competence categories were combined to give an AvgHigh category, which also limited the variability of the data. This could also be one of the reasons weak effects were noted in this study.

Also, for developmental reasons and limited number of tools available in the GUiNZ study, different variables were used to calculate socio-emotional competence scores at each DCW, which means that the index may not be measuring the same thing across all time points. These issues in the measures used in this research should be kept in mind while interpreting the results.

#### **4.5 Implications**

While socio-emotional competence was more strongly related to hot than cool EF, the present study does provide important evidence in support of the association between patterns of early socio-emotional competence development across the early childhood and their association with EF at 4.5 years of age. The use of a large and demographically diverse cohort also gives weight to these findings. Although the longitudinal design of this research aids in drawing at least some causal inferences regarding socio-emotional competence and EF, the mechanisms that drive this association and the role of the preschool learning environment context are not clear. Future research should consider and assess the mediating role of language ability, the quality of parent/caregiver relationships and the home learning environment, to help better understand the pathways through which socio-emotional competency may affect EF development. In addition, future research should consider using continuous scores and control

for earlier levels of EF to assess socio-emotional competence effect on EF. Manipulation of the degree of hotness in an EF task should also be considered.

Overall, these findings suggest that if interventions are introduced into the preschool years to target EF, these need to be considered in light of the development of socio-emotional competence, and that those with a persistently low levels of early socio-emotional competence may benefit most.

## **Chapter 5. Socio-emotional Competence and Emergent Academic Skills in Preschoolers: The Mediating Role of Attention and Language Skills (Study 3)**

### **5.1 Introduction**

The following study addressed the third research question: *How and via what paths does socio-emotional competence across early childhood influence emergent academic skills?* This was the second step in the direction of understanding how early socio-emotional competence relates to cognitive outcomes - emergent academic skills to be specific. The two proposed pathways through which socio-emotional competence may influence emergent academic skills were attention and language. The literature linking socio-emotional competence, attention, language and academic skills was examined to build support for the hypotheses. The study also assessed at what time point during early childhood socio-emotional competence starts to matter for later academic skills. This was specifically of interest given the local and global discourses that are emphasising development of socio-emotional competence as early as possible, both through prevention and/or intervention - stating that early competence is linked with later academic skills.

In the absence of a single measure of emergent academic skills, scores on indicators of emergent academic skills: literacy skills, knowledge of conventional symbols and numeracy skills were combined. Similarly, for attention, interviewers' ratings of children's focus on several performance tasks at 4.5 years were aggregated. Like Study 2, it was not possible to control for prior levels of attention, language skills and literacy skills due to the non-availability of these measures. As an indicator of language abilities, a measure of expressive language, MacArthur Cognitive Development Inventory - Toddler Short Form (Fenson et al., 2000), was administered at the 2-year DCW. However, its items suggesting emotional knowledge have been used to calculate the index of socio-emotional competence at the 2-year DCW. In order to prevent overlap, it was not included in this study. With regards to attention, there was a possibility of using children's scores on the stack and topple task at the 2-year DCW (Ross, 1982; Henderson et al., under review) to control for earlier levels of attention but

including it would have reduced the sample considerably. Other potential covariates related to mother and the child were controlled. The following account is a version of Study 3 manuscript currently under revision for resubmission to *Early Education & Development*.

Learning is a social process (Zina et al., 2007) particularly in early childhood. Children with better socio-emotional skills are likely to be adaptable, easy-going and responsive, which promote positive social interactions (Thomas, 2005). Socio-emotional competence aids adjustment to the demands of the learning environment (Trentacosta & Izard, 2007), leading to a potential upward spiral in their development and learning. These socio-emotional competence skills include emotional expressiveness, understanding emotions, regulation of emotions and behaviours, social problem solving and social relationship skills (Denham, 2006).

### ***5.1.1 Socio-emotional Competence and Academic Skills***

Research has shown that domains of socio-emotional competence (considered individually or two or more considered together) affects early literacy and mathematical skill development. For example, in at-risk preschool children, better social functioning relates to stronger emergent academic skills: pre-literacy, language and mathematics skills (Arnold et al., 2012). Similarly, in an at-risk population of preschool children, socio-emotional problems (social and emotional difficulties and attention) were negatively related to mathematics skills, while socio-emotional strengths (such as initiative, self-control and attachment) were positively associated with them (Dobbs et al., 2006). Longitudinal effects have also been found, with social behaviours of 4-year-olds from schools serving low-income neighbourhoods being related to phonological awareness 5 months later (Girard & Girolametto, 2013).

The majority of research on the role of socio-emotional competence on academic skills has focused on at-risk populations, but there is also value in assessing whether these associations are also found in community samples. It is possible that the variations in socio-emotional competence have a different influence on emergent academic skills in the sample of young children exposed to varying levels of risks. That is why this study aimed to assess the

effect of early socio-emotional competence on emergent academic skills, and the pathways through which it has an effect on them using an ethnically and socioeconomically diverse sample from the longitudinal study Growing Up in New Zealand.

To date, most of the research in this area has focused on separate domains of socio-emotional competence rather than the socio-emotional competence taken as a system of integrated subsystems. In real life these domains work together in an integrated manner (Denham, 1998; Denham et al., 2012) so it is important for research to also consider this. Socio-emotional competence, considered as an aggregate of different domains, may have a different effect on learning than when the socio-emotional skills are considered in isolation. From a policy standpoint, use of composite measures can also be useful as global constructs rather than their components as they are often more widely understood and communicated (Joint Research Centre-European Commission, 2008).

While socio-emotional competencies have been associated with academic outcomes, most of this research has been cross-sectional. It is, however, also valuable to examine the role of socio-emotional competence at more than one time point in early life to assess if earlier lags in socio-emotional competence become critical for the development of emergent academic skills.

#### 5.1.1.1 How Socio-emotional Competence Leads to Academic Skill Development

There are multiple possible explanations for the associations between socio-emotional skills and emergent academic skills. For example, children who are identified as having better socio-emotional competence may be able to identify emotions in themselves and others, and hence make sense of the social situations efficiently, giving them more mental resources available to pay attention to learning tasks (Salisch et al., 2017).

It is also possible that greater socio-emotional competence involves better emotional self-regulation skills, aiding the management of overwhelming emotions, which reduces internal distractions in learning settings (Rhoades et al., 2011; Trentacosta & Izard, 2007).

Another explanation is that social problem-solving and social relationship skills help with developing relationships, improving interactions and resolving conflicts with peers and teachers which, in addition to increasing attention (Thomas, 2005), enhances the opportunities for language development (Vygotsky, 2012) and ultimately the development of academic skills (Nelson et al., 2011). Together these findings highlight the key mediating role that attention and language skills seem to play in the acquisition of academic skills.

#### 5.1.1.2 Attention as a Mediator of Socio-emotional Competence and Academic Skills

Some researchers have assessed the mediational role of attention in the relationship between socio-emotional competence and academic skills. Again, most of this research has focused on domains of socio-emotional competence (not a global measure) and used at-risk populations with domains of socio-emotional competence measured at one time point only. For example, in a sample of 341 economically disadvantaged preschool children, attention skills mediated the relationship between emotional knowledge and first grade academic skills (including the ability to recognise letters, dictations skills and mathematical problem-solving skills). This effect was found after controlling for child's age, sex and receptive vocabulary skills as well as mother's education and family income (Rhoades et al., 2011). Similarly, task engagement (capturing child's sustained attention and engagement in activities averaged from four observations) was found to be a significant mediator in the associations between teacher-reported preschool social skills (including prosocial behaviour and peer acceptance) and gains in language and literacy skills in an economically-disadvantaged sample of 470 children (Vitiello & Williford, 2016). Support for a mediating role of attention (teacher-reported) on the relationship between emotional regulation (in kindergarten) and academic competence (assessed after 10 months in first grade) in a low-income sample of children has also been found (Trentacosta & Izard, 2007).

In addition to attention being explored as a mediator between socio-emotional competence and academic achievement, direct paths between socio-emotional competence and

attention, and between attention and academic achievement have been studied (Arnold et al., 2012; Hume et al., 2016; Johnson et al., 2005; Rabiner et al., 2016; Zumberge et al., 2007). Again, the studies looking at socio-emotional competence and attention have typically looked at domains of socio-emotional competence such as emotional knowledge (Trentacosta et al., 2006) and emotional regulation (Sjowall et al., 2015; Trentacosta, & Izard, 2007), rather than using a more global composite measure, which will be a focus of the present study.

There is also research on the directionality of the relationship between aspects of socio-emotional competence and attention. Emotional knowledge has been found to impact later attention (after controlling for language abilities and earlier attention problems), but no evidence was found for the effect of attention on later emotional knowledge (Salisch et al., 2017). This suggests that the domains of socio-emotional competence predict attention rather than the other way around.

#### 5.1.1.3 Language Skills as a Mediator of Socio-emotional Competence and Academic Skills

To our knowledge, no study has specifically explored the mediating role of language skills in the development of emergent academic skills from socio-emotional competence. The closest found was a study on problem-solving, where an indirect effect for socio-emotional development on problem solving was found via language in economically disadvantaged children aged between 1 and 36 months (Sharkins et al., 2017).

There is, however, substantial evidence that socio-emotional skills help in the development of language skills (Dixon & Shore, 1997; Fish & Pinkerman, 2003; Karrass et al., 2006; Sharkins et al., 2017; Slomkowski et al., 1992) and that language skills such as vocabulary in preschoolers predicts later academic achievement (e.g. Johnson et al., 1999; Snow, Porche, Tabors & Harris, 2007). I also found the converse, that is language difficulties are associated with academic difficulties (Nelson et al., 2010).

With respect to the associations between socio-emotional competence and language, low emotional regulation and higher reactivity has been shown to be associated with children's

language difficulties after controlling for gender, age and prior language abilities (Karrass et al., 2006). Similarly, infants rated more positive and social tended to use more words and communicative gestures 6 months later while infants showing a lack of initiative and high externalising behaviours were found to have to lower language scores (both expressive and receptive) aged four (Fish & Pinkerman, 2003).

In summary, research to date has largely supported the mediating role of attention between *domains* of socio-emotional competence and academic competence while the mediating role of language skills has not been fully explored. In addition to only investigating the domains of socio-emotional competence in at-risk populations, these studies have only assessed socio-emotional competence domains at one time point. The present study aimed to address this gap and assessed the mediating role of observed attention and language skills on the relationship between socio-emotional competence and emergent academic skills across early childhood. In addition, I explored the use of a global measure of socio-emotional competence and a dimensional view of socio-emotional competence (which included combinations of two or more related socio-emotional skills) measured at three time points, 9 months, 2 years and 4.5 years, in a population-based sample of young children. By including a global measure of socio-emotional competence, I was potentially able to discern the difference in patterns of influence when using a broader measure of an integrated system, which socio-emotional competence is, and when more fine-tuned dimensional measures of socio-emotional competence are used. In addition, assessing the role of socio-emotional competence at multiple time points enabled me to assess when in early development the level of socio-emotional competence (and its dimensions) seem to become important for the children's emergent academic skills.

I hypothesised that attention and language will mediate the relationship between early socio-emotional competence at the three DCWs and emergent academic skills at 4.5 years. In keeping with previous studies, this study controlled for factors which are predictive of

emergent academic skills such as age (Rhoades et al., 2011), socioeconomic status, ethnicity and mother's education (Gutman et al., 2003; Lee & Burkam, 2003; Janus & Duku, 2007). I also controlled for gender as it has also been found to influence the associations between social behaviour and emergent literacy skills (Doctoroff et al., 2006). Therefore in this study age, sex, maternal education and socioeconomic status were included in the analyses as covariates, and the invariance of the models was tested across our sample's four major ethnic groups.

## **5.2 Methods**

### **5.2.1 Participants**

The present study used data from the longitudinal GUiNZ study, which has collected data from mothers starting approximately 6 weeks before their child's birth. The initial cohort of 6822 children is broadly representative of New Zealand births from 2007 to 2010. Further details of the study sample can be found in Morton et al. (2015) and details regarding the design and recruitment are available in Morton et al. (2014; 2017).

For this study, our main variable of interest was an index of socio-emotional competence, which was used at three time points. A total of 4839 children had adequate data on measures used to calculate the index of socio-emotional competence, and hence they formed the sample for the current study. Our final reduced sample did not differ significantly from the full sample of 6156 children at 4.5 DCW in terms of mother's age, education (antenatal) and ethnicity (antenatal) and child's gender and parity (antenatal; Table 5.1). However, the reduced sample differed in terms of socioeconomic status with European mothers with high socioeconomic status over-represented. The difference, however, was small (Cramer's  $V \leq 0.042$ ; Cohen, 1988; Table 5.1).

**Table 5.1**

*Demographics of the Participants Comparing the Full Sample (N = 6156) with the Reduced Sample (n = 4767)*

Demographics	Reduced Dataset (N = 4767)	Full Dataset (n = 6156)	Cramer's V
	N (%) or M(SD)	N (%) or M(SD)	
Gender			.006
Boy	2425 (50.9)	3165 (51.4)	
Girl	2342 (49.1)	2986 (48.5)	
Age in days (at 4.5-year DCW)	1654.43 (44.4)	1619.5 (46.2)	-
Child's parity (Antenatal)			.009
First born	1726 (36.2)	2170 (35.3)	
Subsequent birth	2618 (54.9)	3421 (55.6)	
Mother's age (reported at antenatal DCW)			.010
Less than 20 years	191 (4.0)	250(4.1)	
29 to 29 years	1754 (36.8)	2324(37.8)	
30 years or more	2822 (59.2)	3581(58.2)	
Mother's highest education (reported at antenatal DCW)			.017
No secondary	273 (5.7)	377 (6.1)	
Secondary	1028 (21.6)	1385 (22.5)	
Diploma/NCEA 5 or 6/Bachelor's or Higher Degree	3466 (72.7)	4350 (70.7)	
Deprivation Index (at 4.5-year DCW) <sup>1</sup>			.031**
1	489(10.3)	562 (9.1)	
2	556(11.7)	665 (10.8)	
3	456(9.6)	550 (8.9)	
4	486(10.2)	569 (9.2)	
5	442(9.3)	517 (8.4)	
6	441(9.3)	516 (8.4)	
7	396 (8.3)	496 (8.1)	
8	430(9.0)	500 (8.1)	
9	476(10.0)	605 (9.8)	
10	595(12.5)	831 (13.5)	
Ethnicity (mother-reported) <sup>2</sup>			.042**
European	2897 (60.4)	3491 (56.7)	
Māori	604 (12.7)	813 (13.2)	
Pacific	543 (11.4)	785 (12.8)	
Asian	567 (11.9)	845 (13.7)	
Others	149 (3.1)	204 (3.3)	

Note. DCW= Data collection wave;

<sup>1</sup> The New Zealand Deprivation Index combines nine socioeconomic variables from the 2006 census capturing eight dimensions of deprivation at the small area level (Salmond et al., 2007); \*\* $p < .01$

<sup>1,2</sup> 345 (5.6%) and 18 (.3%) participants had data missing data on household deprivation and in the full dataset.

## 5.2.2 *Measures*

### 5.2.2.1 Emergent Academic Skills (Observer's Report)

Scores on four observed measures were used as indicators of emergent academic skills in 4.5-year-olds.

#### 5.2.2.1.1 *Literary Skills*

Emergent literacy skills were assessed through the Dynamic Indicators for Basic Literacy Skills - Letter Naming Fluency task (DIBELS - LNF; Kaminski & Good, 1996; 1998), which is a standard and individually administered measure of early literacy skills in kindergarten. Low scores on the DIBELS can signify risk of poor reading outcomes (Good & Kaminski, 2002). In this task, children are presented with upper- and lower-case letters in a random order on a page, and they are requested to name as many letters as they can in one minute. A score of one is given for every correct answer. If the child is not able to name any letter correctly within the first row, then the assessment is discontinued. Evidence for its divergent and convergent validity has been found in kindergarten children (Rouse & Fantuzzo, 2006). In addition, adequate alternate-form, split-half and test-retest reliability has been established (Good et al., 2002). In the present study, total scores ranged from 0 to 67 with a mean of 8 ( $SD = 10.44$ ).

#### 5.2.2.1.2 *Knowledge of Conventional Symbols*

Early understanding and use of conventional symbols and emergent writing skills were assessed using two tasks from the *Who Am I?* (WAI; de Lemos & Doig, 1999), which is culturally sensitive and involves direct assessment (de Lemos, 2008). The first WAI task involved the participant writing their name while the second one involved writing any numbers. The responses were scored on a scale of 0 to 4. For both tasks, the scores "0" represented "No Response" and a score of "1" represented either "Scribble, or no recognisable numbers/letters from the name". A maximum score (of 4) was given if they wrote a recognisable name with generally clear letters, while for the number task a score of "4" was given if the child wrote numbers only, wrote several numbers and the numbers were clearly

formed and separated. The WAI has been reported to have good internal consistency (.51 to .67) and correlations with other tests of academic performance (.40 to .60; Plake et al., 2003).

#### 5.2.2.1.3 Numeracy Skills

Knowledge of the orders of numbers and counting skills was assessed by asking the participants to count forward from 0 to 10. One score was given for each number counted accurately with children able to score up to a maximum of 10. In the present study, around 75 percent of the children were able to count up to 10.

#### 5.2.2.2 Attention

For the present study, attention is defined as the ability to stay focused on a task. At the 4.5-year DCW, a number of observations (six in total) were made by the interviewer to assess a child's focus on various observational and cognitive tasks: hand clap task, affective knowledge task (AKT), DIBELS-LNF, parent-child interaction, name and numbers tasks, and gift wrap task. Responses were measured on a five-point Likert scale ranging from "1 = *Not at all*" to "5 = *All of the time*." These six items were used as manifest indicators of attention. The derived scale had adequate internal consistency with Cronbach's alpha ( $\alpha$ ) of 0.74.

#### 5.2.2.3 Language skills

Early language ability was measured using an adapted and shortened version of Picture Peabody Vocabulary Test - III (PPVT-III; Dun & Dunn, 1997) at 4.5 years. A modified version of this test, which consists of 40 items was used, as a measure of a child's receptive language. This modified version was developed by the Longitudinal Study of Australian Children (LSAC) using data from 215 children aged 41 to 66 months (Australian Council for Educational Research, 2000; Rothman, 2003). In this task, children were presented with four pictures and asked to name or point to the picture corresponding to the word said by the assessor. Scores ranged from 0 to 40. There is evidence suggesting that the distribution of PPVT and verbal Intelligence Quotient (IQ) are highly similar (Krasileva et al., 2017). In

addition, it has been found to have high a correlation with Wechsler Verbal IQ and Full-Scale IQ (.82 - .92; Dunn & Dunn, 1997).

#### 5.2.2.4 Socio-emotional Competence

An index developed by Ahmad et al., (2019; See Chapter 2 for details) provided a global measure of socio-emotional competence along with scores on its dimensions that emerged. For the present study, I used the socio-emotional competence dimension scores (easy-going, regulation and exuberance) that were available at the three DCWs (9 months, 2 year and 4.5 years) as well as the aggregated scores on the dimensions at each DCW.

The indices were created from 26 scales variables taken from seven measures (see Table 5.2) related to one or more domains of socio-emotional competence based on a model proposed by Denham (2006). In brief these 26 scales were grouped using Exploratory Factor Analysis resulting in two factors at 9 months and 2 years: easy going, regulation; and three factors at 4.5 years: easy-going, regulation and exuberance. Each factor/dimension score (calculated by aggregating equally weighted scale scores) was transformed into z-scores, and aggregated within each DCW (with equal weight given to each factor) creating a global socio-emotional score at each DCW. Of note, the process of index development went through multiple iterations and two kinds of weighting (equal and based-on-factor loadings) were considered (for a more detailed description of the method used, see Chapter 2). Please note that the dimensions that emerged from the Exploratory Factor Analysis did not map onto domains of socio-emotional competence as listed in Denham's model (2006). While this was partly expected as the variables used to construct the index measured more than one domain of socio-emotional competence (see Chapter 2). However, this also raised questions about the validity of the index, and therefore is a limitation of this study.

**Table 5.2**

*Showing Scales Belonging to Socio-emotional Competence Dimensions of Easy-going, Regulation and Exuberance at each Data Collection Wave (DCW).*

DCWs	Easy-going	Regulation	Exuberance
9-month SEC	Negative emotionality – IBQ-R VSF Fear – IBQ-R VSF	Orienting capacity – IBQ-R VSF Affiliation/Regulation – IBQ-R VSF Positive affectivity/Surgency – IBQ-R VSF	
2-year SEC	Conduct problems – SDQ Emotional problems – SDQ Hyperactivity problems – SDQ Peer problems – SDQ Expressive Vocabulary – emotions related	Prosocial – SDQ Impulse Control Scale – DesRosier’s Measure Shame Scale – DesRosier’s Measure	
4.5-year SEC	Negative Affect – CBQ VSF Emotional problems – SDQ Hyperactivity problems – SDQ Conduct problems – SDQ Peer problems – SDQ Hardiness – CBQ VSF	Effortful control – CBQ VSF Attention – CBQ VSF Prosocial – SDQ	Surgency – CBQ VSF Boldness – CBQ VSF Observations– engagement with interviewer and mood (Assessor’s Report, PSRA) Expression identification (AKT)

*Note.* SEC= Socio-emotional competence; IBQ-R VSF= Infant Behavior Questionnaire – Revised Very Short Form (Gartstein, Rothbart & Leerkes, 2014); SDQ=Strengths and Difficulties Questionnaire (Goodman, 1997); CBQ VSF= Child Behavior Questionnaire – Very Short Form (Putnam & Rothbart, 2006); PSRA= Preschool Self-Regulation Assessment (Smith-Donald, Raver, Hayes & Richardson, 2007); AKT = Affective Knowledge Task (Denham, 1986)

In this study the continuous index scores were used from each DCW. The index at each DCW could also be analysed with respect to its dimensions. Therefore, two dimensions (easy-going and regulation dimension) identified at 9 months and 2 years and the three dimensions (easy-going, regulation and exuberance dimension) identified at 4.5 years were used (see Table 5.2).

#### 5.2.2.5 Covariates

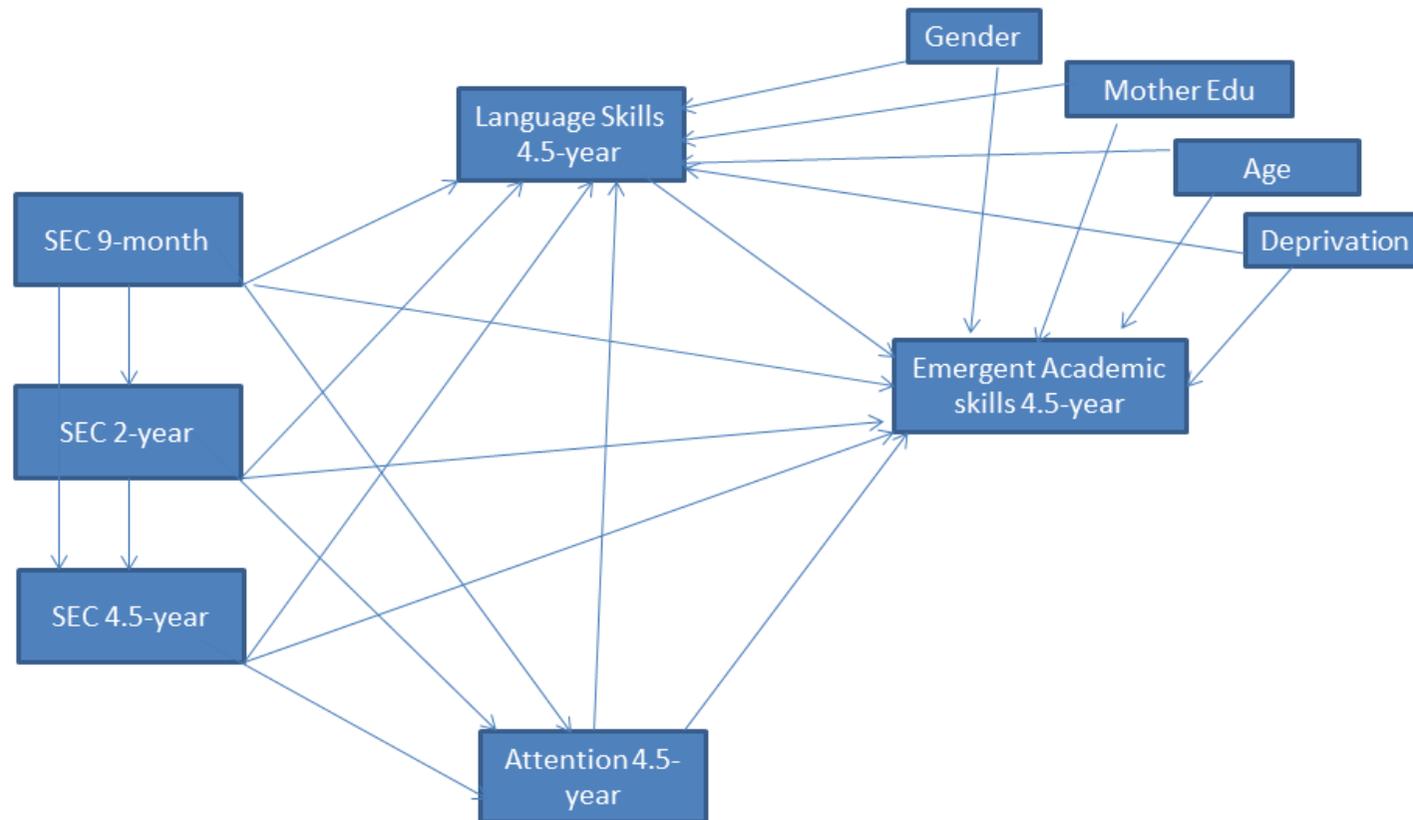
The analyses also included the covariates of age (in days), child's sex (0 = *Male*, 1 = *Female*), maternal education measured during antenatal assessment done approximately 6 weeks before birth (1 = *No education*, 2 = *Secondary education* & 3 = *Diploma/trade certificate/Bachelor's degree or higher*), and finally socioeconomic status as assessed through the New Zealand Deprivation Index (NZ Dep) on a 10-point scale spanning from "1 = *Least deprived*" to "10 = *Most Deprived*." The NZ Dep combines nine socioeconomic variables from the 2006 census capturing eight dimensions of deprivation (including income, owned home, support, employment, qualifications, living space, communication and transport) at the small area level (Salmond et al., 2007).

#### 5.2.3 Data Analyses

Structural equation models were created using IBM SPSS Amos 25.0. In total, four models were examined to assess how the development of socio-emotional competence and its dimensions at 9 months, 2 years and 4.5 years influence emergent academic skills at 4.5 years of age. Figure 5.1 shows the hypothesised base model with the covariates. In order to measure the indirect effect of socio-emotional competence and its dimensions on emergent academic skills via attention and language skills, 500 bootstrapped samples with 95 percent confidence intervals were used. The bootstrapped unstandardised indirect effect was considered to be significant if the 95 percent confidence interval did not include 0 in the range.

**Figure 5.1**

*Hypothesised Model Built to Assess the Role of Attention and Language Skills (Both at 4.5 years) as Mediators in the Relationships Between Socio-emotional Competence (at 9 Months, 2 Years & 4.5 Years) and its Dimensions and Emergent Academic Skills (at 4.5 years)*



*Note.* Figure only mentions SEC as the exogenous variable. As mentioned, dimensions of SEC were also examined but not stated in the hypothesised model for simplicity. SEC= Socio-emotional competence; Mother Edu = Mother's highest education (antenatal); Age= Age at the time of assessment at 4.5-year DCW; Deprivation = New Zealand Deprivation Index at 4.5-year DCW.

Before interpreting the parameters, I examined how well the model fitted the data. As advised by Hooper and colleagues (2008), I relied on multiple goodness of fit statistics: Chi-square statistics (with its degree of freedom and  $p$  value), Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA), gamma hat and Standardized Root Mean Square Residual (SRMR). Model fit was considered excellent with indices of:  $CFI \geq .95$ , gamma hat  $\geq .95$  and RMSEA and SRMR  $\leq .60$  while adequate fit was argued for indices of:  $CFI \geq .90$ , gamma hat  $\geq .90$  and RMSEA and SRMR  $\leq .80$ . Note that while Chi-square is sensitive to large sample, CFI penalises complex models and RMSEA rewards those (Fan & Sivo, 2007). Therefore, I put greater emphasis on the values of gamma hat and SRMR to classify model fit as they are more stable in face of model complexity (Fan & Sivo, 2007). If there were non-significant paths involving the outcome variables, then those paths were deleted, and the model's goodness of fit was assessed again before reporting the parameters.

Invariance testing to look at measurement and structural equivalence of the model with global socio-emotional competence across different ethnicities was conducted using multi-group analysis, which constrains different parameters. In the first instance, configural invariance was tested by examining the best identified model, with factor loadings and threshold free to vary. Configural invariance is supported if the factors identified in the measurement model are associated with the same items across all the groups. Configural invariance is assessed on the basis of the fit indices (M1). Metric invariance, which signifies that the groups are responding to items in the same way, was examined next by constraining the factor loadings to be equal across all the groups (M2; Stone et al., 2013). In order to test structural invariance, structural weights were constrained to ensure that the path coefficients did not vary across the ethnic groups (M3). Each of the last three models was compared with the last less constrained model for differences in statistical significance. In the present study, a difference of equal to or less than 0.01 in the value of CFI ( $\Delta CFI$ ) was considered a support for invariance between the ethnic groups. Traditionally used Chi-square statistics were not

considered for assessing invariance because of their sensitivity to large sample sizes (Cheung & Rensvold, 2002).

### 5.2.3.1 Missing Data

Out of the 4839 participants with socio-emotional competence scores at each DCW, 72 (1.49%) participants had incomplete data on the covariates. As the covariates were all demographic variables, these participants were deleted (leaving us with data on 4767 participants) before proceeding with further analysis.

A further 62 (1.30%) participants had data missing on DIBELS-LNF, name and numbers tasks from WAI, counting forward to 10 and the PPVT, and there was marginal evidence that these participants were missing completely at random:  $\chi^2 = 214.572$ ,  $\chi^2/df = 4.99$ ,  $p = .025$ . A total of 203 (4.36%) participants had data missing on the six manifest indicators of attention, and marginal evidence that this data was missing completely at random was also found ( $\chi^2 = 833.314$ ,  $\chi^2/df = 4.30$ ,  $p = .038$ ). Finally, marginal evidence that data was missing completely at random was found for indicators of emergent academic skills and the PPVT ( $\chi^2 = 214.572$ ,  $\chi^2/df = 4.99$ ,  $p = .025$ ). Due to the large sample I used a Chi-Square ratio rather than the Chi-Square (Tanaka, 1987). Given these findings, estimation maximisation (EM) was considered an appropriate imputation methodology (Schafer & Olsen, 1998).

## 5.3 Results

### 5.3.1 Preliminary Analysis

Table 5.3 shows the intercorrelations between demographics and main variables included in the study. I also assessed the fit of our latent constructs using CFA. The fit for the measurement model for attention was found to be excellent:  $\chi^2 = 111.942$ ;  $\chi^2/df = 12.438$ ,  $p < .05$ ; CFI = .979; RMSEA = .05; gamma hat = .99; SRMR = .024 (see Table 5.4).

The fit was also excellent for our emergent academic skills outcome variable:  $\chi^2 = 10.622$ ;  $\chi^2/df = 5.311$ ,  $p < .05$ ; CFI = .997; RMSEA = .031; gamma hat = .100; SRMR = .010.

**Table 5.3***Intercorrelations Between Covariates and the Socio-emotional Competence and the Emerging Academic Skills Variables in the Study*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
(1). Gender																
(2). Age in days (at 4.5-year DCW)	-															
(3). Mother's highest education (antenatal)	-	-.14***														
(4). Deprivation	-	.16***	-.27***													
(5). SEC 9 months	-.04**	-.04*	.06***	-.09***												
(6). EG 9 months	-.06**	-.10***	.09***	-.17***	.70***											
(7). Reg 9 months	.002	.04*	-.01	.05**	.70**	-.02										
(8). SEC 2 years	.09***	-.09***	.17***	-.19***	.27**	.22**	.16***									
(9). EG 2 years	.08***	-.15***	.22***	-.32***	.25***	.29***	.05***	.83***								
(10). Reg 2 years	.12***	.06***	-.03	.09***	.16***	-.02	.24***	.63**	.16***							
(11). SEC 4.5 years	.11***	-.06**	.14***	-.21***	.27**	.22***	.17***	.41***	.44***	.19***						
(12). EG 4.5 years	.02	-.15***	.20***	-.28***	.20***	.25***	.03**	.44**	.53***	.03***	.69***					
(13). Reg 4.5 years	.26***	.04*	.02	-.01	.21***	.04***	.25***	.28***	.17***	.34***	.64***	.21***				
(14). Exu 4.5 years	-.07***	-.01	.05**	-.13***	.13***	.14***	.04**	.10***	.17***	.01	.62***	.15***	.06***			
(15). Language Skills (PPVT)	.05**	-.05***	.15***	-.26***	.03	.09***	-.06**	.20***	.32***	-.02	.23***	.21***	.07***	.19***		
(16). Literacy Skills (DIBELS – LNF)	.08***	.003	.15***	-.15***	.04**	.05***	.01	.10***	.14***	.01	.18***	.13***	.12***	.17***	.21***	
(17). Numeracy Skills (Counting 1-10)	.04*	-.05**	.13***	-.17***	.03*	.06***	-.01	.15***	.18***	.05***	.22***	.14***	.11***	.10***	.24***	.25***

*Note.* DCW= Data collection wave; SEC= Socio-emotional competence; EG= Easy-going; Reg= Regulation; Exu= Exuberance; Deprivation = New Zealand Deprivation Index at 4.5-year DCW.

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

**Table 5.4***Factor Loadings for the Latent Variables: Emergent Academic Skills and Attention at 4.5 years*

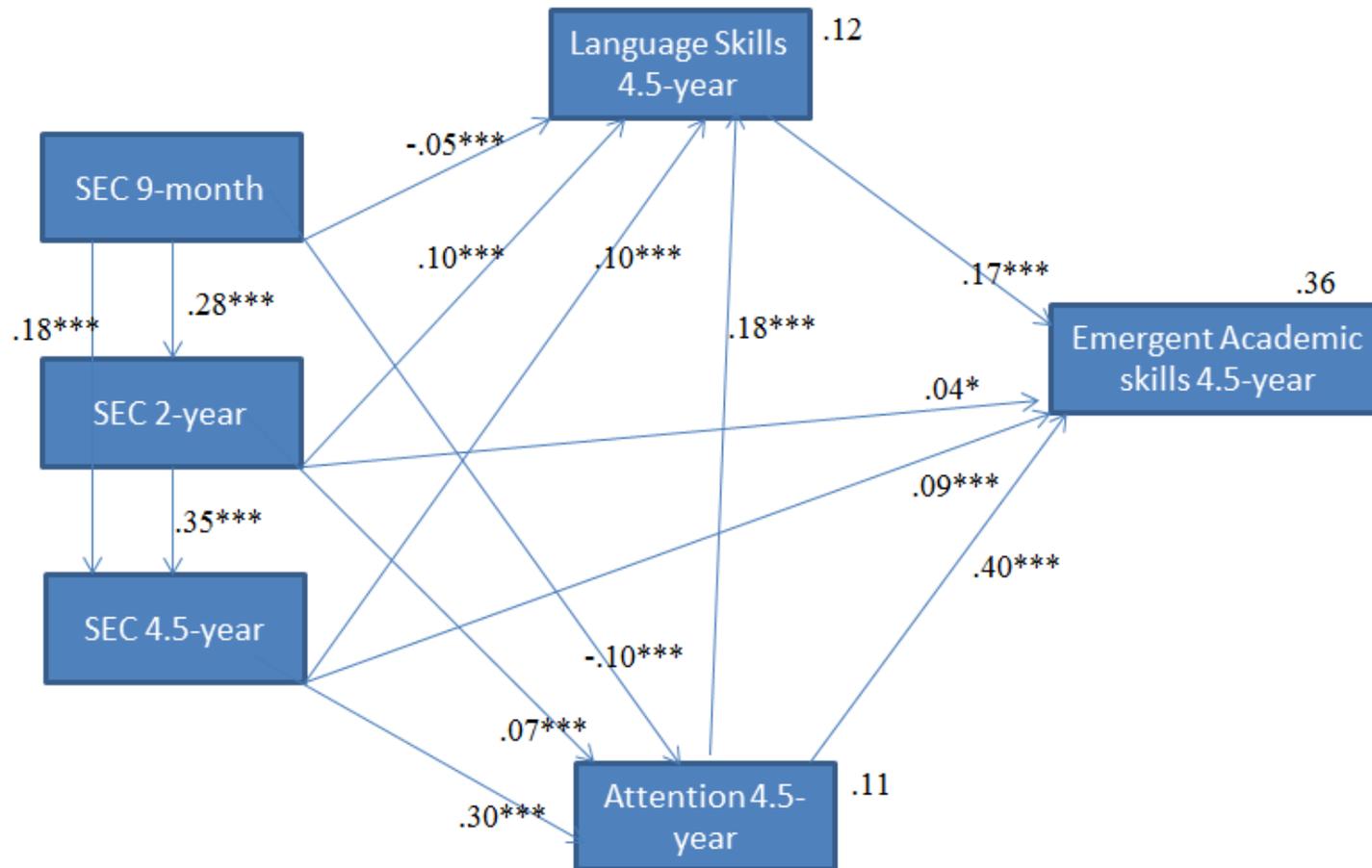
Manifest Variables	Emergent academic skills	Attention (4.5 years)
Literacy skills (DIBELS - LNF)	.68	
Knowledge of conventional symbols		
Who am I? (Name)	.62	
Who am I? (Number)	.63	
Numeracy skills (Counting 1 to 10)	.61	
Attention during the:		
Parent-child interactions		.55
Hand clap task		.63
Affective knowledge task		.51
DIBELS - LNF		.65
Who am I? (Name & Number) & Counting		.67
Gift wrap task		.38

**5.3.2 Path Analyses**

A total of four models were then tested, each explaining 35 to 36 percent of variance in emerging academic skill development. Model 1 explored the relationship between developing socio-emotional competence and emergent academic skills at 4.5 years, and whether attention and language skills were mediators (see Figure 5.2). Model 2, 3 and 4 were similar to Model 1 except that rather than focus on global measure of socio-emotional competence at the three DCWs, the focus was on dimensions of socio-emotional competence (easy-going, regulation and exuberance) at the different DCWs (see Figure 5.3, 5.4 & 5.5). Please note these models also controlled for covariates but are not shown for simplicity.

**Figure 5.2**

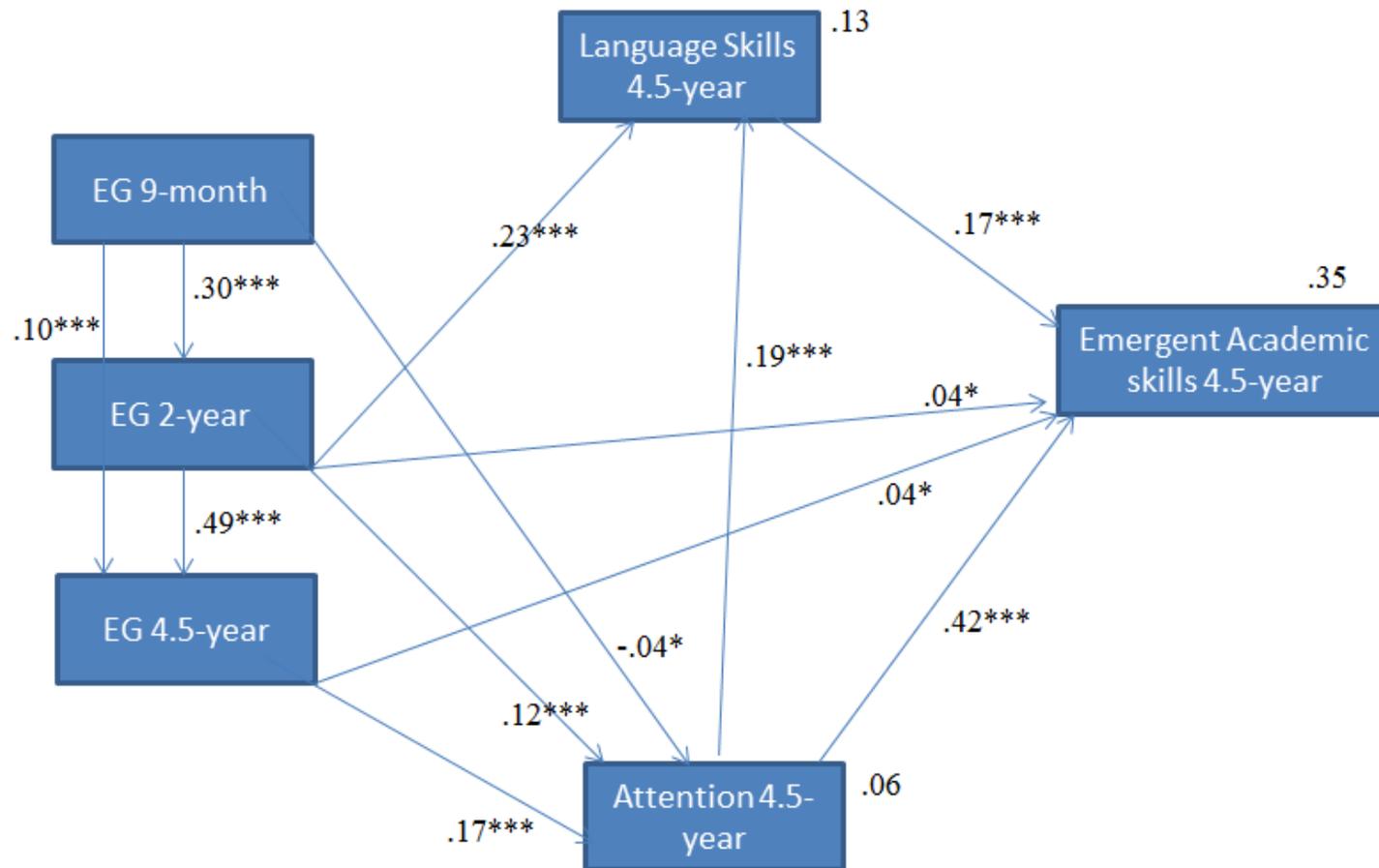
*Results for the Analyses to Assess the Role of Attention and Language Skills (both at 4.5 years) as Mediators in the Relationships Between Socio-emotional Competence (at 9 Months, 2 Years & 4.5 Years) and Emergent Academic Skills (at 4.5 years) after Deletion of Non-Significant Paths that Involved the Main Variables.*



Note. SEC= Socio-emotional competence  
 $*p < .05$ ,  $**p < .01$ ,  $***p < .001$

**Figure 5.3**

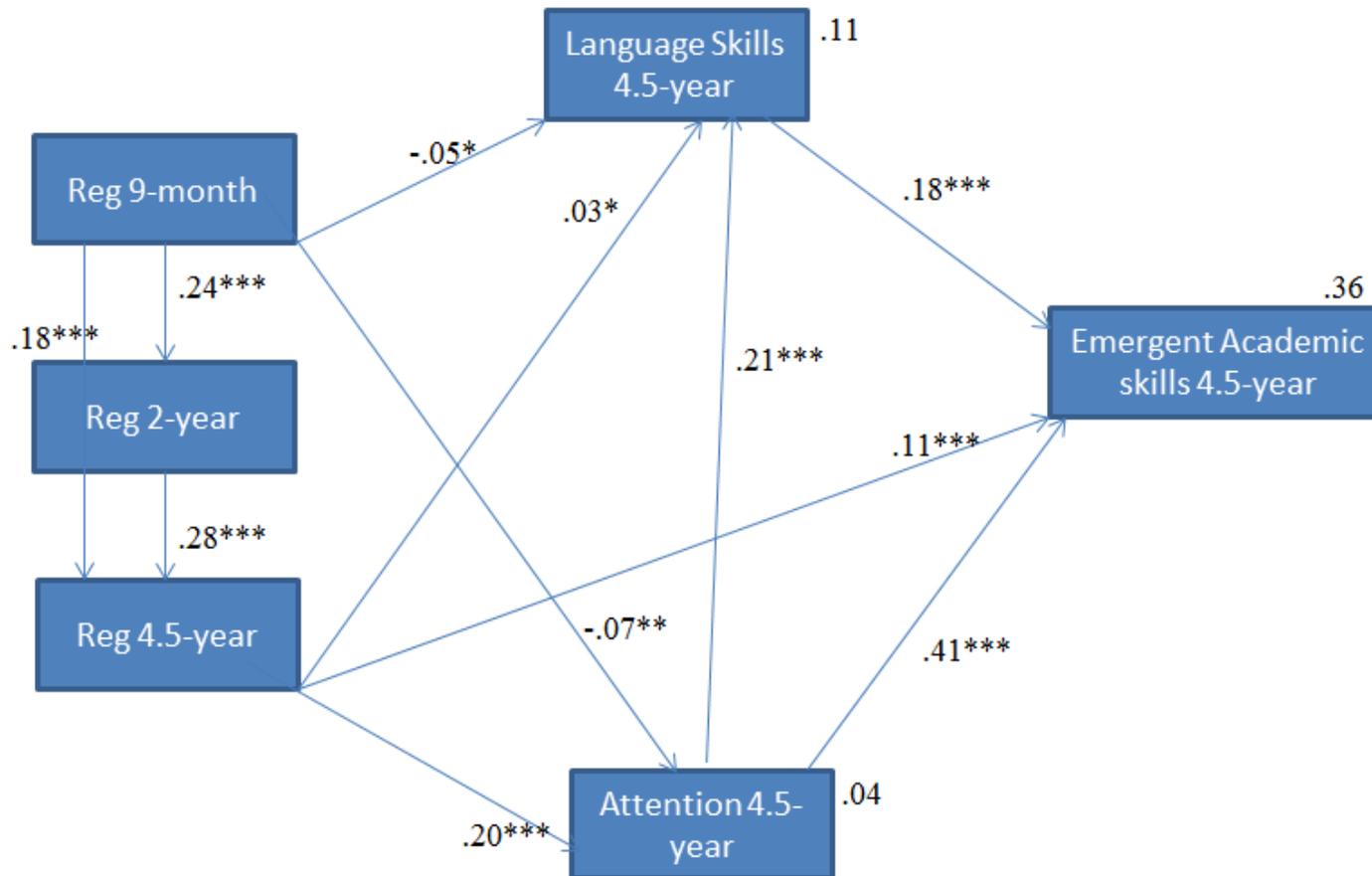
Results for the Analyses to Assess the Role of Attention and Language Skills (both at 4.5 years) as Mediators in the Relationships Between Dimension of Easy-Going (at 9 Months, 2 Years & 4.5 Years) and Emergent Academic Skills (at 4.5 years) after Deletion of Non-Significant Paths that Involved the Main Variables.



Note. EG = Easy-going dimension of socio-emotional competence  
\* $p < .05$ , \*\*\* $p < .001$

**Figure 5.4**

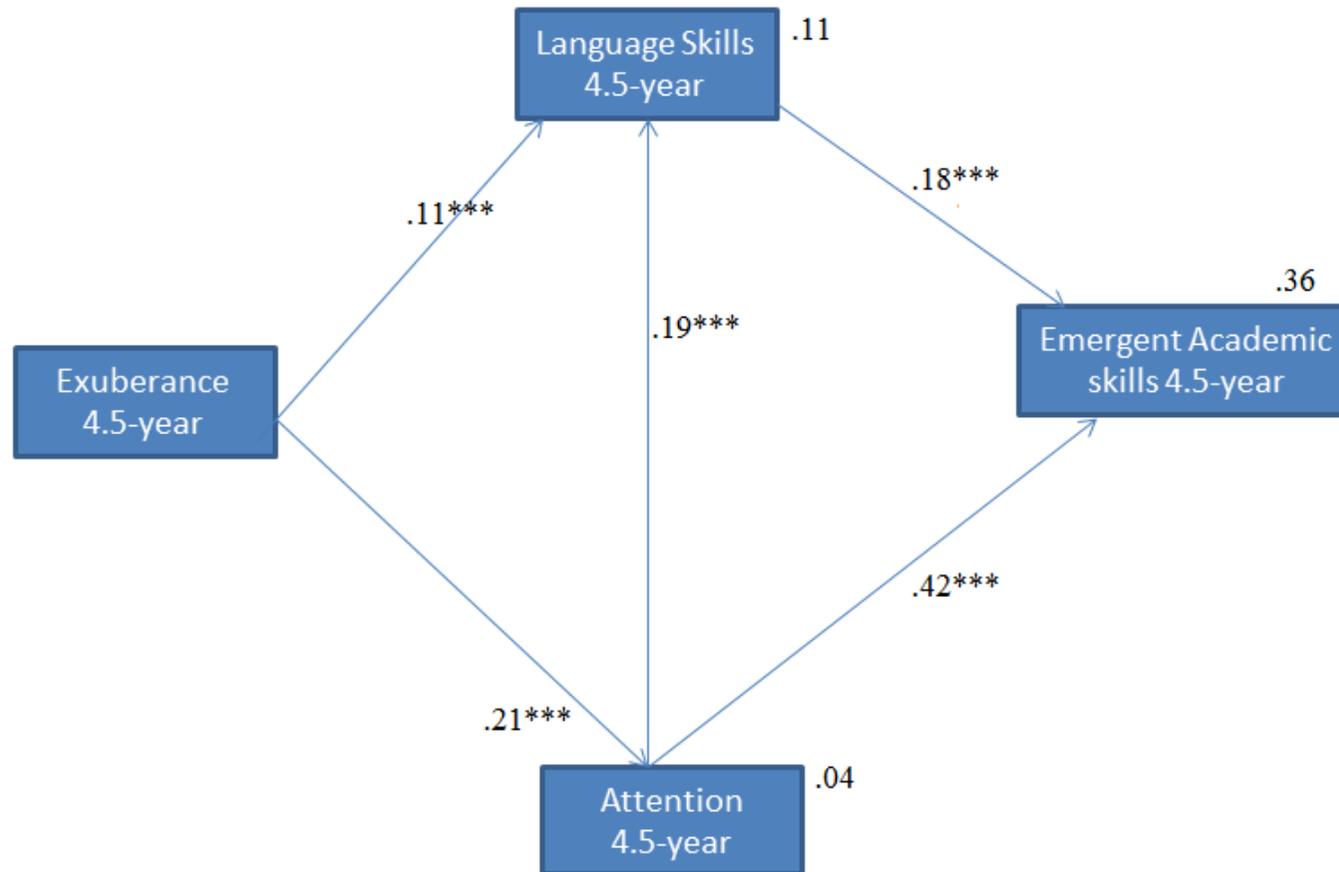
Results for the Analyses to Assess the Role of Attention and Language Skills (both at 4.5 years) as Mediators in the Relationships Between Dimension of Regulation (at 9 Months, 2 Years & 4.5 Years) and Emergent Academic Skills (at 4.5 years) after Deletion of Non-Significant Paths that Involved the Main Variables.



Note. Reg= Regulation dimension of socio-emotional competence  
 $*p < .05$ ,  $**p < .01$ ,  $***p < .001$

**Figure 5.5**

*Results for the Analyses to Assess the Role of Attention and Language Skills (both at 4.5 years) as Mediators in the Relationships Between Dimension of Exuberance (at 4.5 Years) and Emergent Academic Skills (at 4.5 years) after Deletion of Non-Significant Paths that Involved the Main Variables.*



*Note.* Mother Edu = Mother's highest education (antenatal DCW); Age= Age at the time of assessment at 4.5-year DCW; Deprivation = New Zealand Deprivation Index at 4.5-year DCW.

\*\*\* $p < .001$

Overall, the extent to which socio-emotional competence and its dimensions were mediated by attention and language to affect emergent academic skills, varied. That is, while the association between global socio-emotional competence and emergent academic skills was mediated by attention and language, differences in the directions of the associations were found at different time points; specifically, the paths from socio-emotional competence (and its dimensions) at the 9-month DCW were in the opposite direction. In addition, at the dimension level of socio-emotional competence, not all hypothesised mediated paths were statistically significant. For clarity, the statistically significant findings below - which are in keeping with the hypotheses - are summarised before summarising the exceptions that were found with the socio-emotional competence measure at the 9-month DCW.

#### 5.3.2.1 *Model 1*

Attention and language skills at 4.5 years of age were specified as a mediator between global socio-emotional competences at each DCW and emergent academic skills (see Figure 5.1). Results showed that the model had an excellent fit:  $\chi^2 = 1703.674$ ;  $\chi^2/df = 14.556$ ,  $p < .05$ ; CFI = .894; RMSEA = .053; gamma hat = .97; SRMR = .0551. After the deletion of the non-significant direct path from 9-month global socio-emotional competence to emergent academic skills (see Figure 5.2), the model fit remained excellent:  $\chi^2 = 1703.676$ ;  $\chi^2/df = 14.561$ ,  $p < .05$ ; CFI = .891; RMSEA = .053; gamma hat = .97; SRMR = .0551. The relationship between global socio-emotional competence at each time point and emergent academic skills was mediated by attention and language in keeping with the hypothesis, but only partially (Figure 5.2)

More specifically, the indirect effect of 4.5-year global socio-emotional competence via attention on 4.5-year academic skill development was stronger ( $\beta = .12$ ,  $p = .002$ ) than the more distal indirect effect of 2-year global socio-emotional competence via attention ( $\beta = .03$ ,  $p = .004$ ; see Figure 5.2). Similarly, the analyses also suggest that language skills significantly mediated the relationship between emergent academic skills and global socio-emotional

competence at 2-years ( $\beta = .02, p = .002$ ) and 4.5-years ( $\beta = .02, p = 0.005$ ). In terms of size of effect, the indirect path from 4.5-year socio-emotional competence to emergent academic skills via attention had moderate effect size, while the indirect effect via language was small. The indirect effects via attention and language for socio-emotional competence at 2-years DCW were both small, and the direct effects of 2- and 4.5-year socio-emotional competence on emergent academic skills were also small (Kenny, 2021; see Figure 5.2). The models were also tested to ensure invariance across the ethnic groups. Configural and metric invariance were supported as well as structural invariance (see Table 5.5).

**Table 5.5**

*Fit Indices for Variance Analyses across Four Ethnic Groups for Model 1*

	$\chi^2$	df	RMSEA	gamma hat	CFI	$\Delta$ CFI
Ethnicity						
European	890.770	118	.048	.97	.900	
Māori	311.709	118	.052	.97	.897	
Pacific	267.995	118	.048	.97	.897	
Asian	245.961	118	.044	.98	.909	
M1	179.434	505	.023	.97	.898	
M2	1933.141	529	.024	.97	.887	.011
M3	1991.530	562	.023	.97	.885	.002

*Note.* M1=Configural Invariance; M2= Metric Invariance; M3= Structural Invariance.

### 5.3.2.2 Model 2

In Model 2 (Figure 5.3), the mediational roles of attention and language skills at 4.5 years were examined again, but this time in relationship to the easy-going dimension (of socio-emotional competence - see Table 5.1) at the three DCWs and emergent academic skills at 4.5 years. Analyses showed that the model had an adequate fit:  $\chi^2 = 2099.763$ ;  $\chi^2/df = 17.9467$ ,  $p < .05$ ; CFI = .871; RMSEA = .060; gamma hat = .97; SRMR = .0653. After the deletion of non-significant paths from easy-going dimension at 9-month and 4.5-year DCWs to language skills and from easy-going at 9-month DCW to emergent academic skills (compared with hypothesised model, see Figure 5.1), the fit remained acceptable:  $\chi^2 = 2100.813$ ;  $\chi^2/df = 17.507$ ,  $p < .05$ ; CFI = .871; RMSEA = .060; gamma hat = .97; SRMR = .0653.

Unlike the model with global socio-emotional competence (Figure 5.2), the final model had fewer significant paths via language. While attention mediated the relationship between emergent academic skills and easy-going dimension at 2 years ( $\beta = .05$ ,  $p = .004$ ) and 4.5 years ( $\beta = .07$ ,  $p = .002$ ), language skills only mediated the relationship between easy-going dimension at 2 years and emergent academic skills,  $\beta = .04$ ,  $p = 0.004$  (see Figure 5.3). These indirect paths were small in effect size for language but bordered closer to moderate for attention especially when the indirect effect involved socio-emotional competence at 4.5 years. However, the direct effects were small (Kenny, 2021).

In Model 3 (Figure 5.4), the mediatory role of attention and language skills on the relationships between the regulation dimension (of socio-emotional competence) at each DCW and emergent academic competence at 4.5 years was tested (Figure 5.4). Analyses showed excellent fit for the model based on indices of gamma hat and SRMR ( $\chi^2 = 1696.722$ ;  $\chi^2/df = 11.469$ ,  $p < .05$ ; CFI = .885; RMSEA = .053; gamma hat = .97; SRMR = .0494). The model fit remained excellent ( $\chi^2 = 1462.428$ ;  $\chi^2/df = 14.072$ ,  $p < .05$ ; CFI = .885; RMSEA = .052; gamma hat = .97; SRMR = .050) after deleting non-significant paths from regulation

dimension at 9-month and 2-year DCWs to emergent academic skills, and from regulation dimension at 2-year DCW to language skills and attention.

In comparison to the model with global socio-emotional competence, the final model had fewer paths via attention and language. Attention mediated the relationship between regulation at 4.5 years with emergent academic skills ( $\beta = .08, p = .003$ ) and language skills at 4.5 years also mediated the association with emergent academic skills ( $\beta = .01, p = .006$ ). The indirect effect via attention bordered on moderate effect size, while for indirect effect via language and direct effect of socio-emotional competence at 4.5 years on emergent academic skills, the size of effect was small (Kenny, 2021; see Figure 5.4).

#### 5.3.2.3 *Model 4*

In this model, the role of attention and language skills as mediators in relationship between exuberance dimension of socio-emotional competence at 4.5 years and emergent academic skills was examined. Note the exuberance dimension is not measured at 9 months and 2 years. The model had an excellent fit  $\chi^2 = 1463.625; \chi^2/df = 15.738, p < .05; CFI = .890; RMSEA = .056; \text{gamma hat} = .98; SRMR = .0509$ ; the fit remained excellent ( $\chi^2 = 1696.722; \chi^2/df = 11.469, p < .05; CFI = .885; RMSEA = .053; \text{gamma hat} = .98; SRMR = .0494$ ) after the deletion of non-significant paths (please see Figure 5.5). The relationship between the outgoing dimension and emergent academic skills was found to be fully mediated by attention ( $\beta = .09, p = .004$ ) and language skills ( $\beta = .02, p = .002$ ) with no statistically significant direct effects found. Pathway via attention had a medium effect size while for language it was small (Kenny, 2021).

The above findings focused on the statistically significant paths in line with the hypotheses. However, contrary to the hypotheses, global socio-emotional competence at 9 months was negatively correlated with attention and language (see Figure 5.2). At the socio-emotional competence dimension level, the easy-going dimension at 9 months was negatively associated with attention, which served as a mediator of 4.5-year emergent academic skills ( $\beta =$

- .02,  $p = .002$ ). Similarly, the 9-month regulation dimension of socio-emotional competence was also negatively associated with attention and language (see Figure 5.4). Of note, attention and language did not mediate relationship between 9-month global socio-emotional competence and regulation, and emergent academic skills.

#### **5.4 Discussion**

In general, the global measure of socio-emotional competence at 2 and 4.5 years had a direct positive effect on emergent academic skills, with attention and language (albeit to a lesser extent) being significant positive mediators of this association (see Figure 5.2). Each of the models explained a sizable amount of variance in early academic skill development (35 to 36 percent) highlighting the potential importance of the modelled factors for the development of early literacy, numeracy and writing skills.

Generally, our global measure of socio-emotional competence was found to have more mediated paths and stronger associations with attention, language skills and emergent academic skills at 4.5 years in comparison to the models using only the dimensions of socio-emotional competence (that emerged while constructing the index of socio-emotional competence). This lends some support to the assertion that a global or more gestalt measure of socio-emotional competence (which seeks to capture the integrated nature of the construct), is important to consider as it may lead to different findings from the traditional research that has tended to focus on domains of socio-emotional competence.

I also found that, at different ages, socio-emotional competence and its dimensions had varied influences on emergent academic skills (both directly and via attention and language), which may be important to keep in mind if interventions are seeking to improve very early socio-emotional competence under the general guise of promoting later attention, language and early academic skills.

In general, the study found that proximal measures of socio-emotional competence predicted 4.5-year emergent academic skills relatively more strongly than the more distal

measure of socio-emotional competence (taken at 2 years). These stronger and more consistent associations between the outcome, and the proximal measures of socio-emotional competence, may be because self-regulation, which is important for learning, shows stronger development during later preschool years (Rothbart, 2011). However, it could also be a recency effect with the proximal measures simply being more strongly associated than those that were collected at earlier time points as they were measured concurrently.

Perhaps, most importantly, the most distal measure of socio-emotional competence (that is 9-month socio-emotional index) had no direct relationship with emergent academic skills and inconsistent and/or negative relationships with the mediators (language and attention). These findings suggest that early socio-emotional competence may function differently from later socio-emotional competence. This finding is discussed in more detail below.

#### ***5.4.1 Attention and Language as Mediators between Socio-emotional Competence and Emergent Academic Skills***

This study allowed for the simultaneous assessment of the mediating roles of attention and language skills on the relationship between early socio-emotional competence and emergent academic skills. The findings highlight that attention (more than language skills) may be a mechanism through which 2- and 4.5-year global socio-emotional competence becomes associated with emerging academic skills. It is possible that greater socio-emotional competence frees up attentional resources by allowing children to manage emotions, which helps other cognitively intensive skills such as learning to read and write to develop (Rhoades et al., 2011; Trentacosta & Izard, 2007; Vitiello & Williford, 2016). However, since socio-emotional competence, attention, language and emergent academic skills were all measured concurrently at 4.5 years, it is difficult to ascertain the direction of the effects.

When examining the different domains of socio-emotional competence, it seems that different dimensions of socio-emotional competence may play different roles at different time points. For example, at the age of 2, the association between socio-emotional competence and

attention and language may be driven more by the easy-going dimension of socio-emotional competence (which tapped into positive emotions and behaviours in children), as the regulation dimension of socio-emotional competence at 2 years was found to be unrelated to attention or language. However, by 4.5 years of age, the regulation dimension of socio-emotional competence was found to have a positive statistically significant relationship with both attention and language skills, but the easy-going dimension was only significantly related to attention.

It is possible that the effect of the easy-going dimension at 2 years on later language abilities could be a method effect (that is, it may be an effect of the way I calculated socio-emotional competence and its dimensions). The easy-going dimension at 2 years comprised of a variable measuring the use of expressive emotional vocabulary (see Table 5.2), which may have enhanced its predictive relationship with language. However, this would not explain the positive association also found between the easy-going dimension at 2 years and later attention.

Unlike other models with direct effects, attention and language fully mediated the relationship between exuberance dimension and emergent academic skills, suggesting that attention and language could be the key mechanisms through which an exuberant child develops emergent academic skills. The exuberance dimension relates to how outgoing and fearless a child is. Indicators of emergent academic skills were measured through performance-based tasks. Therefore, children who felt more confident and comfortable in novel tasks may have been able to pay more attention in those tasks, thereby performing better. Similar results, albeit in a much older sample, were reported in a study in which academic engagement was found to mediate the relationship between shyness and academic achievement in children aged 9 to 13 years (Hughes & Coplan, 2010). Moreover, children who are more outgoing may also interact more with others allowing more opportunity for language development. However, it is difficult to say anything definitive about the causality as exuberance was measured concurrently with language, attention and emergent academic skills.

By 4.5 years of age, it seems that the association between socio-emotional competence and emergent academic skills via attention and language is driven by all three domains of socio-emotional competence. The exception to this was that the 4.5-year easy-going dimension was only significantly related to attention (and not to language).

#### 5.4.1.1 Unpacking the Negative Associations with 9-Month Socio-emotional Competence

The negative associations between socio-emotional competence at 9 months of age and the socio-emotional dimensions of easy-going and regulation (see Figures 5.2, 5.3 & 5.4) and attention was surprising. These associations were weak in size. The variables were located at significant time distance in terms of early childhood. In addition, socio-emotional competence and attention and language signify different domains of development. Therefore, the fact that the analyses in this study were able to capture associations across domains and between variables that were separated by a considerable period of time does warrant some attention.

It is well known that infants have limited capacity to self-regulate, but through mutual regulation with the mother during infancy, self-regulation typically begins to emerge in the second year of life (Cole et al., 2004). It has also been argued that infants who are low in regulation and high in negative emotions often get more support from their parents (Bell & Wolfe, 2004). In fact, mothers living in environments with fewer emotional stressors tend to pay more attention to children who are more irritable and less regulated. This allows more opportunity for mutual regulation, thus aiding in the development of self-regulation (Crockenberg & Leekes, 2004). The study involved a population-based sample that controlled for deprivation level. Therefore, it is possible that mothers in our sample, who had less easy-going and less regulated infants paid them more attention, providing opportunity for supportive mutual regulation resulting in the development of attention skills later in life.

The easy-going dimension at 9 months also included a measure of fear, specifically fear of strangers. Research has documented that the average age of the onset of fear is also around 9 months (Schaffer, 1966), and that this fear can also be adaptive (hence, not a deficit) helping to

motivate positive behaviour e.g. risk avoidance (Heerwagen & Orians, 2002; Rothbart, 2011). This could also be a possible reason for not finding support for the expected positive influences of easy-going dimension (which contains a measure of low fear) at 9 months on attention, with infants with low fear perhaps being less cautious and less attentive to their environment.

I also found a negative relationship between socio-emotional competence at 9 months and language skills at 4.5 years. This effect might be driven by the regulation dimension, as no relationship was found between the easy-going dimension at 9 months and 4.5-year language skills (compare Figure 5.3 and 5.4). It is possible that parents in our study engaged more verbally with “less regulated” infants to soothe them, which may help in developing their early language skills. At 4.5 years of age, this negative association between regulation and language, however, becomes positive. This suggests that regulation skills that develop later, during early childhood, are beneficial for language development. Perhaps during the later years, children who are more regulated and easy-going may be getting more opportunity to verbally engage with others and pay attention.

With respect to the shift from the negative association between the 9-month regulation and attention and language to a positive relationship at 4.5 years, it is possible that this reflects changes in approaches to parenting infants, toddlers and preschoolers. For example, it may be that children with “lower” socio-emotional competence at 9 months (less regulated) get more positive attention and assistance to regulate their emotions, but that as children get older, the focus switches such so that the more easy-going and regulated children get more positive attention and develop better attention and language skills This parenting style switch may also reflect societal expectations around expected levels of socio-emotional competence (regulation and soothing) and expected parental responsiveness across this age range (Tamis-LeMonda et al., 1998).

Alternatively, the negative associations found at 9 months with attention and language could be due to the composition of the 9-month index and the rate at which the components of

the index develop. The global socio-emotional competence index at 9 months comprises of measures related to negative affect, fear, surgency, and orientation and affiliation capacity but these components may not all develop at the same rate. Rothbart (2011) argues that socio-emotional competence keeps on developing throughout childhood with different aspects coming on board as the baby grows older, with development becoming less rapid beyond the first year (Carter et al., 2003, 2004). The rate of development also varies across infants. These new emerging systems influence the expression of old systems by upgrading them (Rothbart, 2011).

Between the ages of 6 and 12 months, infants also exhibit more curiosity to explore their surroundings, however, they do not have the physiological capacity to fully redirect their energies. This may result in them expressing irritability and appearing less regulated which often resolves itself as they grow older. Therefore, this irritability in infants may be a developmental phase rather than a deficit in socio-emotional competence. Perhaps this is the reason predictive associations between socio-emotional competence in infancy and emergent academic skills later in life were not found.

It is also possible that socio-emotional competence at 9 months was not measured well. Different variables were used to calculate the index of socio-emotional competence at each DCW for developmental reasons. It is therefore possible socio-emotional competence at this early age was not fully captured, and/or that it is developing so rapidly and at different rates across infants that it is hard to capture clearly. It is important to note, however, that our indices are increasingly correlated over time ( $r=.27$  to  $.41$ ,  $ps<.001$ ) suggesting that, despite each index consisting of different measures, they are capturing something in common.

#### **5.4.2 *Strengths and Limitations***

The research studied the roles of attention and language skills as mediators between emergent academic skills and socio-emotional competence, which was investigated both concurrently and longitudinally. Unlike past research, which has mostly studied these variables

concurrently and in at-risk children, this study examined the relationships in a large population-based sample and looked at how emerging socio-emotional competence may contribute to emergent academic skills. However, this study is constrained by a number of limitations as well. The index of socio-emotional competence was composed of different variables at each DCW for developmental reasons (Ahmad et al., 2019; See Chapter 2), assuming that the index, which draws on different measures, is assessing broadly the same thing at each DCW. In addition, the index was developed using Denham's theoretical model of socio-emotional competence (2006). However, the factors (termed as dimensions) that emerged did not match the domains theorised by Denham. On one hand this was expected as scales used to construct the index tapped into more than one domain of socio-emotional competence. Therefore, the factors that emerged also related to more than one domain of socio-emotional competence. In addition, socio-emotional skills do not differentiate adequately during early childhood so clearly demarcated factors possibly did not emerge. On the other hand, this brings the validity of the index into question.

Notably the correlations found between indices at each DCW ( $r = .27$  to  $.41$ ,  $ps < .001$ ), supports the assumption that they have something in common despite consisting of different measures. Nevertheless, the different measures making up the socio-emotional competence measures makes it difficult to assess "true" change across these measures whether it be at the global socio-emotional competence level or at the dimensional level.

Another limitation is that attention, language and emergent academic skills were measured at 4.5 years. This limits the ability to ascertain the direction of effects between socio-emotional competence at 4.5 years and the mediators and the outcome. Attention, language skills and emergent academic skills were measured using performance-based tasks and observations made during them, while socio-emotional competence comprised of mainly maternal reports. This may have affected the results and future research should consider exploring the effect of using more homogenous predictors and outcome variables. In addition,

prior levels of attention, language skills and emergent academic skills were not controlled for due to the unavailability of relevant data. Last but not least, the size of effects noted for both direct and indirect effects were weak. However, this study was looking at the relationship between constructs that belong to different domains - emotive and cognitive. Therefore, it can be argued that these associations, albeit weak, are meaningful.

## **5.5 Conclusion**

Children with better socio-emotional skills are thought to be adaptable, easy-going and responsive. They are thought to have more positive social interactions, aiding adjustment to the demands of the learning environment, which leads to a potential upward spiral in development and learning. The findings support this notion, with greater levels of socio-emotional competence at 2 and 4.5 years of age, related to emergent academic skill development. These associations were partially mediated by attention and, to a lesser extent, language skill development. Importantly, our findings were found using cross-sectional as well as longitudinal data with a large risk-diverse population, supporting earlier cross-sectional research with at-risk populations.

Our findings also highlight the importance of not only studying components of socio-emotional competence but also considering it as an integrated system, as different effects have been found. At the dimension level, the regulation dimension of socio-emotional competence seemed to matter more for emergent academic skills at 4.5 years. As such, the first couple of years of a child's life is probably too early to worry if the child's dysregulation will affect their later attention, language and academic skill development. Finally, "poor" performance on measures of socio-emotional competence during infancy are not likely to have long-term negative effects on 4.5-year attention, language and emerging academic skills. If anything, poor early functioning may encourage additional parental attention, helping to nurture children's socio-emotional competence.

## Chapter 6. Longitudinal Influence of Parental Relationship Warmth and Parent-Child Engagement on Early Socio-emotional Competence (Study 4)

### 6.1 Introduction

The study detailed in the following chapter particularly focused on the child's early and immediate environment, which is often shaped by how parents interact with the child and how they interact with their intimate partners. Drawing on Bronfenbrenner's (1979; 1995) bioecological model, family system theory (Minuchin, 1988; O'Brien, 2005) and social learning theory (Bandura, 1978), this study was an attempt to answer the fourth research question: *How parental factors such as parental relationship warmth (mesosystem) and parent-child engagement (microsystem) influence socio-emotional competence during early childhood?*

More specifically, this study assessed how relationship warmth (before and after birth of a child) and parent-child engagement influences socio-emotional competence across the first five years of a child's life. It also examined the possible pathway through which parental relationship warmth may have an influence on a child's socio-emotional competence, which included parent-child engagement. The influence of intraindividual changes in relationship warmth on early socio-emotional competence was also examined.

In order to measure parent-child engagement, an aggregate of frequency of specific activities that parents and their children may engage in were calculated at 9-month and 2-year data collection waves (DCWs). A measure comprising of 12 items related to parent-child affiliation had initially been included in the analyses, however, it had a high negative skew (that is, most parents rated their affiliation with children as high) so frequency measures of specific parental behaviours were included in its place.

Given that mothers and fathers interact with their children differently, this study used data from both mothers and their partners in the analyses. Attempts were made to model data from both mother and partners together. However, some unexpected results emerged so they

were examined separately. This is explained in the more detail in Section 6.2.3. The following account is a version of Study 4's manuscript currently being revised for resubmission to *Journal of Child and Family Studies*.

During the first few years of life a child usually spends most of their time with their family, especially parents. There is wide consensus that a child's relationship environment is important for their socio-emotional development (Bronfenner, 1995; Bornstein, 2006; Fincham & Hall, 2005). The child's relationship environment is not only structured by their interactions with their primary caregivers, but also by parents interactions with each other. The relationship between parents is argued to have a central influence on family dynamics (Cummings & O'Reilly, 1997), which can influence socio-emotional development directly and/or indirectly via parent-child interactions.

Given that children are more dependent on their primary caregivers during the early years (Carlson et al., 2011), the nature of the parental relationships and parent-child interactions may have even greater implications for children's early socio-emotional development. Using data from a large and demographically diverse longitudinal cohort, this study examines the longitudinal effects of parents' relationship warmth and parent-child engagement on their child's socio-emotional development. The inclusion of the period before the child's birth up until 4.5 years allows us to capture a period of time marked by rapid changes in both family dynamics and children's development. In particular, by looking at the parental relationship quality from before the child is born and the degree of change in the relationship after the birth, I tried to capture the effect of a potentially important relationship change on early socio-emotional development of the child for the first time.

### ***6.1.1 Direct Effect***

In relation to direct effects of parental relationship on socio-emotional competence, emotional security theory explains that conflictual parental relationships may lead to deficits in a child's emotional security within a family environment, resulting in potential adjustment

problems (Cummings & Davies, 2010; Schoppe-Sullivan et al., 2007). Further, social learning theory suggests that, as children grow older, they model the behaviours and interactions they witness around them (Bandura, 1978). Hence, if children witness warm and low-conflict interactions between their parents or caregivers, they are more likely to develop similar emotional and behavioural styles. In line with this, there is now strong research evidence for the influence of different indicators of the quality of marital relationships on children's socio-emotional outcomes (e.g. Harrist & Ainslie, 1998; Fishman & Meyers, 2000; Forsch & Mangelsdorf, 2001; Berger & McLanahan, 2015). For instance, Berger and McLanahan (2015) found that better treatment by partners, as reported by mothers, was linked to less internalising and externalising behaviour problems in children aged 5 years. Similarly, Fishman and Meyers (2000) reported negative associations between mother- and father-reported marital satisfaction and children symptomology (including fearfulness, anxiety, difficulty getting along with peers and problems with compliance with requests) aged between 8 to 11 years.

### **6.1.2 *Indirect Effects***

The relationship between parents may also influence a child's socio-emotional competence indirectly through parent-child interactions. Indeed, Bronfenbrenner (1995) states regular processes that directly involve a child (such as parent-child engagement) have high influence on their development. The influence of these (proximal) processes is said to be a function of a child's characteristics and contextual factors.

Developmentally appropriate engagement with children has been shown to have positive implications for child development outcomes (Sarkadi et al., 2008; Parfitt et al., 2014). The difference between the level of mother and father engagement with children has decreased over the years; however, there are still significant differences (Pleck & Masciadrelli, 2004) with mothers on average tending to be more involved in activities with their children (Yeung et al., 2001). These differences in the level of engagement are also expected to have different

implications for a child's socio-emotional development. Hence, both mother- and father-child engagement measures were included in this study.

Theorists have typically proposed two different pathways through which parental relationships may influence parent-child interaction. The first pathway is *spillover* in which negative feelings and behaviours between partners are hypothesised to potentially spill over and lead to negative interactions with children. Simply put, it is the transfer of feelings, affect and behaviours from one setting to another (Almeida et al., 1999). *Compensation* is the second potential pathway. This relates to a compensatory hypothesis, whereby partners in unsatisfying relationships tend to devote more time and energy to their children (Engfer, 1988; Belsky et al., 1991; Erel & Burman, 1995) to make up for potentially lost support and love (Erel & Burnman, 1995). Both these hypotheses are in line with family system theory, which posits that the family functions as a complex integrated system where members influence and are influenced by all other members (Minuchin, 1988; O'Brien, 2005). Changing relationships and characteristics of family members influence the growth and development of other family members (Goldberg & Carlson, 2014).

Overall, there is more evidence supporting the *spillover* hypothesis in contrast to the *compensatory* hypothesis (e.g. Harrist & Ainslie, 1998; Almeida et al., 1999; Buehler et al., 2006; Mehall et al., 2009; Carlson et al., 2011). Divergent results have also been found for mothers and fathers in some studies. For example, Fishman and Meyers (2000) found that marital dissatisfaction was linked to less involvement with children aged 5 to 11 years cross-sectionally but for mothers only. On the other hand, Mehall et al. (2009) reported that fathers higher marital satisfaction predicted higher father involvement with an infant over a 7-month period (from 7 to 14 months), but for mothers, no such influence was found. Similarly, Kouros et al. (2014) noted stronger *spillover* effects for fathers (of children aged 8 to 16 years) over a shorter period (assessed multiple times after 15 days) while for mothers, compensatory relations were observed between marital relationship quality and the parent-child relationship.

In contrast, no relationship between relationship quality (averaged for couples) and concurrent parent-child engagement was found in a study involving families with children aged 4 years (Schoppe-Sullivan et al., 2014).

Research addressing the indirect effect of parental relationship quality on children's socio-emotional problems through parent-child interaction has largely been cross-sectional and has also produced some mixed results regarding the spillover and compensation theories. For instance, Harrist and Ainslie (1998) found that marital conflict adversely affected the mother- and father-child relationship (both mother-reported, including quality and time spent). This in turn was associated with 5-year-olds aggression and social withdrawal. However, a study by Fishman and Meyers (2000) that was based on both mothers and fathers reports of marital satisfaction (children aged 5 to 11 years did not all belong to the same pair) only found associations between mother-reported marital dissatisfaction and both less involvement with, and higher psychological distress in, their children. Results from another multiple-observer study, however, did not support the mediating role of parenting behaviours (such as supportive presence, structure, hostility, etc.) on the relationship between marital engagement and 3-year-olds behaviour problems (Forsch & Mangelsdorf, 2001).

While these studies were cross-sectional and indicate correlation rather than causation, the three-wave longitudinal study by Schoppe-Sullivan and colleagues (2007), with children aged between 8 to 16 years at the time of study enrolment and their parents, found support for more causal ideas of relevance here. They found that mediation could occur by parental warmth towards their child (comprising of how helpful, dependable and involved parents were at Wave 2) in the relationship between marital conflict (Wave 1) and children's internalising and externalising symptoms (Wave 3), after controlling for the child's early adjustment. The study combined mothers and fathers reports to give scores of marital conflict, parental warmth and child's adjustment. However, there is also value in including data from both mothers and fathers (rather than combining their reports) as they differ in terms of how their individual

perceptions of the relationship quality relate to their engagement with their children (e.g. Fishman & Meyers, 2000; Kouros et al., 2014).

Therefore, in the present study I examined the effects of mother- and partner-reported relationship warmth on early socio-emotional competence directly and indirectly via mother- and partner-reported parent-child engagement using longitudinal data. It was hypothesised that interparental relationship warmth and parental engagement will positively predict socio-emotional competence (Hypothesis 1a) and, further, that interparental relationship warmth will predict socio-emotional competence indirectly via parental engagement (Hypothesis 1b).

### ***6.1.3 Reciprocal Associations between Parent Factors and Child's Socio-emotional Competence***

Family systems theory posits that the family functions as an integrated system. Consequently, child emotions and behaviours are also expected to influence interparental and parent-child relationships. In line with this, both cross-sectional and longitudinal evidence exist for positive relationships between regulated infants with lower levels of negative affect and the quality of parental relationship based on reports from mothers (Porter et al., 2003) and both parents (Mehall et al., 2009).

Regarding different aspects of parent-child interactions such as the amount of parental engagement and parenting practices etc., longitudinal evidence for negative associations between regulation in young children and punitive parental practices (scores from both parents combined) is present (Eisenberg et al., 1999). Between 4 to 12 months in infancy, steeper increases in infants negative emotionality has been shown to positively predict negative parenting practices (such as over-reactivity, laxness and verbosity) at 18 months while faster increase in infant regulation negatively predicted them (Bridgett et al., 2009). Similarly, perceptions of negative emotionality in infants have been found to be related to parenting stress at 3 years (Berryhill et al., 2016). Apart from providing evidence for the effect of a child's emotions and behaviours on a parental relationship and parent-child interactions, these studies

highlight the importance of looking at these associations longitudinally. Therefore, I hypothesised that children's socio-emotional competence will positively predict interparental relationship warmth and parental engagement (Hypothesis 2).

Differences in how young children's emotions and behaviours affect parent-child relationships have been found for mothers and fathers across different studies as well. For example, a study involving fathers of infants showed no longitudinal influence of infants crying and fussing on father-infant attachment (Wynter et al., 2016). Schoppe-Sullivan et al. (2014) reported that mothers are more likely to engage with better regulated young girls. Fathers, on the other hand, have been reported to be more available for temperamentally easy rather than to temperamentally difficult sons (Manlove & Vernon-Feagans, 2002). The strength of this study is that it examines these reciprocal relationships within a dyad.

#### ***6.1.4 Interparental Relationships Before and After Birth***

The antenatal to birth to preschool period is marked with rapid change for both parents and children. It is well known that following the birth of particularly the first child, there is a substantial shift in structure and organisation in a couple's relationships, which can put substantial strain on a relationship (Minuchin, 1974). Newly born babies are completely dependent on parents for their physical, emotional and social needs (Bornstein, 2002). Therefore, it is not uncommon for a couple's satisfaction with the relationship to decline after birth (Belsky et al., 1983; O'Brien & Peyton, 2002) possibly due to increased parenting pressures. Mothers and fathers also react differently to the birth of a child with mothers reporting significantly more dissatisfaction in their relationship with their partner than other groups such as fathers of infants and men or women with older children (Yeung et al., 2001). This study attempted to capture the critical shift in relationship warmth and its effects following the birth of a child (first born or subsequent birth) hypothesising that there will be change (decline) in relationship warmth following the birth of the child (Hypothesis 3a).

Parents are likely to have different challenges during infancy and toddlerhood (Schoppe-Sullivan et al., 2004), and evidence exists suggesting that parental relationship quality also declines between infancy and toddlerhood (O'Brien, 1996; O'Brien & Peyton, 2002; Ahlborg et al., 2009). This could be because children acquire new motor, cognitive and socio-emotional skills and exert greater independence in toddlerhood leading to increased non-compliance with adults requests and interruption in adult activities (O'Brien, 1996). Also, often around this time, many families experience the birth of another child, which can increase burden on parental resources affecting their relationship (Ahlborg et al., 2009). These changes in interparental relationship may potentially influence parent-child engagement and a child's socio-emotional development. That is why this study hypothesised that change in interparental relationship warmth from before birth to infancy and from infancy to toddlerhood will affect parental engagement and the child's socio-emotional competence (Hypothesis 3b).

While the relationships between parental relationship, parent-child interaction and socio-emotional outcomes have been the focus of many studies, most research has explored these independently during early childhood. In addition, most of the studies have been cross-sectional in nature (e.g. Harrist & Ainslie, 1998; Fishman & Meyers, 2000; Forsch & Mangelsdorf, 2001; Sullivan et al., 2014), which makes it difficult to tease out the direction of effects. Further, where longitudinal studies have been conducted, most have consisted of only two data waves (e.g. Mehall et al., 2009; Wynter et al., 2016). To the best of my knowledge, no studies have explored the parental relationship, parent-child engagement and socio-emotional outcomes together in the first 5 years of a child's life starting before the child is born, which is what this study attempts to do.

### **6.1.5 Present Study**

The present study focuses on warmth within a partners relationship, parent-child engagement and the child's subsequent socio-emotional development and seeks to examine both within- and between-person effects. While psychological theory typically focusses on

within person changes (e.g. increases in individual engagement, marital satisfaction, etc.), contemporary research typically relies on cross-sectional data, which only allows for between-person analysis (Curran & Bauer, 2011). It is, however, important to consider both within- and between-person variability and change within longitudinal studies. Individuals may vary in their overall levels of relationship warmth across groups (mothers and fathers) and/or with time (e.g. when the child is an infant or a toddler) and in each parent's specific individual variation (Curran et al., 2014). If both individual and between effects are not taken into account this can lead to different conclusions. For example, it may be hypothesised that, in keeping with social learning theory, parents who report low relationship warmth are more likely to have children with lower socio-emotional competence (between person effect). But at the same time, parents that initially report low levels of parental warmth antenatally, but show increases in their relationship warmth once the child is born (within person effects), may be *less* likely to have children with low socio-emotional competence (Curran et al, 2014). Disaggregating these within- and between-person effects is important for gaining a comprehensive understanding of the nature of these relationships and their potential impact. Therefore, in addition to assessing the aggregate between-person effects, the present study also examined the influence of within-person change in relationship warmth on parental engagement and socio-emotional competence.

Finally, analyses also included covariates such as parity, socioeconomic deprivation, parents age, parental depression and education that have been reported to be associated with socio-emotional competence (Downey & Condron, 2004; Reiss, 2013; Letourneau et al., 2013; Trillingsgaard & Sommer, 2016; D'Souza et al., 2019; Guhn et al., 2020), parent-child engagement/warmth (Davis-Kean, 2005; Wilson & Durbin, 2010; Myers & Johns, 2018; Baizán et al., 2014; Camberis et al., 2016) and parental relationship warmth (Cherlin, 1992; Cowan & Cowan, 2000; Hertwig et al., 2002; Amato et al., 2003; Goldfarb & Trudal, 2019).

## 6.2 Methods

### 6.2.1 Participants

I used data from a longitudinal study: Growing Up in New Zealand (GUiNZ) for this study. The GUiNZ is following the lives of approximately 7000 children from before birth till they turn approximately 21 years of age. The study began collecting data from mothers and their partners approximately 6 weeks before their baby was born. The initial sample of children born was broadly representative of New Zealand births between 2007 and 2010. In addition, specific demographic characteristics of the cohort's mothers (parity, age, and socioeconomic status) were comparable to New Zealand parents based on data available from Statistics New Zealand (2006-2008: Morton et al., 2013). The sample was more ethnically diverse than the population; however, as the ethnic diversity in New Zealand is increasing it is hoped that it will keep the sample relevant in future (Morton et al., 2014). Further details regarding the design and recruitment of the study participants are given in Morton et al. (2017).

The GUiNZ study had data for 6822 mothers and 4401 partners at the antenatal data collection wave (DCW); 6385 mothers and 4049 partners at 9-month DCW; and, 6242 mothers and 3804 partners at 2-year DCW. This study only included participants who had data available for both partners (see Table 6.1 for demographics). Owing to this, and the fact that socio-emotional competence data was not available for all children, our sample was reduced to 2768 couples which, compared to most other couple studies, is considered large. Note, the majority of the partners were biological fathers (99.6 percent) while eight partners identified themselves as female.

**Table 6.1**

*Demographics of the Mothers and Partners Included in the Present Study.*

Demographics	Mothers ( <i>N</i> = 2767)	Partners ( <i>N</i> = 2767)
	<i>N</i> (%) or <i>M</i> ( <i>SD</i> )	<i>N</i> (%) or <i>M</i> ( <i>SD</i> )
Age (Antenatal)	31.4(5.1)	33.5(6.0)
Education (Antenatal)		
No secondary	66(2.4)	146(5.3)

Secondary	514(18.6)	527(19.0)
Diploma/NCEA 5 or 6	758(27.4)	1001(36.2)
Bachelors	825(29.8)	582(21.0)
Higher	605(21.9)	512(18.5)
NZ Deprivation Index (Antenatal) <sup>1</sup>		
1	279(10.1)	280(10.1)
2	297(10.7)	295(10.7)
3	298(10.8)	298(10.8)
4	335(12.1)	336(12.1)
5	254(9.2)	253(9.1)
6	299(10.8)	297(10.7)
7	266(9.6)	268(9.7)
8	270(9.8)	269(9.7)
9	277(10.0)	279(10.1)
10	193(7.0)	193(7.0)
Ethnicity		
European	1941(70.1)	1906(68.9)
Māori	235(8.5)	237(8.6)
Pacific	181(6.5)	220(7.9)
Asian	312(11.3)	262(9.5)
Others	96(3.5)	136(4.9)

<sup>1</sup> The New Zealand Deprivation Index combines nine socioeconomic variables from the 2006 census capturing eight dimensions of deprivation at the small area level (Salmond, Crampton & Atkinson, 2007).

## 6.2.2 Measures

### 6.2.2.1 Relationship Warmth

At the antenatal, 9-month and 2-year DCWs, inter-partner relationship warmth was measured using nine items derived from the observational coding system: IOWA Family Interaction Rating Scales (Melby & Conger, 2001). It has demonstrated validity and reliability. The items used were also included in the New Zealand's Stepfamilies and Resilience study (Pryor & Pryor, 2004).

Participants were requested to consider the past 4 weeks, and state how often they: “let each other know you really care about each other;” “act lovingly and affectionately towards each other;” “let each other know that you appreciate each other’s ideas or the things you do;” “help the other do something that was important to him/her;” “act supportively and understandingly towards each other;” “get angry at each other;” “dislike each others ideas;”

“shout at each other because you were upset;” and “argue with each other when you disagree about something.” Both mothers and their partners responded on these items on a 7-point Likert scale ranging from “1 = *Never*” to “7 = *All the time*” with additional options of “*Don't know*” and “*Refused*” coded as missing. The responses were averaged for mothers and partners to give a relationship warmth score after reverse coding the last four items.

#### 6.2.2.2 Parental Engagement

Parental engagement was measured using five items at 9-months including: “How often do you play games with your baby (e.g. handclapping games such as pat-a-cake, face-hiding games such as peek-a-boo, finger games such as round and round the garden?” “How often do you talk to your baby during everyday activities (e.g. feeding, changing nappies, bathing, playing)?” “How often do you play with toys with your baby?” “How often do you sing songs or tell stories to your baby (do not include reading books)?” and “How often do you read books to your baby?” At 2-year DCW, participants were asked questions regarding reading books and telling stories only. The questions had a five-point response set ranging from “1 = *Seldom or never*” to “5 = *Several times a day*” with additional options of “*Don't know*” and “*Refused*” coded as missing. Both mothers and their partners responded on these questions, and their responses were averaged to give scores for mother and partner’s engagement at 9-month and 2-year DCWs.

#### 6.2.2.3 Socio-emotional Competence

In order to assess socio-emotional competence, an index developed by Ahmad et al. (2019; see Chapter 2) based on the mother’s report and independent observations (observations were only included in the 4.5-year index) was used. The index gives continuous and categorical scores of socio-emotional competence at 9-month, 2-year and 4.5-year DCWs. It was created using data from 26 developmentally appropriate and conceptually relevant scales (selected based on Denham’s (2006) socio-emotional competence model) measured at the three DCWs (see Table 6.2). By using an index constructed of multiple measures the authors argue that they

are casting a wider net that is more likely to be capturing the child's emerging socio-emotional competence.

**Table 6.2**

*Showing Variables Belonging to Socio-emotional Competence Dimensions of Easy-going, Regulation and Exuberance at each Data Collection Wave (DCW).*

DCWs	Easy-going	Regulation	Exuberance
9-month SEC	Negative emotionality – IBQ-R VSF Fear – IBQ-R VSF	Orienting capacity – IBQ-R VSF Affiliation/Regulation – IBQ-R VSF Positive affectivity/Surgency – IBQ-R VSF	
2-year SEC	Conduct problems – SDQ Emotional problems – SDQ Hyperactivity problems – SDQ Peer problems – SDQ Expressive Vocabulary – emotions related	Prosocial – SDQ Impulse Control Scale – DesRosier’s Measure Shame Scale – DesRosier’s Measure	
4.5-year SEC	Negative Affect – CBQ VSF Emotional problems – SDQ Hyperactivity problems – SDQ Conduct problems – SDQ Peer problems – SDQ Hardiness – CBQ VSF	Effortful control – CBQ VSF Attention – CBQ VSF Prosocial – SDQ	Surgency – CBQ VSF Boldness – CBQ VSF Observations– engagement with interviewer and mood (Assessor’s Report, PSRA) Expression identification (AKT)

*Note.* SEC= Socio-emotional competence; IBQ-R VSF= Infant Behavior Questionnaire – Revised Very Short Form (Gartstein, Rothbart & Leerkes, 2014); SDQ=Strengths and Difficulties Questionnaire (Goodman, 1997); CBQ VSF= Child Behavior Questionnaire – Very Short Form (Putnam & Rothbart, 2006); PSRA= Preschool Self-Regulation Assessment (Smith-Donald, Raver, Hayes & Richardson, 2007); AKT = Affective Knowledge Task (Denham, 1986).

Briefly, the 26 scales were grouped at each DCW using Exploratory Factor Analysis (EFA), which resulted in two factors at 9-month and 2-year DCWs and three factors at 4.5-year DCW. The score of each scale was transformed to z-scores, assigned equal weight and averaged to give the factor score at each DCW. The factor scores were further weighted equally and aggregated to give scores of socio-emotional competence at each DCW. Please note, I also considered weighing scales and factors based on factor loadings; however, equal weighting produced the most parsimonious results (for more details on the method used, see Chapter 2).

#### 6.2.2.4 Covariates

The analyses also included the covariates of a child's sex (0 = *Male*, 1 = *Female*), maternal parity (1<sup>st</sup>, or subsequent child), and mother and partner's age and education (0 = *No education*, 1 = *Secondary education*, 2 = *Diploma/trade certificate/NCEA 5-6*, 3 = *Bachelor's degree*, 4 = *Higher degree*) measured during the antenatal assessment (approximately 6 weeks before birth), and mother and partner's depression measured using Edinburgh Postnatal Depression Scale (Cox et al., 1987) at 9-month DCW. In addition, antenatal socioeconomic status was assessed through the New Zealand Deprivation Index (NZ Dep) index on a 10-point scale spanning from "1 = *Least deprived*" to "10 = *Most Deprived*" was included. The NZ Dep combines nine socioeconomic variables from the 2006 census capturing eight dimensions of deprivation (income, owned home, support, employment, qualifications, living space, communication and transport) at the small area level (Salmond et al, 2007). As stated, mother and partner's education and NZ Dep was measured on a 5- and 10-category response format. There is evidence that continuous methods can be used in structural equation modelling if the variable has four or more categories (Bentler & Chou, 1987; Green et al., 1997).

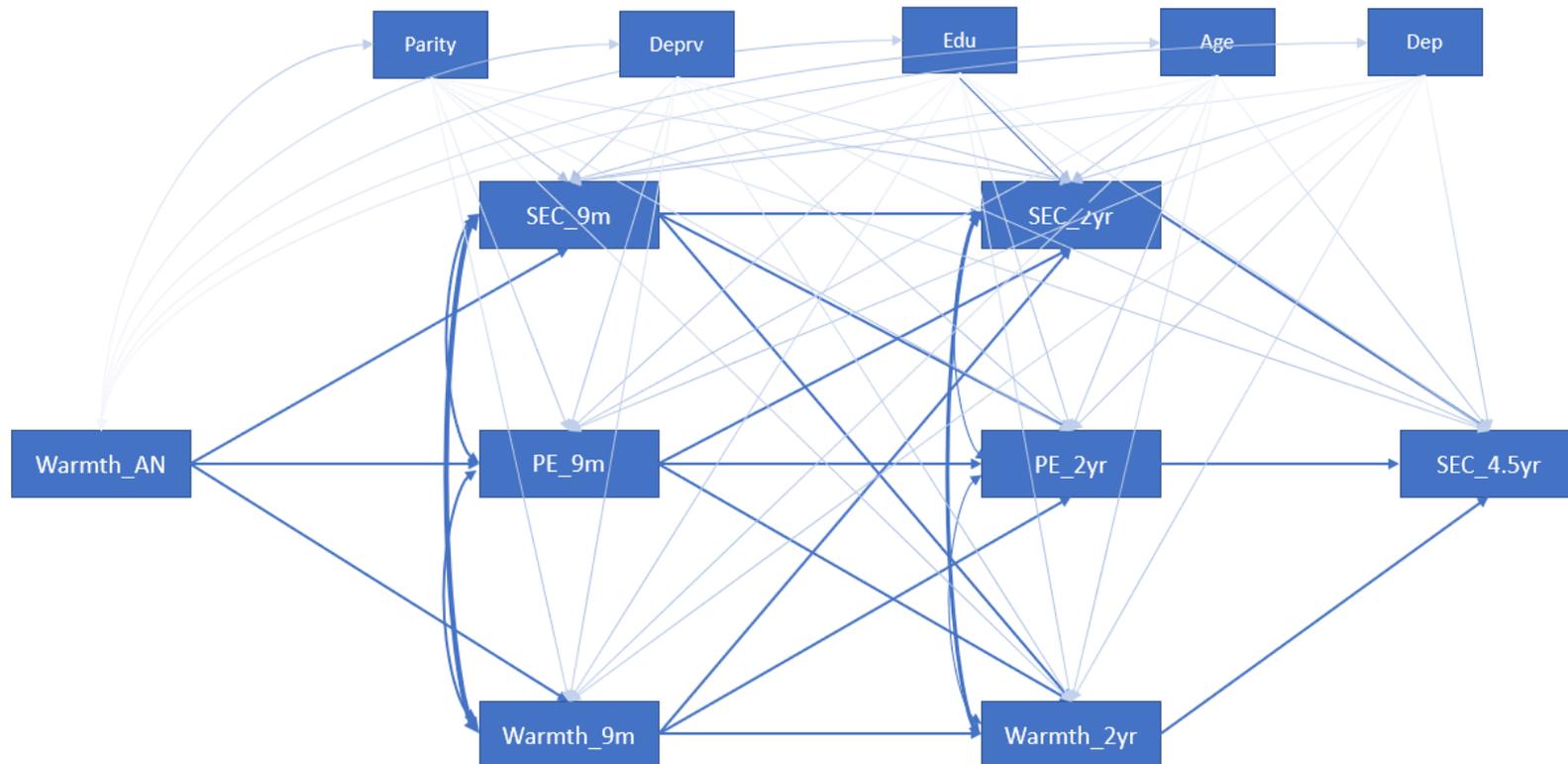
### **6.2.3 Data Analyses**

#### **6.2.3.1 Auto-Regressive Cross-lagged Models**

Structural equation modelling approach was used here, and auto-regressive cross-lagged (AR-CL) models were created using IBM SPSS Amos 25.0. The AR-CL is a commonly used structural model for longitudinal data. It helps in unpacking how variation in an independent variable predicts aggregate change in a dependent variable after controlling for the previous value of the dependent variable – thus indicating the ‘pure’ influence of the independent variable (Schlueter et al., 2007). It helps in drawing inferences about causes by allowing time for causes to have an effect (Cole & Maxwell, 2003). First, the study attempted to model both mothers and partners together. However, some path coefficients were in the opposite direction to what was expected. To rule out a possible suppression effect (Cohen & Cohen, 1983), I modelled mothers and partners separately (see Figure 6.1 for the hypothesised AR-CL model), and the unexpected results disappeared.

**Figure 6.1**

*Hypothesised Model Built to Assess the Predictive Effects of Mother- and Partner-Reported Relationship Warmth at (at Antenatal, 9 Months and 2 Years) and Parental Engagement (at 9 Months and 2 Years) on Socio-emotional Competence (at 9 Months, 2 Years and 4.5 Years) after Controlling for Initial Values of these Variables and Covariates using Auto-Regressive Cross-Lagged Modelling.*



*Note.* Covariances between variables at the same time point were covariances between their error terms.

Paths with lighter shade shows regression paths originating from covariates and covariance between them and relationship warmth (at antenatal)

Deprv = New Zealand Deprivation Index<sup>1</sup> (antenatal); Edu = Highest education (antenatal; mother- or partner-reported); Dep = Depression (9 months; mother- or partner-reported); Warmth = Relationship warmth (mother- or partner-reported); AN = Antenatal; 9m= 9 months; 2yr = 2 years; PE= Parental engagement; SEC = Socio-emotional competence.

<sup>1</sup> The New Zealand Deprivation Index combines nine socioeconomic variables from the 2006 census capturing eight dimensions of deprivation at the small area level (Salmond et al., 2007).

Since there is evidence that relationship warmth may indirectly affect socio-emotional competence via parental engagement, I also tested the data to see if parental engagement with the child mediated this relationship. For the assessment of indirect effects of parental relationship warmth (at 9-month and 2-year DCWs) on later socio-emotional competence (at 2-year and 4.5-year DCWs) via parental engagement at 9-month and 2-year DCWs respectively, I used 500 bootstrapped samples with 95 percent confidence intervals. The bootstrapped unstandardised indirect effect was considered significant if the 95 percent confidence interval did not include 0 in the range (Preacher & Hayes, 2008).

#### 6.2.3.2 Latent Growth Curve Models

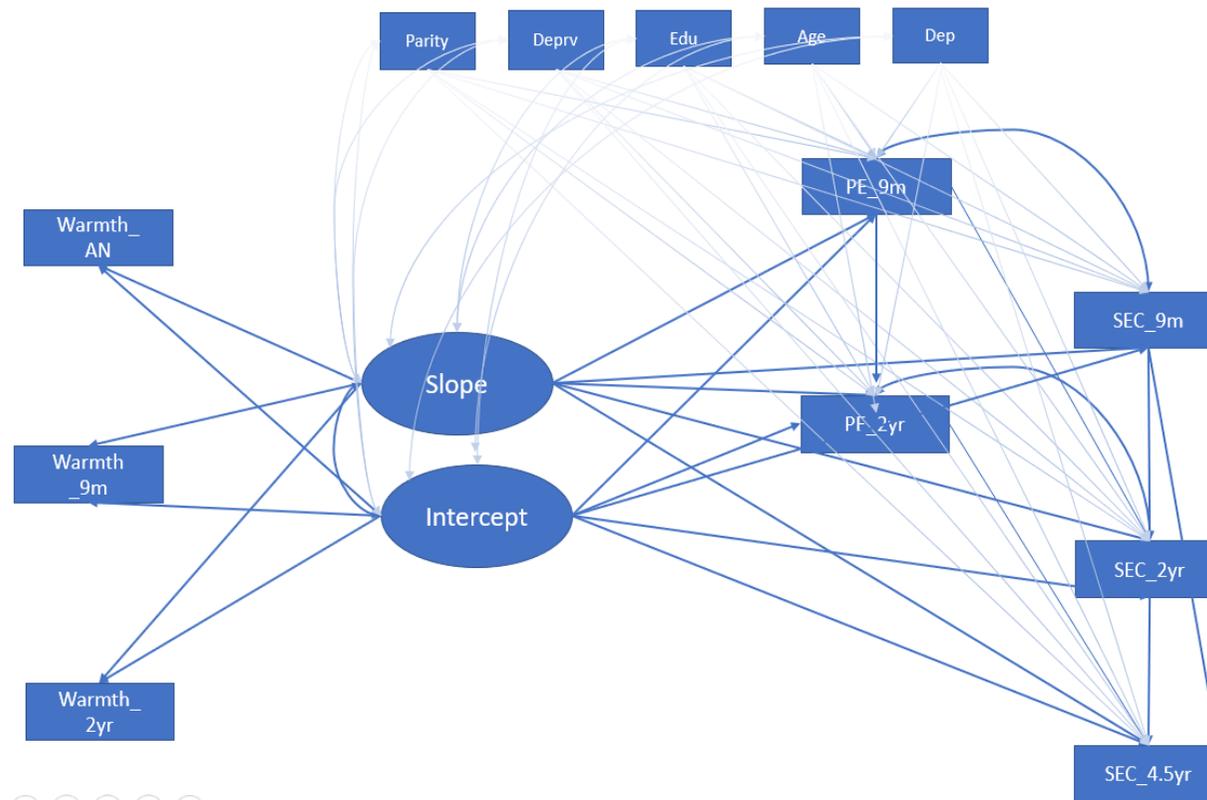
The AR-CL model assumes all coefficients to be the same for all units of study, and it does not account for absolute changes in the scores of individuals on the constructs of interest (Schlueter et al., 2007). Since psychological theory describes both inter- and intraindividual changes in a construct (Curran & Bauer, 2011; Curran et al., 2014), I also constructed a latent growth curve (LGC) model using the IBM SPSS Amos 25.0 to estimate the influence of growth/change in couple relationship warmth on parental engagement with the child (at 9-month and 2-year DCWs) and socio-emotional competence (at 9-month, 2-year and 4.5-year DCWs) after controlling for covariates. The LGC is a statistically powerful procedure that can also help us in assessing intraindividual differences in growth/change across time. It estimates a single underlying trajectory for each individual unit describing individual growth in a given construct over time. It assumes growth to be a function of a latent intercept (average initial starting value) and a latent slope (average individual rate of change over time) plus random error (Bollen & Curran, 2005).

In order to model intraindividual change in relationship warmth, I first modelled the unconditional model for relationship warmth (for both mother and partner) in order to establish how the repeated measures change as a function of time for mothers and their partners (Bollen & Curran, 2005). This is an important step as an incorrect initial growth model is likely to bias

results when expanded (Curran et al., 2011). Next, I ran a conditional model to assess the effect of growth/change in relationship warmth on parental engagement and socio-emotional competence (see Figure 6.2 for the hypothesised model). Note, I was limited in the ability to model growth in socio-emotional competence because unlike relationship warmth, where the same measure could be administered to parents over time, the children's socio-emotional competence scores were based on different age-appropriate tools to best capture the rapidly developing child.

**Figure 6.2**

*Hypothesised Model Built to Assess the Effect of Growth Process in Mother- and Partner-Reported Relationship Warmth from antenatal to 2 years on Parental Engagement (at 9 Months and 2 Years) on Socio-emotional Competence (at 9 Months, 2 Years and 4.5 Years) Using Latent Growth Curve Modelling.*



*Note.* Covariances between variables at the same time point were covariances between their error terms.

Paths with lighter shade shows regression paths originating from covariates and covariance between them and latent slope and intercept.

Deprv = New Zealand Deprivation Index<sup>1</sup> (antenatal); Edu = Highest education (antenatal; mother- or partner-reported); Dep = Depression (9 months; mother- or partner-reported); Warmth = Relationship warmth (mother- or partner-reported); AN = Antenatal; 9m = 9 months; 2yr = 2 years; PE = Parental engagement; SEC = Socio-emotional competence.

<sup>1</sup> The New Zealand Deprivation Index combines nine socioeconomic variables from the 2006 census capturing eight dimensions of deprivation at the small area level (Salmond et al., 2007).

#### 6.2.3.2.1 *Model Fit*

First, how well the model(s) fitted the data was examined. I then considered multiple goodness of fit indicators: Chi-Square statistics (with their degree of freedom and p value), Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA), gamma hat and Standardized Root Mean Square Residual (SRMR; Hooper et al., 2008). The model was considered to have an excellent fit if Chi-square was non-significant, and the indices had values of: CFI  $\geq$  .95, gamma hat  $\geq$  .95 and RMSEA and SRMR  $\leq$  .060, while adequate fit was argued for indices of: CFI  $\geq$  .90, gamma hat  $\geq$  .90 and RMSEA and SRMR  $\leq$  .080. Since Chi-square is sensitive to large samples (which was the case in our study), and CFI penalises complex models while RMSEA rewards those (Fan & Sivo, 2007), I put greater emphasis on the values of gamma hat and SRMR to classify model fit. They are more stable in the face of model complexity (Fan & Sivo, 2007). In case there was non-significant path(s) involving the variables of interest, I deleted them and re-estimated the model parameters.

#### 6.2.3.2.2 *Missing Values*

A total of 20 mothers and 41 partners had more than 10 percent data missing on items of relationship warmth at antenatal DCW while 28 mothers and 30 partners, and 38 mothers and 13 partners had more than 10 percent data missing on relationship warmth and parental engagement at 9-month and 2-year DCWs. These cases were deleted.

Socio-emotional competence scores were available for 4839 children at all of 9-month, 2-year and 4.5-year DCWS. Out of these 4839 children, I only included those who had complete data available for both mother and partner from antenatal to 2-year assessments leaving us with 2767 mothers and partners. The reduced sample did not differ from the sample at full antenatal assessment in terms of mother's age and child's sex at birth. However, there was an overrepresentation of first-borns and mothers with higher education, European ethnicity and low deprivation in the reduced sample. The differences however, were small (Cramer's Vs  $\leq$  0.132,  $ps < .01$ ; Cohen, 1988; see Table 6.3).

**Table 6.3**

*Key Demographics of the Participants Comparing the Reduced Sample (n = 2767) with Full Sample at Antenatal Assessment (n = 6182)*

Demographics	Reduced Dataset	Full Dataset	Cramer's V
	N (%)	N (%)	
Gender (at 6 weeks assessment) <sup>1</sup>			.006
Boy	1406 (50.8)	3525 (51.5)	
Girl	1361 (49.2)	3318 (48.5)	
Child's parity (Antenatal)			.053**
First-born	1155 (41.7)	2415 (39.1)	
Subsequent birth	1612 (58.3)	3767 (60.9)	
Mother's age (reported at antenatal DCW)			.010
Less than 20 years	110(4.0)	247 (4.0)	
29 to 29 years	1018(36.8)	2324 (37.6)	
30 years or more	1638(59.2)	3585 (58.4)	
Deprivation Index (reported at antenatal DCW) <sup>2</sup>			.132***
1	279(10.1)	516 (8.3)	
2	297(10.7)	584 (9.4)	
3	298(10.8)	594 (9.6)	
4	335(12.1)	641 (10.4)	
5	254(9.2)	523 (8.46)	
6	299(10.8)	645 (10.4)	
7	266(9.6)	677 (11.0)	
8	270(9.8)	749 (12.1)	
9	277(10.0)	901 (14.6)	
10	193(7.0)	990 (16.01)	
Ethnicity (mother)			.042**
European	1941(70.1)	3491 (56.7)	
Māori	235(8.5)	813 (13.2)	
Pacific	181(6.5)	785 (12.8)	
Asian	312(11.3)	845 (13.7)	
Others	96(3.5)	204 (3.3)	

Note. DCW= Data collection wave; \*\* $p < .01$ ; \*\*\* $p < .001$ .

<sup>1</sup>It was compared with dataset at six weeks DCW as it was reported then ((N = 6843).

<sup>2</sup>The New Zealand Deprivation Index combines nine socioeconomic variables from the 2006 census capturing eight dimensions of deprivation at the small area level (Salmond et al., 2007).

## **6.3 Results**

### **6.3.1 Preliminary Analysis**

Table 6.4 shows descriptive statistics and t-test results comparing mother- and partner-reported relationship warmth and parental engagement. Mothers reported less relationship warmth in comparison to their partners during the antenatal DCW. However, more engagement with baby was reported by mothers in comparison to their partners at 9-month and 2-year DCWs. Table 6.5 shows correlations between covariates and main variables.

To summarise, being relatively older parents was associated with higher socio-emotional competence across early childhood. In addition, being an older mother was associated with higher mother-reported relationship warmth at antenatal and 9-month DCWs and higher partner-reported relationship warmth from antenatal to 2-year DCWs. It was also associated with more parental engagement at 2-year DCW. On the flip side, being an older father was associated with higher mother-reported relationship warmth from antenatal to 2-year DCW (see Table 6.5).

Higher levels of parental education was also associated with higher socio-emotional competence at 2- and 4.5-year DCWs. Higher levels of deprivation and parental depression had consistently negative associations with socio-emotional competence through early childhood. Higher deprivation was also linked to lower parental engagement at 2-year DCW. Notably, higher parity was associated with lower parental engagement at 9-month and 2-year DCWs. In terms of associations between variables of interest, partner-reported relationship warmth antenatally and at 9-month DCW had relatively stronger associations with their engagement at 9 months in comparison to mothers (see Table 6.5).

**Table 6.4***Descriptive Statistics of and t-test Results Comparing Mother- and Partner-Reported Relationship Warmth and Parental Engagement*

Variables	Antenatal DCW			9-Month DCW			2-Year DCW		
	<i>M</i>	<i>SD</i>	<i>t</i> -test	<i>M</i>	<i>SD</i>	<i>t</i> -test	<i>M</i>	<i>SD</i>	<i>t</i> -test
Relationship warmth (mother-reported)	5.41	.783	-2.73**	5.19	.80	-.58	5.09	.79	-.72
Relationship warmth (partner-reported)	5.45	.785		5.20	.77		5.10	.76	
Parental engagement (mother-reported)	-	-	-	4.43	.49	.60***	3.27	.85	.54***
Parental engagement (partner-reported)	-	-		3.90	.67		2.78	.89	

*Note.* DCW= Data Collection Wave; *M* = Mean; *SD* = Standard Deviation.

\*\*\**p* < .001

**Table 6.5**

*Intercorrelations between Covariates, Mother- and Partner-Reported Relationship Warmth (Antenatal, 9-month and 2-year) and Parental Engagement (9-months and 2-year) and Socio-emotional Competence (9-month, 2-year and 4.5-year Data Collection Waves)*

Variables	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
(1). Age_M	-.22***	-.07***	-.05**	-.05***	-.07	-.04*	-.04*	-.02	-.04*	.03	-.01	.07**	.04*	.07***	.12***	.14***	
(2). Age_P	-.17***	-.03	-.08***	-.05***	-.03	-.05*	-.01	-.04*	-.03	.02	-.03	.03	.02	.07***	.06***	.09***	
(3). Edu_M	-.21***	-.08***	-.04*	.01	.02	.01	-.01	.01	-.01	.11***	.09***	.15***	.16***	.01	.15***	.10***	
(4). Edu_P	-.19***	-.05**	-.06**	.06**	.00	.04	-.00	.05*	-.01	.06**	.06**	.10***	.15***	.02	.11***	.08***	
(5). Parity	.08***	.06**	.01	-.15***	-.10***	-.06**	.01	-.02	.03	-.17***	-.18***	-.15***	-.18***	-.07***	-.05*	-.04	
(6). Deprv		.09***	.09***	.01	.02	-.00	.03	.00	.03	-.07**	.00	-.09***	-.09***	-.08***	-.12***	-.12***	
(7). Dep_M			.17***	-.21***	-.12***	-.32***	-.16***	-.22	-.12***	-.10***	-.07***	-.07***	-.07***	-.16***	.17***	-.19***	
(8). Dep_P				-.08***	-.16***	-.12***	-.24***	-.08	-.18***	-.04*	-.05*	-.02	-.06**	-.05**	-.07***	-.08***	
(9). RW_AN_M					.54***	.68***	.42***	.57***	.37***	.18***	.13***	.12***	.10***	.21***	.15***	.14***	
(10). RW_AN_P						.44***	.67***	.37***	.61***	.13***	.21***	.06***	.13***	.07***	.05**	.04*	
(11). RW_9m_M							.54***	.67***	.43***	.17***	.12***	.14***	.09***	.23***	.17***	.16***	
(12). RW_9m_P								.44***	.69***	.12***	.20***	.06**	.13***	.08***	.07***	.05*	
(13). RW_2yr_M									.52***	.12***	.08***	.16***	.09***	.17***	.23***	.19***	
(14). RW_2yr_P										.07**	.14***	.06**	.06***	.05**	.08***	.03	
(15). PE_9m_M											.27***	.39***	.18***	.23***	.17***	.13***	
(16). PE_9m_P												.14***	.40***	.08***	.09***	.06**	
(17). PE_2yr_M													.25***	.17***	.26***	.20***	
(18). PE_2yr_P														.06**	.14***	.09***	
(19). SEC_9m															.29***	.30***	
(20). SEC_2yr																.40***	
(21). SEC_4.5yrs																	1.00

Note. M = Mother; P = Partner; Edu = Education; Parity = Antenatal Parity; Deprv = New Zealand Deprivation Index<sup>1</sup>; RW = Relationship Warmth; AN= Antenatal; 9m = 9 months; 2yr = 2 years; PE = Parental Engagement; SEC = Socio-emotional competence.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

### **6.3.2 Auto-Regressive Cross-Lagged Modelling**

To assess the predictive effect of relationship warmth and parental engagement on socio-emotional competence after controlling for the initial values of variables (where possible), I estimated auto-regressive cross-lagged models for mothers and partners.

#### **6.3.2.1 Mothers**

The mother-reported relationship warmth, parental engagement and socio-emotional competence model had adequate fit and after deletion of non-significant paths, from 9 months parental engagement, and socio-emotional competence to relationship warmth at 2 years, the fit was excellent (see Table 6.6 & Figure 6.3).

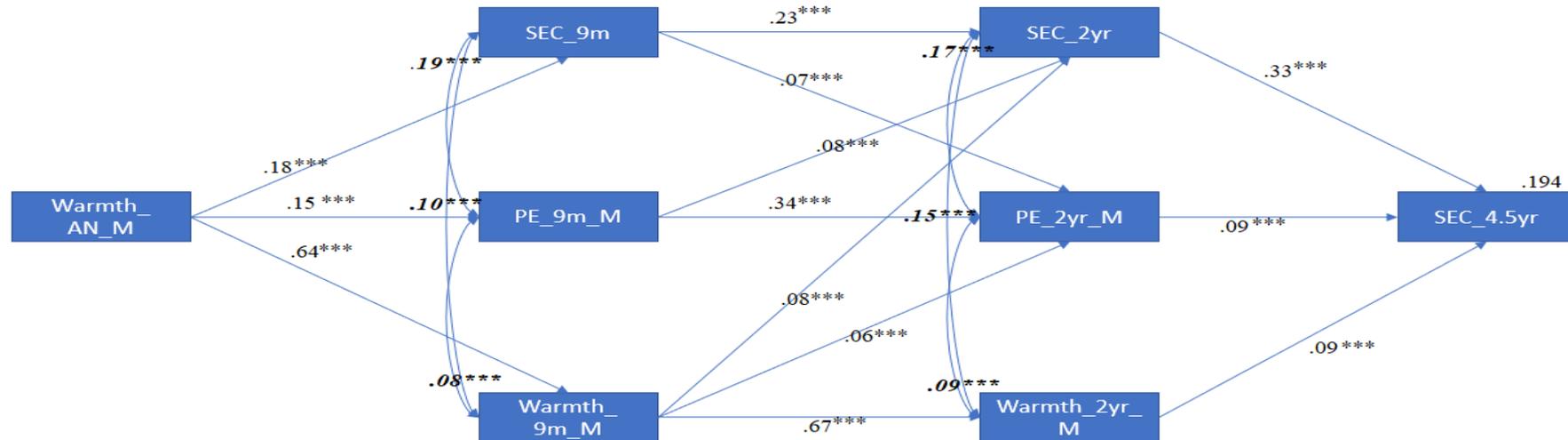
**Table 6.6**

*Model Fit of Auto-Regressive Cross-Lagged Models and Latent Growth Curve Models: Conditional and Unconditional.*

Models	$\chi^2$	<i>df</i>	$\chi^2/df$	CFI	RMSEA	Gamma Hat	SRMR
Auto-regressive cross-lagged models							
Mothers – full model	251.198***	10	25.720***	.964	.095	.98	.026
Mothers – non-significant paths deleted	259.539***	12	21.628***	.964	.08	.98	.026
Partners – full model	375.136***	10	375.136***	.942	.12	.99	.028
Partners – non-significant paths deleted	317.190***	15	25.146***	.942	.09	.99	.028
Latent growth curve models: Unconditional							
Relationship warmth (mother-reported) – linear growth	95.670***	3	31.890***	.970	.106	.064	.010
Relationship warmth (mother-reported) – Freely estimated	43.179***	2	21.590**	.990	.086	1.00	.015
Relationship warmth (partner-reported) – linear growth	129.277***	3	43.092***	.965	.123	.60	.015
Relationship warmth (partner-reported) – Freely estimated	4.885**	2	6.312	.999	.023	1.00	.004
Latent growth model: conditional							
Mothers – full model	158.442***	14	11.317***	.979	.061	.99	.017
Mothers – non-significant paths deleted	159.683***	17	9.393**	.979	.055	.99	.017
Partners – full model	79.583***	14	5.684*	.984	.041	1.00	.014
Partners – non-significant paths deleted	82.158***	21	3.912*	.984	.032	1.00	.014

**Figure 6.3**

*Results from Analysing Model Built to Assess the Predictive Effects of Mother-Reported Relationship Warmth (at Antenatal, 9 Months and 2 Years) and Parental Engagement (at 9 Months and 2 Years) on Socio-emotional Competence (at 9 Months, 2 Years and 4.5 Years) after Controlling for Initial Values of these Variables and covariates using Auto-Regressive Cross-Lagged Modelling.*



*Note.* Covariances shown between variables at the same data collection wave were covariances between their error terms, and their values are italicized and in bold.

Please note that covariates are not shown in the figure for ease of interpretation.

M = Mother; Warmth = Relationship warmth (mother-reported); AN = Antenatal; 9m = 9 months; 2yr = 2 years; PE = Parental engagement; SEC = Socio-emotional competence.

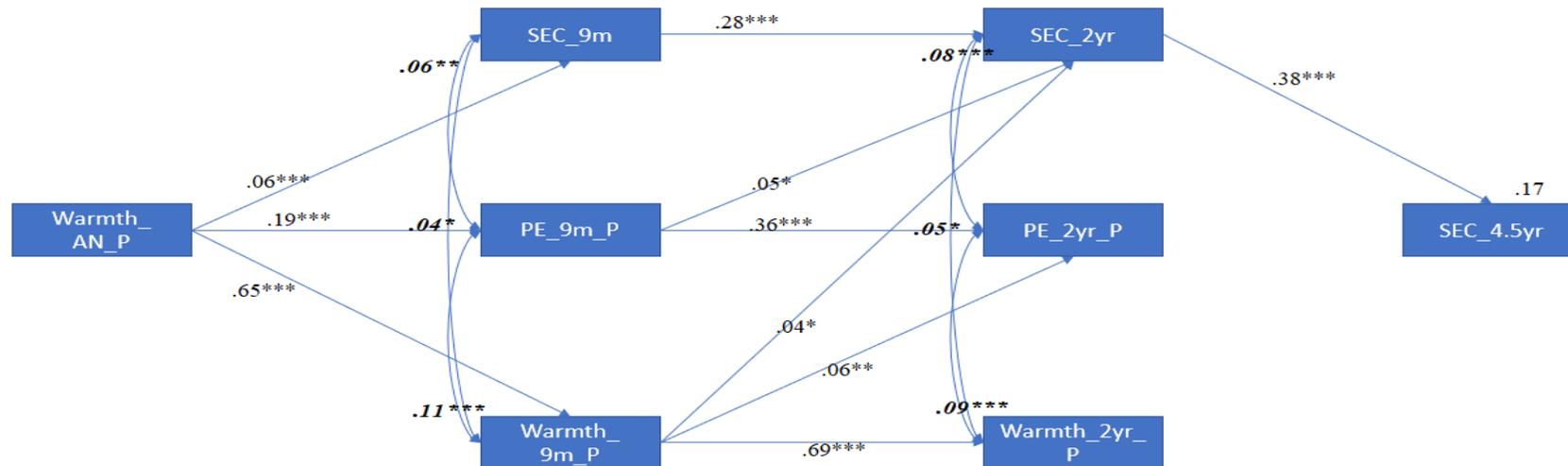
In line with Hypothesis 1a, relationship warmth and parental engagement positively predicted socio-emotional competence. Notably, these predictive associations were similar in magnitude. As hypothesised (Hypothesis 1b), evidence was found for mediation between maternal perceived relationship warmth at antenatal and 9-month DCWs and socio-emotional competence at 2-year and 4.5-year DCWs by parental engagement at 9-month ( $\beta = .01, p = .004$ ) and 2-year ( $\beta = .005, p = .004$ ) DCWs respectively. The size of mediation was small (Kenny, 2021). The model explained 6%, 13.4% and 19.4% variance in socio-emotional competence at 9-month, 2-year and 4.5-year DCWs correspondingly.

#### 6.3.2.2 Partners

The partner-reported relationship warmth, parental engagement and socio-emotional competence model had adequate fit before deletion of non-significant paths from: parental engagement and socio-emotional competence at 9-month DCW to relationship warmth at 2-year DCW; socio-emotional competence at 9-month to parental engagement at 2-year DCW; and relationship warmth and parental engagement at 2-year DCW to socio-emotional competence at 4.5-year DCW. The fit became excellent after deletion of these paths (see Table 6.6 & Figure 6.4).

**Figure 6.4**

*Results from Analysing Model Built to Assess the Predictive Effects of Partner-Reported Relationship Warmth (at Antenatal, 9 Months and 2 Years) and Parental Engagement (at 9 Months and 2 Years) on Socio-emotional Competence (at 9 Months, 2 Years and 4.5 Years) after Controlling for Initial Values of these Variables and covariates using Auto-Regressive Cross-Lagged Modelling.*



*Note.* Covariances shown between variables at the same data collection wave were covariances between their error terms, and their values are italicized and in bold.

Please note that covariates are not shown in the figure for ease of interpretation.

P = Partner; Warmth= Relationship warmth (mother-reported); AN = Antenatal; 9m = 9 months; 2yr = 2 years; PE = Parental engagement; SEC = Socio-emotional competence.

Results showed positive predictive associations between socio-emotional competence and prior partner-reported antenatal and 9-month relationship warmth and 9-month parental engagement, partially confirming Hypothesis 1a for partners. Like mothers, the predictive associations between socio-emotional competence at 2-year DCW and prior relationship warmth and parental engagement were similar in magnitude (see Figure 6.4). Only parental engagement at 9-month DCW mediated the relationship between relationship warmth at antenatal DCW and socio-emotional competence at 2-year DCW ( $\beta = .010, p = .02$ ), partially confirming Hypothesis 1b. The size of mediation was small (Kenny, 2021). The model explained 2.1%, 11.6% and 16.9% variance in socio-emotional competence at 9 months, 2 years and 4.5 years correspondingly.

It has also been hypothesised that a child's socio-emotional competence will positively predict interparental relationship warmth and parental engagement. However, only 9-month socio-emotional competence predicted 2-year mother-reported parental engagement. At inter-individual level, the associations between relationship warmth at the three DCWs were similar (see Table 6.5).

### **6.3.3 Latent Growth Modelling**

#### **6.3.3.1 Unconditional Models**

The developmental trajectory of relationship warmth for mothers and their partners were modelled separately to examine the shape of the growth. Linear growth was initially specified for both mother and partner, however, it yielded poor fit for both. The fit improved when 2-year relationship warmth's on the slope factor was freely estimated (see Table 6.6). The freely estimated model yielded factor loadings of 0, .31 and .48 for mothers and 0, .33 and .45 for partners suggesting that most of the change in relationship warmth, which on average was decline, occurred between antenatal and 9-month DCWs.

For mothers and partners, results showed significant means for slope (Mothers:  $\mu = -.201, p < .001$ ; Partners:  $\mu = -.248, p < .001$ ) and intercept factors (Mothers:  $\mu = 5.409, p <$

.001; Partners:  $\mu = 5.453, p < .001$ ). In addition, there was significant variance for latent slopes (Mothers:  $\varphi = .057, p < .001$ ; Partners:  $\varphi = .061, p < .001$ ) and latent intercepts (Mothers:  $\varphi = .449, p < .001$ ; Partners:  $\varphi = .449, p < .001$ ) indicating substantial inter-individual differences in growth processes of relationship warmth. In confirmation of Hypothesis 3a, there was change in relationship warmth after birth, and decline was noted in it for mothers and partners since slope values were negative.

Negative associations were found between latent slope and intercept factor (Mothers:  $r = -.28, p < .001$ ; Partners:  $r = -.34, p < .001$ ) indicating if initial levels of relationship warmth were higher, there was less decline in relationship warmth over the two years following birth.

#### 6.3.3.2 Conditional Models

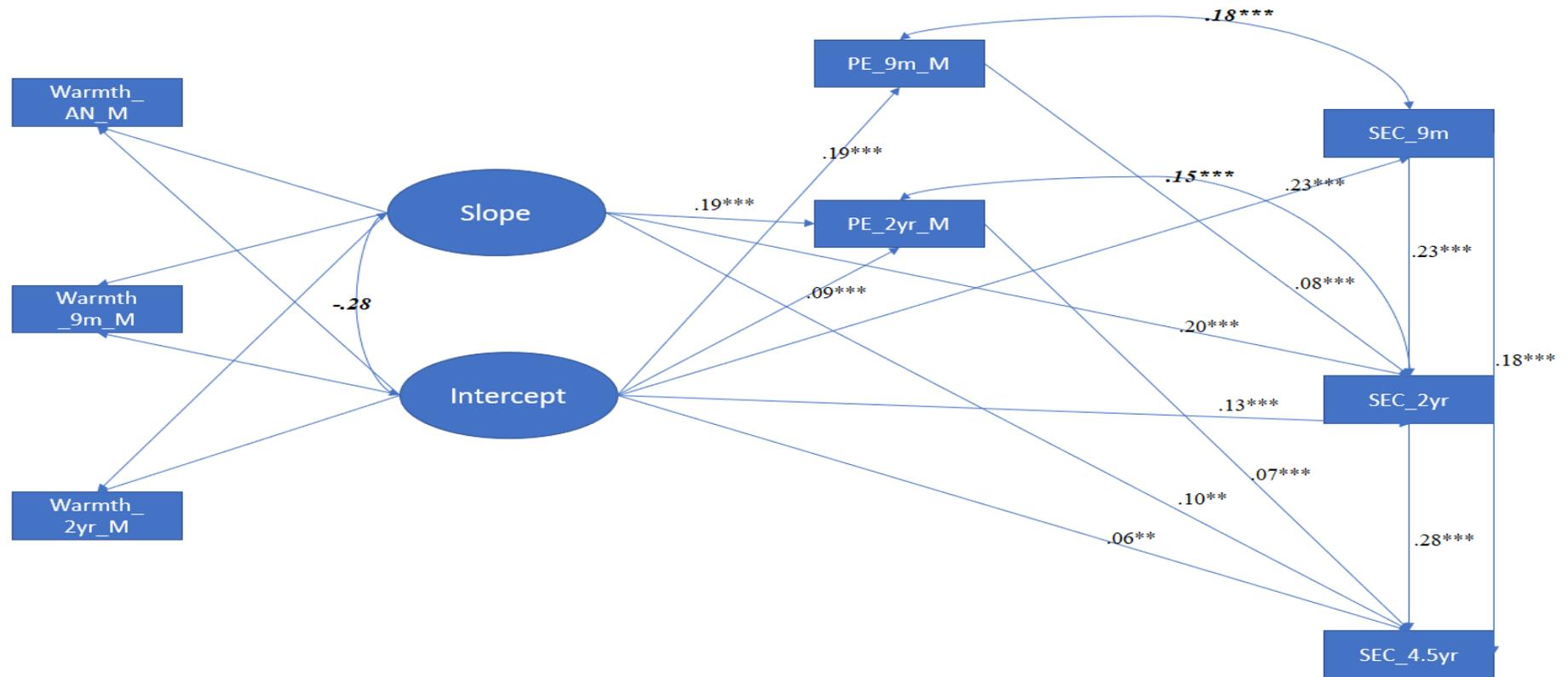
After testing unconditional models, conditional models to assess the effect of growth in relationship warmth from antenatal to 2-year DCW on parental engagement and socio-emotional competence were tested after controlling for covariates. Results are described below.

##### 6.3.3.2.1 Mothers

The model (Figure 5) fitted the data well before and after the deletion of non-significant paths (see Table 6.6) from: slope to socio-emotional competence and parental engagement at 9 months, and parental engagement at 9-month DCW to socio-emotional competence at 4.5-year DCW.

**Figure 6.5**

*Results from Analysing Model Built to Assess the Effect of Growth Process in Mother-Reported Relationship Warmth from antenatal to 2 years on Parental Engagement (at 9 Months and 2 Years) on Socio-emotional Competence (at 9 Months, 2 Years and 4.5 Years) Using Latent Growth Curve Modelling.*



*Note.* Covariances between variables at the same time point were covariances between their error terms. Values of covariances are italicised and in bold.

Warmth= Relationship warmth; AN= Antenatal; 9m= 9 months; 2yr= 2 years; PE= Parental engagement; SEC= Socio-emotional competence.

As hypothesised (Hypothesis 3b), the results show that gains in mother-reported relationship warmth from the antenatal to 2-year DCWs had a positive predictive effect on socio-emotional competence at 2-year and 4.5-year DCWs and on parental engagement at 2-year DCW (see Figure 6.5). Parental engagement at 2-year DCW partially mediated the relationship between the change in parental warmth and socio-emotional competence at 4.5-year DCW ( $\beta = .01, p = .003$ ), albeit that the effect was very small. The direct effect of slope that is change in parental relationship warmth was higher in magnitude but similarly weak in size in both these cases ((Kenny, 2020; see Figure 6.5).

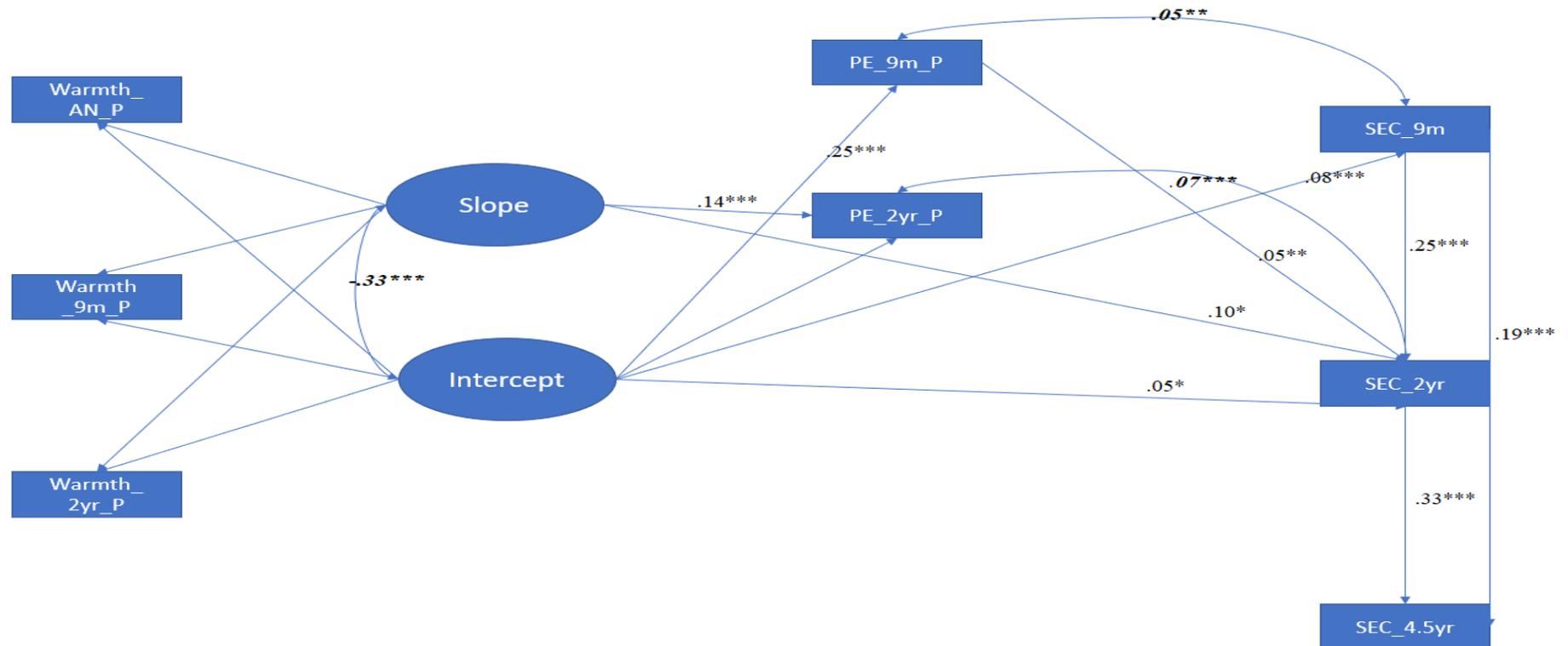
#### 6.3.3.2.2 *Partners*

Similar to mothers, model fit for the conditional model with partner-reported relationship warmth and parental engagement was excellent before and after the deletion of non-significant paths (see Table 6.6) from: slope to socio-emotional competence at 9-month and 4.5-year DCWs and parental engagement at 9-month DCW; intercept to socio-emotional competence at 4.5-year DCW; parental engagement at 2-year to socio-emotional competence 4.5-year DCW, and socio-emotional competence at 9-month to parental engagement at 2-year DCWs.

The hypothesis that there would be an effect of change in relationship warmth following the birth of the child on socio-emotional competence and parental engagement (Hypothesis 3b) was partially confirmed, as increasing relationship warmth was associated with higher 2-year socio-emotional competence and parental engagement (see Figure 6.6).

**Figure 6.6**

*Results from Analysing Model Built to Assess the Effect of Growth Process in Partner-Reported Relationship Warmth from antenatal to 2 years on Parental Engagement (at 9 Months and 2 Years) on Socio-emotional Competence (at 9 Months, 2 Years and 4.5 Years) Using Latent Growth Curve Modelling.*



*Note.* Covariances between variables at the same time point were covariances between their error terms. Values of covariances are italicised and in bold.

Warmth= Relationship warmth; AN= Antenatal; 9m= 9 months; 2yr= 2 years; PE= Parental engagement; SEC= Socio-emotional competence.

## 6.4 Discussion

The present study used data from a population-based longitudinal study to examine the influence of relationship environment (interparental and parent-child) on a child's early socio-emotional competence considering both inter- and intraindividual differences in parental warmth. This study also provides an insight into the relationship dynamics before and after the birth of a child, and the effects it has on the child's socio-emotional development using data from both mothers and partners.

Confirming the hypotheses, both interparental relationship warmth and parental engagement positively predicted socio-emotional competence over time, and these effects are found over and above the influence of parental depression at 9 months and area level deprivation. These findings are consistent with the literature in that, during infancy, high parental conflict may undermine a child's emotional security (Cummings & Davies, 2010). Infants (aged 6 to 14 months) have been found to display more frequent negative reactions and pay more attention to destructive and depressive discussions between parents (du Rocher Schudlich et al., 2011). By toddlerhood, they may also have developed the ability to learn socio-emotional skills from the behaviours modelled by their parents (Bandura, 1978). These likely contribute towards negative socio-emotional outcomes in children exposed to low warmth and high conflict parental relationships. Notably, this research also found that how much warmth parents have in their relationship and the time they spent engaged in different activities with their child almost exert the same level of influence on their child's subsequent socio-emotional competence.

Interestingly, the level of parental relationship warmth before birth positively predicted a child's 9-month socio-emotional competence after controlling for mother's and father's depression and socioeconomic deprivation. A similar pattern was found in an earlier large-scale longitudinal study in which antenatal marital conflict was found to be positively associated with emotional and conduct problems at 42 months (Hanington et al., 2011). The

effects of antenatal relationship warmth on children's socio-emotional competence were relatively stronger for mothers compared to partners. These findings are in line with the fetal programming hypothesis, whereby the development of the hypothalamic–pituitary–adrenal (HPA) axis, limbic system, and prefrontal cortex are all affected by the intrauterine environment via effects of maternal mood (Van den Bergh, et al., 2005). Some argue that what seem like effects of antenatal environment on a child's emotions and behaviours may be due to postnatal factors. However, in the present study, both maternal and paternal depression at 9 months, as well as socioeconomic deprivation, were accounted for, which may be possible confounders (Van den Bergh et al., 2005).

As hypothesised, results also provided support for an indirect effect of relationship warmth on socio-emotional development via parental engagement. Support for these indirect effects was found more often in the case of mother than for their partners. However, the size of these indirect effects was small (Kenny, 2021). In line with past studies (e.g. Harrist & Ainslie, 1998; Almeida et al., 1999; Buehler et al., 2006; Mehall et al., 2009; Carlson et al., 2011), this study found the warmth that couple experienced in their relationship seems to spill over into their engagement with their children. However, the level spill over was weak in this study.

Interestingly, this spill over was relatively stronger in magnitude for partners between the antenatal and 9 months assessments than for mothers. Perhaps given the developmental stage and needs of infants, mothers consider themselves more responsible for taking care of the infant and are unable to withdraw from parenting (Crockenberg et al., 2007). This may partly explain why mother-reported relationship warmth does not seem to have as much bearing on their amount of engagement with the infant. The results provide some support for this, as mothers engaged with children more than their partners at 9 months (Table 6.4). Also, at the 9 months' time point, partner-reported relationship warmth was more strongly associated with partner engagement with the child in comparison to mothers (Table 6.5).

In line with the hypothesis, the study found evidence for a change in couple relationship warmth following the birth of the child with most change occurring from antenatal to 9 months assessments. The findings suggest the relationship warmth on average declines between this period despite it often being a period of significant family adjustment. This finding is in line with previous research suggesting birth of a child, especially the first child, leads to a decline in a couple's relationship (e.g. Moss et al., 1986; Shiparo et al., 2000; Lawrence et al., 2008; Luhmann et al., 2011; Figueiredo & Conde, 2015). Some of these studies exclusively studied first time parents (i.e. Moss et al., 1986; Shiparo et al., 2000; Lawrence et al., 2008) while this study's sample also included couples who had had children before (58.3 percent). This suggests that, regardless of number of children, the birth of a child is a stressful event – leading to decline in relationship quality. Unlike past studies, this study's sample was large scale, ethnically and socioeconomically diverse. In addition, despite the fact that the data was collected from New Zealand, which may be different from the countries where previous studies were conducted (e.g. in USA and Portugal) in terms of its social policies and support for parents, parenting roles and work life balance, decline in relationship warmth still held.

Supporting one of the key hypotheses, an increase in mother-reported relationship warmth positively influenced socio-emotional development at 2 and 4.5 years. In contrast, for partners, change in relationship warmth affected socio-emotional only at 2 years. Similar to this pattern, relationship warmth had a consistently positive influence, albeit weak in size, on subsequent socio-emotional competence (after controlling for its initial level), and it was relatively stronger for mothers in comparison to their partners for whom the influence disappeared beyond 2 years (see Figures 6.3 & 6.4). It is possible that these findings reflect a gender discrepancy in how mothers and partners interpret couple warmth. That is, mothers may have a higher threshold for what they consider to be 'warmth,' and what they rate as warm may be more pronounced (or lacking) enough to be observed by children and modelled in their emotions and behaviours. It may also have to do with greater attachment between children and

mothers during early childhood. In support of this, model specified for mothers also explained greater variance in socio-emotional competence across the early childhood in comparison to their partner.

#### **6.4.1 Limitations and Suggestions**

This study used data from a large-scale longitudinal study and, owing to limited time resources, data was not available at 4.5 years for relationship warmth and parent-child engagement. This limited the ability to model autoregressive cross-lagged and latent growth together as it requires repeated measures at more than three times to provide more robust results.

In addition, there was no battery of socio-emotional competence available that was administered repeatedly. Instead, I relied on different measures that tapped into domain(s) of socio-emotional competence to construct an index of socio-emotional competence at 9 months, 2 years and 4.5 years. Since there were no variables common between 9-month and 2-year socio-emotional competence I was not able to model growth, but I was able to look at rank order stability, that is the level of SEC at each time point relative to other children in the sample. In addition, moderate to strong correlations between socio-emotional competence for each time point ( $r = .29 - .40, p < .001$ ) suggest that the indices are tapping into a similar construct, albeit with different tools.

Another limitation is that the study relied on mother-reported data to calculate socio-emotional competence with the exception of 4.5-year socio-emotional competence (which included observer reports). This may have attenuated the relationship between socio-emotional competence and partner-reported relationship warmth and parental engagement. In addition, parental engagement at 2 years was only based on aggregate of two items: reading books and telling stories. It did not include as many activities as parental engagement at 9 months did. This may have undermined the magnitude of associations calculated. Finally, I did not have a measure of parent-child closeness or relationship quality available. It may be interesting to see

how relationship warmth affects closeness in and the quality of the parent-child relationship as another way to understand spillover and the compensatory effects of couple warmth on socio-emotional development. Perhaps, when quality of parent-child relationship is considered in conjunction with parent-child engagement and interparental relationship warmth, it will account for greater variance in socio-emotional competence levels across the early childhood than what was found in this study.

## **6.5 Conclusion**

This study contributes to existing literature by assessing mother- and partner-reported relationship warmth and parental engagement and socio-emotional competence during early childhood starting during before birth at both inter- and intraindividual levels. It highlighted that it is not only important *how much* parents engage with their children, but how they behave with each other which has an influence on a child's socio-emotional development. The effects of which seem to start even before the child is born and extend to across the first 5 years, especially for mothers.

This study also highlights the importance of the role mothers have to play in children's early socio-emotional development. Results showed what mothers thought of their relationship with their partner, and the frequency of their engagement with their children, mattered more than that of their partner for socio-emotional development of their children. The study also found decline in the parental relationship following birth (regardless of whether it was first or subsequent child), which signals the need to provide couples with more support as they experience the birth of a child.

## **Chapter 7. Proximal Processes and Contextual Factors Associated with Early Socio-emotional Competence Development (Study 5)**

### **7.1 Introduction**

The fifth and final study of this thesis addressed the research question: *What are some of the proximal and contextual predictors of socio-emotional competence across early childhood that can be identified in a large and diverse cohort?* Following the bioecological model developed by Bronfenbrenner (1979, 1995), this study attempted to identify a range of contextual and proximal factors that facilitate or inhibit the development of early socio-emotional competence. While the previous study (Study 4) was primarily focused on family context, the scope of this study was relatively broader.

A range of variables that were available in the Growing Up in New Zealand (GUiNZ) data set including biopsychological factors (child's gender, health, communication abilities, etc.), contextual factors (deprivation, parental relationship warmth, childcare attendance, etc.) and proximal processes (such as maternal behaviours, parenting styles, closeness, etc.) were included in Study 5. Factors that are likely to stay stable during the early childhood were only included once. For example, Study 4 found a high level of stability between mother reports of relationship warmth during the antenatal phase, at 9 months and 2 years and, therefore, only relationship warmth at 9 months was included in the model. There were also some instances where the same measures of a variable were not available across the three time points such as child's health and screen time. If there was a clear conceptual overlap in the measures available, they were included in the analysis. Finally, the analyses also controlled for several mother, child and birth related variables. The following account is a version of the Study 5 manuscript that is currently under review in *Child Psychiatry and Human Development*.

In the last decade or so, interest in socio-emotional competence has grown in parents, educators, employers and policy makers. In 2003, the Organisation for Economic Co-operation and Development (OECD), comprising of 37 member countries, introduced the DeSeCo (Definition and Selection of Competencies) project, which proposed three broad categories of

key competencies that are needed for sustainable economic growth and social cohesion. These key competencies not only include traditional academic skills, but also skills related to socio-emotional competence (Organisation for Economic Co-operation and Development, 2005). Many countries have since incorporated these key competencies into their curricula (Trier, 2001) with the view that they should be developed as early as possible within the education system. In support of this, research has consistently shown that early socio-emotional competence has positive associations with academic achievement, physiological and psychological well-being and later employability (e.g. Burt et al., 2008; Cheevers & O'Connell, 2012; Jones et al., 2015).

Given the potential importance of early socio-emotional competence for later outcomes, and the emphasis on developing them early, the present study examined the contextual and proximal factors that influence development across the first 5 years of life using data from the GUiNZ multidisciplinary population-based longitudinal study. The study draws on Bronfenbrenner's 1979 ecological model (which was later revised to the bioecological model of human development) to identify a range of possible predictors within the GUiNZ study.

Bronfenbrenner's (1979) model emphasised the importance of environment in human development and divided this environment into nested and interconnected systems: microsystem, mesosystem, macrosystem, exosystem and chronosystem. Microsystems include any immediate relationships and/or institutions that the child directly interacts with such as family, friends or schools while mesosystem encompasses relationships between the microsystems. For instance, parental interest in a child's peer group may help in developing and maintaining friendships. Mesosystem is followed by ecosystem, which includes the settings that the child experiences indirectly, such as a parent's work environment. The next level is macrosystem including social and cultural values, and the political and economic conditions of the families (Bronfenbrenner, 1979) as well as material resources available (Bronfenbrenner, 1994). Lastly, the chronosystem is the historical context in which the systems

are embedded (Bronfenbrenner, 1979). For example, during war and famine, more focus is on providing food and shelter to children and ensuring their safety rather than spending quality time with them and engaging in activities that facilitate socio-emotional competence.

Bronfenbrenner (1995) revised his theory to emphasise the importance of proximal processes for human development. These proximal processes are increasingly complex, reciprocal interactions that occur between an evolving biopsychological individual and other people, objects and symbols in the immediate environment. These processes must occur on a regular basis over an extended period of time to have an effect. Bronfenbrenner argued that in order to understand the effect of these proximal processes, we need to consider the person, context and developmental outcomes we are studying.

The GUiNZ study includes measures of a broad range of biopsychological and contextual factors and proximal processes, which allows me to explore some of the factors that together may influence socio-emotional development across early childhood. This is potentially of interest to parents and policy makers who are increasingly looking at how we can support the development of these competencies in young children.

### ***7.1.1 Proximal Processes***

During early childhood, children spend most of their time with family. In line with this, several familial proximal and contextual factors have been documented to have an influence on socio-emotional competence. These proximal factors can be general, such as parent-child closeness, general parenting style; or specific, such as engagement in specific activities. There is evidence that age-appropriate paternal engagement with children also contributes towards positive socio-emotional outcomes (Sarkadi et al., 2008; Parfitt et al., 2014). For example, maternal responsiveness and sensitivity is associated with less behavioural problems during preschool years (Miner & Clarke-Stewart, 2008; Petitclerc & Tremblay, 2009). Similarly, strong evidence exists in support of the effect of parenting styles on them (Stack et al., 2010). For example, harsh, authoritarian and inconsistent parenting are predictive of negative

behaviour (e.g. Beck et al., 2004) while authoritative, consistent and warm parenting contributes towards positive socio-emotional outcomes (Melnick & Hinshaw, 2000). Engagement in specific activities also lead to gains in socio-emotional competence such as reading (O'Farrelly et al., 2018) and music activities (Standley et al., 2009).

### *7.1.2 Contextual Factors*

Contextual factors can belong to a child's immediate, as well as distant, environment. From among contextual factors in a child's immediate environment, marital satisfaction is found to be linked with children's socio-emotional outcomes (e.g. Fishman & Meyers, 2000; Harrist & Ainslie, 1998; Berger & McLanahan, 2015). In addition, maternal depression is associated with later (e.g. Velder et al., 2011; Letourneau et al., 2013; Van Batenburg-Eddes, 2013) or persistent behavioural difficulties (D'Souza et al., 2019). Also, having siblings has been reported to have a positive effect on socio-emotional development (Downey & Condrón, 2004). The macrosystem construct of socioeconomic status also makes up the context that children develop in. Research has shown detrimental associations between low socioeconomic status and children's mental health outcomes (e.g. Spady et al., 2001; Reiss, 2013; Guhn et al., 2020). Related to socioeconomic status, quality of neighbourhood is also implicated in a child's well-being (e.g. Beyers et al., 2003; Harding, 2003; Haynes et al., 2003). Childcare may also be a part of child's environment, although research has produced mixed results with regards to the effects of childcare on socio-emotional development whereby childcare attendance during very early years is said to have negative effects on socio-emotional development (Vandell et al., 2011). A number of factors are associated with childcare (such as attendance, quality of childcare facility, curriculum, etc); which may account for differential effects of childcare on socio-emotional competence as studies have explored different aspects of childcare settings.

### **7.1.3 *Biopsychological Factors***

Research has documented that gender is associated with social and emotional skill development (e.g. Baillargeon et al., 2007; Sanson et al., 2007; Matthews et al., 2009), with girls being statistically more likely to engage in prosocial behaviours (Maguire et al., 2016) while boys are statistically more likely to exhibit externalising behaviours (Maguire et al., 2016; Steinberg, 2008). Along with gender, evidence exists that physiological health is also linked with social and emotional skills (Cheevers & O'Connell, 2012; Sanson, et al., 2010) as is sleep, which is argued to be an important part of healthy development and socio-emotional skill development in early childhood (e.g. Berger et al., 2012; Winsper & Wolke, 2014; Sadeh et al., 2015; Mindell et al., 2017).

## **7.2 Method**

### **7.2.1 *Growing Up in New Zealand***

Growing Up in New Zealand (GUiNZ) was launched in April 2008 after gaining ethics approval from the Ministry of Health Northern Y Regional Ethics Committee. Recruitment was carried out using non-probability sampling (Morton et al., 2014). Initially, 6822 mothers agreed to participate in the study till their children turned 21 years of age (Morton et al., 2013). The children cohort consisted of 6846 children who survived to at least six weeks after expected delivery date accounting for 11 percent of all births in New Zealand during the recruitment period. The sex of the baby was not statistically different from the national data (2006-2010) although the sample had fewer babies born preterm (before 37 weeks) relative to the national data (Morton et al., 2014).

The demographical characteristics of the recruited cohort are comparable to all New Zealand parents in terms of maternal age, deprivation and parity according to data available from Statistics New Zealand between 2006-2008 (Morton et al., 2013). The sample was more ethnically diverse than the population. With increases in ethnic diversity in New Zealand, the hope is that it will keep the sample relevant in future (Morton et al., 2014). Data was collected

using face-to-face and computer assisted interviews (Morton et al., 2013). This study mainly used data from four data collection waves (DCWs): antenatal, 9 months, 2 years and 4.5 years. Further details regarding the design and recruitment of the study participants are given in Morton et al. (2017).

## **7.2.2 Measures**

### **7.2.2.1 Socio-emotional Competence**

The GUiNZ study does not include a single measure of socio-emotional competence. Therefore, Ahmad et al. (2019) developed composite indices of socio-emotional competence at 9-month, 2-year and 4.5-year DCWs using different measures chosen based on Denham's (2006) model of socio-emotional competence (see Table 7.1; see Chapter 2 for details on methods followed to calculate the index).

In total, 26 scales used in GUiNZ were chosen. After their selection, the scales were grouped at each DCW based on Exploratory Factor Analysis (EFA). The EFA resulted in two factors at 9-month and 2-year DCWs and three factors at 4.5-year DCW. The score on each scale was transformed to a z-score and then aggregated after assigning equal weights to give each factor a score at three DCWs. The factor scores were further weighted equally and averaged to give socio-emotional index scores at 9 months, 2 years and 4.5 years of age. For further details on the method used to develop the index, see Ahmad et al. (2019; Chapter 2).

Sufficient data on the domains of socio-emotional competence was not available for all children at each of the three DCWs, which restricted my ability to calculate scores of socio-emotional competence indices for all the participating children. A total of 4839 children had socio-emotional competence index scores available across all three DCWs (Ahmad et al., 2019; see Chapter 2).

### **Table 7.1**

*Variables Belonging to Socio-emotional Competence Dimensions of Easy-going, Regulation and Exuberance at each Data Collection Wave (DCW).*

DCWs	Easy-going	Regulation	Exuberance
9-month SEC	Negative emotionality – IBQ-R VSF Fear – IBQ-R VSF	Orienting capacity – IBQ-R VSF Affiliation/Regulation – IBQ-R VSF Positive affectivity/Surgency – IBQ-R VSF	
2-year SEC	Conduct problems – SDQ Emotional problems – SDQ Hyperactivity problems – SDQ Peer problems – SDQ Expressive Vocabulary – emotions related	Prosocial – SDQ Impulse Control Scale – DesRosier’s Measure Shame Scale – DesRosier’s Measure	
4.5- year SEC	Negative Affect – CBQ VSF Emotional problems – SDQ Hyperactivity problems – SDQ Conduct problems – SDQ Peer problems – SDQ Hardiness – CBQ VSF	Effortful control – CBQ VSF Attention – CBQ VSF Prosocial – SDQ	Surgency – CBQ VSF Boldness – CBQ VSF Observations– engagement with interviewer and mood (Assessor’s Report, PSRA) Expression identification (AKT)

*Note.* SEC = Socio-emotional competence; IBQ-R VSF = Infant Behavior Questionnaire – Revised Very Short Form (Gartstein et al., 2014); SDQ = Strengths and Difficulties Questionnaire (Goodman, 1997); CBQ VSF = Child Behavior Questionnaire – Very Short Form (Putnam & Rothbart, 2006); PSRA = Preschool Self-Regulation Assessment (Smith-Donald et al., 2007); AKT = Affective Knowledge Task (Denham, 1986).

### 7.2.2.2 Proximal Processes

To capture the interactive aspect of development, the present study included data on maternal confidence (while caring for the baby; 9-month DCW), maternal closeness (felt for baby; 9-month DCW), maternal parenting styles: empathetic relational parenting, authoritarian parenting, punishment parenting and permissive parenting (4.5-year DCW) and whether mother or child dominated interaction during an observed task (4.5-year DCW) as proximal factors. Maternal confidence and closeness were both measured using a single item while the parenting styles were measured using items from the Parenting Practices Questionnaire (Robinson, et al. 1995).

This study also included a single item measure of frequency of engagement of mothers in specific activities with their children including: playing games with baby (9-month DCW), talking to baby during daily activities (9-month DCW), playing with toys with baby (9-month DCW), singing songs or telling stories (9-month DCW), reading books (9-month, 2-year & 4.5-year DCWs) and telling stories (2-year & 4.5-year DCWs). In addition, it included whether there were rules about TV and technology use (2-year & 4.5-year DCWs). Finally, measures of how often the child watched TV, videos and/or DVDs (9-month DCW) and played musical instruments whether real or toy (2-year DCW) were also added as proximal processes.

### 7.2.2.3 Contextual Factors

Specific to family environment, the study included measures of maternal depression (measured at 9-month DCW using Edinburgh Depression Inventory; Cox et al., 1987), parental relationship warmth (measured at 9-month DCW using nine items derived from observational coding system: IOWA Family Interaction Rating Scales, Melby & Conger, 2001), extent of family stress across different domains (9-month DCW), deprivation (measured at 9-month DCW using the NZ index of deprivation; Salmond et al., 2007), number of siblings living in the house at 16 weeks and mother's employment (2-year DCW). Apart from these familial factors, whether the child attended childcare (at 9-month & 2-year DCWs) and whether family

social services were accessed (at 2-year & 4.5-year DCWs) were also considered as contextual factors. Finally, I considered mother's perception of the neighbourhood facilities, cleanliness and safety which was a seven items scale used in the Longitudinal Study of Australian Children. This was measured at the 2-year DCW.

#### 7.2.2.4 Biopsychological Factors

For the present study a range of biopsychological factors were used including infant's sex and a measure of early language and communication development at 9-month DCW (Communication and Symbolic Behavior; Wetherby & Prizant, 2001), which taps into emotion and use of eye gaze, communication and sounds of the infant. In addition, the study considered health rating by mother (9-month, 2-year & 4.5-year DCWs) and quantity of sleep during the day and night (2-year DCW). Further, an aggregate of a child's frequency of participation in different physical activities (climbs trees, frames etc; plays with ball; play chasing and running games; rides a bike, tricycle, skateboard or scooter; dances around the house and takes part in physical activities with family) measured at 4.5-year DCW was also included.

#### 7.2.2.5 Demographics

The analyses controlled for a number of demographic variables, using data from the antenatal and 9-month DCWs. These demographics were the characteristics that could not be modified, and included whether the delivery was full term or not, if pregnancy was planned or not, parity (first or subsequent birth), maternal age, self-prioritised ethnicity (European, Māori, Pacific, Asian and Others), maternal education (highest qualification - antenatal) and rurality (mothers report of whether they lived in rural or urban areas). These demographical variables were controlled because of their possible effect on socio-emotional competence (see Cowan & Conwan, 2000; Amato et al., 2003; Sheridan et al., 2014; D'Souza et al., 2019).

### 7.2.3 *Participants*

This study used data from participants with socio-emotional competence scores at 9-month, 2-year and 4.5-year DCWs. A total of 583 participants had data missing on one or more

demographical variables (including gender, preterm delivery, planned pregnancy, maternal parity, ethnicity, education and deprivation). Therefore, their data was not included in the analysis. In addition, the analyses did not include data for participants who were missing single-item variables as well as more than 10 percent data missing on variables derived from multiple items (N = 1056). I used EM to impute missing data on Communication and Symbolic Behavior scale for participants that had less than 10 percent data missing. While the Little's MCAR test was statistically significant for the scale ( $\chi^2 = 1185, df = 793, p < 0.001$ ) the Chi-square test is extremely sensitive to large sample sizes (Tanaka, 1987). So I further calculated Chi-square ratio to df ( $\chi^2/df = 1.49, p = 0.22$ ) which was not statistically significant. See Table 7.2 for the remaining participants' demographic information (N = 3200).

**Table 7.2***Demographics of the Sample in the Present Study.*

Demographics	Mothers ( <i>N</i> = 3200) <i>N</i> (%)
<b>Delivery</b>	
Preterm (less than 37 weeks)	162 (5.1)
Full term (37 – 41 weeks)	3038 (94.9)
<b>Pregnancy</b>	
Unplanned	1035 (32.3)
Planned	2165 (67.7)
<b>Baby sex</b>	
Boy	1629 (50.9)
Girl	1571 (49.1)
<b>Parity</b>	
First born	1219 (38.1)
Subsequent birth	1981 (61.9)
<b>Mother's age – antenatal</b>	
Less than 20 years	85 (2.7)
20 - 29 years	1143 (35.7)
30 - 34 years	1104 (34.5)
35+ years	868 (27.1)
<b>Ethnicity – antenatal<sup>1</sup></b>	
European	2019 (63.1)
Māori	368 (11.5)
Pacific	343 (10.7)
Asian	374 (11.7)
Other	96 (3.0)
<b>Mother's education – antenatal</b>	
No secondary education	142 (4.4)
Secondary education	649 (20.3)
Diploma	993 (31.0)
Bachelors	842(26.3)
Higher degree	574 (17.9)
<b>NZ deprivation index – 9 months<sup>2</sup></b>	
Low deprivation	939 (29.3)
Middle deprivation	1270 (39.7)
High deprivation	991 (31.0)
<b>Location</b>	
Urban	2901 (90.7)
Rural	299 (9.3)

*Note.* <sup>1</sup> Ethnicity is self-prioritised ethnicity.

<sup>2</sup> The New Zealand Deprivation Index combines nine socioeconomic variables from the 2006 census capturing eight dimensions of deprivation at the small area level (Salmond, Crampton & Atkinson, 2007).

#### **7.2.4 Analyses**

A series of hierarchical multiple regression analyses were run to identify the predictors of socio-emotional competence at 9-month, 2-year and 4.5-year DCWS and to determine if the addition of biopsychological factors, contextual factors and proximal processes improved the prediction of socio-emotional competence over and above demographics and prior socio-emotional competence level (where applicable). All analyses were carried out using version 26.0 IBM SPSS Statistics.

Table 7.3 shows the models predicting socio-emotional competence that were tested at each time point, and the amount of unique variance explained by each model at each step. For example, Model P included prior level(s) of socio-emotional competence where applicable. Model 1 included the demographic factors as predictors of socio-emotional competence while Model 2 added biopsychological factors and Model 3 added contextual factors (etc). While I show the final models with all possible steps in Tables 7.4 – 7.6, they primarily focused on contextual and proximal factors that related to socio-emotional development as these are arguably more modifiable and of potentially greater interests to parents and those working with very young children.

**Table 7.3**

*Unique Contribution (Variance Accounted for) of Each Model Over and Above the Prior Model Predicting Socio-emotional Competence at 9 Months, 2 Years and 4.5 Years.*

Models	$\Delta R^2$		
	9-month SEC	2-year SEC	4.5-year SEC
Model P – Prior SEC	NA	<b>.081</b>	<b>.195</b>
Model 1 – Prior SEC and demographics (where applicable)	<b>.037</b>	<b>.059</b>	<b>.031</b>
Model 2 – Prior SEC (where applicable), demographics & 9m biopsychological factors	<b>.043</b>	<b>.016</b>	<b>.009</b>
Model 3 – Prior SEC (where applicable), demographics, 9m biopsychological factors & 9m contextual factors	<b>.042</b>	<b>.016</b>	<b>.008</b>
Model 4 – Prior SEC (where applicable), demographics, 9m biopsychological factors, 9m contextual factors & 9m proximal processes	<b>.051</b>	<b>.015</b>	.002
Model 5 – Prior SEC, 9m SEC, demographics, 9m biopsychological factors, 9m contextual factors, 9m proximal processes & 2yrs biopsychological factors		<b>.011</b>	<b>.002</b>
Model 6 – Prior SEC, 9m SEC, demographics, 9m biopsychological factors, 9m contextual factors, 9m proximal processes, 2yrs biopsychological factors & 2yrs contextual factors		<b>.009</b>	.001
Model 7 – Prior SEC, 9m SEC, demographics, 9m biopsychological factors, 9m contextual factors, 9m proximal processes, 2yrs biopsychological factors, 2yrs contextual factors & 2yrs proximal processes		<b>.024</b>	.002
Model 8 – Prior SEC, 9m SEC, demographics, 9m biopsychological factors, 9m contextual factors, 9m proximal processes, 2yrs biopsychological factors, 2yrs contextual factors, 2yrs proximal processes & 4.5yrs biopsychological factors			<b>.023</b>
Model 9 – Prior SEC, 9m SEC, 2yr SEC, demographics, 9m biopsychological factors, 9m contextual factors, 9m proximal processes, 2yrs biopsychological factors, 2yrs contextual factors, 2yrs proximal processes, 4.5yrs biopsychological factors & 4.5yrs contextual factors			.000
Model 10 – Prior SEC, 9m SEC, 2yr SEC, demographics, 9m biopsychological factors, 9m contextual factors, 9m proximal processes, 2yrs biopsychological factors, 2yrs contextual factors, 2yrs proximal processes, 4.5yrs biopsychological factors, 4.5yrs contextual factors & 4.5yrs proximal processes			<b>.050</b>
<b>Total variance explained (%)</b>	<b>17.3</b>	<b>23.1</b>	<b>32.3</b>

*Note.* SEC= Socio-emotional competence; 9m = 9 months; 2yrs = 2 years; 4.5yrs = 4.5 years; NA = Not applicable. Significant  $\Delta R^2$  are in bold.

For each analysis, linearity was assessed by partial regression plots and a plot of studentised residuals against the predicted values. There was independence of residuals, as assessed by Durbin-Watson statistic, whose values were within the range of 1.981 – 2.040. There was homoscedasticity, as assessed by visual inspection of plots of studentised residuals versus predicted values. There was no evidence of multicollinearity, as assessed by tolerance values greater than 0.1. The assumption of normality was met, as assessed by Q-Q Plots. Results of each analysis are explained below:

### **7.3 Results**

#### **7.3.1 9-Month Socio-emotional Competence**

The final model predicting 9-month socio-emotional competence (Model 4, Table 7.3) which included demographics, biopsychological factors, contextual factors and proximal processes was statistically significant,  $F(33, 3166) = 19.9551, p < .001$ ; adjusted  $R^2 = .164$ . This final model explained approximately 17% variance and is shown in detail in Table 7.3.

Proximal processes of maternal confidence and closeness, and maternal engagement with the baby including: playing games with baby, playing with toys with the baby, singing songs or telling stories and reading books, also positively predicted socio-emotional competence at 9-month DCW. Contextual factors of relationship warmth, family stress, number of siblings and childcare attendance predicted socio-emotional competence at 9-month DCW (see Table 7.4).

**Table 7.4***Predictors of 9-month Socio-emotional Competence.*

	<i>B</i>	<i>t</i>	<i>p</i>
Demographics			
Full term 37 – 41 weeks	.003	.208	.835
Pregnancy planned	-.014	-.780	.435
Subsequent birth (parity)	-.020	-.961	.337
Age mother (20-29 years old vs >20)	-.023	-1.278	.202
<b>Age mother (30-34 years old vs &gt;20)</b>	<b>.064</b>	<b>3.340</b>	<b>.001</b>
<b>Age mother (35 + years old vs &gt;20)</b>	<b>.108</b>	<b>5.640</b>	<b>.000</b>
<b>Māori vs European</b>	<b>-.076</b>	<b>-2.359</b>	<b>.018</b>
<b>Pacific vs European</b>	<b>-.071</b>	<b>-2.065</b>	<b>.039</b>
<b>Asian vs European</b>	<b>-.085</b>	<b>-2.578</b>	<b>.010</b>
<b>Other Ethnicity vs European</b>	<b>.119</b>	<b>2.809</b>	<b>.005</b>
Secondary education vs No secondary	<b>-.016</b>	-.951	.341
Diploma vs No secondary education	.024	1.480	.139
Degree vs No secondary	-.011	-.648	.517
Higher degree vs No secondary	-.021	-1.151	.250
Rurality	.017	.983	.325
Biopsychological factors – 9 months			
<b>Baby girl</b>	<b>-.043</b>	<b>2.063</b>	<b>.039</b>
<b>No health/developmental problem</b>	<b>.034</b>	<b>2.063</b>	<b>.039</b>
<b>Communication development</b>	<b>.138</b>	<b>8.073</b>	<b>.000</b>
Contextual Factors– 9 months			
Middle vs Low deprivation	-.022	-1.197	.231
High vs Low deprivation	.012	.562	.574
Mother's Depression	-.033	-1.738	.082
<b>Parental Relationship warmth</b>	<b>.105</b>	<b>5.815</b>	<b>.000</b>
<b>Family stress</b>	<b>-.042</b>	<b>-2.263</b>	<b>.024</b>
<b>Siblings at 16 weeks</b>	<b>-.061</b>	<b>-2.795</b>	<b>.005</b>
<b>Childcare attendance</b>	<b>.052</b>	<b>3.134</b>	<b>.002</b>
Proximal Processes – 9 months			
<b>Maternal confidence</b>	<b>.109</b>	<b>6.009</b>	<b>.000</b>
<b>Mother child closeness</b>	<b>.068</b>	<b>3.855</b>	<b>.000</b>
<b>Plays games with baby</b>	<b>.070</b>	<b>3.811</b>	<b>.000</b>
Talks to baby during everyday activities	-.013	-.755	.450
<b>Plays with toys with baby</b>	<b>.041</b>	<b>2.224</b>	<b>.026</b>
<b>Reads books with baby</b>	<b>.110</b>	<b>6.065</b>	<b>.000</b>
<b>Sing songs or tell stories to baby</b>	<b>.051</b>	<b>2.895</b>	<b>.004</b>
<b>Watches screen several times a day</b>	<b>.040</b>	<b>2.176</b>	<b>.030</b>

*Note.* N = 3200; *B* = Standardised beta weight;  
 Ethnicity is self-prioritised ethnicity

### 7.3.2 2-Year Socio-emotional Competence

The final model (Model 7; see Table 7.3) for the prediction of socio-emotional competence at 2-year DCW was statistically significant,  $F(44, 3155) = 21.511, p < .001$ ; adjusted  $R^2 = .22$ , and explained around 23% variance. The addition of 2-year biopsychological factors, contextual factors and proximal processes statistically improved the model (see Table 7.5).

Table 7.5 indicates that, like the 9-month socio-emotional competence model, the proximal processes of 9-month maternal confidence and closeness continued to predict socio-emotional competence at 2 years, with screen time at 9 months becoming a negative predictor. While talking to their baby at 9 months was not a significant predictor of 9-month socio-emotional competence, it was a significant predictor of 2-year socio-emotional competence.

While 9-month activities (reading books, singing songs and playing) were significant predictors of 9-month socio-emotional competence, they were not significant predictors of 2-year socio-emotional competence. However, the concurrent proximal processes of telling stories, reading books to the child and rules about watching TV, DVDs and videos positively predicted 2-year socio-emotional competence (Table 7.5). As shown in Table 7.5, contextual factors of parental relationship warmth and family stress at 9-month DCW and mother's employment, neighbourhood liveability and accessing social services also related to 2-year socio-emotional competence.

**Table 7.5***Predictors of 2-year Socio-emotional Competence.*

	<i>B</i>	<i>t</i>	<i>p</i>
<b>9-month socio-emotional competence</b>	<b>.171</b>	<b>9.869</b>	<b>.000</b>
Demographics			
Full term 37 – 41 weeks	.018	1.160	.246
Pregnancy planned	-.001	-.067	.947
Subsequent birth (parity)	.003	.162	.871
Age mother (20-29 years old vs >20)	.007	.424	.671
<b>Age mother (30-34 years old vs &gt;20)</b>	<b>.041</b>	<b>2.186</b>	<b>.029</b>
<b>Age mother (35 + years old vs &gt;20)</b>	<b>.043</b>	<b>2.262</b>	<b>.024</b>
<b>Māori vs European</b>	<b>-.015</b>	<b>-.463</b>	<b>.643</b>
<b>Pacific vs European</b>	<b>-.098</b>	<b>-2.924</b>	<b>.003</b>
<b>Asian vs European</b>	<b>.084</b>	<b>2.592</b>	<b>.010</b>
Other Ethnicity vs European	-.032	-.784	.433
Secondary education vs No secondary	-.016	-.974	.330
Diploma vs No secondary education	-.010	-.654	.513
<b>Degree vs No secondary</b>	<b>.044</b>	<b>2.615</b>	<b>.009</b>
<b>Higher degree vs No secondary</b>	<b>.057</b>	<b>3.241</b>	<b>.001</b>
Rurality	.028	1.633	.103
Biopsychological factors – 9 months			
<b>Baby girl</b>	<b>.076</b>	<b>4.840</b>	<b>.000</b>
<b>No health/developmental problem</b>	<b>.022</b>	<b>1.394</b>	<b>.163</b>
<b>Communication development</b>	<b>.054</b>	<b>3.184</b>	<b>.001</b>
Contextual Factors– 9 months			
Middle vs Low deprivation	.016	.898	.369
High vs Low deprivation	-.026	-1.275	.202
Mother’s Depression	-.012	-.660	.510
<b>Parental Relationship warmth</b>	<b>.040</b>	<b>2.244</b>	<b>.025</b>
<b>Family stress</b>	<b>-.040</b>	<b>-2.206</b>	<b>.027</b>
Siblings at 16 weeks	.020	.913	.361
Childcare attendance	.029	1.691	.091
Proximal Processes – 9 months			
<b>Maternal confidence</b>	<b>.042</b>	<b>2.368</b>	<b>.018</b>
<b>Mother child closeness</b>	<b>.046</b>	<b>2.737</b>	<b>.006</b>
Plays games with baby	-.011	-.632	.527
<b>Talks to baby during everyday activities</b>	<b>.038</b>	<b>2.370</b>	<b>.018</b>
Plays with toys with baby	.019	1.098	.272
Reads books with baby	-.029	-1.560	.119
Sing songs or tell stories to baby	.004	.224	.823
<b>Watches screen several times a day</b>	<b>-.069</b>	<b>-3.819</b>	<b>.000</b>
Biopsychological factors 2-year			

	<i>B</i>	<i>t</i>	<i>p</i>
<b>Good general health status</b>	<b>.096</b>	<b>5.923</b>	<b>.000</b>
Sleep duration during night and day	.031	1.863	.062
<b>Mother not employed</b>	<b>-.053</b>	<b>-2.887</b>	<b>.004</b>
Childcare attendance	.007	.360	.719
<b>Neighbourhood liveability</b>	<b>.087</b>	<b>5.077</b>	<b>.000</b>
<b>Family social services not accessed</b>	<b>.032</b>	<b>1.974</b>	<b>.048</b>
<b>Proximal processes - 2-years</b>			
Play musical instruments (toy or real)	.025	1.491	.136
<b>Tell stories with child</b>	<b>.113</b>	<b>6.737</b>	<b>.000</b>
<b>Read books your child</b>	<b>.093</b>	<b>4.691</b>	<b>.000</b>
<b>Rule about hours of TV, videos, DVDs</b>	<b>.042</b>	<b>2.544</b>	<b>.011</b>

Note. *N* = 3200; *B* = Standardised beta weight;  
Ethnicity is self-prioritised ethnicity

### 7.3.3 4.5-Year Socio-emotional Competence

The full model (Model 10 see Table 7.3) for the prediction of 4.5-year socio-emotional competence was statistically significant,  $F(58, 3141) = 26.050, p < .001$ ; adjusted  $R^2 = .312$ , and explained 32.5% of the total variance. The addition of 9-month proximal processes, 2-year contextual and proximal processes and 4.5-year contextual factors to the prior models did not statistically improve prediction of 4.5-month socio-emotional competence (see Table 7.3).

From 4.5-year proximal processes, mother dominated interaction during an observed task, physical punishment and permissive parenting negatively predicted socio-emotional competence while maternal praise (observed during the task), authoritative parenting and maternal behaviour of telling stories to the child positively predicted 4.5-year socio-emotional competence. Unlike the prediction of 9-month and 2-year socio-emotional competence, maternal depression at 9-month DCW negatively predicted 4.5-year socio-emotional competence. Biopsychological factor of how much the child sleeps during the day and night at 2-year DCW positively predicted 4.5-year socio-emotional competence (Table 7.6).

Biopsychological factors were also predictors of socio-emotional competence at each DCW. For example, concurrent health status positively predicted socio-emotional competence at each of the three DCWs. Being a girl negatively predicted socio-emotional competence at 9-

month DCW but for 2 and 4.5-year DCW, the predictive associations were positive. Please see Table 7.4 – 7.6 for complete results of these analyses.

**Table 7.6**

*Predictors of 4.5-year Socio-emotional Competence.*

	<i>B</i>	<i>t</i>	<i>p</i>
<b>9-month socio-emotional competence</b>	<b>.112</b>	<b>6.763</b>	<b>.000</b>
<b>2-year socio-emotional competence</b>	<b>.224</b>	<b>13.010</b>	<b>.000</b>
<b>Demographics</b>			
Full term delivery > 37 weeks	.007	.459	.646
Pregnancy planned	.008	.459	.646
Subsequent born (parity)	.033	1.703	.089
Age mother (20-29 years old vs >20)	-.010	-.586	.558
Age mother (30-34 years old vs >20)	-.002	-.135	.893
<b>Age mother (35 + years old vs &gt;20)</b>	<b>.043</b>	<b>2.395</b>	<b>.017</b>
Māori vs European	.055	1.826	.068
<b>Pacific vs European</b>	<b>-.130</b>	<b>-4.035</b>	<b>.000</b>
Asian vs European	-.002	-.054	.957
Other Ethnicity vs European	.020	.513	.608
Secondary education vs No secondary	.019	1.247	.213
Diploma vs No secondary education	.023	1.522	.128
Degree vs No secondary	.027	1.693	.091
<b>Higher degree vs No secondary</b>	<b>.047</b>	<b>2.836</b>	<b>.005</b>
Rurality	.015	.940	.347
<b>Biopsychological factors – 9 months</b>			
<b>Baby Girl</b>	<b>.103</b>	<b>6.820</b>	<b>.000</b>
No health/developmental problem	-.003	-.224	.823
Communication development	-.001	-.094	.925
<b>Contextual Factors– 9 months</b>			
Middle vs Low deprivation	.006	.381	.703
High vs Low deprivation	-.017	-.885	.376
<b>Mother’s Depression</b>	<b>-.041</b>	<b>-2.351</b>	<b>.019</b>
Parental Relationship warmth	.004	.259	.795
Family stress	.006	.361	.718
Siblings at 16 weeks	-.015	-.708	.479
Childcare attendance	.008	.513	.608
<b>Proximal Processes – 9 months</b>			
Maternal confidence	-.002	-.107	.915
Mother child closeness	-.007	-.407	.684
Plays games with baby	-.004	-.220	.826
Talks to baby during everyday activities	-.019	-1.230	.219
Plays with toys with baby	-.008	-.460	.645
Reads books with baby	-.017	-.965	.334
Sing songs to baby	-.011	-.648	.517

	<i>B</i>	<i>t</i>	<i>p</i>
Watches screen several times a day	-.027	-1.589	.112
Biopsychological factors 2-year			
Good general health status	.017	1.097	.273
<b>Sleep duration during night and day</b>	<b>.033</b>	<b>2.088</b>	<b>.037</b>
Contextual factors – 2-year			
Mother not employed	.017	.995	.320
Childcare attendance	.009	.537	.591
Neighbourhood liveability	.023	1.401	.161
Family social services not accessed	.007	.453	.650
Proximal processes - 2-years			
Play musical instruments (toy or real)	-.026	-1.642	.101
Tell stories to child	-.009	-.559	.576
Read books with child	.028	1.442	.149
Rule about hours of TV, videos, DVDs	.004	.226	.821
Biopsychological factors 4.5-year			
<b>Good general health</b>	<b>.079</b>	<b>4.932</b>	<b>.000</b>
<b>Child's activity level</b>	<b>.108</b>	<b>6.636</b>	<b>.000</b>
Contextual factors – 4.5-year			
Family social services not accessed	.021	1.365	.172
Proximal processes – 4.5-years			
<b>Mother dominated interaction</b>	<b>-.039</b>	<b>-2.537</b>	<b>.011</b>
Child dominated interaction	.007	.474	.636
<b>Maternal praise</b>	<b>.042</b>	<b>2.736</b>	<b>.006</b>
<b>Empathetic relational parenting style</b>	<b>.140</b>	<b>8.505</b>	<b>.000</b>
Authoritarian parenting style	-.028	-1.577	.115
<b>Punishment parenting style</b>	<b>-.065</b>	<b>-3.661</b>	<b>.000</b>
<b>Permissive parenting style</b>	<b>-.113</b>	<b>-6.704</b>	<b>.000</b>
<b>Tell stories with child</b>	<b>.039</b>	<b>2.380</b>	<b>.017</b>
Read books with child	.028	1.507	.132
Rule about hours of TV, videos, DVDs	.017	1.131	.258

*Note.* *N* = 3200; *B* = Standardised beta weight;  
Ethnicity is self-prioritised ethnicity

## 7.4 Discussion

The present study assessed contextual and proximal factors that have an influence on socio-emotional competence across the first 5 years of a child's life using data from a prospective, population-based study. Overall, controlling for demographics and prior socio-emotional competence level(s), where applicable, results showed a number of biopsychological, contextual and proximal processes had an effect on early socio-emotional competence development. They explained 17 to 32 percent of variance in socio-emotional

competence from 9 months to 4.5 years. Results also showed that a number of factors affect socio-emotional competence across early childhood that belong to different systems of Bronfenbrenner's bioecological model of development (1979; 1995): microsystem (such as maternal confidence, reading to the child, parenting styles, childcare attendance); mesosystem (such as parental relationship warmth); and exosystem (such as accessing social services, neighbourhood liveability).

This section first discusses proximal processes that belonged to microsystems (as they are relatively more modifiable than contextual factors) followed by contextual factors and biopsychological effects. In general, contemporaneous proximal processes seem to have stronger effects on socio-emotional competence. For example, maternal behaviours of playing games, playing with toys, singing songs or telling stories and reading books to the baby positively predicted socio-emotional competence at age 9 months. However, these early parental activities did not have carry over effects on subsequent indices of socio-emotional competence. Although maternal confidence and closeness to baby at 9 months predicted socio-emotional competence at both 9 months and 2 years, the predictive associations were stronger at 9 months. In terms of strength of effects, maternal confidence and reading books with baby had relatively stronger effects.

Interestingly, talking to baby (at 9 months) predicted socio-emotional competence at 2 years but not at 9 months. Social interactions help in the development of language abilities (Carlson, 2009; Vygotsky, 1978). Perhaps talking to babies during routine activities encourages language development. With the development of language skills, children become better able to regulate their emotions and behaviours by, for example, psychologically distancing themselves from situations using symbol systems (such as language; Beck & Carlson, 2007; Carlson et al., 2005). Since the ability to self-regulate is argued to consolidate during the latter part of early childhood (Rothbart, 2011), this is perhaps why we did not see a significant effect of talking to babies on socio-emotional competence at 9 months.

Surprisingly, more screen time was associated with socio-emotional competence at 9 months but less screen time was associated with later (2 years) competence. During infancy, parents are more likely to co-view and interact verbally with the baby possibly because of their age and less developed ability to comprehend and physically handle screens. The amount of verbal interactions during co-viewing decreases over time (Supanitayanon et al. 2020). Barr et al.'s (2008) naturalistic study found that scaffolding and coordinated joint attention occurs when parents use screens with their infants, and the interactions that occur in this context are on par with interactions in other contexts in terms of quality. Therefore, it is possible that verbal interactions, scaffolding and coordinated joint attention that occur during co-viewing during infancy may contribute positively towards socio-emotional competence at this stage in life.

Infants who view more screen may become habitual of viewing screen frequently. In toddlerhood, parents may be less likely to view screen with their children (Supanitayanon, 2020). Screens may be used as a babysitter, which may have negative impact on socio-emotional competence. While the study did not measure screen viewing frequency at 2 years, it did include having rules around screen time at 2 years, which was associated with more socio-emotional competence lending some support to this. Having more rules around watching screens could include not using screen as a babysitter and, hence, possibly more parental engagement, which in turn may have positive implications for the child's development of socio-emotional competence. In terms of strength of associations, telling stories and reading books at 2 years had stronger influence on concurrent socio-emotional competence.

As mentioned, results showed stronger concurrent effects (i.e. proximal to the outcome). In line with this, the more that parents reported telling stories and reading books at 2 years and telling stories to children at 4.5 years, the stronger socio-emotional competence was at 2 and 4.5 years respectively. The fact that concurrent effects were stronger (than distal

events) highlights the importance of maintaining these behaviours across early childhood to maintain their positive effects on socio-emotional competence.

Maternal praise (observed) and empathetic relational parenting at 4.5 years also positively predicted socio-emotional competence. Empathetic relational parenting style corresponds with what is traditionally known as authoritative parenting. It involves balancing demandingness and responsiveness in interacting with children. Research has shown it to have positive implications for emotional and social development (Bornstein & Bornstein, 2007).

On the other hand, the more that the interviewers observed mother-dominated interactions, the poorer child's socio-emotional competence was, which is in line with past research (Miner & Clarke-Stewart, 2008; Petitclerc & Tremblay, 2009). Mother-dominated interactions may be indicative that the mother is less responsive to the child – telling them what to do rather than working together. The latter allows children to learn and take initiative in a safe and encouraging environment. This is in line with previous research. In addition, as both permissive and punishment parenting style scores increased, socio-emotional competence tended to decrease. Others have documented the negative impacts of permissive parenting (Bornstein & Bornstein, 2007), as permissive parenting may lack appropriate guidance and direction needed for development of morals and social and emotional skills. Permissive parenting together with empathetic relational parenting had relatively strongest effects on socio-emotional competence at 4.5 years.

While past research has predominantly shown that authoritarian parenting is associated with negative socio-emotional outcomes (Beck et al., 2004), this study did not support it. Some researchers have noted that authoritarian parenting may be adaptive in settings involving children exposed to cumulative risks (Bornstein & Bornstein, 2007). Perhaps this is why results did not find an effect of authoritarian parenting style in our more general (risk diverse) sample. Also, not many mothers reported using this parenting style, which may have reduced the

magnitude of the association. Our authoritarian parenting, however, did not include physical punishment (for which negative effects were documented in this study).

Results showed that socioeconomic deprivation did not have a negative impact on socio-emotional competence. However, more specific environmental factors such as accessing family and social services, living in a more negative neighborhood and exposure to family stressors did. This points to some of the complex inequities that some families are having to navigate across these early years, and the possible unintended spillover effects of this on their child.

Similar to proximal factors, contextual factors generally had relatively stronger concurrent effects. For example, less parental relationship warmth and more family stress were associated with low socio-emotional competence at 9 months and 2 years with stronger effects for 9 months. Mother non-employment, low scores in neighborhood livability and accessing family social services at 2 years negatively influenced socio-emotional competence at 2 years but their effects did not extend beyond this period. This is encouraging in the sense that it suggests negative effects of these contextual factors may not have a lasting impact on socio-emotional competence.

However, results did show that maternal depression at 9 months was associated with low socio-emotional competence at 4.5 years. Notably, for 9 months socio-emotional competence the association was marginally non-significant suggesting an earlier trend. There is evidence that chronic and/or recurrent depression is more likely to have an adverse effect on child outcomes rather than postpartum depression alone (Grace et al., 2003). It could be those effects of early maternal depression compound as the child grows up. Unfortunately, the study did not include measures of depression at 2 and 4.5 years so its chronicity could not be assessed. Also, the study used a continuous score of depression. Measuring whether a mother was depressed or not may have produced different results.

Having less siblings was associated with socio-emotional competence during infancy unlike results from past research (Downey & Condron, 2004). Infants require mutual regulation during infancy. Having more siblings may reduce the opportunity parents get to engage with their babies impeding socio-emotional competence development. Possibly related to this, attending childcare at 9 months negatively predicted concurrent socio-emotional competence but only at 9 months. The study did not measure quality of the facility and did not discriminate between formal and informal childcare settings, limiting my ability to explain this result. Having said that, being in childcare may take the baby away from its primary caregivers – reducing opportunity of mutual early regulation and forming adaptive attachment with the parents resulting in low socio-emotional competence at 9 months of age.

Finally, with regards to biopsychological factors, being a girl negatively predicted socio-emotional competence at 9 months but had positive effects on socio-emotional competence at subsequent time points. The change in direction of this effect could also be a reflection of the nature of the index. The index of socio-emotional competence at 9 months comprised a scale of fear (see Table 7.1) with a higher score on it considered maladaptive. Related to this, a meta-analysis of studies on gender differences in temperament for children aged 3 months to 13 years found that girls exhibit more temperamental fear than boys. While the difference was small (Else-Quest et al., 2006), perhaps this contributed to why girls scored lower on socio-emotional competence at 9 months. Further, the meta-analysis found evidence for moderate gender differences favouring girls for effortful control while boys scored higher on surgency. This may be one of the reasons why boys scored lower on socio-emotional competence at both 2 and 4.5 years; several measures tapping into externalising behaviours were used to calculate socio-emotional competence at these two time points.

#### **7.4.1 Limitations**

One of the limitations of the present study was that some variables included at more than one DCW were not measured using the same item(s)/tool e.g. health status, which may have made it difficult to compare results associated with them. However, the underlying constructs were similar. In addition, I did not have a measure of maternal depression and parenting styles available at each time point. Parenting style, to elaborate, was not measured at 2 years because there was not enough time resource available to administer a full parenting style questionnaire. Some measures included in the present study may also be proxies of other things. For example, having rules around screen viewing and sleep duration could be a reflection of parents being able to create a structured and less chaotic household. Therefore, mechanisms not explored could be factors that explain these findings and unexplained variance in socio-emotional competence.

I also relied on maternal reports of contextual and proximal factors and the socio-emotional competence index was also largely based on mother-reported data, which may have exaggerated the associations. Finally, the study used data of a subset of participants who had adequate information available, which may have limited our ability to generalise findings to the population.

#### **7.5 Conclusion**

This study has helped identify a range of specific behaviours (such as reading with children and telling stories) and general maternal behaviors (such as maternal confidence, empathetic relational parenting style) that had a positive effect on socio-emotional competence across the preschool years. The findings suggest that at the population level there are a number of universal strategies that may help parents, families and professionals working with young children who are looking to support the development of children's socio-emotional skills.

The key messages could potentially include specific behaviours of playing games and playing with toys with children, singing songs or telling stories to them, reading books with

them, having rules around viewing TV, DVDs and videos, praising children while undertaking a task and encouraging shared caregiver and child interactions rather than mother-led interactions. The findings also showed these strategies need to be consistently practiced as stronger contemporaneous effects were found. The results also suggest that families exposed to greater family stressors, living in more negative neighborhoods, and those in contact with family and social services may need additional supports to reduce negative impacts on socio-emotional competence development.

## Chapter 8. General Discussion

The aim of the present thesis was to assess and understand early socio-emotional competence development. Developing early socio-emotional competence has been argued to be important due to its associations with school readiness (Denham, 2006; Britto, 2012; Raver, 2014; United Nations Children’s Emergency Fund., 2012), having healthy and meaningful relationships (Parker & Gottman, 1989; Parke, 1994; Saarni, 1990), and sound mental and overall health (Cheevers & O’Connell, 2012; Sanson et al., 2010; Shonkoff & Phillips, 2000).

Within a large and demographically diverse cohort, this thesis examined the levels and patterns of early socio-emotional competence development. It also assessed how early socio-emotional development relates to cognitive outcomes in preschoolers, and finally, it explored some of the early predictors of socio-emotional competence development. Studies undertaken for this thesis specifically investigated the following research questions with a large demographically diverse New Zealand cohort:

1. What is the level and patterns of socio-emotional competence development across early childhood?
2. How do different patterns of socio-emotional competence development relate to EF at 4.5 years?
3. How and via what paths does socio-emotional competence across early childhood influence emergent academic skills?
4. How do parental factors such as parental warmth and parent-child engagement influence socio-emotional competence during early childhood?
5. What are different contextual factors and proximal processes that predict socio-emotional competence across early childhood that can be identified in large and diverse cohort?

This discussion has four sections. In Section 8.1 I summarise the key findings from the five main studies with respect to the five broad research questions above. I then reflect on these findings to highlight this thesis’ original contribution to knowledge (Section 8.2). I highlight

what the findings tell us with respect to the measurement, development and patterns of early socio-emotional competence within a population. Given the increasing political interests in developing socio-emotional competence in preparation for school entry, I highlight some key messages from our findings that speak to this growing agenda in terms of what socio-emotional competence predicts, and what factors influence its early levels. In Section 8.3 I discuss some of the unexpected findings with respect to possible lines of future inquiry to clarify these. In Section 8.4, I note some of the key limitations and make recommendations for possible next steps for this body of work before offering a final conclusion.

## **8.1 Summary of Main Findings Across the Five Studies**

### ***8.1.1 What is the Level and Patterns of Socio-emotional Competence Development Across Early Childhood?***

I was fortunate to use data from the GUiNZ study to address our research questions for this thesis. Due to the non-availability of a single short measure of socio-emotional competence both within the GUiNZ study, and in the field more generally, I developed an index of socio-emotional competence for this thesis at 9 months, 2 years and 4.5 years. A total of 26 variables from 7 measures were chosen corresponding to the domains of socio-emotional competence specified in the theoretical model proposed by Denham (2006). Three dimensions of socio-emotional competence emerged through analysis: easy-going, regulation and exuberance. The third dimension of exuberance only emerged at the 4.5 years DCW. These dimensions did not map onto unitary domains of socio-emotional competence proposed by Denham (2006), instead each dimension related to two domains. For instance, the dimension of regulation tapped into the domains of understanding of emotions and regulation of emotions and behaviours. This is a weakness of this index. Notwithstanding that, it was partly expected as the scales used to calculate the index were mostly tapping into more than one domain of socio-emotional competence.

I found that socio-emotional competence scores had stronger correlations with each other at 2 and 4.5 years in comparison to their associations with socio-emotional competence at

9 months. Associations between dimensions were generally stronger between the same dimensions across the DCWs (e.g. between *easy-going* dimension at 9 months, 2 year and 4.5 years). Relatively fewer associations were noted for the *regulation* dimension at 9 months and 2 years with other dimensions (easy-going and exuberance).

Significant positive associations between socio-emotional competence at each DCW and pragmatic language (at 4.5 years) and mother-perceived school readiness (at 6 years) were found. The associations were relatively stronger with pragmatic language. Generally, the relationships between these outcomes and the *global* measure of socio-emotional competence (index scores) were stronger relative to the relationships between individual dimensions (easy-going, regulation and exuberance).

I categorised the scores for each index at the three DCWs into *low* (scored less than 1SD below the average), *average* (scored between -1SD and 1SD) and *high* (scored more than 1SD above the average). A little more than two-thirds of participating children had average or high levels of socio-emotional competence across all three DCWs, and around one-fifth experienced improvement in their levels of socio-emotional during the first 5 years of their lives. Only 5.4 percent of children experienced lows across all DCWS, or at 2 years and 4.5 years.

Around 70 percent of children who experienced a low in socio-emotional competence at 9 months experienced improvement as they developed further skills, while 42 percent of children with a low at both 9 months and 2 years continued to experience a low at 4.5 years. Further, 35 percent of children with a low at 2 years (regardless of their level of socio-emotional competence at 9 months) continued to experience a low in socio-emotional competence at 4.5 years. These findings highlight the shifting nature of socio-emotional competence across early childhood within the population.

### **8.1.2 How Do Different Patterns of Socio-emotional Competence Development Relate to EF At 4.5 Years?**

In Study 2, the interest was in understanding how patterns of socio-emotional competence influence EF at 4.5 years. I hypothesised that children with persistently low (Low-

Low-Low or Avg/High-Low-Low) or a recent low in socio-emotional competence will have lower EF at 4.5 years relative to the group with persistently average or high socio-emotional competence. I examined this with respect to what is sometimes called “cool” and “hot” EF. The former is said to be more logic-based while the latter is argued to have a more emotional context to it (Grafman & Litvan, 1999; Zelazo & Muller, 2002). Generally, I found support for our hypotheses. Children with persistently low socio-emotional competence had increased likelihood of having lower than average cool and hot EF. However, having a pattern of socio-emotional competence development with a recent low (in comparison to lows across all the DCWs or at 2 and 4.5 years) was associated with an increased likelihood of having average or higher than average hot EF. However, this was not found for cool EF only for hot EF task. Unexpectedly, no pattern of differences was noted in terms of how socio-emotional competence related to cool and hot EF (discussed in Section 8.3).

### ***8.1.3 How and Via What Paths Socio-emotional Competence Across Early Childhood Influence Emergent Academic Skills?***

In Study 3, I was interested in examining associations between socio-emotional competence across early childhood and emergent academic skills. Further, I hypothesised that attention and language will positively mediate the relationship between socio-emotional competence and emergent academic skills across early childhood. The study used both global measures of socio-emotional competence and its dimensions in the analyses.

Our main finding was that higher socio-emotional competence at 2 years and 4.5 years was associated with higher emergent academic skills at 4.5 years, but was partially mediated by attention and, to a lesser extent, language at 4.5 years. Proximal effects were generally stronger. For example, socio-emotional competence at 4.5 years had a stronger effect on emergent academic skills relative to socio-emotional competence at 2 years. In general, the global measure of socio-emotional competence had more mediated paths and stronger associations with 4.5-year attention, language skills and emergent academic skills compared to socio-emotional competence at 2 and 4.5 years.

Interestingly, the most distal measure of socio-emotional competence at 9 months had no association with emergent academic skills and negative associations with 4.5-year attention and language. Like global socio-emotional competence at 9 months, I also noted unexpected results for its dimensions at 9 months. For example, the easy-going dimension negatively predicted attention while the regulation dimension negatively predicted attention and language at 4.5 years. These findings suggest that either the relationship with socio-emotional competence changes, or that the 9-month index may be behaving differently than the 2- and 4.5-year index (discussed further in Section 8.3).

#### **8.1.4 *How Parental Factors Such as Parental Warmth and Parent-Child Engagement Influence Socio-emotional Competence During Early Childhood?***

The aim of this study was to investigate the influence of mother- and partner-reported parental relationship warmth (before and following birth) and parent-child engagement on socio-emotional competence across early childhood. The study hypothesised that the parental relationship will predict socio-emotional competence directly and via parental engagement with the child. The findings suggested that higher parental relationship warmth and parental engagement with the child was associated with higher socio-emotional competence at each time point for mothers. For their partners, however, these were positively associated with subsequent socio-emotional competence up till 2 years only. The higher the level of relationship warmth was before birth, the higher socio-emotional competence at 9 months was experienced. Also, generally stronger associations were noted for mothers in comparison to fathers. Importantly the results showed that parental relationship warmth and parental engagement related to socio-emotional competence over time (i.e. at the subsequent DCW) at similar levels. Results also showed that high parental relationship warmth *spilled over* to have a positive influence on parental engagement, which in turn positively affected socio-emotional competence. The reported mediation effects were weak in size, and mediation by parental engagement was only reported at 9 months by partners. Interestingly, this spillover effect was stronger for partners between antenatal and 9-month time points compared to mothers. These specified paths

explained 19.4 and 16.9 percent variance in socio-emotional competence at 4.5 years for mother and their partners respectively.

In line with the hypothesis, significant change in mother- and partner-reported relationship warmth following birth was found. On average, decline (intraindividual) in relationship warmth was noted. While, as hypothesised, the improvement in mother-reported relationship warmth was related to higher socio-emotional competence levels across 2 to 4.5 years, increase in partner-reported relationship warmth only had a positive effect on socio-emotional competence at 2 years.

#### ***8.1.5 What are Different Contextual Factors and Proximal Processes that Predict Socio-emotional Competence During Early Childhood?***

In contrast to Study 4, where I examined parental factors, in Study 5 I considered a broad range of contextual and proximal factors predictive of socio-emotional competence. Also where in Study 4 I had aggregated indicators of maternal and paternal engagement, in this study I examined specific behaviours such as reading and singing to the child individually.

In general, concurrent proximal processes and contextual factors had stronger associations with socio-emotional competence at each time point (9 months, 2 years and 4.5 years of age). With regards to proximal processes, more frequent specific mother-child interactive behaviours of playing games, playing with toys, singing songs or telling stories and reading books to the baby related to higher socio-emotional competence at 9 months. These activities during infancy, however, did not seem to be associated with later socio-emotional competence. However, talking more to their baby at 9 months was associated with higher socio-emotional at 2 years but not at 9 months.

Interestingly, more screen time (assessed) at 9 months was associated with higher socio-emotional competence at 9 months but resulted in lower socio-emotional competence at 2 years (discussed further in Section 8.3). In line with the stronger concurrent associations noted, more engagement in activities such as telling stories and reading books with a child at 2 years and

telling stories to children at 4.5 years was related with higher socio-emotional competence at 2 and 4.5 years, correspondingly.

In addition to maternal behaviours, parenting factors such as maternal confidence and closeness to the baby at 9 months predicted socio-emotional competence at 9 months and 2 years, and the predictive associations were stronger for socio-emotional competence at 9 months. At 4.5 years of age, high maternal praise and empathetic relational parenting was associated with higher socio-emotional competence, while high observed mother-dominated interactions, permissive and punishment parenting were associated with lower socio-emotional competence.

Contextual factors of low parental relationship warmth and high family stress at 9 months were associated with low socio-emotional competence at 9 months and 2 years with stronger associations noted for 9-month socio-emotional competence. While no effects of level of deprivation were found, potential indicators of deprivation such as low scores in neighborhood livability and having accessed family social services were associated with lower socio-emotional competence at 2 years. Surprisingly, high maternal depression at 9 months was associated with low socio-emotional competence at 4.5 years with no associations noted in between (for socio-emotional competence at 9 months or 2 years). Having more siblings (16 weeks) and attending childcare at 9 months was also associated with more socio-emotional competence at 9 months.

## **8.2 Original Contribution to Knowledge**

Increasingly we are witnessing a movement away from a narrower focus on cognitive skills development, to a growing appreciation that ultimately, in today's world, cognitive skills alone are not enough for success in life and the workforce (Taylor, 2018). This has led to an increase in calls to promote socio-emotional development, especially during early childhood, both globally and nationally. A prominent feature in current Western political child development discourse is the need to develop socio-emotional competence as soon as possible.

Indeed, such statements are often accompanied by warnings against missing a tipping point beyond which socio-emotional competence possibly cannot be helped (Butler, 2014).

### ***8.2.1 We can Measure Socio-emotional Competence during Early Childhood***

In this context, this thesis described what the measurement of early socio-emotional competence might look like within a large and diverse cohort using relatively easy to administer tools, and described the natural developmental flux or change within a population. These arguably basic questions about measurement, stability and change are important to understand at a population level in the context of claims about the perceived importance of assessment and development of early socio-emotional competence. Further, in order to interpret the success of any given intervention designed to improve socio-emotional competence, there is a need to understand the natural flow and flux in its development in the population before introducing any new intervention. In this thesis, this was addressed in a New Zealand population providing information regarding what a nationwide baseline might look like.

To the best of my knowledge, this is first time socio-emotional competence has been measured at a population level in New Zealand. The index scores across the three DCWs had moderate to strong associations with each other, providing evidence for conceptual overlap. Also, meaningful correlations were found between socio-emotional competence index scores and outcomes. These suggest that the indices hold some merit and provide some information about the levels of socio-emotional competence at multiple time-points during early childhood. However, it is important to be mindful of the fact that I was limited by what was assessed in GUiNZ in terms of socio-emotional skills. For example, I did not have measures that assessed encoding and interpretation of social cues.

However, it was noted that socio-emotional competence index scores at 9 months behave differently from the indices at later time points. For instance, socio-emotional competence at 9 months was negatively associated with attention and language at 4.5 years. I have tried explaining these findings suggesting that perhaps at 9 months, what is considered as

deficits in socio-emotional competence are, in fact, adaptive. For instance, parents of infants who are more fearful may engage more in mutual regulation, which is needed for self-regulation to develop (Cole et al., 2004). Also, early fear has been argued to stop children from being impulsive and hence also helps in later regulation (Rothbart, 2011). However, if high levels of fearfulness persist it can lead to the development of anxiety (Brooker et al., 2013). Regardless, this thesis provides evidence that socio-emotional competence can be measured at a population level by combining different measures corresponding to domains of socio-emotional competence after infancy. In addition, the measures I used to develop the index are easily accessible, and our methods of index development can thus be easily replicated.

Our global measure of socio-emotional competence was generally more predictive than its dimensions. These findings provide some support to the conceptualisation of socio-emotional competence as an integrated system of different competencies (Denham, 1998; Saarni, 1999; Denham et al., 2011) reflecting the idea that the whole may be greater than the sum of its parts. This highlights the value of using a global measure of socio-emotional competence in addition to assessing its domains separately, as within a child, different domains of socio-emotional competence likely interact with each other rather than functioning entirely independently. While assessing specific domains of socio-emotional competence may help in gaining nuanced information, our findings suggest that these domains interact with each other and that, collectively, they may be able to make up for lags in specific domains. Within the context of recent calls to assess socio-emotional competence before a child enters school, assessment of socio-emotional competence as a whole construct should be considered, as this may give a fuller picture.

### **8.2.2 *Flux in Early Socio-emotional Competence in Normal Population***

The research showed that most children in the sample experienced no low levels of socio-emotional competence across three DCWs in the first 5 years of childhood. This is in line with research on problematic behaviours from 2 to 4.5 years, which also used data from the

GUiNZ study (D'Souza et al., 2018). These results give a positive picture of socio-emotional development in New Zealand at a population level. I also noted considerable movement for better socio-emotional competence during the first 2 years and development becomes more stable beyond that. This provides support to the argument that as new competencies and skills come online, most children improve in the global levels of socio-emotional competence (Carter et al., 2004; Carter et al., 2003). This to some extent is reassuring to parents and practitioners that may be worried about a child showing signs of early low socio-emotional competence during the first 2 years of life compared to other children their age

Around half of the children in our sample (45 percent) who had low socio-emotional competence at 9 months and 2 years continued to experience low socio-emotional competence at 4.5 years. This is potentially important to know from an intervention standpoint because it may make sense to assess children at 9 months and 2 years but intervene only if there is persistence in the low levels of socio-emotional competence. However, it is important to be mindful of costs and efforts involved in two assessments in the first two years of a child's life and of any potential stigma associated with any testing results. Given that I found a higher degree of flux in socio-emotional competence during infancy, assessing and making decisions based on our 9-month data would increase the risk of needlessly identifying a possible lag in skills that is likely to resolve itself naturally. Flagging lags may also have an impact on parenting confidence and style. The findings suggest that if we assessed socio-emotional competence at only 2 years, we would only decrease the hit rate of identifying those with persistently low socio-emotional competence by about 7 percent. Hence, if assessment is deemed necessary and important by policy makers, it may make sense to assess from 2 years onwards only, in order to reduce possible negative effects from labelling and the potential costs of mistargeted interventions.

It is also important to be mindful that large-scale assessments run the risks of decontextualising children and may lead to misidentification. Children are argued to acquire socio-emotional skills that match the requirements of their immediate environments (Callaghan

et al., 2016, Ugazio, 2013), which mostly comprises of their homes during early childhood. Also, as noted, parents may not be able to differentiate between problematic and non-problematic behaviours in young children (Carter et al., 2004). It may therefore be that children identified with lower socio-emotional skills compared to the population are not perceived as having any problematic behaviours in the contexts in which they are growing up. Hence it would seem important to consider the child's individual living circumstances and if the child's behaviours are of a concern to the parents alongside any formal socio-emotional testing and referral process.

Policy-wise, the motivation behind assessing socio-emotional competence and intervening is because lags in early socio-emotional competence skills are considered to be potentially detrimental for later outcomes, especially school readiness and academic performance. Our findings showed that socio-emotional competence at 9 months does not have an impact on emergent academic skills (measured at 4.5 years before most children enter school). In addition, socio-emotional competence just before the child is to enter school had a stronger relationship with emergent academic skills in comparison to socio-emotional competence when they were toddlers. It was not the early lags that had an adverse effect on EF but the persistence in them that was disadvantageous. Even fluctuations in socio-emotional competence for worse was related to better outcomes for hot EF in comparison to children with persistent lows (in socio-emotional competence) across the three DCWs or across 2- and 4.5-years DCWs. In addition, on average, improvement in socio-emotional competence across early childhood had a positive effect on EF.

If our findings are considered in terms of calls to intervene before the child turns 3, or even 18 months of age (Williams, 2014), they suggest there is no need to fear missing a tipping point during the first few years of childhood beyond which lags (in socio-emotional competence) become problematic for later outcomes. Further, our findings suggest that intervening within the first 3 years may mean needlessly subjecting the majority of children (and their families) to potentially costly interventions, when their (low) level of socio-emotional

competence may just be due to different rates of development, will eventually make up for any deficits, and hence, may not have an adverse effect on later outcomes.

### **8.2.3 *Early Socio-emotional Competence and Cognitive Outcomes***

As stated, I investigated the influence of early socio-emotional competence development on two cognitive outcomes: EF and emergent academic skills (Studies 2 & 3). In the past, most research has examined the influence of EF on socio-emotional competence. Our thesis provided longitudinal evidence for the effect of socio-emotional competence on EF starting from infancy, and adds substantially to the theory and also the literature, which has predominantly provided support for the positive effect of EF on socio-emotional competence (e.g. Espy et al., 2011; Gilotty et al., 2002; McEvoy et al., 1993). Our findings were in line with results reported by D'Souza et al. (2020) who found adverse effects of persistent behavioural difficulties across 2 and 4.5 years on cool EF at 4.5 years using data from the GUiNZ study.

In terms of emergent academic skills, this thesis contributes to the literature as it is the first study to examine the effect of socio-emotional competence using a global measure, at three different time points during early childhood, and on emergent academic skills at 4.5 years when children are about to enter primary school. This is something that policy makers increasingly seem to want to know as they seek to intervene sooner with a view that improving socio-emotional competence early makes a difference to the development of key skills in preparation for school. It also adds to the understanding of the paths via which socio-emotional competence affects emergent academic skills and highlights the importance of attention and language development. To our knowledge, the mediating role of language skills has not been explored, despite there being theoretical basis for it. In addition, the mediating role of attention has been examined with regards to specific domains of socio-emotional competence in at-risk children only (e.g. Rhoades et al., 2011; Trentacosta & Izard, 2007; Vitiello & Williford, 2016). Since I found evidence for socio-emotional competence influence on emergent academic skills via

attention and language, these must be kept in mind when designing interventions to potentially address possible lags in socio-emotional competence development.

#### **8.2.4 Predictors of Early Socio-emotional Competence**

Drawing on Bronfenbrenner's (1995) model of development, in the last two studies I examined predictors of early socio-emotional competence both at familial and broader levels. I found that family context matters, and predicts socio-emotional competence both concurrently and longitudinally. In fact, I also found how parents are with each other matters as much as their engagement with their children. This is different from what Bronfenbrenner (1995) theorised suggesting proximal processes have stronger effect on development than contextual factors. Perhaps because young children are vulnerable and highly dependent on their parents during the early years, problems in parental relationships undermine their emotional security as much as problems in parents' engagement with them.

Our findings add to the literature as they extend our understanding of how parental relationship warmth (assessed antenatally as well as after the child was born) and parental engagement longitudinally affects socio-emotional competence across early childhood. Importantly, I included data from both mothers and partners as previous research has shown differential effects of mother and father perception of their relationships on parental engagement (e.g. Fishman & Meyers, 2000; Kouros et al., 2014). It also brought some clarity to the question of how mother and partner-reported relationship warmth affects parental engagement that is, it spills over into the parent-child interaction. In line with Bronfenbrenner's (1995) bioecological model, I found that the parental relationship warmth, which is a contextual factor, influenced socio-emotional competence through its effect on parental engagement, which a proximal process.

When I considered a broader range of predictors, I found that, generally, contemporaneous proximal processes (such as parenting styles and reading, singing and talking to children, etc.) and contextual factors (such as family stress, having siblings at home, etc) had

stronger relationships with socio-emotional competence. This highlights the importance of consistently practising these proximal processes. On the flip side, it also showed that the impact of environmental factors was stronger for concurrent socio-emotional competence suggesting that the child may benefit from modifications to the environment. Overall, these findings increase our knowledge of what potentially works for the socio-emotional competence development of children in New Zealand at a population level.

Our findings also helped in understanding the influence of various micro-, meso-, exo- and macrosystems, or contextual factors and proximal processes conceptualised by Bronfenbrenner (1979, 1995), on socio-emotional competence across early childhood. For example, I found that the macrosystem of deprivation did not influence socio-emotional development. Instead, related exosystems, including accessing family support and neighbourhood liveability, do. This thesis also aided in identifying parts of the microsystem (proximal processes such as having rules around screen time and reading, singing and talking to the children, etc.) that at a population level seem to improve socio-emotional competence development. Policy makers could extract some messages to communicate to the general public about the positive effects of practising these behaviours at home. Instead of taking the route of early assessment and intervention, this population level approach is relatively less complicated in terms of costs and issues of falsely flagging lags in socio-emotional competence.

Generally, I found that how mothers perceive warmth in their relationships and how much they engage with their children matters more for socio-emotional development in comparison to their partners. This is probably because most children spend more time with their mothers during the very early years (Craig, 2006). Also, perhaps what mothers' rate as warmth in their relationship with their partner, or the lack of it, may be pronounced enough to be noted by children and modelled through their behaviours and emotions.

In terms of policy, our findings add to the growing push to enable primary caregivers to spend more time with their infants and making parent-friendly policies (such as longer parental leave, job security, etc.), when children are very young. Related to this, Burman (1994, 2008)

had warned against the tremendous preoccupation especially with mothers in developmental psychology. Mothers are considered central to child's social world. This risks the possibility of holding her responsible for all aspects of a child's development. She is also held responsible for her life circumstances including abandonment, abuse and poverty (Jackson, 2000) especially those circumstances which are considered to have adverse effects on a child's development (Burman, 2008). This is often argued to be a politically convenient way of assessing situations reflecting a neoliberal approach in which a person is held responsible for their life's problems (Crawford, 2006). In relation to our findings that certain maternal behaviours are associated with increased socio-emotional competence, it is important to note that they related to time and material resources, which affect how much parents can engage with their children. Therefore, policy makers and researchers should consider looking into factors that increase the likelihood that parents will engage in behaviours (such as book reading) that seem to facilitate socio-emotional competence in the population.

### **8.3 Unexpected Findings and Future Research**

In this section, I discuss some of the unexpected findings in this thesis and possible directions future research may take to further clarify them. Firstly, no associations were noted between different dimensions of socio-emotional competence generally when it involved regulation at 9 months and 2 years. It was argued that this can potentially be explained in terms of rapid development during the early years, which may not be uniform across all domains of socio-emotional competence (Cole et al., 2004). Also, while dysregulated behaviours are not out of the ordinary during the early years when children are starting to develop autonomy and skills to carry out their will (Dunn et al., 1996), some parents might have noted early dysregulated behaviour as maladaptive (Carter et al., 2003) clouding the results. Therefore, future research should consider collecting and using data on socio-emotional competence based on observations from trained interviewees in conjunction with parental reports.

Given the emotional context of hot EF, it was expected it to be more strongly correlated with socio-emotional competence development compared to cool EF. As mentioned, no pattern emerged and, in some cases, socio-emotional competence had a stronger influence on “cool” EF. Mixed support exists for the differentiation between these two forms of EF, and it is argued that “cool” EF tasks may also invoke emotional responses (Peterson & Welch, 2014). Another reason attributed to this unexpected finding was that hot EF is said to mature later (Prencipe et al., 2011), making it harder to differentiate between the two types of EF. Notwithstanding that, only a single measure was available to assess cool and hot EF at 4.5 years in GUiNZ. More clarity could potentially be attained if future inquiries use multiple tools to assess these two types of EF, which would provide us with more conclusive information regarding their differences.

As noted, I found no relationship between socio-emotional competence at 9 months and emergent academic skills, while it was negatively correlated with language and attention at 4.5 years. At the dimension level, these negative associations seemed to be driven by both easy-going and regulation dimensions at 9 months for attention and by the regulation dimension at 9 months only for language. The ability to self-regulate starts to consolidate in the second year of life, and it is argued to develop through mutual regulation with the primary caregivers (Cole et al., 2004). It could be that infants who are low in regulation and experience more negative emotions and/or fear get more attention from their parents, which provides more opportunity for mutual regulation. Infants who are low in regulation may also invite more verbal interactions from people around them facilitating language development. In addition, as the expectations from children also change with age (TamisLeMonda et al., 1998) and as such, children who are more regulated may get more opportunity to verbally engage with others and are able to pay more attention beyond the very first years of their lives. Attempts were made to explain these results in terms of the possible influence of changing parental expectations on how they respond to children during early childhood. Therefore, to fully understand these results, future research

needs to consider the influence of changing parental expectations on how parents respond to young children.

Finally, more screen time assessed at 9 months was associated with higher socio-emotional competence at 9 months and lower socio-emotional competence at 2 years. These results could be explained in terms of the greater likelihood of co-viewing (with primary caregivers) during infancy, but less co-viewing in toddlerhood due to the growing independence of the child. Co-viewing has also been argued to be associated with increased verbal interactions during infancy (Barr et al., 2008), and this higher level of interaction based around a screen may be contributing to the infants early co-regulation. However, viewing screens can become habitual during toddlerhood and is often accompanied with a decreased chance of co-viewing with a parent (Supanitayanon, 2020), potentially limiting the opportunity to co-build socio-emotional skills. Future research could consider assessing co-viewing and verbal interactions as possibly moderating the effect of screen time on socio-emotional development. In Study 5, maternal depression at 9 months also did not influence socio-emotional competence while higher scores on maternal depression at 4.5 years was associated with lower socio-emotional competence at 4.5 years of age. Grace et al. (2003) argues that chronic maternal depression is more likely to have an adverse effect on child development so perhaps that is why the study did not show an effect of postpartum depression, which was marginally non-statistically significant. It is also possible that the effects of early maternal depression could have compounded over years to come through at 4.5 years.

#### **8.4 Limitations and General Conclusions**

To the best of our knowledge, this thesis is the first to measure early socio-emotional competence in a population-based ethnically diverse sample and provide information regarding its level and patterns during the first years of a child's life. The work makes further contributions to knowledge by providing insights into how socio-emotional competence relates to outcomes which the importance of developing early socio-emotional competence is normally

associated with. With respect to developing socio-emotional competence, this thesis contributes to literature by signalling possible factors that may be related to high socio-emotional competence. Nonetheless, the contributions and findings of this thesis and research need to be understood considering some major limitations. Therefore, before concluding the thesis, I identify some limitations and recommend further research to address them.

#### **8.4.1 Limitations and Way Forward**

A key limitation that runs through all the studies in this thesis was the use of different variables to calculate the index of socio-emotional competence. This was necessary because of the longitudinal nature of the project: that is, by the rapid development and change in manifestation and increase in complexity of different socio-emotional skills across early childhood (Carter et al., 2003, 2004). In addition, the research were limited by the tools that were used during the DCWs due to practical and resource-related constraints. This limits our ability to compare index scores across the three DCWs. Having said that, I found support for conceptual overlap between the indices at the three time points as their associations with each other were reported to be moderate to strong ( $r_s = .27-.41$ ). In order to further establish the validity of this index, future research should consider examining the relationship between the socio-emotional competence index and relevant factors measured during GUiNZ's 8-year DCW such as school achievement, bullying, social information processing, etc. School achievement, in particular, is noted as the reason behind emphasising socio-emotional competence. If stronger associations are found between socio-emotional competence at 4.5 years, which is closer to when a child enters schools in New Zealand, it may lend support to calls for developing a new New Zealand school entry system of assessment which includes measures of socio-emotional competence.

In addition to limiting our ability to compare index scores, lack of common variables used to calculate the socio-emotional competence index at 9-month and 2-year DCWs prevented us from modelling individual level change in it. Indeed, it is essential to consider

both between and with person variability and change in longitudinal studies as it gives a more comprehensive picture (Curran et al., 2014). As such, future research should try and model change in early socio-emotional competence starting after infancy to understand the predictors of this change. The cut-offs used to categorise socio-emotional competence levels used in Study 1b and 2 were also arbitrary. Although I used population-based data, I did not have normative data available to compare the socio-emotional competence scores against and categorise. Therefore, readers should keep this in mind while interpreting the results.

I also relied on mother-reported data to calculate the index of socio-emotional competence with exception of the index at 4.5 years where I also included observations. Mother-reports were available for a wider variety of measures in comparison to their partner's. For instance, at 4.5 years only mother-reported data was collected due to funding reasons. This almost exclusive reliance on mother-reports may have strengthened the associations of socio-emotional competence with mother-reported data in Study 4 in comparison to partner-reported data. It is argued that mothers are likely to rate behaviours as less problematic relative to fathers during early childhood (D'Souza et al., 2018). Hence, going forward, research should consider collecting and using data on socio-emotional competence based on father-reports as well.

Relatedly, I identified a number of proximal processes and contextual factors associated with socio-emotional competence in Study 5 but these were based on maternal reports. Future research may add information to the existing body of research by including paternal reports. The paternal behaviours identified as helpful (for socio-emotional competence) may also be made a part of messages sent to parents.

Since the study GUiNZ collected longitudinal information across multiple domains, it was not practically possible to gather in-depth information regarding a particular domain of socio-emotional competence, nor was it possible to use the same tools repeatedly (as it may have reduced the time that could be dedicated to assessing other domains). For instance, in Study 4 I did not have a measure of relationship warmth at 4.5 years. That is why I was not able to model the effect of inter- and intraindividual changes in relationship warmth on socio-

emotional competence together because it required repeated measures at more than three time points. In Study 4 I was also not able to model change in parental engagement. The GUiNZ study's 4.5- and 8-year DCWs include questions related to activities that mothers engage in with their children (such as reading to them, playing music/singing with them, baking/cooking together, doing art together, etc.). Hence future research could explore changes in maternal engagement from infancy to 8 years to examine its effect on socio-emotional competence levels. Generally speaking, it will also be interesting to see how engagement changes from infancy to early school years for mothers and fathers. Note that it is not possible to do this using data from GUiNZ as it does not include father reports at 4.5- and 8-year DCWs.

In Study 5, some of the variables included were not calculated using the same tool/question from the earlier DCWs, which may raise questions regarding the comparability of their effects on socio-emotional competence across the DCWs. Also, in Study 5 I did not examine the mediational effect of proximal processes on relationship between contextual factors and socio-emotional competence. Bronfenbrenner (1995) has theorised that biopsychological factors and contextual factors influence development via proximal processes (hence the term proximal). Therefore, future studies could add to our results by examining these mediational roles of proximal processes. For instance, they could potentially investigate by what proximal processes, maternal depression, childcare attendance or living in a negative neighbourhood influences socio-emotional competence.

In terms of the size of effects, the size of associations was small in some cases in our studies. However, the models examined explained a good portion of variance in the outcomes. For example, in Study 3 the model including socio-emotional competence at each DCW, attention and language abilities at 4.5 years explained 35 percent variance in emergent academic skills at 4.5 years. Similarly, in Study 5, a model with biopsychological factors, contextual factors and proximal processes explained 23 percent variance in socio-emotional competence at 2 years. However, out of this around 8 percent of the variance was explained by

socio-emotional competence at 9 months. These effects, however small, are also likely to compound over time.

Another limitation of this thesis is that it only very briefly touched upon ethnic differences. For instance, ethnicity was controlled in Study 2 and 5, and I tested for measurement and structural equivalence of the model across different ethnicities in Study 3. Other than the latter, ethnic difference were not focused on or explored. Given the growing ethnic diversity in New Zealand (Statistics New Zealand, 2018); the influence of ethnicity on family dynamics (such as how parents interact with other and with their children); and factors such as deprivation, stress, etc., which often fall along ethnic lines), there is value in exploring these in future research alongside our ethnic and cultural leaders in the field. Specifically, it will be worth exploring whether parental behaviours and contextual factors that influence socio-emotional development differ across ethnicities. Moreover, ethnic differences that exists in what emotional and behavioural responses are considered adaptive or maladaptive would be good to explore. For example, shyness in children is valued in Asian cultures while in Western contexts it is often not.

#### **8.4.2 General Conclusion**

Within the context of a growing emphasis on developing socio-emotional competence earlier in life, this thesis provides important and timely information at a population level. I found that socio-emotional competence can be measured at a population level by developing an index combining multiple measures, and the index provides us with meaningful information. I also found that most children (around two-thirds of the sample) experienced *no* lows in socio-emotional competence through early childhood while infants with low socio-emotional competence tended to experience improvement in it without any targeted intervention that I am aware of. This demonstrated that there is a natural flux in early socio-emotional competence levels and assessing, and potentially intervening, to improve socio-emotional competence during early childhood could lead to false positives. Our findings also suggest that what is

assessed as low socio-emotional competence at 9 months may in fact help infants develop more skills later on – possibly due to their low socio-emotional competence leading them to get increased attention and support for the development of later socio-emotional skills. This suggests that parents that perceive their child to have low early socio-emotional competence do not need to worry, as it may not be associated with preschoolers cognitive outcomes. However, if children experience persistent lows in early socio-emotional competence and/or they have a low in socio-emotional competence during late preschool years, then it is more likely to be associated with poorer EF and school readiness outcomes at 4.5 years of age. Future research could confirm this by exploring how the index relates to educational and socio-emotional outcomes measured in the recently released 8-year DCW.

Further, by examining a broad range of contextual factors and proximal processes that affect socio-emotional competence, this thesis highlights multiple pathways through which socio-emotional competence can be improved at the population level by promoting equity and/or sending messages to parents to encourage behaviours such as singing to children, playing games with them, reading to them, etc. Future research should build on this work by collecting data from multiple informants about socio-emotional competence in the early years (reducing the reliance on maternal reports) and using a multi-method approach. In addition, it should seek to find ways to examine the predictors and outcomes associated with intraindividual change in early socio-emotional competence and the potentially moderating influences of ethnicity.

Finally, as I reflect back on this thesis, and write this conclusion in the midst of an ongoing pandemic which has affected so many lives and has resulted in perpetual isolation and unimaginable losses for many, it seems the topic of socio-emotional competence is even more relevant, than when I began three and a half years ago. The pandemic has accentuated many things, but for me it is has highlighted the importance of people being able to work together and show compassion no matter what age we are. Despite the complexity of this multifaceted construct, there seems to be real value in continuing to try and understand the nature and

development of socio-emotional competence, so we can work towards gently fostering it, not only to provide evidence to inform political agendas around well-being and economic growth, but most importantly to build a connected and compassionate world. I hope this thesis contributes in some small way to furthering that understanding.

## Appendix A

### Hand Clap Task

The Pencil Tapping task, which measures working memory, attention and inhibitory control in four years or older children, from Luria-Nebraska Battery (Golden et al., 1979), was modified into hand clap task in 4.5-year DCW, in which children were requested to clap rather than tap a pencil as it is easier to follow by children. This task is sensitive to development, and has been executed in a diverse sample of children (Diamond and Taylor, 1996). The task comprised 16 trials in which children were meant to clap once if the assessor clapped twice and vice versa. The participants were assigned a score of 1 for a correct response while 0 was given for a wrong response. The scores were later aggregated. The above-mentioned abilities are implicated in learning behaviour and social competence (Denham et al., 2012).

### Pragmatic Language

Pragmatic language is an individual's ability to communicate over and above their vocabulary. It was assessed through Parent Rating of Oral Language and Literacy (PROLL; Dickinson et al., 2001), which is an adapted version of Teacher Rating of Oral Language and Literacy. This ability was measured through the following five questions at 4.5-year DCW.

- Which of the following best describes {Name}'s pattern of asking question?
- How often does {Name} try out new word?
- Which of the following best describes {Name}'s ability to communicate personal experiences in a clear and logical way?
- How often is {Name} understandable when speaking to adults other than you or other family?
- Which of the following best describes {Name}'s ability to communicate if {He/She} is not first understood?

Exploratory Factor Analysis with Direct Oblimin rotation showed this items loading onto one factor with loading ranging from .45 to .54 ( $\alpha = .61$ ). Therefore, the responses on these items were averaged to give a single score for pragmatic language.

### School Readiness

School readiness was calculated using seven relevant questions drawn from data collected at 6-year DCW from the mother/caregiver:

1. I think that my child/children feel like their school is a good place to be.
2. I think that my child/children feel like they belong in their school.
3. I think that my child/children are happy in their school.
4. I think that my child/children can mix with other children well at school.
5. I think that my child/children have the reading and writing skills necessary at school.
6. I think that my child/children find it easy to be left at school each morning.
7. I think that my child/children are independent enough to cope with school.

Each question had seven response options (1 = *Strongly Disagree*" to "5 = *Strongly Agree*", with additional options of "*Don't know*" and "*Prefer not to say*," which were coded as missing). Exploratory Factor Analysis with Direct Oblimin rotation showed these questions loading onto one factor with loadings ranging from .72 to .48 ( $\alpha = .80$ ). The responses on these questions were averaged to give a single score of readiness for school.

## Appendix B. Supplementary Tables

### Supplementary Table 1

*Number and Percentage of Children that followed Different Patterns of Shift in the Levels of Socio-emotional Competence Across the Three Data Collection Waves (N = 4839)*

Groups	Data Collection Wave (DCW)			n	%
	9 months	2 years	4.5 years		
Persistent Lows (5.4%)	Low	Low	Low	98	2.0
	AvgHigh	Low	Low	166	3.4
Recently Low (10.3%)	AvgHigh	AvgHigh	Low	401	8.3
	Low	AvgHigh	Low	97	2.0
Improved (19.6%)	Low	Low	AvgHigh	138	2.9
	AvgHigh	Low	AvgHigh	357	7.4
	Low	AvgHigh	AvgHigh	449	9.3
No Lows (64.8%)	High	Avg	High	129	2.7
	Avg	High	High	148	3.1
	High	High	Avg	108	2.2
	High	High	High	108	2.2
	Mostly Average <sup>1</sup>			2640	54.6

*Note:* <sup>1</sup>Mostly Average consisted of Avg-Avg-High; Avg-High-Avg; High-Avg-Avg; Avg-Avg-Avg.

## Supplementary Table 2

### *Characteristics of the Sample before and after Deletion and Missing Value Analysis*

Characteristics	Full Data ( <i>N</i> = 6156)		Restricted Dataset ( <i>N</i> = 4839)	
	<i>n</i>	%	<i>n</i>	%
Child's Gender				
Boy	3165	51.4	2459	50.8
Girl	2986	48.5	2378	49.1
Child's Parity				
0	2170	35.3	1740	36.0
1-5	3328	54.1	2567	53.0
6-10	79	1.3	59	1.2
≥11	14	.2	11	.2
Mother's Age				
<20	250	4.1	199	4.1
20-24 years	829	13.5	657	13.6
25-29 years	1495	24.3	1131	23.4
30-34 years	1972	32.0	1587	32.8
35-39 years	1338	21.7	1058	21.9
≥ 40 years	271	4.4	207	4.3
Mother's Ethnicity				
European	3491	56.7	2927	60.5
Māori	813	13.2	622	12.9
Pacific	785	12.8	558	11.5
Asian	845	13.7	571	11.8
MELAA	115	1.9	79	1.6
Others (includes New Zealanders)	89	1.45	70	1.45
Household deprivation quintile index 2013 <sup>1</sup>				
NZ Dep Q1 (least deprived)	1227	19.9	1048	21.7
NZ Dep Q2	1119	18.2	948	19.6
NZ Dep Q3	1033	16.8	887	18.3
NZ Dep Q4	996	16.2	832	17.2
NZ Dep Q5 (most deprived)	1436	23.3	1095	22.6

*Note.* MELAA = Middle Eastern, Latin America, or African.

<sup>1</sup>The New Zealand Deprivation Index combines nine socioeconomic variables from the 2006 census capturing eight dimensions of deprivation at the small area level. In this table the original deprivation scores (measured in deciles) have been collapsed into quintiles. Quintile 1 (Q1: Deciles 1 and 2) represents the households in the least deprived 20% areas, whereas Quintile 5 (Q5: Deciles 9 and 10) represents the households in the most deprived 20% areas (Salmond, Crampton, & Atkinson, 2007).

### Supplementary Table 3

Results from Binary Logistic Regression of “Cool” and “Hot” Executive Function at 4.5 Years on Covariates Which had Significant Associations with “Cool” and “Hot” Executive Function

Covariates	“Cool” EF Average			“Hot” EF <sup>b</sup>		
	<i>B</i> (SE)	OR	(95% CI)	<i>B</i> (SE)	OR	(95% CI)
Child’s gestation age (weeks)	.04(.02)	1.04	1.00-1.08	.01(.02)	1.01	.97-1.06
Child’s birth weight (grams)	.00(.00)	1.00	1.00-1.00	.00(.00)	1.00	1.00-1.00
Child’s sex						
Boy	REF			REF		
Girl	.28(.07)	1.32***	1.16-1.50	.63(.07)	1.87***	1.62-2.15
Child’s parity						
First born	REF			REF		
Subsequent birth	.16(.07)	1.17*	1.02-1.35	.19(.07)	1.21**	1.05-1.40
Child’s age at 4.5 years’ assessment (days)				-.001(.00)	1.00	.998-1.001
Mother’s age						
<20	REF					
20-29 years	.11(.18)	1.12	.78-1.60			
≥ 30 years	.15(.19)	1.17	.81-1.69			
Mother’s education						
No secondary education	REF					
Secondary education	-.12(.17)	.88	.64-1.23			
Diploma/trade certificate/Bachelor’s degree or higher	.04(.16)	1.05	.76-1.43			
Mother’s ethnicity						
European	REF			REF		
Māori	-.08(.11)	.92	.74-1.15	-.35(.11)	.71**	.57-.88

Covariates	“Cool” EF Average			“Hot” EF <sup>b</sup>		
	<i>B</i> (SE)	OR	(95% CI)	<i>B</i> (SE)	OR	(95% CI)
Pacific	-.36(.12)	.70**	.55-.89	-.43(.11)	.65***	.52-.82
Asian	.36(.11)	1.44**	1.17-1.76	-.44(.11)	.65***	.52-.80
MELAA	-.11(.25)	.90	.55-1.46	-.62(.25)	.54*	.33-.88
Other (includes New Zealanders)	.45(.27)	1.57	.92-2.67	.14(.32)	1.15	.62-2.16
Household deprivation quintile index 2013 <sup>c</sup>						
NZ Dep Q1 (least deprived)	REF					
NZ Dep Q2	-.10(.10)	.90	.74-1.09			
NZ Dep Q3	.05(.10)	1.05	.86-1.28			
NZ Dep Q4	-.25(.11)	.78*	.63-.96			
NZ Dep Q5 (most deprived)	-.33(.12)	.72**	.57-.90			
Planned pregnancy						
Yes	REF			REF		
No	-.04(.08)	.97	.84-1.12	-.15(.08)	.86	.74-1.00
Alcohol consumption after 1 <sup>st</sup> trimester						
0-3 drinks per week	REF					
≥4 drinks per week	-.72(.43)	.49	.21-1.12			

Note: EF = Executive Function; REF = Reference Category

<sup>a</sup>Child’s performance on the hand clap task: achieving a score of greater than 13 (Median)

<sup>b</sup>Child’s performance on the gift wrap task: managing not to peek.

<sup>c</sup>The New Zealand Deprivation Index combines nine socioeconomic variables from the 2006 census capturing eight dimensions of deprivation at the small area level. In this table the original deprivation scores (measured in deciles) have been collapsed into quintiles. Quintile 1 (Q1: Deciles 1 and 2) represents the households in the least deprived 20% areas, whereas Quintile 5 (Q5: Deciles 9 and 10) represents the households in the most deprived 20% areas (Salmond, Crampton, & Atkinson, 2007).

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

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