THE EFFECTS OF A SELF-REGULATION PROFESSIONAL LEARNING INTERVENTION
ON EARLY CHILDHOOD EDUCATOR BELIEFS AND PRACTICES REGARDING CHILD
BEHAVIOUR, RELATIONSHIPS WITH CHILDREN, AND PROFESSIONAL STRESS

ANGELA ROSATI

A DISSERTATION SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

GRADUATE PROGRAM IN EDUCATION
YORK UNIVERSITY
TORONTO, ONTARIO

DECEMBER 2019

Abstract

Decades of research on early student-teacher relationships (STRs) show that they play a pivotal role in the behavioural, academic, and social outcomes of the child. This research allows us to conclude with near certainty that early STRs have a lasting impact on the academic and developmental trajectories of children. Studies show that child behaviour is a significant contributor to the quality of this relationship. Given the importance of STRs in the early years, the purposes of this study were to explore the variables associated with the development of early STRs and to investigate the potential of a professional learning course on the neurophysiology of child behaviour, as framed by Self-Reg theory, to impact these variables. To achieve these ends, this study utilized a mixed method, quasi-experimental, pre-test, intervention, posttest design in which a sample of early childhood educators ($n = 104$) were surveyed on their experience with challenging child behaviour, their relationships with students, their beliefs and practices regarding child behaviour, their beliefs about self-regulation, and their own professional stress. A subset of survey respondents who expressed an interest in the professional learning were randomly assigned to either a PL ($n = 20$) or control group ($n = 22$). PL participants then participated in a two-day professional learning course that explained child behaviour as a neurophysiological, stress-related phenomenon, as framed by Self-Reg theory. In order to investigate the impact of the PL on the STR variables, PL participants and controls were re-surveyed eight weeks post-intervention and PL participants were also interviewed, individually and in focus groups. Exploratory analyses of survey data confirm the role of challenging child behaviour in the conflictual STR and further highlight the role of educator emotional exhaustion, revealing it as both related to challenging child behaviour and a predictor of educator practices regarding challenging child behaviour. Findings in regards to the Self Reg PL show a significant

impact on educator beliefs and practices regarding challenging child behaviour and their understanding of self-regulation as a neurophysiological construct. These results suggest that a two-day Self Reg PL intervention can produce a shared neurophysiological understanding of the self-regulation construct with associated changes in educator cognition and behaviour.

Acknowledgements

My husband Paul Keogh continuously cleared the track without question and without complaint. His caretaking allowed me to move forward unfettered. Thank you for your undying faith and support Paul.

My daughter Ella thinks I am smarter than I am and her reverence was motivational. My younger daughter Mary doesn't think I am smart at all and this kept me grounded. Thank you Ella and Mary.

Thank you to my examination committee members Dr. Brenda Smith-Chant and Dr. Jodi Martin for your careful consideration of the dissertation and above all, for your kindness during the stressful Defense process.

My employer, Sheridan College, made it relatively easy to work full time and pursue a PhD simultaneously and I am thankful to work for an institution that values their employees' research endeavours. The SRCA grant Sheridan provided greatly enhanced the quality of this study.

I have held some of the ideas presented in this dissertation for a long time and I first pronounced them to Graham Clyne when I was fresh out of graduate school. He listened and provided the initial vehicle, and so many thereafter, that drove my career forward. Thank you Graham.

There were times on this journey where I lost site of the big picture and my friend Nadia Breese uplifted me in these moments by reminding me that what I was doing really mattered. Thank you Nadia.

Table of Contents

List of Tables

List of Figures

CHAPTER 1

INTRODUCTON

Student-teacher relationships (STRs) in the early years play a significant role in

determining the socio-emotional and educational trajectories of children (Birch & Ladd, 1998;

Hamre & Pianta, 2001; Rimm-Kaufmann & Wanless, 2012; Shonkoff & Phillips, 2000). STRs in

the early years that are emotionally supportive promote a child's achievement in both the

academic and social aspects of schooling and establish a positive first footing that increases the

likelihood of continued success thereafter (Downer, Sabol, & Hamre, 2010; Hamre & Pianta,

2001, 2005; McCormick, O'Connor, Cappella, & McClowry, 2013; Sabol & Pianta, 2012).

Recent research showing that early relationships lay the foundation for a child's stress response

system offers a neurophysiological explanation for the established association between early

STRs and school achievement (Hostinar & Gunnar 2013; Nelson, Kendall, & Shields, 2013;

Shonkoff, Boyce, & McEwen, 2009; Shonkoff & Phillips, 2000; Tarullo & Gunnar, 2006) and

elevates the importance of educational research on the topic of emotionally supportive STRs in

the early years.

Examination of the STR construct shows that its initial quality hinges largely on child

behaviour (Buyse, Verschueren, Doumen, Van Damme, & Maes, 2008; Thijs & Koomen, 2009).

Specifically, a teacher's initial reading of, and consequent response to, a child's behaviour sets

the foundation for the STR that will thereafter develop in a bi-directional fashion as the child

responds to teacher input and expectations (Bronfenbrenner, 1977; Bronfenbrenner & Morris, 1998; Sameroff, 2010; Zhang & Sun, 2011). In this way, STRs have the potential to become enduring both within and across school years, with the earliest STRs setting the foundation for those that follow (Howes, Phillipsen, & Peisner-Feinberg, 2000). Challenging child behaviours (such as aggression, inattention, impulsivity, antisocial behaviour, defiance, and non-compliance) are related to a conflictual STR that serves to perpetuate problem behaviours and bolster student-teacher conflict (Doumen et al., 2008; Jerome, Hamre, & Pianta, 2009; Ladd & Burgess, 1999; Lei, Cui, & Chui, 2016; Sabol & Pianta, 2012; Skalická, Belsky, Stenseng, & Wichstrøm, 2015; Stuhlman & Pianta, 2001). Unfortunately, an increase in challenging child behaviours threatens to strain the quality of STRs in early learning classrooms. Data from the last four reporting cycles of the Early Development Instrument (EDI) in Ontario reveal a rise in educator-reported incidence of aggression, hyperactivity, and inattention, and a decreased incidence of prosocial behaviour in children (Offord Centre for Child Studies, 2017). In the United States, a recent large-scale survey of primary teachers found that 68% reported an increased level of behaviour problems in children over the previous five year period (Scholastic, 2012). Consistent with this, a survey by Gilliam (2002) of prekindergarten childcare providers in the United States shows that preschool children are being expelled for problem behaviour at a rate more than three times that found in school age children.

A key mechanism by which challenging child behaviour influences the STR is through educator stress. Educators report that the misbehaviour of children, and specifically their feelings of inefficacy in managing misbehaviour, is a primary source of professional stress and emotional exhaustion (Blase, 1986; Friedman, 1995; Hastings & Bahm, 2003; Kokkinos, 2007; Kyriacou, 1987, 2001; Tsouloupas, Carson, Matthews, Grawitch, & Barber, 2010). Further, the stress level of educators impacts their perception of and response to a child's behaviour and specifically,

whether they consider it to be problematic (Thijs & Koomen, 2009). The interplay between challenging child behaviour and educator stress leads to a conflictual STR that, if left uninterrupted, can become self-perpetuating and entrenched (Mantzicopoulos, 2005; Whitaker, Dearth-Wesley & Gooze, 2015; Yoon, 2002). Children whose behaviour directly implicates them in this negative STR system, face a diminished opportunity to achieve the early school success that a supportive STR facilitates. Accordingly, there is a growing need to deepen educator understanding of the roots of child behaviour as a potential mechanism for reducing both child and educator stress, thereby enabling the provision of educator emotional support, and ultimately circumventing the development of a conflictual STR.

As this practical need for focusing on the STR and child behaviours is intensifying, simultaneously the field of developmental neuroscience is simultaneously producing research that offers new insight into the neurophysiological underpinnings of child behaviour. Specifically, research shows the body's stress response system is a driver of both cognitive and behavioural capacities in children (Gunnar & Quevedo, 2007; Shanker, 2016; Thompson, 2014). Excessive stress impairs executive function capacities and poses deleterious effects on a child's ability to self-regulate and to behave in a calm and focused manner (Blair, Granger, & Peters-Razza, 2005; Shanker, 2016; Smider et al., 2002). Yet excessive stress in children can be attenuated by the emotional support of significant others and, conversely, insensitive or harsh interactions with significant others can elevate child stress (Dettling, Parker, Lane, Sebanc, & Gunnar, 2000; Gunnar & Hostinar, 2015; Sims, Guilfoyle, & Perry, 2010). Such research introduces the possibilities that child stress underlies the behaviour that propels the initial STR and that STRs have the potential to impact a child's neurophysiology in a way that either lends itself to, or interferes with, a child's learning and behaviour in the classroom. These recent advances regarding the neurophysiological roots of child behaviour shift STR research into a

neuroscientific realm. Moreover, the finding that supportive relationships can moderate a child's stress response system, and therefore their learning and behaviour, elevates the need for studies aimed at understanding and promoting supportive STRs.

While child behaviour is known to be a primary variable in the onset of STRs, it has not been a focus of professional learning for early years educators despite these new insights into child behaviour as a neurophysiological construct. Nash, Schlosser, and Scarr (2015) report that 86% of primary educators believe that children are in control of their behaviour and choose to be disruptive, a finding which highlights the gap between what is known about the nature of child behaviour and educator beliefs regarding child behaviour. This breach between research and practice is further exemplified by Teyfur's (2015) finding that 26% of primary educators manage undesirable behaviour by "not showing love" (p. 2429). Research exploring professional learning interventions designed to close the gap between findings from the field of neuroscience and educator beliefs and practices regarding child behaviour may offer a means to promoting emotionally supportive educator practices and, by extension, positive STRs. One theoretical model that could serve this professional learning endeavour is Self-Reg theory (Shanker, 2016), a framework that addresses the neuroscience of stress, its impact on the self-regulation and behavioural capacities of the child, and the role of relationships in the stress paradigm. Although this framework has been adopted by the Ontario Ministry of Education as outlined in the *How Does Learning Happen: Ontario's Pedagogy for the Early Years* (Ontario Ministry of Education, 2014), the *Ontario Early Years Policy Framework* (Ontario Ministry of Education, 2013) and the *Kindergarten Curriculum* (Ontario Ministry of Education, 2016) documents, there remains considerable confusion among educators regarding the definition of self-regulation (Burman, Shanker, & Green, 2015).

Given the importance of STRs in the early years, the purposes of this study are to explore the variables associated with the development of early STRs, and investigate the potential impact of a professional learning course on the neurophysiology of child behaviour on these variables. This study utilizes a mixed-method, quasi-experimental, pre-test, intervention, posttest design in which a sample of early childhood educators were surveyed on their experience with challenging child behaviour, their relationships with students, their beliefs and practices regarding child behaviour, their beliefs about self-regulation, and their own professional stress. A subset of interested survey respondents became the intervention participants in the study. These participants were then randomly assigned to either a professional learning (PL) or a control group. PL participants participated in a learning course on the neurophysiological roots of child behaviour as explained by Self-Reg theory. These participants were then interviewed during a post PL site visit and in focus groups in order to provide qualitative data on the impact of the PL program. All intervention participants were re-surveyed in order to quantitatively investigate the impact of the PL on the STR variables. Specifically, this study was designed to answer the following questions:

1. What are early childhood educators' experience with challenging child behaviour, their relationships with students, their beliefs and practices regarding child behaviour, their beliefs about self-regulation, and their professional stress all as reported prior to intervention?

2. Are the reported pre-intervention variables of early childhood educators' experience regarding challenging child behaviour, relationships with students, beliefs and practices regarding child behaviour, beliefs about self-regulation, and professional stress related? If so, how?

3. Does participation in a professional learning course on Self-Reg theory change early childhood educator reported relationships with students?

4. Does participation in a professional learning course on Self-Reg theory change early childhood educator reported beliefs and practices regarding child behaviour?

5. Does participation in a professional learning course on Self-Reg theory change early childhood educator reported beliefs about the concept of self-regulation?

6. Does participation in a professional learning course on Self-Reg theory change early childhood educator reported level of professional stress?

CHAPTER 2

LITERATURE REVIEW

Student-teacher relationships have long been known as an important contributor to child development and achievement in the early years. Researchers have sought to uncover the variables implicated in the STR and to develop professional learning programs to enable educators to build supportive relationships with students. Because advances in neuroscience, and specifically those regarding the neurophysiology of stress, provide new insight into the neurophysiological roots of child behaviour, a new view of the STR construct can be developed which will inform our efforts to develop effective professional learning programs to enhance STR quality in early learning environments.

The following literature review will first examine the research on the significance of STRs, the role of child behaviour and educator stress in determining the quality of these STRs, and professional learning studies with educators in this area. Next, research on the neurophysiology of stress, its impact on cognitive and behavioural outcomes in children, and the potential of significant others to act as a "buffer" for excessive child stress will be examined. The case will be made for marrying findings from these disparate academic realms. This literature review will support the proposition that in accordance with a bio-ecological framework, STRs have the potential to impact a child's neurophysiology in a way that can either positively or negatively impact their learning and behaviour in the classroom. The need for professional

learning for early years educators on the neurophysiological roots of child behaviour as a mechanism for promoting emotionally supportive STRs will be highlighted. Self-Reg theory (Shanker, 2016) will be presented as a theoretical framework for this work.

Student-Teacher Relationships and Student Outcomes

In much research examining the importance of STRs on student academic and socio-emotional outcomes, the STR is measured using a teacher-report survey that assesses the STR in terms of conflict versus closeness. A close STR is exemplified by an educator's positive response to statements such as "I share an affectionate, warm relationship with this child" (Pianta, 2001, p. 12). Conflictual relationships are associated with an educator's positive response to statements such as "This child drains my energy" (Pianta, 2001, p. 11). Close relationships are those in which the educator demonstrates a high level of emotional support illustrated by warm and respectful interactions, sensitivity, and personal involvement with the child. Conversely, low levels of emotional support in which teachers display anger, sarcasm, and irritability are associated with a conflictual STR (Buyse et al., 2008). In his meta-analysis of the research examining the association between STRs and student outcomes, Cornelius-White (2007) concludes that the person-centred teacher variables of empathy, warmth, and positive affect are the critical operating variables in the close STRs that support positive student outcomes on both behavioural and cognitive measures.

Studies investigating the significance of STRs in the early years are replete with findings demonstrating an association between emotionally supportive STRs and a variety of positive child outcomes in both the short and long term. Specifically, the impact of early STRs has been studied in relation to child measures such as academic achievement, school engagement, prosocial behaviour, and child stress.

STRs and Student Achievement

Overall, in early childhood research, a significant positive association between the quality of early STRs and achievement scores in a variety of school subjects including math and literacy has been reported (Birch & Ladd, 1998; Crosnoe et al., 2010; Curby, Rimm-Kaufman & Ponitz, 2009; McCormick et al., 2013; O' Connor & McCartney, 2007; Spilt, Hughes, Wu, & Kwok, 2012; Wenglinsky, 2001; Wu, Hughes, & Kwok, 2010). A study by Hamre and Pianta (2001) shows that early student-teacher relationships predict student grades and standardized test scores. In a subsequent study, these researchers report that when placed in classrooms with emotionally supportive teachers, students who are at-risk for school failure obtain achievement scores commensurate with their low-risk peers (Hamre & Pianta, 2005). Additionally, in a study of first grade students that measures the relationship between STRs and student academic performance, Pianta and Stuhlman (2004) observe that the STR is a significant predictor of teacher-rated student academic performance. Long-term effects of positive early STRs on academic variables have also been found. For example, in a longitudinal study by Connor, Son, and Hindman (2005), children who experience a more responsive STR in preschool have stronger vocabulary and decoding skills at the end of first grade. Not only has the STR been shown to relate to, and in some cases predict, achievement, recent research (Valiente, Lemery-Chalfant, Swanson, & Reiser, 2008) further suggests that if a teacher is sensitive to a child's needs, the potentially negative impact of difficult temperament on achievement can be ameliorated. Specifically, in addition to finding a positive correlation between STRs and student achievement in kindergarten, Valiente et al. (2008) report that the relationship between a child's effortful control and their grades is moderated by the teacher–child relationship. A close STR reduces the strength of the correlation between low effortful control and low achievement scores.

STRs and Student Engagement

The concept of student engagement is defined as the quality of a student's involvement behaviourally, emotionally, and cognitively with the schooling experience (Fredericks, Blumenfeld, & Paris, 2004). In one meta-analysis investigating the impact of STRs on all aspects of student engagement from preschool to high school, close STRs were significantly associated with all measures of student engagement and the negative impact of unsupportive STRs on engagement was greatest in the primary grades (Roorda, Koomen, Spilt, & Oort, 2011). In their investigation into the association between STRs and student outcomes in kindergarten, Hamre and Pianta (2001) observe that teacher-reported negative STRs are a significant predictor of child work habits as measured by participation and compliance.

STRs and Prosocial Behaviour

Emotionally supportive STRs are associated with a child's emotional development and prosocial behaviour in the classroom (Griggs, Mikami, & Rimm-Kaufmann, 2016; Hamre & Pianta, 2001; Maldonado-Carreno & Votruba-Drzal, 2011; Pianta & Stuhlman, 2004). An observational study of 36 kindergarten teachers by Merritt, Wanless, Rimm-Kaufman, Cameron, and Peugh (2012) shows that higher teacher emotional support scores relate to lower scores on child aggression and higher scores on child measures of behavioural self-control. In a study examining the moderating impact of STRs on preschooler peer play, Griggs, Gagnon, Huelsman, Kidder-Ashley and Ballard (2009) report that less conflictual STRs are associated with less disruptive peer play leading these authors to conclude that positive interactions with teachers lend to a child's capacity to engage in positive social behaviour. Similarly, in a longitudinal study of preschool to grade five children, high-quality teacher relationships relate to positive changes in children's externalizing and internalizing behaviour problems, and serve as a

protective factor in preventing children with high levels of internalizing behaviour in early childhood from developing trajectories of long-term behaviour problems (O'Connor, Dearing, & Collins, 2011). Attachment research shows that STRs buffer the behavioural and emotional problems displayed by children identified as having an insecure maternal attachment style (O'Connor & McCartney, 2007). Finally, children deemed to be emotionally at-risk show better academic and social outcomes over the school year when they have a close relationship with their teacher (Baker, 2006; Hamre & Pianta, 2005).

STRs and Student Stress

In an examination of the impact of educator emotional support on child stress, Ahnert, Harwradt-Heinecke, Kappler, Eckstein-Madry, and Milatz (2012) report that seven year old students in classrooms where teachers are rated as emotionally supportive, show better stress regulation capacity over the course of the school week than their peers in unsupportive classrooms. Stress regulation in this study is considered a neurophysiological construct and is measured by assessing student levels of cortisol; a hormone that is released when the body responds to stress. Cortisol level was captured by collecting saliva from each student four times a day, on a Monday and subsequent Friday, to determine the release of cortisol over the day. These measures comprise a daily diurnal cortisol profile for each student. Comparisons between Monday and Friday cortisol profiles of the same student served as an estimate of their stress regulation throughout the week. In addition to showing that students in classrooms with emotionally supportive teachers display better stress regulation, this study further shows that students in STRs that rate high in conflict aree less able to down-regulate their stress, as demonstrated by a diurnal cortisol profile that was flattened, a phenomenon that occurs when the

stress response system is overstrained. Although sparse in the educational literature, studies such as this support the idea that STRs have a neurophysiological impact on the child.

Collectively, the research on STRs as they relate to student outcomes in the early years, shows a positive association between close STRs and academic, behavioural, and neurophysiological outcomes for the child. Indeed, that emotionally supportive STRs, particularly in the early years of schooling, operate as a "developmental asset to children" (Sabol & Pianta, 2012, p. 218) is well established in the literature.

Student-Teacher Relationships: A Dynamic System

The relationship between a student and teacher is a dynamic system involving many interpersonal and contextual variables (Pianta, Hamre, & Stuhlman, 2003). According to Pennings and Hollenstein (2019), the dynamic STR system includes both the moment to moment behaviours between student and teacher and the stable behaviour sequences, referred to as attractors, that each of them get "stuck in" (p. 2). The literature examining early STRs reveals that child behaviour and educator stress are integral components of the STR system. Child behaviour plays a pivotal role in the onset of the STR system as it impels the initial emotional and behavioural response of the educator (Buyse et al., 2008; Mantzicopoulos, 2005) which then influences the consequent behaviour of the child (Merritt et al., 2012). Overall, challenging child behaviours are linked to conflictual STRs (Hastings & Bahm, 2003) and with higher levels of educator stress (Kokkinos, 2007; Tsouloupas et al., 2010), a known contributor to poor quality STRs (Mantzicopoulos, 2005). Further, as Thijs and Koomen (2009) report, educator response to child behaviour is influenced by their own level of stress. In the standard way of viewing this issue, the challenging child behaviour leads to educator stress, which in turn

weakens the STR. These variables of child behaviour, educator stress, and the interplay between them in relation to the STR, are discussed below.

Child Behaviour and STRs

Child behaviour is a significant predictor of STR quality. Children identified as having easy temperaments, defined as flexible, adaptive, and positive in mood, are more likely to realize supportive interactions with their teacher (Birch & Ladd, 1998; Rudasill, 2011; Rudasill, Reio, Stipanovic, & Taylor, 2010; Valiente, Swanson, & Lemery-Chalfant, 2012). In a longitudinal study on the relational effects of temperament, children with difficult temperamental traits such as high intensity, low adaptability, and negative mood, all of which have implications for adaptive behaviour, have a greater number of negative interactions and conflict with their teachers (Guerin, Gottfried, Oliver, & Thomas, 2003). Likewise, students who demonstrate aggressive or externalizing behaviours are more likely to have relationships with teachers that are rated high in conflict (Jerome et al., 2009; Ladd & Burgess, 1999; Lei et al., 2016; Sabol & Pianta, 2012; Skalická et al., 2015; Stulman & Pianta, 2002). In a longitudinal study examining the reciprocal relationship between child behaviour and STRs from preschool to third grade, Skalická, Stenseng, and Wichstrom (2015) report bidirectional relationships between student–teacher conflict and child social skills, and between student-teacher conflict and externalizing behaviour. In particular, they find child externalizing behaviour to be a stronger predictor of conflictual STRs than child social skills and that a conflictual STR is predictive of child externalizing behaviour. From a meta-analysis examining student characteristics as they relate to teacher-child relationships, Nurmi (2012) concludes that teachers report more conflict and less closeness with children who exhibit either high external or internal problem behaviour. Finally, Dobbs and Arnold (2009) report that teachers' interactions with children who they had rated as

having behaviour problems are more verbally demanding in nature than with other children; an interactional style known to be associated with conflictual STRs (Buyse et al., 2008).

Importantly, as noted by Sabol and Pianta in their 2012 review of the STR literature, the behaviours that lead to conflictual relationships with teachers are likely to be exacerbated by the lack of emotional support children consequently experience in the classroom. This conclusion, which illustrates the reinforcing effect of conflictual STRs, is supported by research demonstrating a stability in both problem behaviours and poor quality STRs over time (Wu et al., 2010).

Child Behaviour and Educator Stress

Educator stress is defined by Kyriacou (1987) as the "experience of unpleasant emotions such as tension, frustration, anxiety, anger and depression resulting from aspects of work as a teacher" (p. 146) and child misbehaviour plays a significant role in this construct (Blase, 1986; Hastings & Bahm, 2003; Yoon, 2002). Student misbehaviour systematically predicts educator stress as measured by the Maslach Burnout Inventory (MBI) (Kokkinos, 2007). In this research, the time and effort involved in handling student misbehaviour is considered to lead to educator emotional exhaustion and, further, educator inability to successfully manage the behaviour leads to feelings of discouragement and inefficacy that exacerbates educator stress (Kokkinos, 2007).

Drawing on a stress-contagion framework, a recent study conducted by Oberle and Schonert-Reichl (2016) examines the variable of student stress in relation to educator stress. This study, which assesses student stress by measuring the stress hormone cortisol and educator stress using the MBI survey, shows that higher levels of educator stress significantly predict high cortisol levels of students. This study adds the element of child stress to the discussion of the STR system and shows that child stress and educator stress are interrelated variables. This

finding, when considered alongside research showing that child stress underlies problems with behavioural and emotional control (Mathewson et al., 2012; Smider et al., 2002), supports the notion that STRs are impacted by, as they impact, the variables of child behaviour, teacher stress, and child stress.

Thus, child behaviour and educator stress are interrelated variables in the STR construct. As elucidated by Raver, Blair and Li-Grining (2012), the emotional exhaustion of teachers who experience challenging child behaviour contributes to a negative attributional bias, which in turn contributes to poor quality STRs and the perpetuation of difficult child behaviour. Because two of the variables in this maladaptive STR cycle, namely challenging child behaviour (Offord Centre for Child Studies, 2017) and teacher stress (Travers & Cooper, 1996), are rising in prevalence, there is a growing need for educational researchers to find ways to interrupt this STR system when it is maladaptive in nature. One route is through professional education.

Professional Learning to Improve STRs

Given the importance of STRs to student outcomes, researchers in early learning settings have focused on developing the educator's capacity to build emotionally supportive relationships with students. A variety of professional learning programs have been developed. Examples include the Banking Time approach (Driscoll & Pianta, 2010), group training on interaction style as in the Teacher-Child Interaction Training program (Lyon et al., 2009), and web-based training on supporting teacher's beliefs about the importance of interactions with children (Pianta, Mashburn, Downer, Hamre, & Justice, 2008). The efficacy of these approaches is determined through the use of teacher reports, direct observation, and video-taped interactions. In general, in-service training programs that are designed to improve educator responsiveness and educator knowledge regarding the importance of relationships, are shown to positively impact relationship

quality and children's adjustment in the classroom (Sabol & Pianta, 2012). Further, randomized control studies show that programs designed to improve student-teacher relationships lead to improved student outcomes in terms of grades (Murray & Malmgren, 2005) and behaviour (Webster-Stratton, Reid & Hammond, 2004).

While in-service professional learning designed to manage teacher behaviour as a means to improving STRs have been effective at building educator capacity to be emotionally supportive, considerably less attention has been given to professional learning that is focused on improving educator understanding of child behaviour despite findings that child behaviour is a principal contributor to the STR (Nurmi, 2012). Research outside of the educational realm outlining the neurophysiological underpinnings of behaviour as a stress response, offers a promising new lens through which educators may view, understand, and respond to child behaviour.

The Nature of Neurophysiological Stress and Its Impact on Learning and Behaviour

Although stress has come to be regarded as a psychosocial construct in popular psychology, the original conception of stress has a biological basis. Defined first by Walter Cannon (1929), stress was described as anything that requires the expenditure of energy to keep a homeostatic system operating within its functional range. These systems include for example, those that maintain body temperature, the amount of sodium and glucose in the bloodstream, and the management of emotions (Shanker, 2016). When environmental stimuli, or stressors, challenge the equilibrium of these systems, the body automatically engages in an energy-expensive response to restore balance, or homeostasis (Cannon, 1929). This neurophysiological reaction to stressors is referred to as the stress response (Thompson, 2014). In order to support regulation in response to stress, the body produces cortisol which supports functions such as

metabolism, immune response, and vascular tone (Gunnar & Quevedo, 2007). The extent to which the stress response is engaged can be assessed by measuring the amount of cortisol in the individual's blood or saliva. Moderate levels of cortisol are adaptive, as manageable stress serves to elevate attention and mobilize energy. A high level of cortisol in the system, however, is indicative of excessive stress that, in over-working the neurophysiological systems associated with the stress response, depletes energy and affects attention and behaviour (LeDoux, 2015; Shanker, 2012; 2016).

The Stress Response System

The human stress response system is designed to serve an adaptive function (Cannon, 1929). When stressors are experienced by an individual, two interrelated neuro-biological systems are activated by the hypothalamus within the limbic system of the brain: the sympathetic-adrenomedullar (SAM) system and the hypothalamic-pituitary-adrenocortical (HPA) system. The SAM system works to engage the fight or flight response by releasing epinephrine (adrenalin) and norepinephrine from the adrenal gland. In order to ensure the blood supply to the brain and muscles required for defense, SAM activation results in increased cardiovascular tone, respiratory rate, vasodilation of muscles and constriction of blood vessels in the skin and gut (Gunnar & Quevedo, 2007). While adrenalin and norepinephrine produced by the adrenal gland do not cross the blood-brain barrier, norepinephrine produced in the locus coeruleus of the brain serves to promote vigilance, arousal and narrowing of attention (de Kloet, 2003).

The HPA axis, the more widely studied system of stress response, produces glucocorticoids (cortisol in humans) which, unlike adrenalin, target the brain. This system, triggered by the effects of SAM mechanisms, begins with the hypothalamus' release of cortico-

tropin releasing hormone (CRH) triggering the subsequent release of adrenocorticotropic

hormone (ACTH) from the pituitary gland which then stimulates the release of glucocorticoids

from the adrenal cortex (Lupien et al., 2005). The HPA axis both supports the fight/flight

response and also serves to suppress the impact of fight/flight reactions (Gunnar & Quevedo,

2007; Meaney, 2001). One effect of HPA activation is its minimization of neural and

physiological functions that do not service the defense response as a means to conserve energy.

Of particular relevance in educational contexts is the impact of this system on rational thought.

Deemed less essential in what are perceived as life-threatening circumstances, executive function

capabilities such as planning, self-monitoring, and reflection, are impaired when the defense

response is engaged (LeDoux, 2015).

Maintaining one's viability through the activation of this stress response system to deal

with stressors is referred to as allostasis and the physiological wear and tear that results from

their frequent activation is known as the "allostatic load" (McEwan & Seeman, 1999). There is

considerable variation among individuals in the reactivity of their stress response and ongoing

allostatic load. While temperament may lead to naturally occurring differences in stress response

reactivity in humans (Gunnar & Quevedo, 2007), the external stress regulation provided by early

caregivers and the experience of trauma in the early years, a time when this neural circuitry is

first wired, are both widely regarded to impact a child's developing stress response (Dettling et

al., 2000; Fisher, Kim, & Pears, 2009; Flory et al., 2009; Tarullo & Gunnar, 2014; Thompson,

2014).

The Impact of Excessive Stress on Child Behaviour

The reactivity of one's stress response is highly individualized. Genetics, temperament,

and early caregiving all influence its development in young children (Thompson, 2014). Further,

an individual's particular profile of stressors (what engages their stress response) is also highly individualized. What one individual experiences as stress, another can experience as calming, something especially true for sensory experiences where, for example, bright lighting or noise may be aversive for some but desired for others (Delahooke, 2017; Shanker, 2016). When the stress response is engaged and cortisol is released by the adrenal cortex of the HPA axis, it normally binds quickly onto receptors and the concentration of cortisol in the body reduces to normal levels as the threat passes. When stress is chronic however, high levels of cortisol may remain active in the system. Salivary cortisol as a measure for unbound or "free" cortisol has been widely used as a biomarker of HPA axis activity (Jessop & Turner-Cobb, 2008; Keil, 2012). High levels of cortisol in children have been shown to relate to certain aspects of cognitive and socio-emotional functioning. Specifically, high cortisol in children is associated with deficits in visual and verbal memory (Heffelfinger & Newcomer, 2001; Lupien et al., 2005; Quesada, Wiemers, Schoofs, & Wolf, 2012), working memory for numbers, words, and quantitative concepts that relate to general math deficiencies (MacKinnon-McQuarrie, Siegel, Perry, & Weinberg, 2014). The socio-emotional effects of high cortisol include social difficulties (Mathewson et al., 2012; Smider et al., 2002), peer rejection (Gunnar, Sebanc, Tout, Donzella, & Dulman, 2004), self-regulation problems (Blair, et al., 2005), and student misconduct (Ruttle et al., 2011). Thompson (2014) summarizes that under conditions of high stress, cortisol's general effect of heightened vigilance may lead to downstream problems with memory, attention, poor emotional regulation, and poor social functioning in children. More recently, Marin, Raymond, and Lupien (2019) note that while cortisol's effect of increased vigilance can be beneficial, under high stress, the increased attention may be biased toward negative information in order to maximize survival.

Overall, these studies suggest that stress that exceeds a child's adaptive capacity, leading to excessive cortisol in his or her system, affects the child's ability to remember things, maintain positive relations with peers, and self-regulate – all behaviours that are considered to be maladaptive in classrooms. This association between child stress and maladaptive classroom behaviour suggests that excessive stress undermines a child's potential to achieve positive relationships with their educators. The downstream impact of child stress on STRs is particularly relevant in classrooms where these maladaptive behaviours may be interpreted by educators as intentional misbehaviours, perceived for example, as defiance or aggression. Such perceptions are quite likely given Nash et al.'s (2015) finding that 86% of primary teachers believe that children choose to be disruptive, even though science explaining the neurophysiology of stress and its impact on behaviour tells us otherwise. Maladaptive behaviour may not be a choice, but may be the effect of an overtaxed stress response system.

Relationships and the Stress Response

Animal and human studies over recent decades have shown that the neurobiological response to stress, and specifically the functioning of the HPA axis, can be modified and even reversed through responsive relationships. These studies generally fall under two broad methodological categories: those which correlate cortisol levels with different caregiving styles, and those which aim to improve HPA axis functioning by manipulating the responsiveness variable.

Perhaps the earliest research to examine the association between relationships and stress response involves work with rats. The postnatal handling of rat pups during the first weeks of life lowers the reactivity of their stress response (Hutchings, 1963; Levine, 1957). Meaney's (2001) work extends this research to demonstrate that maternal licking and grooming in rat pups

significantly dampens the pups HPA activity and reduces the release of cortisol. Specifically, rats that experience more grooming by their mother have lower levels of cortisol in their systems (Meaney, 2001).

In human research work, a strong relationship has been found between the quality of relationships and cortisol levels in children. Secure attachment relationships buffer infants from elevated cortisol under stressful conditions and maternal responsiveness is related to lower cortisol levels (Gunnar, Brodersen, Nachmias, Buss, & Rigatuso, 1996). Similarly, middle-school aged girls with secure attachment patterns to their mother, show lower cortisol than controls when they are given access to their mothers following stress induction than a control group with no access to their mother (Seltzer, Ziegler, & Pollack, 2010). For middle-school aged children, peers buffer the reactivity of the HPA axis. Children who are excluded by peers have higher levels of cortisol at school, an effect that is significantly reduced for excluded children who have more friends or better quality friendships (Peters, Riksen-Walraven, Cillessen, & de Weerth, 2011).

A focus on the HPA stress response in an educational context occurs largely in preschool settings. Dettling et al. (2000) report that in a United States home-based childcare, children's cortisol patterns correlate with the amount of positive attention the caregiver provided. Children in these settings show similar cortisol patterns at home and in care. On the other hand, children whose caregivers' rate low on positive attention measures show increased levels of cortisol over the day, while exhibiting normal cortisol patterns at home. This study, which controls for family and child characteristics, provides strong evidence for the effect of caregiving quality on cortisol release. A parallel study, based in Australia, corroborates these findings in that children attending high quality childcare, as measured by caregiver interactions, show lower stress levels across the

day than children in programs with adults who are observed as being unresponsive to their individual need (Sims et al., 2005). Similarly, first grade students with emotionally supportive teachers are better able to regulate stress (as measured by cortisol) than students who have a conflictual relationship with their teacher (Ahnert et al., 2012).

Collectively, these studies show that the stress response is strongly associated with relational input, prompting Hostinar, Sullivan, and Gunnar (2014) to remark that "discovering the stress-buffering effects of social relationships has been one of the major findings in psychobiology in the last century" (p. 1). Gunnar and Hostinar (2015) refer to this effect as "social buffering," a process through which the sensitive response of a significant other reduces the activity of stress-mediating neurobiological systems. In a classroom context, educators have the potential to be these social buffers, playing a potentially important role in the mediation of child stress and by extension, child behaviour.

Child Development as a Dyadic Phenomenon: From Bronfenbrenner to the Brain

The stress buffering potential of emotionally supportive relationships illustrates that, in a neurobiological sense, child development is a dyadic phenomenon. That is, the central nervous system, while framed by its genetic blueprint, develops in response to relational events with significant others. The idea that children develop in the context of relationships with the important adults in their life, in what Shonkoff and Phillips (2000) refer to as "serve and return" interactions, has roots in the bio-ecological framework of Urie Bronfenbrenner (1977; 1998). Bronfenbrenner contends that development is a bi-directional process: the child both influences, and is influenced by, the environment. Neuroscience scientifically substantiates this long-standing theoretical idea. In the field of neuroscience, children's brains in the early years are described as being experience-expectant, waiting for stimulation from more developmentally

advanced partners in order to develop optimally (Shonkoff et al., 2009). Likewise, the brain is

reported as being experience-dependent; each child's brain comes to reflect his or her unique

experiential history (Belsky & de Haan, 2011). Shanker (2016) asserts that the relational

connection between a child and a significant other is akin to an "interbrain," a term first

introduced by Tantam (2009) to describe the wireless "hook up" which tethers the undeveloped

child brain to its higher-order adult counterpart. The interbrain mechanism shapes how the

child's brain responds to external stimuli, contributing to the development of their stress

response system and hence their behavioural output (Schore, 2012; Shanker, 2016). As

articulated by Shanker (2016), through shared gaze, voice, and emotion, the interbrain "lays the

deep neurological, psychological and sensory circuitry for co-regulation" (p. 59). In time, the

circuits that are built based on these early co-regulatory events become the foundation of a

child's independent regulatory capacity, otherwise known as their stress response system (Perry,

2017).While the potential of the brain to respond to and be shaped by environmental stimulation

is life-long, the brain is most receptive to experience and relational input in the early years before

synaptic pruning, a process designed to improve brain efficiency by way of eliminating the

connective possibility of unconnected neurons (Belsky & de Haan, 2011; Perry, 2017; Shonkoff

& Phillips, 2000). Simply, relationships in the early years shape the neurophysiological systems

that underlie a child's behavior.

  In classrooms, educators constitute the higher-order adult brain in the interbrain construct

(Shanker, 2016). While children come to these settings with neurological systems partially

established based on their early relational interactions, these systems remain malleable and

responsive to relational input for a lifetime and particularly in the early years (Gunnar &

Hostinar, 2015; Gunnar & Quevedo, 2007). Knowledge of the development and functioning of

these physiological systems in an educational setting provides educators with a scientific lens that may enable a deeper, more informed, understanding of child behaviour. Moreover, this research highlights the potential role of educators in shaping these regulatory systems in the children they serve. Given the well-documented significance of STRs on a child's developmental and academic trajectories, it may be argued that the field of education has an epistemic responsibility (Code, 1987) to embrace and incorporate the implications of this neurophysiological research into both its theoretical endeavours and its frontline classroom practices. One way the field of education might achieve this is to adopt the neurophysiological view of self-regulation, a developmental construct that, although regarded as important to early education, remains conceptually elusive in pedagogical practice.

Self-Regulation in Educational Research and Practice

Even though self-regulation is widely recognized as important to early learning and development and the promotion of self-regulation has become a central goal in preschool and kindergarten settings (Blair & Diamond, 2008), there is considerable theoretical confusion surrounding the concept. An examination of the definition of self-regulation in use across a collection of studies examining its impact on early learning shows that it has been variously defined as behavioral control (Broekhuizen, Slot, Aken, & Dubas, 2017), attentional control (Garner & Waajid, 2012), emotional competence (Garner & Waajid, 2012), and executive function and learning capacity (Boekaerts & Cascallar, 2006; Dignath, Buettner, & Langfeldt, 2008). Indeed, a recent study by Burman, Green, and Shanker (2015) observes that there are 441 different terms associated with the word self-regulation in the psychological, peer-reviewed literature. Using a computerized analysis program, Burman et al. (2015) categorize these terms under the broad conceptual headings of agency, self-control, emotional control, personality, self-

monitoring, social behaviour, and executive function. Burman et al.'s (2015) study supports the notion that social science researchers are referring to a variety of theoretical ideas when they are studying what they refer to as self-regulation. Despite this theoretical confusion, the promotion of a child's self-regulation continues to be a primary goal in early educational settings. Self-regulation is not only a learning skill that is evaluated on the Provincial Report Card in Ontario, but is featured widely in the province's various early learning policy documents such as the *Early Years Policy Framework* (Ontario Ministry of Education, 2013), *Think, Feel, Act* (Ontario Ministry of Education, 2013), *How Does Learning Happen* (Ontario Ministry of Education, 2014), and the *Kindergarten Curriculum* (Ontario Ministry of Education, 2016). Yet, despite wide acknowledgement of its significance in the province of Ontario, professional learning on self-regulation for early years educators is not systematic across the province in either pre-service or in-service contexts. Given the lack of theoretical clarity in the research field, it is likely that early years educators, although mandated to evaluate and support self-regulation in the children they serve, hold mixed beliefs and thereby employ varied practices in the name of self-regulation. Indeed, Bodrova and Leong (2006) note that, while there is agreement among practitioners as to the significance of self-regulation in the classroom, there is no common understanding of what it is. Researchers examining the topic of self-regulation in early learning settings have explicitly called for professional development on this important, yet ill-defined, concept (Bodrova & Leong, 2006; Raver et al., 2012).

Professional Learning on Self-Regulation

The various interpretations of the self-regulation construct make it difficult to identify what educators should know about it and how they might promote self-regulation in their students (Bodrova & Leong, 2006). Indeed, the extent to which a program to promote educator

understanding of self-regulation is regarded as necessary is itself a function of how one defines the construct. For example, if self-regulation is perceived as a constitutional construct, based on temperament and reflective of personality, then it might be considered unamenable to educator intervention (Bodrova & Leong, 2006). Likewise when self-regulation is viewed as the consequence of brain maturation (Bronson, 2000), educator intervention may be seen as less efficacious prior to the development of the prefrontal cortex.

Tools of the Mind, a professional learning program based on self-regulation as a learned construct, focuses on the educator's role in promoting cognitive and socio-emotional regulation in children. This program, is based on the Vygotskian view of development as socially constructed. The program teaches educators that self-regulation is learned when children engage in informal interactions with peers or adults (Bodrova & Leong, 2006). In the program, in addition to engaging in "other-regulation" where an adult is assisting a child's regulation skills, the child is also encouraged to participate as the "regulator" with their peers. Professional learning for this program, which involves a three-day workshop at the beginning of the school year and half-day workshops three times during the school year, emphasizes the development of the teacher's ability to assess children's regulation capacities and to individualize activities to help children develop this skill. A study on the effectiveness of this approach on both child-outcomes and student-teacher interactions within seven programs involving 150 teachers and 2,500 students, indicates that *Tools of the Mind* training improves classroom quality and children's executive function as measured by scores on a problem behaviour scale (Barnett et al., 2008)

In an examination of the impact of educator self-regulatory capacities on child behaviour, Raver et al. (2012) note that a teacher's own regulatory capacity is an important, yet under-

recognized factor, in terms of the extent to which a new intervention is taken up and implemented. In what these authors refer to as a "teacher stressor cycle," the stress that is related to teacher dysregulation leads to emotional exhaustion and negative attributional biases which in turn, reinforce teachers' emotional withdrawal from students whose difficult behaviour first led to their stress (Raver et al., 2012). This detachment and negative bias then serves to reinforce the difficult child behaviour and undermines the self-regulation aims of the professional learning intervention. One widely held criticism of professional learning initiatives is that those most likely to attend are those who need it the least, yet Li-Grining et al. (2010) report that in their professional learning program to improve educator self-regulation, educators reporting the highest levels of work-related stress attended the most training sessions and were the most highly engaged. This finding mirrors a study by Domitrovich, Gest, Gill, Bierman, and Welsh (2009), in which teachers reporting high levels of emotional exhaustion were more involved in implementing a new classroom intervention than their less emotionally exhausted colleagues. These findings speak to the hopeful possibility that teachers who are most overwhelmed by child behaviour and personal stress, are most likely to seek the promise that new classroom strategies might hold.

Merging Neuroscience, STR Research, and Classroom Practice: The Promise of Self-Reg Theory

Although research has significantly advanced our understanding of the neurophysiological processes underlying child behaviour and the impact of relationships on these processes, these scientific understandings have not yet penetrated STR research or classroom practice. Self-regulation, a construct already recognized in education, albeit with little conceptual consistency, represents a potential avenue for aligning this neurophysiological research and

educational practice. Specifically, when self-regulation is understood as a neurophysiological concept, it captures recent learning regarding the dynamic interplay between a child's stress response system, the child's behaviour and learning, and relational input. One theory that approaches the self-regulation construct from this neurophysiological perspective and stands to contribute to this empirical marriage is Shanker's (2016) Self-Reg theory. This theory of self-regulation, which has been adopted by the Ontario Ministry of Education, rests on Cannon's (1929) original conception of stress as anything that, by virtue of engaging energy expensive neurophysiological systems, disrupts their smooth operation and the body's homeostasis (LeDoux, 2015). Accordingly, self-regulation in Shanker's model, is broadly explained as a function of the energy expenditure associated with the engagement of the child's stress response system and involves identifying and managing the highly individualized stressors implicated in a particular child's stress response (Shanker, 2016). Specifically, Self-Reg theory explains that the neurobiological processes associated with the experience of stress consume energy and, when in excess, impair executive functioning, ultimately impacting behavioural outcomes. Citing the neuroscientific literature, Shanker (2016) explains how the lower level neurophysiological systems that are associated with survival (i.e., fight or flight processes) take precedence over higher level thinking systems when the stress response is excessively engaged. With educators in mind, Shanker (2016) refers to these lower and higher order brain systems as the red and blue brain respectively and notes that when encumbered by too many stressors, the red brain becomes dominant in the child, leading to behaviour that is defensive, impulsive, and emotionally charged. Further, as the child's neurophysiological systems are naturally driven to reduce stress to maintain homestasis, the child may adopt maladaptive, often subconscious, ways of self-regulating (i.e., consuming sugar or playing video games) which, while possibly serving to

regulate the child in the moment, ultimately reduce opportunities for developing growth-promoting modes of self-regulation. In the view of Self-Reg theory, a child's misbehaviour is reframed as potential stress behaviour or a sign of maladaptive self-regulation (Shanker, 2016). This reframing of misbehaviour as stress behavior, encourages educators to assist the child in reducing the stress that may be impinging on his or her nervous system and to help the child to developing adaptive mechanism for self-regulation, rather than discipline the behaviour in a frustrated fashion, a response that can serve to exacerbate the defensive behaviour of the child. Reflective of the neuroscience regarding the responsivity of the stress response to sensitive caregiving, a key mechanism for stress reduction in Self-Reg theory involves the provision of emotional support (Shanker, 2012; 2016).

In Self-Reg theory, stress is considered to be both an overt and hidden construct in children's lives. For example, the emotional stress associated with poor peer relations may be an obvious strain on a child, but bright lighting or loud noise may be draining a child's physiological systems without that child knowing. Just as a thermostat adjusts a furnace in order to maintain optimal room temperature, so do individual stressors trip our physiological thermostat to maintain optimal functioning (LeDoux, 2015; Shanker, 2016). Distinct from popular notions of stress as a psychosocial construct, this approach discusses stress as potentially rooted in five domains: biological (e.g., hunger, noise, light), cognitive (e.g., difficulty discerning patterns) emotional (e.g., feelings of sadness or anger), social (e.g., difficulty navigating interpersonal cues) and prosocial (e.g., difficulties in understanding another's feelings) (Shanker, 2016). Self-Reg explains the nature of stress across these domains and encourages educators to learn how to identify and respond to them for the children they work with. A key principle of Self-Reg theory is that stressors are highly individualized: what might

trigger one child's stress response, may have no effect on another. These individualized responses to environmental stimuli are a result of genetics, temperament, and experiential history (Thompson, 2014). A heightened stress response may be inborn or may be the result of early trauma or otherwise poor co-regulatory experiences in the early years when these processes are first wired in the brain (Gunnar & Quevedo, 2007).

Contrary to purely constitutional views of self-regulation, Self-Reg theory is formulated on the premise that the neurophysiological systems designed to keep one calm and focused are responsive to experience. That is, when a child's stressors are identified and reduced, the stress response system can be moderated, enabling the child to achieve the calm and focused state required for adaptive behaviour and cognitive functioning (Shanker, 2016). In this view, the educator's role in a child's self-regulatory capacities in the classroom is critical as an educator may identify and reduce stressors on a child and assist the child in doing this autonomously. Further, a trusted educator can serve as a signal of safety and dampen a child's triggered stress response both in the moment and over the long term. In accordance with interbrain theory, the educator's own regulation is crucial to the child's regulation capacity in the classroom; a dysregulated educator can become a source of threat to a child (Shanker, 2016; Tantam, 2018). Accordingly, Self-Reg theory further encourages each educator, as the adult component of the interbrain, to appreciate the impact of one's own regulation on child behaviour. As such, Self-Reg theory answers the call of Raver et al. (2012) to incorporate into professional learning on self-regulation the significance of the educator's own regulatory capacities on the classroom environment.

Summary

The research shows that relationships between young children and their teachers play a pivotal role in their achieving success at school by impacting academic, behavioural, and neurophysiological outcomes. Indeed, the hypothesis that early STRs relate to a child's growth and learning at school can be affirmed with near certainty. Investigation into how these relationships develop suggests that while they are a dynamic construct involving many variables including teacher stress and child stress, child behaviour serves a key role in the initial formation of this system. Despite the central role of child behaviour in the STR construct, and recent findings regarding the neurophysiological underpinnings of behaviour, intervention studies aimed at improving STRs have not addressed educator understanding of child behaviour. There is, therefore, a significant gap between what is known about the neurophysiological roots of behaviour and the professional preparation educators receive on how they might perceive and best respond to child behaviour in the classroom. As the need to comprehend child behaviour grows, so too does our potential to view it through a neurophysiological lens. Findings regarding the neurophysiology of stress, its impact on child behaviour and learning, and its receptivity to emotional support may provide a new way of understanding child behaviour and the impact of STRs. It is important to ascertain how to successfully extend teachers' thinking about self-regulation to include these neurophysiological ideas and it is toward this end that the present study will focus on the evaluation of an in-service professional learning program on Self-Reg theory to improve educator capacity to respond sensitively to children and to build supportive relationships.

CHAPTER 3

METHODOLOGY

This study has two components:

a) an exploratory examination of the STR variables of educator relationships with children, experience with challenging child behaviour, beliefs and practices regarding child behaviour, knowledge of self-regulation, and professional stress, and

b) an intervention designed to investigate whether participation in a professional learning program on Self Reg theory would impact these STR variables.

Study participants were convenience sampled from a cooperating regional child care agency. All early childhood educators employed by the agency were emailed an Educator Survey and the data of 104 eligible respondents were quantitatively analyzed to answer the initial research questions investigating the status of, and relationships among, the variables of interest. Of these 104 respondents, 42 indicated interest in participating in the professional learning (PL) phase of the study. These 42 participants were randomly assigned, with consideration for PL integrity, to either the PL or control group. Using a quasi-experimental pretest-posttest control group design (Campbell & Stanley, 1963) with a convergent mixed method component, this intervention phase of the study investigated the impact of a PL Self-Reg course on the STR

variables of interest. Research questions regarding the impact of the professional learning were quantitatively answered using pre and post survey data from the intervention subsample. This analysis was augmented by qualitative data gathered from PL participant site visits (conducted 4 weeks following PL) and PL participant focus group interviews (conducted 12 weeks following PL). These qualitative findings were used to expand upon the quantitative results regarding the impact of the PL (Creswell, 2012; Patton, 2015).

Participants

All 200 early childhood educators (ECEs) working within a large cooperating child services organization (see Appendix A for Letter of Access) in a suburban context in Ontario were invited to complete the Educator Survey via an online link that was sent to their workplace email. A total of 106 respondents completed the survey of which two were excluded based on having had prior professional learning on Self-Reg theory. The remaining 104 respondents met the inclusion criteria of having an ECE diploma and being a practicing early childhood educator (ECE) and constituted the final sample for the initial exploratory phase of this study.

In the Educator Survey, a final survey question asked respondents to indicate their interest in participating in a professional learning course pertaining to the survey's topics. This question allowed for the recruitment of a subsample of educators for the intervention phase of the study. A total of 42 survey respondents indicated an interest in the professional learning. These 42 practicing early childhood educators were randomly assigned to either a PL or control group. One participant who was originally placed in the PL group could not attend the date of the professional learning and was added to the control group. Twenty PL and 22 control participants consented to participate in the study. Details regarding the gender and years of work experience of participants as well as the age groupings of the children they worked with are presented in

Table 1. This table is organized by the participant sample for each of the exploratory and intervention phases of the study.

Table 1.

Summary of Educator Demographic Information

Characteristic	Exploratory Phase ($n = 104$)	
	(*n*)	%
Gender		
Male	2	.02
Female	102	98
Years Experience		
0-5	37	35.6
5-10	19	18.3
10-15	13	12.5
15-20	10	9.6
20 +	25	24
Age of Children		
Infants	3	3
Toddlers	28	26.9
Preschoolers	49	47.1
Kindergarten	18	17.3
Before/After School Program	6	5.9

	Intervention Phase			
	PL ($n = 20$)		Control ($n = 22$)	
	(*n*)	%	(*n*)	%
Gender				
Male	1	.05	0	0
Female	19	95	22	100
Years Experience				
0-5	5	25	6	27
5-10	3	15	3	15
10-15	2	10	4	18.1
15-20	3	15	2	9
20+	7	35	7	31.8
Age of Children				
Infants	0	0	0	0
Toddlers	7	35	6	27.3
Preschoolers	9	45	10	45.5
Kindergarten	4	20	5	22.7
Before/After School Program	0	0	1	5

The total number of children in exploratory participants' (n = 104) classrooms ranged from 3 to 30 with an average of 16 children per classroom. The total number of children in the intervention participants' (n = 42) classrooms ranged from 5 to 30 with an average of 17 children per classroom.

The full sample of 104 pre-intervention participants provided quantitative data for the exploratory research questions. The intervention subsample of 42 participants provided post-intervention quantitative data and of these, the 20 PL participants (i.e., those who received the professional learning intervention), also provided qualitative data for research questions regarding the impact of the professional learning course.

Procedures

The procedures for this study will be described in terms of its three phases: pre-intervention, intervention, and post-intervention. Pre-intervention involved both a pilot of the Educator Survey and its full administration in the cooperating child care agency. Survey respondents interested in the professional learning program were randomly assigned to PL and control groups for the intervention phase that involved delivery of the Self-Reg professional learning program and an associated site visit to PL participants. Finally, the post-intervention phase included a second administration of the Educator Survey to both PL and control participants as well as focus group interviews with PL participants. These phases and associated measures are outlined in Figure 1 below. A general timeline for these procedures can be found in Appendix B.
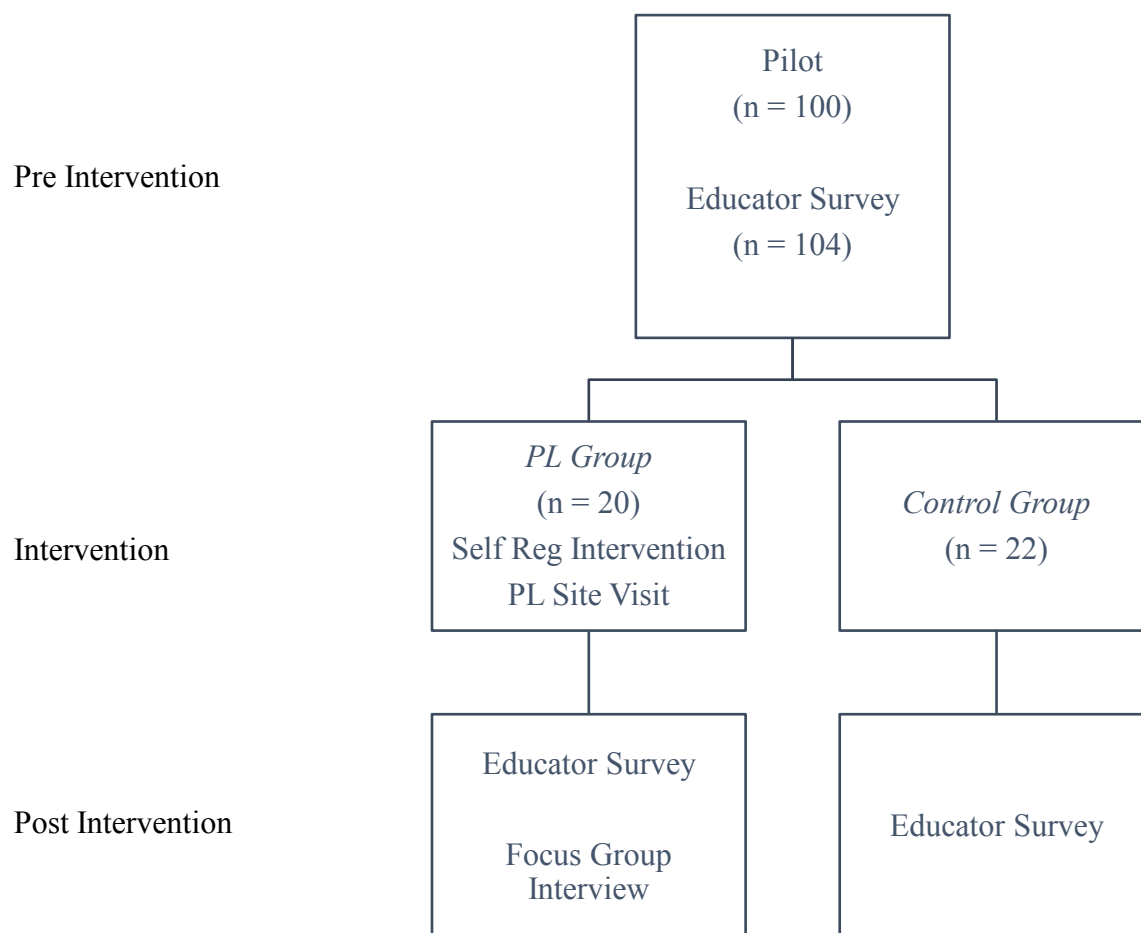
Figure 1. Study Phases and Measures

Pre-Intervention

The pre-intervention phase of the study consisted of two parts: a) a pilot study of the Educator Survey, and b) the administration of the finalized Educator Survey to ECE's in a cooperating child care agency. These are described below.

Survey pilot. The Educator Survey was piloted with 100 in-service early childhood educators working in the province of Ontario. Pilot participants were recruited with assistance from the AECEO (Association for Early Childhood Educators of Ontario) who posted the survey link on their social media website. Pilot participants were ECE's who followed AECEO on this social media outlet. The survey was posted for 5 days and was removed after 100 responses were

received. The pilot of the Educator Survey had two purposes: first, to identify areas where clarification in either instructions or items were needed, and, second, to assess the reliability of the researcher-constructed Beliefs Regarding Child Behaviour and Practices Regarding Child Behaviour scales. To obtain feedback on clarity, pilot participants were invited to provide remarks in an open comment section following each of the six sections of the survey. This feedback led to minor wording changes in eight items within the Beliefs scale and two items within the Practices scale. These wording changes reflected participant suggestions for improved clarity and none of the revisions impacted the nature of the item. Internal consistency of the 15-item Educator Beliefs Regarding Child Behaviour scale and the 15-item Educator Practices Regarding Child Behaviour scale was analyzed using Cronbach's Alpha and was found to be .77 and .75 respectively. These are considered acceptable reliability coefficients (Adams & Lawrence, 2015).

Survey administration. In March, the revised Educator Survey was emailed to 200 ECE's employed by the cooperating child care agency. This final version of the survey included a participant ID section asking participants to enter a unique 5-digit ID code using prompts for responses that would not change over the course of the study (e.g., first letter of mother's first name) to enable tracking of the pre and post data of intervention participants. The Letter of Information and Consent was embedded as the first page of the survey and respondents were asked to read and indicate agreement before proceeding (see Appendix C). The study was described as investigating educator experiences, beliefs, and practices in their work with children. Respondents were offered a $10 gift card as an incentive for survey completion. To receive this incentive, participants were asked to email the researcher to indicate they had completed the survey and through this correspondence, arrangements were made to mail out the

gift card. This process for gift card delivery maintained the anonymity of the respondent's survey data.

Participants who indicated an interest in the professional learning that was mentioned as a final survey item were taken to a separate online link where they were asked to provide contact information. By providing this information outside of the original survey, the anonymity of the respondent's survey data was protected. Participation in the professional learning course was encouraged by the regional employer who offered to provide a stipend to the workplace of participating ECE's to cover the cost of their replacement for the two professional learning days. Survey respondents who indicated an interest in participating in the intervention component of the study were randomly assigned (with conditions outlined below) to either a PL or control group.

To create PL and control groups, the names of interested participants were randomly drawn to be alternately placed in one then the other group. In the interest of internal validity, it was considered important that PL and control group participants did not work alongside each other in the same classroom as inadvertent sharing of learning might occur. To this end, if a name pulled for the control group was of an ECE who worked directly alongside a PL group member (or vice versa), that name was returned and another name was drawn. The employer, knowing the centre and classroom location of each participant, assisted in this group assignment process which continued until there were two groups of 21, where no control participants worked in the same classroom as a PL participant. Once these groups were established, these intervention participants were emailed a second Letter of Information and Consent pertaining specifically to the intervention phase of the study (see Appendix D). Following this communication with intervention participants, one participant originally assigned to the PL group was moved to the

control group due to an inability to attend the professional learning dates. For ethical reasons, all interested participants were advised they would receive the PL however, those identified as control participants received PL after data collection for the present study was completed. This post-intervention professional learning for control subjects was conducted as a courtesy and occurred outside of the parameters of this study. As all interested participants would receive the professional learning, groups were designated by the month in which their training would take place, namely, "June" and "October" rather than "PL" and "control" groups, in the Intervention Consent Letter.

Intervention

The intervention in this study consisted of a two-day professional learning course on Self-Reg theory and an associated site visit to participants. This course was developed and delivered with consideration for what is known regarding effective professional learning for educators. The processes for developing and delivering this course are discussed in turn below.

Development of the Self-Reg professional learning course. The professional learning on Self-Reg theory was developed by the researcher who, in addition to being a professor of Early Childhood Education specializing in human development, is a consultant for The Mehrit Centre (TMC), an internationally regarded organization that delivers online courses and professional presentations on Self-Reg theory to educators, parents, and community leaders. Various theoretical sources on the neurophysiology of behaviour were used to develop the two-day professional learning course, and videos and graphics from TMC were used to illustrate this theoretical information.

During the development process, considerable attention was paid to apply what is known about effective professional development for early years educators. Increased attention to the

impact of the early years on later learning and development has led to a proliferation in programs aimed at improving educators' ability to deliver quality early childhood education programs (Sheridan, Pope-Edwards, Marvin, & Knoche, 2009) and research on these professional learning programs has served to highlight the factors associated with their effectiveness. In their meta-analytic examination of this research, Sheridan et al. (2009) emphasize that professional learning courses should go beyond simple "information giving" to include demonstrations, practice, and feedback from the facilitator. To this end, the PL was designed to include several video and case study components. Additionally, participant reflection on personal experience as it applied to the content was built into each segment of the professional learning in order to encourage meaningful engagement with the theory (Guskey, 2000; Sheridan et al., 2009). These reflective components were intentionally designed to recognize and incorporate the existing experience and knowledge of the educators so as to encourage processing of the new information into existing personal schemas, a mechanism used to improve retention (Schachter, 2015; Downer, Jamil, Maier, & Pianta, 2012).

Perhaps one of the most notable factors for effective professional learning interventions, is the ability of the facilitator to establish a positive relationship with participants (Gallacher, 1997; Guskey, 2000; Sheridan et al., 2009). As noted by Green, Everhart, Gordon and Garcia-Gettman (2006), the establishment of a positive relationship is essential to meeting the goals of the training, influencing, for example, whether or not the instruction is received in a favourable way. The facilitator's long-held belief that successful learning at all ages occurs in the context of trusting and safe relationships was explicitly and implicitly embedded into the development and delivery of all aspects of the professional learning. The facilitator worked to develop a collegial learning environment and incorporated elements of self-disclosure throughout the program so as

to be seen as an authentic learning partner (Rogers, 1969). Also, in recognition of the fact that early childhood educators take part in many training programs that offer varied and sometimes contradictory strategies for working with young children as part of their ongoing registration with the Ontario College of Early Childhood Educators, this professional learning was intentionally designed so as not to be another of these strategy-based programs. That is, the intention of the Self-Reg professional learning was to share current information from the field of neuroscience in order to gently nudge knowledge, with the underlying belief that new knowledge might naturally shift perspective and inform practice. Because this professional learning was not developed or delivered as a packaged program but rather as an information sharing session that might enable a new way of seeing child behaviour (i.e., through a neurophysiological lens), it was anticipated that it would not be perceived as being in competition with the various existing programs that educators might be employing.

An additional feature of the professional learning, designed in part to promote a positive relationship between the facilitator and the learner, was the inclusion of a coaching, or site visit component. There is general consensus in the literature that the inclusion of such a component serves to extend the length of the relationship between educator and participant and is more effective than traditional professional development alone (Domitrovich et al., 2012). As noted by Domitrovich et al. (2012), "the longer engagement in professional development that coaching offers provides an opportunity for a more positive relationship to be created" (p. 81). Beyond the opportunity to establish a relationship over time, site visits were included to provide a chance for the facilitator to offer feedback and support to the learner in the work environment (Powell, Diamond, & Burchinal, 2012). Notes taken during these visits also served as qualitative data for the study.

Finally, Guskey (2000) notes that the most effective professional learning programs focus on attending to the basic human needs of participants and these were considered in the design of the professional learning. Morning and afternoon refreshments as well as a nutritional lunch were provided on both days. Further, the course took place in the cooperating agency's boardroom which was comfortably furnished, appropriately sized for 20 participants, and had adjustable controls for lighting and heating.

Delivery of Self-Reg professional learning intervention. The professional learning intervention was delivered in June by the researcher. The overall aim of the PL course was to share research on the science of stress and its impact on child behaviour, as framed by Self-Reg theory, in order to shift educator knowledge and beliefs about why children behave as they do and to increase educator capacity to be emotionally supportive. Specifically, the content of the professional learning was designed to encourage educators to reframe children's behaviour as potentially related to the neurophysiological stress response system, and further to understand how this system can be predicated on, and assuaged by, emotional support of significant others (including educators). By encouraging educators to see child behaviour in this light, it was intended that the professional learning would lead to a more compassionate teacher-child interaction, which would in turn, promote adaptive child behaviour and potentially lower teacher stress. This overall aim was captured by the guiding notion that when you see a child differently, you see a different child (Shanker, 2016) and, further, that when you see a child differently (i.e., as a biological being operating with a neurophysiological stress response system), you respond to him/her differently (with support versus punishment).

The professional learning course was offered across two consecutive workdays from 9:30 a.m. to 3:00 p.m. In addition to morning and afternoon refreshments and a full lunch, participants

were provided with a printed copy of the PowerPoint presentation, printed colour graphics of important theoretical concepts, coloured pens, a notepad, and a binder. At the end of Day 1, participants were given a copy of the book Self-Reg by Stuart Shanker and asked to read Chapter 1 for homework. A detailed overview of the two-day course can be found in Appendix E. A summary is provided below:

Day 1 of the course was titled *The Brain, Stress, and Self-Regulation: The Roots of Behaviour* and covered the following topics:

a) the brain and the nature of stress,

b) the nature of self-regulation

c) the five domains of stress, and

d) dynamic systems theory of stressors.

Videos, handouts, and practical, real life examples shared by both the facilitator and participants lent to the accessibility and applicability of the largely scientific information of this first day of learning. The theme of Day 1 was captured by the idea: Behaviour is not about character; it is about biology (Shanker, 2016).

Day 2 of the course was titled *Self-Reg in Practice: Reframing Child Behaviour* and included the topics of:

a) self-regulation versus self-control,

b) stress behaviour versus misbehaviour,

c) emotional support as a stress mediator, and

d) case study practice.

Day 2 was designed to encourage educators to reframe children's behaviour through a neurophysiology lens and included practical activities utilizing videos, scenarios, and case study

analyses. The theme of Day 2 was captured by the question: Why am I seeing this behaviour and why now? (Shanker, 2016).

Prior to the onset of learning, an informal introduction to the session was delivered. This 10-minute segment included an introduction to the researcher, her primary research interests, and a few personal details including the mention of her two daughters who came to be featured in stories shared to illustrate several of the theoretical concepts in the training. This introduction also included a two-minute welcome video from Stuart Shanker and Susan Hopkins, CEO and Executive Director of The Mehrit Centre respectively. This video emphasized the importance of the work of ECE's and expressed gratitude for the participants' commitment to the profession. Following this, the researcher reiterated the importance of the participants' work by sharing findings from research showing the impact that early years educators have on the short and long-term academic and developmental trajectories of children. The researcher offered to share links to this literature and five participants requested these studies. The professional learning session was presented as a knowledge-sharing session that might help participants to better understand the children they serve from a neurophysiological lens. It was made clear that the professional learning was not a program they were being asked to adopt. The instructional tone typical of many professional learning workshops was intentionally replaced with one of partnership and information exchange. This tone was achieved through introductory comments such as:

I am here to share what we have learned in regards to neurophysiology and child behaviour. It is very difficult to keep up with this science as it evolves so quickly and we are all busy! I will not be telling you what to do, but rather I hope the information might change what you see when you look at the challenging behaviour of children. The thinking is that, if your perception changes as a result of new knowledge, what you do

with children will shift naturally. As I spend my time as an educator teaching young

adults, I hope to learn as much from you about your experience with children as you may

learn from me.

In general, the delivery of the professional learning content was flexible. Specifically,

participants were encouraged to ask questions as the professional learning proceeded and the

facilitator occasionally adapted content to meet the needs of participants. For example, it became

evident early on Day 1 that many participants did not have an understanding of early brain

development and as this knowledge was considered foundational to the professional learning,

some time was taken to explain brain development processes. Also, relevant facilitator and

participant stories that illustrated the theoretical concepts being discussed were spontaneously

shared.

PL Site visit. Consistent with the positive benefits of coaching and the establishment of

an ongoing relationship between facilitator and learner in professional learning programs (Powell

et al., 2012), the PL in the present study included one 30-minute follow-up visit to the

participant's work site approximately 4 weeks following the professional learning. Site visits

served the dual purpose of providing an opportunity for participants to ask questions regarding

the application of PL content to their practice allowing the researcher to take notes which

provided qualitative data for research questions related to the impact of the PL. These visits were

scheduled at a time when the educator could be available outside of the classroom (e.g., lunch

break) and were conducted using a conversational style approach (Patton, 2015). Given its

additional purpose as a data source, further details regarding the PL site visit are provided under

the heading Data Collection Tools.

Post Intervention

All PL and control participants were asked to re-take the Educator Survey in September, three months following the professional learning intervention. These 42 participants were sent an online link to the Educator Survey via their workplace email. Survey completion was encouraged with a $10 gift card incentive. Arrangements for the delivery of the gift card were made outside of the survey, via email exchange, to maintain the anonymity of respondent data. Following the re-administration of the Educator Survey, PL participants were invited by email to attend one of two 90-minute focus group interviews which were held at the end of two workdays within the same week at the headquarters of the cooperating child care service agency. Participants were invited to attend the date that was most convenient for them. Dinner and refreshments were served at these focus groups. In order to ensure anonymity of participants in these audio-recorded sessions, participants were assigned a number to replace their name. These numbers were displayed on a tent card that participants placed in front of them. A research assistant took notes on non-verbal cues that would not be detectable in the audio recording. Given its purpose as a source of qualitative data, additional information on these focus groups is provided under the heading Data Collection Tools.

In the interest of providing the professional learning to all of those who had expressed an interest, a second professional learning was offered for control participants following the completion of data collection for the present study. This occurred approximately 4 weeks following post-intervention survey administration. This professional learning, which was done as a courtesy, served to bolster relationships with control participants who may have otherwise felt that their desire to participate in the professional learning had been compromised for the sake of experimental procedure (i.e., the need for a control group). This courtesy proved to be important

to achieving a full response rate to the post administration of the Educator Survey as it served to maintain the engagement of control group members in the study.

Data Collection Tools

The present study employed three data collection tools: a) an Educator Survey (delivered online pre and post intervention), b) a site visit to each PL participant (post-intervention), and c) focus group interviews with PL participants (post-intervention). These are described in turn below.

The Educator Survey

The Educator Survey is a researcher-constructed survey that consists of six sections designed to gather data on participant background as well as the study's main variables of interest (see Appendix F). The six sections of the Educator Survey are: 1) Background Information (includes one item for each of the variables of experience with challenging child behaviour and relationships with children), 2) Beliefs Regarding Child Behaviour, 3) Practices Regarding Child Behaviour, 4) Beliefs Regarding Self-Regulation, 5) Professional Stress—Maslach Burnout Inventory (MBI), and 6) Further Participation. In total, the Educator Survey includes 64 items and took respondents approximately 20 minutes to complete.

Section one: Background information, experience with challenging behaviour, and relationships with children. This section of the survey includes nine items in total. Items 1 and 2 are exclusion items and ask whether the respondent is a practicing ECE and if the respondent had any prior professional learning on Self-Reg theory. Items 3 to 7 gather relevant demographic and professional information, and the final two items in this section pertain to two of the study's variables of interest: a) educator experience with challenging child behaviour, and b) educator relationships with children.

To gather data on educator experience with challenging behaviour, Item 8 asks respondents to identify the number of children in their current classroom who display each of the eight challenging behaviours that is listed. There is also an open "other" field in the event a challenging behaviour the educator is experiencing is not listed. While there can be many interpretations of challenging behaviour, Smith and Fox (2003) define challenging behaviour in preschool children as "any repeated pattern of behavior, or perception of behaviour, that interferes with or is at risk of interfering with optimal learning or engagement in prosocial interactions with peers and adults" (p. 7). In their comprehensive report that investigates current knowledge and service systems regarding challenging child behaviour in preschool children, these researchers categorize challenging behaviour for preschoolers as: disrupted sleeping and eating routines, physical and verbal aggression, property destruction, severe tantrums, self-injury, noncompliance, and withdrawal (Smith & Fox, 2003). The Educator Survey utilizes these broadly accepted categories of challenging behaviour (Powell, Dunlap, & Fox, 2006).

In order to gather data on educator relationships with children, Item 9 asks respondents to indicate the number of students in their current classroom that fall into each of four relationship categories listed: very close, close, conflictual, and very conflictual. These categories and their descriptions represent a blended adaption of research by Yoon (2002) and Pianta (2001). In her work in classifying educator relationships with students, Yoon (2002) asks educators to describe this relationship using one of four categories: "a very good relationship with them," "a good relationship with them," "a negative relationship with them" and "a very negative relationship with them." The Educator Survey uses these four delineations but replaces Yoon's language with that found in Pianta's widely used Student-Teacher Relationship Scale (STRS) survey (Birch & Ladd, 1998; Hamre & Pianta, 2005; Rudasill et al., 2010). Specifically, Pianta describes student-

teacher relationships in terms of closeness versus conflict and the item descriptors from his STRS scale were used here to describe the nature of relationships on four levels ranging from very close to very conflictual. While the STRS is typically administered to teachers to gather data on relationships with individual children, it was considered reasonable for the purpose of the present study, which considers relationships in aggregate, for educators to indicate the total number of students in each of the four categories.

Section two: Beliefs regarding child behaviour. This section of the survey contains 15 researcher-constructed items designed to collect data on educator beliefs regarding child behaviour. Items within this section measure the degree to which educators report believing child behaviour is a consequence of the child's capacity for self-control (items 1, 3, 5, 6, 8, 10, 11, 12) versus their neurophysiology (2, 4, 7, 9, 13 14, 15). Until recently, the prevailing view in developmental and popular psychology has been that behavioural control is a cognitive, or executive function, capacity (Diamond & Lee, 2011; Hofmann, Schmeichel, & Baddeley, 2012; Marotz & Allen, 2013). Educational research examining educator views on this issue is limited, but a recent study by Nash et al. (2015) reveals that a large percentage of primary educators believe that children are in control of their behaviour and that misbehavior is a choice. This view is now being challenged by recent findings which reveal that the limbic, or emotional centre of the brain, drives executive function and self-control capacities, and that this limbic brain is in turn, driven by one's neurophysiological response to stress (Gunnar & Hostinar, 2015; Gunnar & Quevedo, 2007; Shanker, 2016). This latter research was central to the professional learning intervention in this study. Items included in this section are intended to capture educator beliefs with regards to these two different interpretations of behaviour. Educators were asked to indicate their level of agreement to each item on a 5-point Likert scale ranging from "strongly disagree"

to "strongly agree." Items 2, 4, 7, 9, 13, 14, and 15, which represent a view of behaviour as a neurophysiological phenomenon, were reverse scored. Responses on these items were totalled to calculate an overall score on this variable for each respondent. Higher scores on this measure represent a stronger belief that children are in control of their behaviour and therefore choosing to misbehave.

     Section three: Practices regarding child behaviour. This section of the survey contains 15 researcher-constructed items designed to collect data on educator practices regarding child behaviour. Items in this section measure the degree to which educators report engaging in a thoughtful, emotionally supportive, and individualized way versus a more reflexive, discipline based, and standardized fashion when responding to challenging child behaviour. Items within this scale are based on research that describes what emotionally supportive responses to children look like in practice. Specifically, items 1, 4, 7 and 10 reflect the methodologies of intervention studies aimed at improving the emotional support provided by educators (Hamre & Pianta, 2005; Rimm-Kaufman, Voorhees, Snell, & Paro, 2003). Items 6 and 15 are adapted from Arnett's Caregiver Interaction Scale (1989) which is designed to measure emotional tone, disciplinary style and the responsiveness of the educator. Items 3, 5, 8, and 12 reflect Shanker's (2016) idea that a key component of responsive educator practices regarding child behaviour involves the educator pausing to ask him or herself why this behaviour might have occurred before responding. Finally, items 2, 9, 11, 13 and 14 reflect a report published by the Irish National Teachers Organization (2004) that outlines strategies for teachers on how to respond to challenging child behaviour. Although this report is particular to the early educators of Ireland, it is reasonable to believe that it can be applied to Canadian practices as both education systems were developed under the British Commonwealth and the countries share cultural and political

traditions (Government of Canada, 2014). For each item, educators were asked to indicate their response on a 5-point Likert scale ranging from "never" to "always." Items 3, 4, 5, 6, 8, and 12 which represent emotionally supportive interactions were reverse scored. Responses on these items were totalled to calculate an overall score on this variable for each respondent. Higher scores on this measure represent more standardized, discipline-based practices in response to challenging child behaviour.

Section four: Beliefs regarding self-regulation. This section of the survey contains one item designed to capture educator thoughts on the definition of self-regulation. This item asks respondents to select the one definition from a list of eight that they consider to best reflect their beliefs about the self-regulation construct. The development of these eight definitions was guided by the work of Burman et al. (2015) who, in seeking conceptual clarity of the construct, examined the "multiple discursive meanings" of self-regulation in the peer reviewed literature (p. 1508). This analysis uncovered that the meaning of self-regulation is interpretable through seven related terms: agency, emotional regulation, self-control, self-management, self-monitoring (i.e., self-observation), self-monitoring (i.e., personality) and self-regulated learning. Accordingly, each of the listed definitions for this item reflects one of these terms. The eighth definition reflecting self-regulation as defined by Shanker (2016) and the Ontario Ministry of Education early learning curriculum and policy documents, interprets self-regulation in relation to one's neurophysiological energy use in response to stress. Responses to this item (coded as 1 to 7) enabled examination of educators' interpretation of the self-regulation construct (i.e., the frequency with which various definitions were reported). The categorical coding of responses, (such that the neurophysiological definition was coded as 1 and other definitions were coded as

0), enabled statistical examination of this item in both the exploratory and intervention research questions.

   Section five: Professional stress—Maslach Burnout Inventory (MBI). This section of the Educator Survey contains all 22 items of the Maslach Burnout Inventory—Educator Survey (MBI-ES) developed by Maslach, Jackson, and Leiter (1997). A license to use the MBI-ES for use in this study was purchased from Mind Garden in June 2017. The MBI-ES is a widely used measure of stress in educators and has been used extensively in studies involving stress within early childhood educator populations (Boyd & Pasley, 1989; Lovgren, 2016; Nislin et al., 2016; Townley, Thornburg, & Crompton, 1991; Tsigilis, Zachopoulou, & Grammatikopoulos, 2006). The MBI-ES measures three aspects of burnout in educators: emotional exhaustion, depersonalization, and lack of personal accomplishment. Each aspect is measured by several items that are used to determine three subscale scores. The Emotional Exhaustion subscale (items 1, 2, 3, 6, 8, 13, 14 and 16) measures feelings of being emotionally overextended and exhausted by one's work and the depletion of emotional energy. The Depersonalization subscale (items 5, 10, 11, 15, and 22) measures an unfeeling and impersonal response toward students, and the Personal Accomplishment subscale (items 4, 7, 9, 12, 17, 18, 19, and 21) measures feelings of competence and successful achievement in one's work with students (Maslach, Jackson & Leiter, 1997). Iwanicki and Schwab (1981) have reported Cronbach alpha estimates of .90 for the Emotional Exhaustion subscale, .76 for the Depersonalization subscale, and .76 for the Personal Accomplishment subscale. Evidence for the validity of the MBI-ES comes from studies that relate scores on the three subscales to scores on similar assessments (Maslach, Jackson & Leiter, 1997). For example, Tsigilis et al. (2006) show that scores for early childhood educators on the Emotional Exhaustion subscale correlate significantly with scores on a job satisfaction inventory.

Similarly, Boyd and Pasley (1989) report that scores on the Emotional Exhaustion subscale correlate significantly with measures of feelings of competence and feeling supported at work. Items on the MBI-ES are written in the form of statements about personal feelings or attitudes about their work (e.g., "I feel emotionally drained by my work") and respondents score each item on a 7-point scale ranging from "never" to "every day." The MBI produces a score on each subscale for each respondent. Higher scores on the Emotional Exhaustion and Depersonalization subscales indicate a higher degree of burnout and lower scores on the Personal Accomplishment subscale indicate a higher degree of burnout.

Section six: Further participation. This section of the Educator Survey contains two items designed to recruit participants for the intervention component of the study. These items ask respondents to indicate interest in further participation and if they are interested, to link to another webpage to provide contact information. Linking to a separate page to enter contact information ensured that survey responses for these individuals remained anonymous.

Site Visit

As part of the professional learning intervention, approximately four to six weeks following the PL, the researcher visited each of the 20 PL participant in their workplace at a time that was convenient for them. These visits were designed to be an informal check-in with the participant to answer any questions they had with regards to the PL learning and its application and served the additional purposes of both extending the researcher-participant relationship and gathering qualitative data regarding the impact of PL. As such, these visits took place in a space outside of the classroom and were conducted using a dialogic interview style (Boeree, 1998). This conversational style was chosen so as to create an informal, friendly, and non-threatening mood that mirrored the mood of the professional learning session and invited unguarded

exchange. To this end, the researcher took minimal notes during her time with the ECE and made a more thorough account of the conversation once she returned to her car. Visit times were coordinated through the centre's Director who ensured the ECE could be released from classroom duties to meet with the researcher.

Discussion during these visits generally began with two standard introductory questions posed by the researcher, namely, "How have you been?" and "Can I support you with anything we discussed in our training session?" Other than these standard introductory prompts, these conversational meetings relied on the "spontaneous generation of questions in the natural flow of interaction" (Patton, 2015, p. 437) and allowed participants to pursue topics and ideas of interest to them. If discussion waned, the researcher posed questions (still in conversational style) based on research questions aimed at uncovering the impact of the professional learning such as "Have you noticed any change in your beliefs or practices with children where challenging behaviour is concerned? Have you noticed any change in your relationships with children? Have you noticed any change in your professional stress?" These visits ranged from 20 to 30 minutes in length and occurred over the course of two weeks. Notes from these site visits were later analyzed in conjunction with focus group data to answer research questions related to the impact of the PL course on the variables of interest.

Focus Group Interviews

Following post-intervention administration of the Educator Survey (and three months following PL), focus group interviews were scheduled with PL participants in order to gather a deeper level of educator thoughts, feelings, and impressions regarding the impact of the intervention than would have been possible through survey data alone. Different from the PL site visit, these group interviews were designed and conducted with the specific research questions in

mind. Professional Learning participants were invited by email to attend one of two sessions scheduled at the end of two separate work days within the same week at the cooperating agency's headquarters. There were seven and eleven PL participants respectively in each of the scheduled sessions. Two PL participants were unable to attend either of the days. Consent to participate in the focus group interview was part of the consent letter associated with participation in the intervention phase of the study (see Appendix D).

Comfort and collegiality were considered paramount in these peer group discussions and to this end, the researcher, who also served as moderator, began the sessions by allowing participants to re-introduce themselves to each other and to update the group on any work stories (e.g., children featured as case studies) that arose as part of the PL intervention. This update included the moderator's own update on the status of her children that she used as examples in the PL session. Participants were seated in a U-shape which allowed them to see and interact with each other, promoting comradery and "checks and balances" on extreme views as suggested by Patton (2013). To encourage cognitive comfort, the moderator provided pens and paper to participants to allow them to organize their thoughts and ideas on each question before sharing their response verbally if they chose, so as to alleviate the discomfort that may be associated with speaking "off the cuff." Snacks and drinks were provided, and natural lighting and a moderate temperature was maintained to promote the physical comfort of participants. Confidentiality was also ensured from the onset. As focus groups were audio-recorded, participants were given a number on a tent card which they propped in front of them. Participants were asked to refer to each other by this number throughout the session in order that speakers not be identified by name on the audio-recording.

As the purpose of these group interviews was to collect qualitative data on the research questions related to the impact of the PL intervention on educator beliefs and practices regarding child behaviour, relationships with children, knowledge of self-regulation, and professional stress, the focus group discussion was framed by these research questions:

1. How might you describe your beliefs about child behaviour before and after the professional learning course?

2. How might you describe changes in your practices regarding child behaviour before and after the professional learning course?

3. Would you say there has been any change in the nature of your relationships with students following the professional learning course?

4. Have your beliefs about the concept of self-regulation changed following the professional learning course?

5. Have you noticed any change in your level of professional stress following the professional learning course?

These open-ended questions were designed to "establish the territory" but also to allow a participant to "take the direction he or she wants" (Seidman, 2006, p. 85). Each question was projected on a large screen for the duration of its discussion and as dialogue on each question tapered off, participants were asked if they had any final thoughts on the question before the next one was displayed. An assistant was present to take notes on the proceedings. This assistant noted, by the participant's number, when a new person began speaking and also recorded any interesting body language that supported or contradicted participants' verbal contributions. Throughout, the moderator worked to promote the inner versus public voice of participants (Seidman, 2006) by listening for vague language and encouraging deeper, more specific

reflection as required. The first focus group involving seven participants was approximately 60 minutes long and the second focus group with eleven participants was approximately 90 minutes long. Focus group data were analyzed in conjunction with site visit data to provide insight into research questions related to the impact of the PL.

Data Analysis

In order to answer questions related to the exploration of the variables of interest (i.e., educator relationships with students, experience regarding challenging child behaviour, beliefs and practices regarding child behaviour, beliefs about self-regulation, and professional stress), pre-intervention survey data from 104 respondents were statistically analyzed using SPSS software. In order to answer questions related to the impact of the Self-Reg professional learning course on these same variables, both pre and post intervention survey data and qualitative data collected from the PL site visits and focus groups with PL participants were examined. Consistent with the convergent, mixed-method approach, quantitative and qualitative data were analyzed separately and then considered together to find potential points of convergence (Creswell & Plano Clark, 2007). In this study, qualitative data was utilized in a supplemental fashion to provide a more comprehensive understanding of the impact of the professional learning than would be gained via quantitative data alone. These data analysis procedures, organized by their quantitative and qualitative nature, as well as the process of data integration are outlined below.

Quantitative Analysis

Exploratory research questions were answered using descriptive statistics, correlational analyses, and linear regressions. These analyses were performed utilizing the pre-intervention survey data from 104 respondents. Quantitative examination of the post-intervention questions

regarding the impact of the PL on variables of interest employed *t*-tests, ANOVA, and cross-

tabulation procedures. These analyses were performed on the pre and post survey data of the 42

intervention participants. Following is a discussion of how survey data were prepared for these

statistical procedures as well as details regarding the statistical procedures themselves.

Exploratory questions. Educator Survey data from the exploratory sample of 104

participants were used to answer the following research questions:

1. What are early childhood educators' experience with challenging child behaviour, their

   relationships with students, their beliefs and practices regarding child behaviour, their

   beliefs about self-regulation, and their professional stress all as reported prior to

   intervention?

2. Are the reported pre-intervention variables of early childhood educators' experience

   regarding challenging child behaviour, relationships with students, beliefs and practices

   regarding child behaviour, beliefs about self-regulation, and professional stress related? If

   so, how?

Prior to statistical analysis, survey data were checked for missing entries and extreme

outliers indicative of error in respondent entry. In cases where missing entries were presumed to

mean zero, such as where responses were in list format and entries were made in all other

presented options (e.g., how many children display each of the following challenging

behaviours?), a zero was entered. All other missing data were treated as missing and dealt with

using the 'missing listwise' function in SPSS. This function instructs SPSS to include only

variables with no missing values in the analyses. One extreme outlier was found in the item

asking respondents to enter the number of children in their classroom. In this case, a 56 was

replaced with the average number, 16, since it can be safely assumed that no early childhood

educator could have 56 children in one class. Following this, the raw data were transformed to create variables for analysis. First, in regards to item 8 which captured educator experience with challenging child behaviour, the number of children in each category was calculated relative to that educator's reported class size in order to determine a percentage of children in each category of challenging behaviour for each educator. The representation of this data in percentage form enabled the variation in class size to be removed and it allowed the calculation of a mean percentage for each category of challenging behaviour across educators.

A similar procedure was followed for item 9 which measured educator relationships with children. The number of students that educators identified within each category was calculated relative to the overall number of students in their classroom in order to derive a percentage score for each educator for each of the four categories of very close, close, conflictual and very conflictual relationships. As with the challenging behaviour variable, the conversion of this data to a percentage format enabled the removal of the influence of class size variation and also allowed the calculation of a total mean percentage for each category of this variable. Given the relatively small sample size and the intended use of this variable in data analysis, the present study combined very close and close categories to create a total close variable and combined very conflictual and conflictual categories to create a total conflictual variable. The STRS categories are frequently collapsed in this way when distinctions between the four levels may not be warranted (Birch & Ladd, 1998; Hamre & Pianta, 2005; Rudasill et al., 2010). For this study, which was interested in relationship quality in the context of various other measures, it was determined that two levels of relationship were sufficient.

Respondent data for section two of the survey, which was comprised of the educator beliefs regarding child behaviour scale, were totalled (items 2, 4, 7, 9, 13, 14, and 15 were

reverse scored) to tabulate an overall score on this measure for each participant. Higher scores on this measure represent a stronger belief that children are in control of their behaviour and therefore choosing to misbehave. Internal consistency of this 15-item scale was calculated using Cronbach's Alpha and was found to be .79. Similarly, responses to section three of the survey, which included the educator practices regarding child behaviour scale, were totalled (items 3, 4, 5, 6, 8, and 9 were reverse scored) to tabulate an overall score on this measure for each participant. Higher scores on this measure indicate more standardized, discipline-based practices in response to challenging child behaviour. Cronbach's Alpha for this 15-item scale was calculated as a measure of internal consistency and found to be .70.

In addition to analyzing the frequency of beliefs about self-regulation, the item asking respondents to choose a definition of self-regulation from those listed, was also examined in terms of its relationship to other variables. In order to conduct relational analyses, participant responses on this item were recoded as categorical data such that the definition of interest (i.e., self-regulation is the ability to be aware of energy use in response to stress and to recover from stress-related energy depletion) was coded as a 1, and all other definitions were coded as a 0.

Finally, scores for each of the three MBI subscales were totalled to provide three scores on each of the professional stress subscales of Emotional Exhaustion, Depersonalization and Personal Accomplishment. Chronbach alpha estimates were calculated on each of the subscales and found to be .89, .60, and .79 for the Emotional Exhaustion subscale, the Depersonalization subscale and the Personal Accomplishment subscale respectively. Due to the low reliability score on the Depersonalization subscale in the present study (a result mirrored in a study by Aiken and Poghosyan in 2009), this subscale was excluded from the ensuing statistical analyses leaving Emotional Exhaustion and Personal Accomplishment as the measures of professional stress.

Statistical procedures for exploratory questions. In order to answer the exploratory questions regarding interrelationships of the variables of interest in the present study, descriptive, correlational, and regression analyses were performed. An explanation of these statistical procedures and their suitability in regards to the present data set are discussed in turn below.

Descriptive statistics. In order to describe educator experience with regards to the variables of challenging child behaviour, relationships with children, beliefs and practices regarding child behaviour, beliefs regarding self-regulation, and professional stress, descriptive analyses on each of these variables were performed. For the challenging child behaviour and relationships variables, which were recoded as percentages to remove the influence of class size variation, mean percentages for each of the challenging behaviours and relationship categories were calculated. For the beliefs and practices variables, which were tabulated as total scores across each of the 15-item scales, the range and mean score were calculated. Additionally, the percentage of respondents who agreed or strongly agreed with each item on each of these scales was calculated to provide an overall impression of educator beliefs and practices regarding child behaviour. For beliefs regarding self-regulation, frequencies for each of the definitions were calculated to provide an overview of educator views on this variable. Finally mean scores for each of the MBI professional stress scales (i.e., Emotional Exhaustion, Depersonalization and Personal Accomplishment) were calculated and examined in the context of the MBI researcher-reported means but Depersonalization scores were disregarded due to low internal reliability.

Correlational analyses. To begin exploration of the relationships among the STR variables measured by the survey, a Pearson's product-moment correlational analysis was conducted that included all of the continuous variables in the study: eight challenging behaviour scores, total close scores, total conflict scores, beliefs and practices regarding child behaviour

scores, and emotional exhaustion and personal accomplishment scores as measures of professional stress. As this analysis describes the strength and the direction of the linear relationship between two variables (Pallant, 2015), it was utilized to gain a preliminary understanding of all of the possible associations between the variables under investigation.

Multiple regression analyses. In order to gain a deeper understanding of the relationships between the variables, and particularly the predictive potential of variables shown to be significant in correlational analyses, a series of standard multiple regression analyses were performed. By exploring the relationship between one continuous variable and a group of independent variables, this procedure analyzes the predictive power of a variable, or set of variables, in relation to a particular outcome variable of interest. A standard multiple regression, where all independent (or predictor) variables of interest were entered simultaneously, was used in this study as there were no theoretical grounds for entering the variables in a hierarchical fashion. This approach tells how much variance in the dependent variable is explained by the set of predictors entered and also how much unique variance in the dependent variable is explained by each of the independent variables (Pallant, 2010). As only continuous variables can be used in regression analyses, these tests excluded the categorical variable beliefs about self-regulation.

T-tests. In order to gain insight into whether educator beliefs about self-regulation, coded as a categorical variable, related to the other variables of interest, a series of independent samples t-tests were performed. Independent samples t-tests were selected as they allow the comparison of the mean scores of two different groups (Adams & Lawrence, 2015). In this case, educator scores on the STR variables for the group of educators who believed self-regulation to be a neurophysiological construct were compared to the scores of the group of educators who did not (i.e., had chosen another definition).

Impact of PL questions. Pre and post Educator Survey data from the 20 PL and 22 control participants and qualitative site visit and focus group data from PL participants were used to answer the following research questions:

3. Does participation in a professional learning course on Self-Reg theory change early childhood educator reported relationships with students?

4. Does participation in a professional learning course on Self-Reg theory change early childhood educator reported beliefs and practices regarding child behaviour?

5. Does participation in a professional learning course on Self-Reg theory change early childhood educator reported understanding of the concept of self-regulation?

6. Does participation in a professional learning course on Self-Reg theory change early educator reported level of professional stress?

In order to answer these questions regarding the impact of PL on the variables of interest, the pre and post survey data from the 20 PL and 22 control group participants were merged, using the unique ID code of participants, to create a second data file consisting of only intervention subjects. This involved locating the 42 intervention participants' survey data in the original data file of 104 respondents and merging it with the post administration file. Post survey data were differentiated from pre survey data in this data file by adding the number "2" to the variable names from the second administration before data integration from the two files occurred. The preparation of data in this data set (i.e., examination for missing data and outliers) and the transformation of variables then proceeded as described in the exploratory phase procedures.

Statistical procedures for impact of PL questions. Once the post-intervention data set was prepared, a variety of statistical analyses was performed to answer questions related to the

impact of the PL on the study's variables. These tests included t-test, ANOVA, and cross-tabulation analyses.

Independent samples t-tests. Before statistically analyzing the impact of the PL on the variables of interest by comparing the posttest scores of the PL and control groups, it first had to be established that there was no difference in the scores of these two groups on any of the variables prior to the intervention. To do this, a series of t-tests were conducted on the pre-intervention scores of the intervention group on all of the variables being investigated. The independent samples t-test is used to determine if there is a significant difference between the means of two groups (Adams & Lawrence, 2015).

Two-way ANOVA's. Following the establishment of no pre-intervention difference between the PL and control groups on the variables, a series of two-way ANOVAs with one between (i.e., group) and one within subject factor (i.e., time), was conducted on each of the continuous STR variables. This is an omnibus test that analyzes differences between groups pre-intervention (i.e., time 1), differences between groups post-intervention (i.e., time 2), and differences pre and post intervention for each group. This mixed ANOVA also tests the interaction of the two factors (i.e., group and time) on the dependent variable of interest which, if significant, can be further analyzed with a post-hoc follow up test. Running this single test over multiple sub-tests avoids the error associated with getting statistically significant results by chance alone (Adams & Lawrence, 2015).

Cross-tab. Finally, a crosstab using McNemar test was conducted to determine any impact of the PL on the categorical variable of beliefs regarding self-regulation. The cross tab test is used to determine differences over time for each of the PL and control group on the dichotomous self-regulation variable based on frequency counts. The significance of any

difference in change was then calculated using a follow up McNemar test which analyzes the difference in nominal data from dependent groups (Adams & Lawrence, 2015).

Qualitative Analysis

Data from both the focus group interviews and site visit notes were analyzed and examined in conjunction with quantitative data to answer research questions regarding the impact of the professional learning. This qualitative data provided additional insight into the impact of the professional learning. Examination of qualitative data began with third-party transcription of the two focus group sessions (each approximately 90 minutes in length and involving 7 and 11 participants respectively) in their entirety so as to avoid the imposition of the researcher's frame of reference (Seidman, 2006). As noted by Lapadat and Lindsay (1999), the process of transcribing is framed by the transcriber's theoretical position and while focus group data in the present study was transcribed by a third party, decisions with regard to the treatment of the transcripts were made by the researcher. First, it was decided that all data on the transcripts would be considered relevant, including the social talk at the beginning and end of the focus group sessions. Also, in order to account for visual data not captured on a verbal transcript, a research assistant noted any facial or body gestures that seemed to contradict or inform what participants were saying during the focus groups. These notes were considered when reading the transcripts and two participant comments were annotated as having been said with great excitement. Finally, to preserve "linguistic variety" (Baily, 2008) and the disposition of the speaker, no changes were made to grammatically incorrect utterances, even where they may have obscured meaning. Similarly, colloquialisms, false starts, and repetitions were retained (e.g., "he was, like he was having a bad day").

Site visit notes from meetings with the 20 PL participants were left in raw, hand-written form. Qualitative coding began with the focus group transcripts as they represented the larger of the two qualitative data sources. Categories deduced from the focus groups were then used to examine the researcher's hand-written site visit notes.

Focus group coding. The process of qualitative analysis began with the coding of the longer of the two focus group transcripts. Preliminary coding, which proceeded with research questions in mind, involved the jotting of notes in the margins of the transcripts of potentially relevant participant comments, specifically those that spoke to the impact of the professional learning. The actual words of participants, or in-vivo comments (Miles, Huberman, & Saldana, 2014), were noted in this first iteration of coding. Once the entire transcript was analyzed in this way, coding proceeded to the "axial" stage where similar in-vivo codes were grouped (Strauss & Corbin, 1998). This stage of coding went beyond noting the actual in-vivo comments to a more interpretive analysis wherein conceptually similar comments were categorized. The creation of categories followed Merriam and Tisdell's (2016) rules for category construction; categories were exhaustive, mutually exclusive, sensitive to the data, and conceptually congruent. Specifically, the categorization process continued until all noted in-vivo comments were included within a category. The codes within each category shared a conceptual underpinning with each other but not with those in other categories, and all categories were of the same level of conceptual abstraction (i.e., none was more specific or more general than another). The in-vivo comments within each category were then examined to identify potential subcategories where there were several comments that could themselves be grouped conceptually. Main categories were assigned a comprehensive heading that captured the essence of the in-vivo codes and sub-categories (where applicable). These main categories were then assigned a colour and

number. The transcript was then examined again and this time, annotated using this colour and number scheme, whereby comments demonstrative of a particular category were colour-underlined and numbered accordingly. This annotation process served the purpose of ensuring the capturing of all applicable comments, the comprehensiveness of the categories, and the visual representation of the frequency and depth of particular categories.

The second focus group transcript was then reviewed in constant-comparative style with these categories and subcategories in mind (Strauss & Corbin, 1998). Participant comments in the second transcript that fit the original categorical scheme were noted using the devised colour and numbering system. Next, and again with research questions in mind, this transcript was examined for any new comments that might not have been captured by the original categories but were considered relevant. These were noted in in-vivo style in the margins. These new in-vivo comments were then examined as to whether they warranted either the adjustment of an existing category or the creation of a new one. The categories from transcript one and two were then merged to create a master list of categories and subcategories.

Site visit coding. The initial coding of the site visit notes used the master list of categories and subcategories from the two focus group transcripts to read the site visit data in a constant comparative fashion. These data were annotated using the colour and number scheme of the master list of categories. Next, site visit data were examined for new comments that did not fit the original master list of categories but were considered relevant. Consideration was given as to whether existing categories could be adjusted to accommodate these new comments or whether the creation of a new category was warranted. A new category pertaining to the general effectiveness of the PL emerged from the site visit notes. This new category was then added to the master list. Focus group data were then re-scanned for any evidence of this new category and

any applicable in-vivo comments were noted and added to the master list. Following is the list of six categories and their subcategories:

1. Previous Beliefs About Child Behavior as Character-Based: Fixed Stance

2. Changed Beliefs about Child Behaviour as Changeable: Open Stance

   2.1 New Understanding of Behaviour

   2.2 Role of Neurophysiology in Child Behaviour (Brain and Stress)

3. Changed Beliefs in Regards to Self

   3.1 Understanding of Self/Personal Stress

   3.2 View of Others in Life

4. Changed Practices in Regards to Child Behaviour

   4.1 New Ways of Addressing Behaviour

   4.2 Less Labelling

   4.3 Role of Self in Child Behaviour and Changed Relational Practices

   4.4 General Classroom Practices

5. Knowledge Development

   5.1 New Knowledge about the Brain

   5.2 New Knowledge about Self-Regulation

6. Effectiveness of Professional Learning

The final master list of categories and subcategories, including exemplary in-vivo comments for each, can be found in Appendix G. This master list of categories and subcategories was used in conjunction with quantitative data to answer research questions related to the impact of the PL.

Theme development. From this master list of five categories and subcategories, a list of general themes was developed. In order to develop themes, the in-vivo comments beneath each category were examined with the following questions in mind:

a) Along what lines are these comments connected?

b) What general story do they tell in relation to the study's research questions?

c) What themes, if any, emerge from these categories that were unexpected or unrelated to the research questions?

From this analysis, five general themes representative of broad qualitative findings emerged. Three of these themes were in direct relation to the study's research questions and two, pertaining to the personal impact of the professional learning and the nature of the professional learning itself, were unforeseen. This list of themes was then member-checked with the PL participants. The member-checking process involved emailing the list of five themes to all participants and asking them to consider whether they accurately capture what they shared during site visits and focus groups in regards to the professional learning and its impact and if not, why. Ten of the 20 participants responded to this member-checking request and all of those who responded indicated agreement with the proposed themes with no further comment. With this validation, a final list of themes, with one or more exemplary in-vivo comments for each, was created. Following are the five themes and associated exemplary in-vivo statements:

1. Beliefs about child behavior have shifted from fixed, character-based stance to a more open/questioning stance (i.e., asking why, wondering).

    Examples:

    "I thought he was being bad before this and now I wonder more."

2. Practices in regards to child behaviour mirror changes in beliefs and have shifted from a standardized, disciplinary approach to a more inquisitive, individualized approach (reflecting an increased understanding of the role of self and neurophysiology on child behaviour).

   Examples:

   "I ask other teachers not to tell me what they think. I want to see and experience the behaviour for myself." "Now I think about digging in deeper."

3. Recognition of brain processes and the neurophysiology of stress was evident.

   Examples:

   "Behaviour is biological. I wouldn't even think of biology before." "Understanding and knowing the science part of the brain and how one part can't work as well when the other is more active…it totally changes everything about how we view things; children and self-regulation."

4. Personal reflection on stress of self and others was evoked.

   Examples:

   "I think focusing on the children's stress actually brings down my own… focusing on theirs helps mine, like knowing there's a reason and one they can't necessarily help on their own, lowers my stress because it makes me realize I don't have to fix it right away. so, it's lowered mine." "I see red brain and blue brain in my partner at home."

5. The Self Reg PL experience was perceived as a positive and effective experience.

   Examples:

> *"I do think this course should be taught in all centers." "This training gave me the language to put understanding into practice." "It was the most interesting workshop I've ever attended."*

These general themes, and their associated in-vivo comments, were then considered alongside quantitative results during the process of data integration.

Integration of Quantitative and Qualitative Data

A convergent mixed methods design is used when the researcher wants to validate or expand on one type of data (i.e., quantitative or qualitative) using the other (Creswell, 2012). In this study, qualitative data was used to provide deeper insight into the quantitative findings regarding the impact of the PL course on the STR variables. Accordingly, the quantitative and qualitative analyses were conducted distinct from each other but within the same post-intervention period. Themes, categories, and associated in-vivo exemplars that emerged from the qualitative analyses were then examined in the context of quantitative findings and these data were aligned where applicable. Specifically, where qualitative findings were found to explicate statistical results regarding the impact of the PL, this theme and/or comment was added beneath the quantitative results. For example, theme 1 which states: 'Beliefs regarding child behaviour seemed to shift from a fixed character-based stance to a more open, questioning stance' and the associated participant comment "*I just thought he was bad before and now I wonder what is wrong*" were noted as supporting the quantitative finding that educator beliefs regarding child behaviour were significantly changed by the PL program.

CHAPTER 4

FINDINGS

This study's research questions were answered using data collected in two phases: pre and post intervention. Analysis of pre-intervention data answered research questions 1 and 2. This analysis involved quantitative exploration of survey responses from 104 eligible ECE's where description of, and relationships between, the study STR variables of educator relationships with children, experience with challenging child behaviour, beliefs and practices regarding child behaviour, beliefs about self-regulation, and professional stress were examined. Post intervention data analyses answered research questions 3, 4, 5, and 6 and involved both quantitative and qualitative investigation into the impact of the PL intervention on these same variables. Here, pre and post survey data from the intervention subsample of 42 participants were examined to uncover differences between the PL and control groups on the dependent variables of interest. All quantitative analyses were conducted using SPSS version 25.0 software. This analysis of post-intervention survey data was supplemented by qualitative findings from PL participant site visits and PL participant focus group interviews. These qualitative findings were used to expand upon the quantitative findings regarding the impact of the PL (Creswell & Plano Clark, 2007). The findings will be organized according to the exploratory and intervention research questions. Quantitative results for each question will be reported and for questions pertaining to the impact of the PL (i.e., research questions 3, 4, 5, and 6), these results will be

supplemented by the applicable qualitative findings. A discussion of all qualitative themes will follow.

Exploration of STR Variables

Statistical analyses were conducted on the pre-intervention survey data of 104 participants to examine the STR variables as they were experienced and reported by educators and to uncover the relationships between these variables.

Research Question 1

The first question was: What are early childhood educators' experience with challenging child behaviour, their relationships with students, their beliefs and practices regarding child behaviour, their beliefs about self-regulation, and their professional stress all as reported prior to intervention?

Challenging behaviour. This study used the categories of challenging child behaviour outlined by Smith and Fox (2003) and included: disrupted sleeping and eating routines, physical aggression, verbal aggression, property destruction, severe tantrums, self-injury, noncompliance, and withdrawal. Educators indicated the number of children in their class who exhibited each of these eight categories of challenging behaviours. These numbers were divided by the total number of children per classroom in order to calculate a proportional score for each behaviour for each respondent. This proportional score allowed mean percentages for each of the behaviours to be calculated. For example, as displayed in Table 2, on average per classroom, 15% of students displayed physical aggression.

Table 2.

Challenging Behaviours Ranked According to Mean Percentage Reported Per Classroom

Challenging Behaviour	M	SD
Physical Aggression	15.2	.12
Non-compliance	12.1	.12
Disrupted Sleeping and Eating	11.6	.13
Verbal Aggression	10.7	.10
Property Destruction	7.2	.08
Severe Tantrums	6.8	.08
Withdrawal	4.3	.77
Self-Injury	3.0	.06

As shown, physical aggression is the challenging behaviour most frequently reported by educators. This is followed by non-compliance, disrupted sleeping and eating, and verbal aggression. Property destruction, severe tantrums, withdrawal, and self-injury are reported to occur with relatively lower frequency. As children may appear in more than one category, an overall Challenging Behaviour score could not be calculated and these behaviours were treated as individual variables in the analyses that follow.

Relationships. Educators were asked to rate their current relationship with each child in their classroom according to the four relationship categories identified in Pianta's (2001) Student-Teacher Relationship Scale (STRS): very close, close, conflictual, and very conflictual. Educators were instructed to ensure that the total across the four categories was equal to the total number of children in their classroom. The number for each category was divided by the total children to calculate a proportional score for each relationship category for each educator. This allowed comparison on this variable and the calculation of an average for each of the four categories across all educators. As is common in research using the STRS, the four categories

were then collapsed into two by combining the very close and close to create a total close

variable and the very conflictual and conflictual to create a total conflict variable (Birch & Ladd,

1998; Hamre & Pianta, 2005; Rudasill et al., 2010). The original and collapsed percentages

across educators for each category are shown in Table 3.

Table 3.

Overall Percentage of Relationship Categories

Relationship Category	Percentage	
		Total Close
Very Close	43.5	
		82
Close	38.5	
		Total Conflictual
Conflictual	12.3	
		18.6
Very Conflictual	6.3	

Note. $N = 104$. Totals are not 100 because of rounding.

As shown, educators reported having close relationships with a large percentage of the

children in their care. However, close to 20% of reported relationships were categorized as

conflictual.

Beliefs regarding child behaviour. This 15-item scale was designed to measure the

degree to which educators believe child behaviour to be a consequence of his/her capacity for

self-control (items 1, 3, 5, 6, 8, 10, 11, 12) versus their neurophysiology (2, 4, 7, 9, 13 14, 15).

Cronbach's Alpha for this scale was determined to be .79. This was considered an acceptable

reliability score. Items 2, 4, 7, 9 13, 14, and 15 were reverse scored and a total Beliefs score for

each respondent was calculated. Lower scores on this scale indicate a belief that behaviour is a

consequence of a child's neurophysiology and therefore, might be beyond his/her conscious

control. Higher scores on this scale indicate a stronger belief that behaviour is within a child's

control and that challenging behaviour is, therefore, a choice the child makes. The lowest

possible score on this measure is 15 and the highest is 75. Scores on this scale ranged from 19 to

56 with a mean score of 36.3 (SD=6.7). To provide an overall impression of educator beliefs

regarding child behaviour, the percentage of respondents who either agree or strongly agree with

each item of the scale is shown in Table 4.

Table 4.

Percentage of Respondents in Agreeance With Beliefs Scale Items

Item	Percentage Agree/Strongly Agree
1. I believe that children are generally in control of their behaviour.	49%
2. I believe that a child's behaviour is related to biological processes.	58%
3. I believe that a child's ability to behave appropriately is based on their willpower.	26%
4. I believe that emotional support can positively impact a child's ability to behave appropriately in the classroom.	89%
5. I believe that behaviour is a choice; when children behave appropriately or inappropriately, they are choosing to do so.	31%
6. I believe that children who misbehave have lost control.	31%
7. I believe that behaviour can be a consequence of brain and body systems that operate beyond a child's control.	63%
8. I believe that a child's misbehaviour is intentional most of the time.	16%
9. I believe that it is possible for a child to be totally unaware of why he/she behaved a certain way.	76%
10. I believe that a child's ability to be calm is dependent on the child choosing to be calm.	30%
11. I believe that misbehaviour is a form of disobedience.	16%
12. I believe that misbehaving is something that a child chooses to do.	23%
13. I believe that a child's misbehaviour is largely a result of the environment that the child is in at the moment.	68%
14. I believe that a child's misbehaviour can be a subconscious expression of need.	84%
15. I believe that a child's behaviour can change without their intention as a result of a change in the situation.	85%

This table shows that overall, a large percentage of educators believe that the environment and emotional support play a significant role in a child's behaviour and further, that misbehaviour can be a subconscious expression of need. However, close to one-half of the educators surveyed believe that children are in control of their behaviour and over one-third

believe that behaviour is a choice and that children expressly choose to misbehave. Similarly, many educators (16%) believe that misbehaviour is intentional and a form of disobedience.

Practices regarding child behaviour. This 15-item scale was designed to measure the degree to which educators report engaging in practices that reflect standardized, disciplinary approaches in response to child behaviour (items 1, 2, 7, 9, 10, 11, 13, 14, 15) versus individualized, emotionally supportive approaches (items 3, 4, 5, 6, 8 and 12). Cronbach's Alpha for the 15-item scale was determined to be .70, an acceptable reliability score. Items 3, 4, 5, 6, 8 and 12 were reverse scored and a total Practices score for each respondent was calculated. Lower scores on this scale indicate a more individualized, emotionally supportive response to child behaviour while higher scores indicate a more standardized, disciplinary response. The lowest possible score on this measure is 15 and the highest is 75. Scores on this item ranged from 15 to 54 with a mean score of 35.2 (*SD* = 6.7). To provide an overall impression of educator practices regarding child behaviour the percentage of respondents who either agree or strongly agree with each item of this scale is shown in Table 5.

Table 5.

Percentage of Respondents in Agreeance with Practices Scale Items

Item	Percentage Agree/Strongly Agree
1. I have standard disciplinary practices that I apply equally to all children.	55%
2. My practices involve isolating children who are displaying challenging behaviour.	3%
3. When children display challenging behaviour, I stop and as myself why before reacting.	57%
4. When a child is displaying challenging behaviour, I offer emotional support.	84%
5. When a child is off-task or disengaged, I help them to understand why they might be off-task or disengaged.	65%
6. When a child is misbehaving in a way that is disruptive, my first response is to approach them calmly.	88%
7. When a child expresses oppositional behaviour either verbally or physically, I get angry with him or her.	2%
8. When a child displays challenging behaviour, I wonder what has prompted it.	79%
9. When a child is aggressive either physically or verbally, I discipline the child immediately.	40%
10. When children display challenging behaviour, I see it as an attempt for attention and I ignore the behaviour.	10%
11. When a child is off-task or disengaged, I respond by reminding the child what they should be doing.	66%
12. In general, I search for reasons for challenging behaviour in children.	66%
13. I have a set of clear consequences for child misbehaviour. For example, misbehaviour that does not stop may mean that the child will have to stay in during the outdoor play period.	22%
14. If the classroom is significantly disrupted by a child's behaviour, I will have the child exit the classroom and go to another room, or the supervisor's office, or home.	11%
15. I speak with irritation in my voice when addressing a child who is misbehaving so that he/she understands I am angry.	14%

This table shows that overall, a large majority of educators report providing emotional

support in response to challenging behaviour. Additionally, a majority of educators report

wondering about and searching for reasons for challenging behaviour. However, over half of survey respondents report engaging in standard disciplinary practices that apply equally to all children and approximately one-quarter report that these practices involve punitive measures such as taking away outdoor time or removing the child from the room. Finally, while very few ECEs report getting angry with children, more than one in ten report expressing anger through their voice when responding to challenging behaviour.

Beliefs regarding self-regulation. This variable was measured using one survey item that asked educators to choose from a list of eight definitions the one that they thought most accurately captured their understanding of the self-regulation construct. Seven of the eight definitions reflect those discovered by Burman et al. (2015) to be the definitions in use in the social sciences literature. The final definition (number 6 below) reflects the construct as explained by Shanker (2016) and the Ontario Ministry of Education's early learning and policy documents. Frequencies for each definition are summarized in Table 6.

Table 6.

Frequency of Self-Regulation Definitions (N = 104)

Definition	*n*	*%*
Self-regulation is the ability to feel in charge of one's choices and behaviours.	4	3.8
Self-regulation is the extent to which a person is able to exhibit self control; the ability to control impulses.	25	24
Self-regulation is the ability to monitor and control emotions.	9	8.6
Self-regulation is the ability to be aware of oneself and to be self-reflective in regards to behavioural and emotional responses.	45	43
Self-regulation is a personality trait related to self-esteem and conscientiousness.	0	0
Self-regulation is the ability to be aware of energy use in response to stress and to recover from stress-related energy depletion.	17	16.3
Self-regulation is the ability to adjust one's behaviour to be appropriate according to specific types of social situations.	4	3.8
Self-regulation is the ability to develop plans for learning and to stay on task during learning activities.	0	0

As shown, almost half of survey respondents consider self-regulation to be self-awareness in relation to behavioural and emotional responses and approximately a quarter of respondents see it as related to self control. The next most frequent definition was the one of interest in this study, self-regulation as related to stress and energy use.

Professional stress. Professional stress was measured using the Maslach Burnout Inventory—Educator Survey (MBI-ES) developed by Maslach, Jackson, and Leiter (1997). The MBI-ES measures three aspects of burnout in educators: emotional exhaustion, depersonalization, and lack of personal accomplishment. Respondent scores on subscales and Cronbach alpha estimates for each subscale were calculated and found to be .89, .60, and .79 for

the Emotional Exhaustion subscale, the Depersonalization subscale and the Personal Accomplishment subscale respectively. Due to the low reliability score on the Depersonalization subscale, this subscale was excluded from the present analyses. The Emotional Exhaustion subscale (items 1, 2, 3, 6, 8, 13, 14 and 16) measures feelings of being emotionally overextended, exhausted by one's work and depleted of emotional energy, while the Personal Accomplishment subscale (items 4, 7, 9, 12, 17, 18, 19, and 21) measures feelings of competence and successful achievement in one's work with students (Maslach, Jackson & Leiter, 1997). Higher scores on the Emotional Exhaustion subscale and lower scores on the Personal Accomplishment subscale indicate a higher degree of burnout. The mean score for the Emotional Exhaustion was 17.0 ($SD = 10.2$), which is lower than the developer's reported mean score of 21.3 ($SD = 11.01$). The mean score for Personal Accomplishment was 39.8 ($SD = 5.9$), which is higher than the developer's reported mean score of 33.5 (SD 6.9).

Research Question 2

The second question was: Are the reported pre-intervention variables of early childhood educators' experience regarding challenging child behaviour, relationships with students, beliefs and practices regarding child behaviour, beliefs about self-regulation, and professional stress related? If so, how?

Correlational analysis. To begin, examination of the relationships among the study's STR continuous variables Pearson correlations were conducted. Table 7 shows the correlation matrix for these continuous variables.

Table 7.

Correlations Between Continuous STR Variables

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Close STR	-													
2. Conflictual STR	-.705**	-												
3. Beliefs	-.095	.080	-											
4. Practices	-.102	.146	.442**	-										
5. Emotional Exhaustion	-.161	.337**	.015	.360**	-									
6. Personal Accomplishment	.190	-.186	-.102	-.378**	-.302**	-								
7. Disrupted Sleeping	-.040	.098	.229	.557	.269**	-.107	-							
8. Physical Aggression	.044	.062	-.034	.029	.232*	-.007	-414**	-						
9. Verbal Aggression	-.284**	.453**	-.114	.057	.327**	-.121	.325**	.505**	-					
10. Property Destruction	-.027	.158	-.165	.038	.394**	-.072	.344**	.473**	.469**	-				
11. Severe Tantrums	-.072	.420**	.037	.117	.453**	-.288**	.176	.309**	.541**	.474**	-			
12. Self Injury	-.133	.299**	-.018	-.057	.272**	-.108	.316**	.321**	.343**	.351**	.501**	-		
13. Noncompliance	-.045	.151	-.168	.081	.344**	-.162	.485**	.194	.334**	.337**	.351**	.168	-	
14. Withdrawal	-.072	.233*	-.095	.074	.192	-.166	.117	.126	.316**	.108	.323**	.259**	.325**	-

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Overall, this correlation matrix shows the complex relational interplay between the various STR variables and particularly the interconnectedness of the conflictual STR, educator stress, and challenging behaviour variables. As might be expected, conflictual STR correlates significantly with many challenging behaviours and also with educator emotional exhaustion. Also not surprising is that many of the challenging behaviours significantly correlate with each other. Further, educator emotional exhaustion correlates significantly with all challenging child behaviours except for "withdrawal" and negatively correlates with personal accomplishment. Interestingly, there is a significant correlation between the educator beliefs and educator practices variables, suggesting an alignment between what educators believe about the nature of challenging child behaviour and how they respond.

Regressions. In order to gain a deeper understanding of the relationships between the various STR variables and specifically, their predictive potential on dependent variables of interest, a series of standard regression analyses were performed. The variables chosen as the outcome measures for these series of regressions were: Conflictual STR, Emotional Exhaustion, Practices, and Verbal Aggression. Preliminary analyses were conducted to ensure no violation of the assumptions of normality and multicollinearity. These regressions and the rationale for each are discussed below.

Conflictual STR. As the understanding of the dynamics of the student-teacher relationship is of fundamental interest in this study, conflictual STR was entered as the dependent variable for the first regression analyses with all other continuous variables, namely, close STR, emotional exhaustion, personal accomplishment, beliefs, practices, and the four highest frequency challenging behaviours (physical aggression, disrupted sleeping and eating, non-compliance, and verbal aggression) entered as independent variables. In this model, close

STR, verbal aggression, and emotional exhaustion emerged as significant predictors for conflictual STR. A follow up regression was then run to assess the ability of only these significant variables to predict conflictual STR. The results of the regression showed that the three predictors explained 58% of the variance in conflictual STR scores ($R^2 = .58$, $F(3,87) = 39.92$, $p < .000$) with close STR and verbal aggression emerging as the most significant predictors. The results of this regression are shown in Table 8.

Table 8.

Regression Analysis Summary for STR Variables Predicting Conflictual STR

Variable	B	SE B	β	t	p
Close STR	-.54	.06	-.61	-8.40	.000
Verbal Aggression	.39	.13	.23	3.00	.003
Emotional Exhaustion	.003	.001	.17	2.34	.022

Note. $R^2 = .58$ (N = 91, p < .000)

Emotional exhaustion. Of the two stress measures, emotional exhaustion emerged as having the greatest number of significant relationships with the other STR variables in the study. This measure of educator stress was therefore chosen as the dependent variable in a regression analysis examining educator stress with all other variables. A follow up regression was then run using the significant predictors of conflictual STR, personal accomplishment, and practices regarding child behaviour. The results of this regression indicated that these three predictors explained 24% of the variance in educator emotional exhaustion scores ($R^2 = .24$, $F(3, 83) = 8.92$, $p < .000$) with conflictual STR emerging as the most significant predictor. Results of this regression are shown in Table 9.

Table 9.

Regression Analysis Summary for STR Variables Predicting Emotional Exhaustion

Variable	*B*	*SE B*	*β*	*t*	*p*
Conflictual STR	16.56	6.00	.27	2.78	.007
Personal Accomplishment	-.43	.18	-.25	-2.38	.020
Practices	.29	.17	.18	1.7	.057

Note. R^2 = .24 (N = 87, p < .000)

Practices. The researcher-constructed scales of educator practices and educator beliefs in regard to child behaviour are of special interest in this study as they have the potential to offer a unique contribution to the literature on the STR construct. As the educator practices score emerged as most often significantly related to the other STR variables in correlational analyses and also highly correlated with the beliefs score, the variable of educator practices was entered as the dependent variable with all other variables as independent variables. A regression entering the significant predictors of emotional exhaustion, personal accomplishment, and beliefs was then run. The results of this regression showed each of the variables to be significant predictors and that together they explained 35% of the variance in educator practices regarding challenging child behaviour (R^2 = .35, $F(3, 90)$ = 16.26, $p < .000$). In this model, beliefs regarding child behaviour emerged as the most significant predictor. Results of this regression are shown in Table 10.

Table 9

Regression Analysis Summary for STR Variables Predicting Practices

Variable	B	$SE\ B$	β	t	p
Emotional Exhaustion	.14	.05	.23	2.62	.010
Personal Accomplishment	-.27	.09	-.27	-2.97	.004
Beliefs	.37	.08	.41	4.75	.000

Note. R^2 = .35 (N = 94, p < .000)

Verbal aggression. Finally, while child behaviour is known to relate to educator stress

and student-teacher relational status (a finding confirmed in the correlational and regression

analyses described above), it was of interest to consider which, if any, STR variables might

actually predict challenging child behaviour. As verbal aggression emerged as a significant

predictor to conflictual STR, it was chosen as the dependent variable for this regression analyses

with all other variables entered as predictors. Only the significant predictors of conflictual STR

and emotional exhaustion were then entered in a follow-up regression. Results of this regression

showed only conflictual STR to be a significant predictor of verbal aggression although

emotional exhaustion approached significance. Together, the two variables explained 22% of the

variance in verbal aggression (R^2 = .22, $F(2, 88)$ = 12.33, $p < .000$). Results of this regression are

shown in Table 11.

Table 10.

Regression Analysis Summary for STR Variables Predicting Verbal Aggression

Variable	B	$SE\ B$	β	t	p
Conflictual STR	.22	.06	.38	3.79	.000
Emotional Exhaustion	.02	.001	.17	1.74	.066

Note. R^2 =.22 (N = 91, p < .000)

Summary of Results of Regression Analyses. Overall, this series of standard regression

analyses suggest that STR is a dynamic system strongly influenced by relational conflict and

educator stress. Interestingly, child verbal aggression is a significant predictor of conflictual STR and is itself predicted by relational conflict. Finally, it is notable that the variable of educator practices regarding child behaviour, a measure not examined in STR literature to date, was predicted by educator emotional exhaustion, personal accomplishment, and beliefs regarding child behaviour and was also a factor in the significant model predicting educator emotional exhaustion, although it was just beyond the cut off for statistical significance.

T-Tests on beliefs regarding self-regulation. In order to assess the relationship between the categorical beliefs about the self-regulation variable and the other variables of interest, a series of *t*-tests was performed. These *t*-tests used the categorical beliefs about self-regulation variable (i.e., as believed to be related to stress or not) as the grouping variable on the various STR variables in order to answer the question as to whether believing that self-regulation is a function of stress relates to relationships, beliefs and practices, professional stress, and challenging behaviours of children. Table 12 shows the results of these *t*-tests.

Table 12.

Differences for STR Variables Between Self-Regulation as Related to Stress Group and Other

STR Variable	Self-Regulation as Related to Stress		Other		t	p
	M	SD	M	SD		
Close STR	.85	.16	.81	.18	.79	.433
Conflictual STR	.15	.16	.18	.16	.58	.566
Beliefs	33.69	9.17	36.84	6.08	1.74	.084
Practices	31.19	8.37	36.00	5.98	2.75	.007
Emotional Exhaustion	20.63	12.14	16.35	9.72	-1.55	.125
Personal Accomplishment	38.86	6.54	39.93	5.88	.62	.539
Disrupted Sleeping	.15	.22	.11	.10	-.60	.561
Physical Aggression	.16	.18	.15	.11	-.18	.858
Verbal Aggression	.12	.15	.11	.09	-.26	.798
Property Destruction	.10	.12	.07	.08	-.97	.348
Severe Tantrums	.08	.08	.07	.08	-.82	.415
Self Injury	.05	.07	.02	.54	-1.58	.118
Noncompliance	.16	.18	.12	.12	-1.00	.331
Withdrawal	.06	.13	.04	.07	-.73	.469

Results of these independent sample *t*-tests show that educator's practices regarding child behaviour can be distinguished depending on their beliefs about self-regulation. Specifically, a belief that self-regulation is related to stress led to lower scores on the practice measure suggesting that these educators were more emotionally supportive in response to challenging behaviour. Similarly, there is a notable difference, that approaches significance, in the beliefs regarding child behaviour score between these two groups suggesting that those who see self-regulation as related to neurophysiology have stronger beliefs about behaviour being a biological construct.

Impact of Professional Learning

Post intervention analyses involved measuring the impact of PL on the STR variables of interest. A convergent, mixed methods approach was used wherein quantitative results were expanded upon with the qualitative data (Creswell, 2012). Accordingly, quantitative results for each post-intervention research question will be presented and followed by associated qualitative findings. Questions pertaining to continuous variables will be discussed first followed by the question regarding the beliefs about self-regulation variable which was categorical in nature and analyzed using a different statistical procedure. After presenting these integrated results for each question, the overall qualitative themes will be reviewed.

Research Questions 3, 4, and 6

The following results pertain to research questions 3, 4, and 6 regarding the impact of the professional learning on the continuous variables of relationships, beliefs and practices, and professional stress. The research questions being answered in this section are:

Question 3. Does participation in a professional learning course on Self-Reg theory change early childhood educator reported relationships with students?

Question 4. Does participation in a professional learning course on Self-Reg theory change early childhood educator reported beliefs and practices regarding child behaviour?

Question 6. Does participation in a professional learning course on Self-Reg theory change early educator reported level of professional stress?

Following *t*-test analyses that confirmed no significant pre-intervention differences between the PL and control group on any of the variables in question (see Appendix H), a series of two-way ANOVAs with one between subject and one within subject factor was conducted to

answer each of these research questions. Prior to these analyses, tests of normality and homogeneity of variance were conducted to ensure that the assumption of normality was met for all variables, and that there was no significant variation in scores between the groups on any of the variables. Table 13 below provides an overview of the pre and post intervention means on the relationship, beliefs, practices, and professional stress variables referred to in questions 3, 4, and 6.

Table 11.

Pre-Post Means and Standard Deviations for PL and Control Groups on Continuous STR Variables

	PL				Control			
	Pre		Post		Pre		Post	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Total Close	.85	.16	.86	.14	.82	.13	.81	.31
Total Conflict	.15	.16	.15	.14	.18	.13	.19	.14
Beliefs	36.65	8.91	28.20	6.36	36.95	5.86	35.80	5.38
Practices	37.20	5.75	30.50	4.82	35.90	6.39	34.10	5.95
Emotional Exhaustion	19.22	11.91	17.56	11.60	14.85	11.01	15.04	8.96
Personal Accomplishment	38.26	6.07	39.74	8.24	39.10	7.40	39.74	10.14

To assess the significance of these differences in means, a repeated measures ANOVA with one between subject factor (i.e., group) and one repeated-measures factor (i.e., time) was conducted for each of the dependent variables. This analysis assesses differences between groups pre-intervention (i.e., time 1), differences between groups post-intervention (i.e,. time 2), and differences pre and post intervention for each group in one analysis. This mixed ANOVA also tests the interaction of the two factors (i.e., group and time) on the dependent variable of interest which, if significant, can be further analyzed with a post-hoc test. Running this omnibus test over multiple sub-tests avoids the error associated with getting statistically significant results by chance alone. Results from the series of ANOVA's using relationships (i.e., total close and total

conflict), beliefs, practices, and professional stress (i.e., emotional exhaustion and personal

accomplishment) as the dependent variables are shown in Table 14 below.

Table 12.

Analysis of Variance Results for the Effects of PL on Continuous STR Variables

Variable	Source	Between Subjects					Within Subjects				
		df	*SS*	*MS*	*F*	*p*	*df*	*SS*	*MS*	*F*	*p*
Close	Group	1	.03	.03	.95	.337					
	Error 1	33	1.01	.03							
	Time						1	.00	.00	.02	.892
	Time x Group						1	.00	.00	.14	.712
	Error 2						33	.28	.01		
Conflict	Group	1	.02	.02	.74	.396					
	Error 1	33	1.07	.03							
	Time						1	.00	.00	.14	.711
	Time x Group						1	.00	.00	.12	.737
	Error 2						33	.25	.01		
Beliefs	Group	1	324.69	324.69	4.43	.042					
	Error 1	39	2857.51	73.27							
	Time						1	476.26	476.26	27.01	.000
	Time x Group						1	277.24	277.24	15.72	.000
	Error 2						39	687.79	17.64		
Practices	Group	1	30.63	30.63	.544	.465					
	Error 1	39	2195.18	56.29							
	Time						1	366.96	366.96	35.42	.000
	Time x Group						1	129.88	129.88	12.54	.001
	Error 2						39	404.02	10.36		

Variable	Source	Between Subjects					Within Subjects				
		df	*SS*	*MS*	*F*	*p*	*df*	*SS*	*MS*	*F*	*p*
Emotional Exhaustion	Group	1	228.92	228.92	1.09	.304					
	Error 1	37	7802.46	210.88							
	Time						1	10.56	10.56	.42	.521
	Time x Group						1	16.71	16.71	.67	.420
	Error 2						37	930.62	25.15		
Personal Accomplishment	Group	1	3.37	3.37	.03	.852					
	Error 1	36	3445.26	95.70							
	Time						1	21.05	21.05	1.047	.313
	Time x Group						1	3.37	3.37	.168	.685
	Error 2						36	723.58	20.10		

As shown, there were no significant interactions of group and time (i.e., pre and posttest) effects for the total close, total conflict, emotional exhaustion or personal accomplishment variables. There was however, a significant interaction effect for both of the variables of beliefs regarding child behaviour, $F(1, 39) = 15.72, p < .001$, and practices regarding child behaviour, $F(1, 39) = 12.54, p < .001$, indicating that the PL had a significant impact on these measures. An examination of these ANOVA results in light of plotted means and qualitative findings for each of the study's variables are discussed in turn below.

Question 3. Question 3 asked whether participation in a professional learning course on Self-Reg theory changes early childhood educator reported relationships with students. As shown in Table 14, there was no significant effect between or within subjects on the total close or total conflict variables suggesting that the professional learning intervention did not significantly impact participant scores on either of these measures. However, when group means are plotted for total close and total conflict as shown in Figure 2 and 3 respectively, a trend is revealed that suggests a difference between the PL and control group for both of these variables.
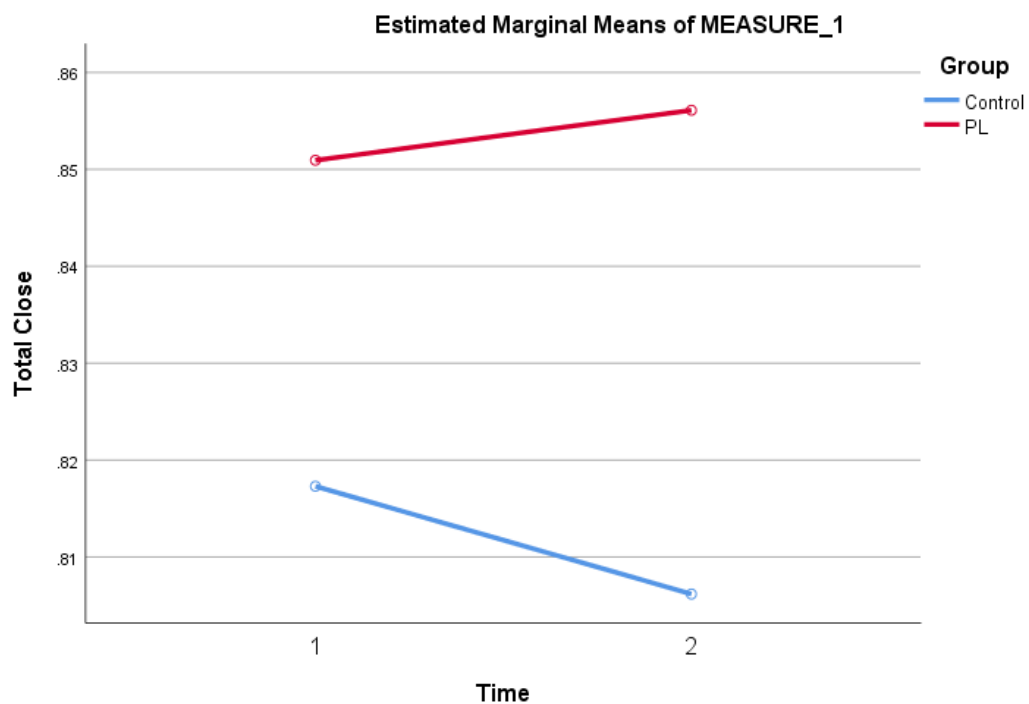
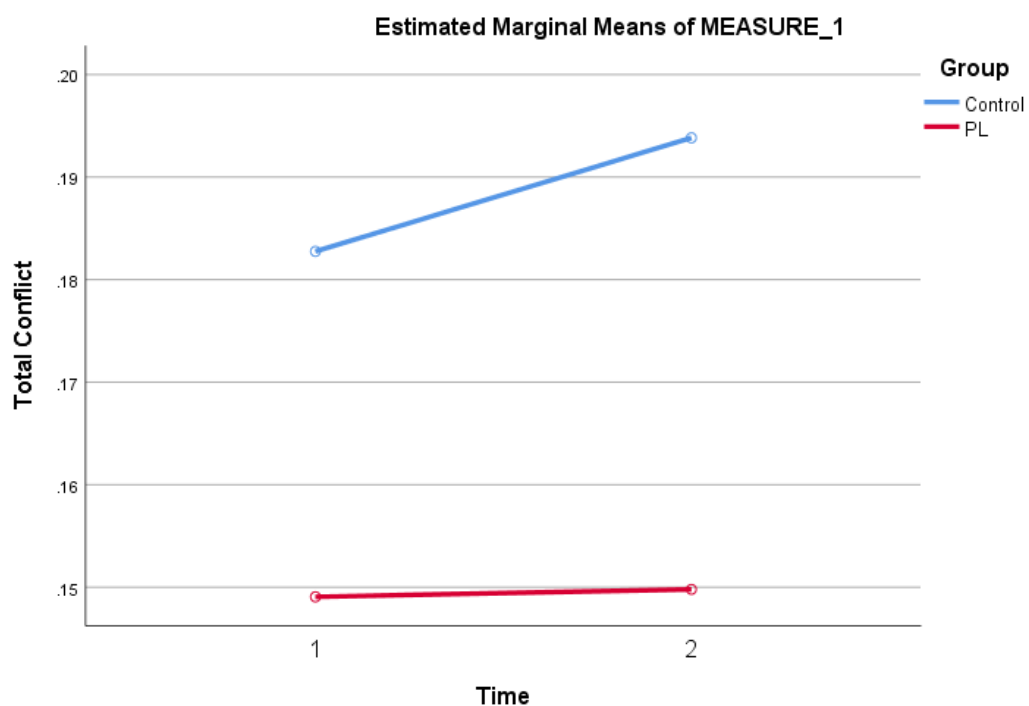Figure 2. Effect of Group and Time on Total Close Score

Figure 3. Effect of Group and Time on Total Conflict Score

For the total close variable, Figure 2 shows a slight incline in scores for the PL group from time 1 (pretest) to time 2 (posttest) whereas there is a slight decline in scores for the control group. Moreover, as depicted in Figure 3, scores on the total conflict variable increased slightly over the pre-post period for the control group whereas this measure held steady for the PL group.

These quantitative trends for the relationship variables are illuminated by qualitative findings that suggest PL participants have noticed positive changes in their relationships with children. Comments during focus groups and site visits speak to the idea that the neurophysiological view of child behaviour they gained from the professional learning served to change various aspects of their relational interactions with children. The following exchange between a PL participant and the moderator during a focus group interview depicts how her changed perception with regards to child behaviour increased her compassion, and led to what she described as more authentic relationships:

> Educator 7: I think for me, changing relationships have come from the misbehaviour to stress behaviour lens and really now I see every child as they're under stress, they're not misbehaving. I've always known behaviour as caused by something you do, like the ABCs of behaviour, but now really…. I don't know if I'm more, not more passionate, but more compassionate maybe? Like I know it's not a self-control issue. It's a huge thing. I mean no child wants to make you angry or not have great day, so really looking at it that way I think it's kind of taken the stress off them as well as myself.
>
> Moderator: Do you think you've noticed an actual change in how children interact with you?
>
> Educator 7: I feel like they have. It's more of an authentic relationship I find now.
>
> Moderator: Can you describe what you mean by authentic?

Educator 7: I just feel like they're more at ease I guess and more relaxed. And, again, in a calm state. So if I'm calm and I'm not having necessarily that lens of them being bad per se. I'm letting them be who they are and helping them figure that out.

This idea that the professional learning led to a changed stance, or way of being with the children, was reiterated by Educator 18 who noted, "what I will say is it [the training] has given me pause to really listen and give children more space." Finally, a third focus group participant mentioned how changes in her tone of voice following the professional learning led to an increase in child engagement and a resulting ability to know children better:

I have changed my tone of voice that I use with the children, so I think I've been able to form deeper relationships with more of them because they listen now. I found that I was able to actually get to know each child on their own and form better relationships individually with each of them (Educator 16).

These PL participant comments regarding relational changes post professional learning suggest that the training had the effect of producing more thoughtful, calm, and individualized exchanges between the educators and children. Although these changes in interactions with children did not produce a significant change in posttest relationship scores, the trends depicted in Figures 2 and 3 indicating a higher number of close relationships and a lower number of conflictual relationships for the PL group, considered in light of these PL participant comments, suggests that quantifiable change in student-teacher relationships may develop in time.

Question 4. Question 4 asks whether participation in a professional learning course on Self-Reg theory changes early childhood educator reported beliefs and practices regarding child behaviour. As shown in Table 14, both the beliefs regarding child behaviour and practices regarding child behaviour scores were significantly impacted by the professional learning. The

ANOVA results show a significant interaction between time and group in terms of belief scores, $F (1, 39) = 15.72, p < .001$, and also a significant interaction between time and group in terms of practices scores, $F (1, 39) = 12.54, p < .001$. Post hoc pairwise comparisons of these interaction effects indicated that the post intervention mean score on the beliefs variable for the PL group ($M = 28.15, SD = 6.36$) was significantly different from the control group ($M = 35.81, SD = 5.38$). Pairwise comparisons also show that that the PL group's posttest scores on this measure significantly differ form their own pretest scores ($M = 36. 65, SD = 8.92$). Likewise, post hoc pairwise comparisons for the practices variables show that the PL group's mean score on the practice measure ($M = 30.45, SD = 4.83$) was both different from the control group posttest ($M = 34.19, SD = 5.95$) and also significantly different from its own pretest scores ($M = 37.2, SD = 5.75$). Plots of means of these variables shown in Figures 4 and 5 clearly depict the difference between the groups over pre and posttest times.
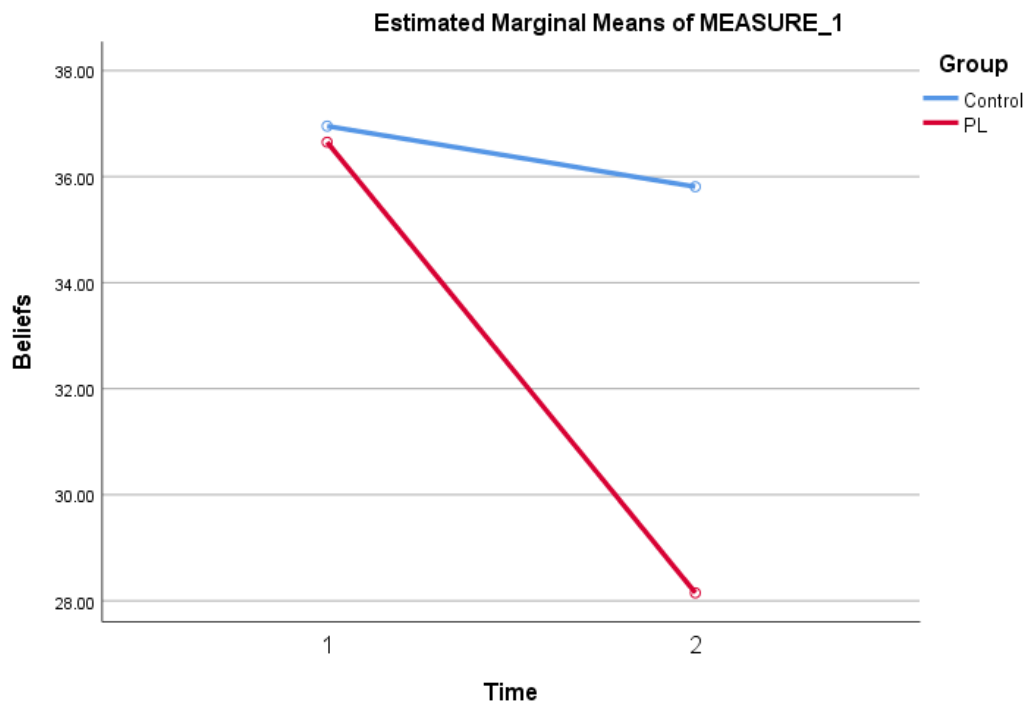
Figure 4. Effects of Group and Time on Beliefs Scores
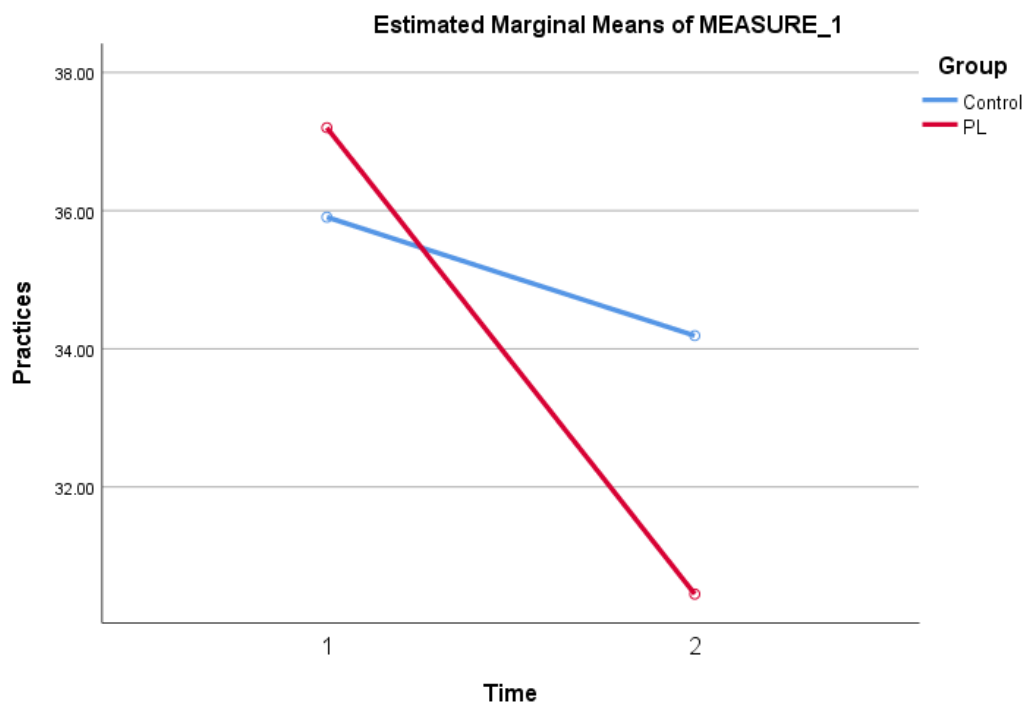
Figure 5. Effects of Group and Time on Practices Scores

Results for the beliefs variable show not only a significant difference at posttest between the PL and control group but also a significant difference from pre to posttest within the PL group itself. This suggests that those educators who participated in the professional learning were less likely than controls at posttest to believe that children are in total control of their behaviour and therefore misbehave with intention. As shown in both ANOVA results and in Figure 4, these changes did not occur for the control group.

This significant finding for the beliefs regarding child behaviour variable was supported by the first general qualitative theme: *Beliefs about child behavior have shifted from fixed, character-based stance to a more open/questioning stance (i.e., asking why, wondering).* This theme reflects the overall finding that educators' beliefs about child behaviour shifted from a critical, accusatory stance toward one that is more open-minded, flexible, and curious following

the professional learning. The nature of this change was succinctly captured by Educator 8 during the focus group:

> So before the workshop I sometimes felt the kids were doing this just to get attention or just to get on my nerves and now I know that they act like that because they really can't control themselves and they're just trying to express themselves but they don't know how. They don't have the ability to figure out what they actually need. Afterwards I really thought more deeply about the reason for the behaviour and what stressors might be in the child's life that are causing the behaviours, that it's not because he just wants to come and piss you off, right? He's got a reason for it.

Other participants spoke specifically about seeing children's behaviour as related to stress after the professional learning and that this new perception changed what they used to believe was a problem inherent to the child. For example, Educator 2 noted,

> I think before I was constantly searching for a developmental delay, the language delay, what was happening at home, those components of the child. After, I now look at the stress of that child. It just brings a different light to how I view the behaviour. I look at the stress now.

Similarly, the change from a belief that a child is misbehaving, and therefore being a problem, to a belief that the child is experiencing stress was noted by several PL participants. For example, Educator 18 commented that she is "looking at behaviour differently" with a changed view from "misbehaviour to stress behaviour." Educator 12 similarly discusses this shift in beliefs when she says,

> They are little and the world is big and that's a big stressor right there. I didn't think about it that way before – I knew there was a problem with him and knowing more

information about it, it's like that light bulb has gone off. This child is under stress not

misbehaving.

These PL participant comments support the quantitative finding that educator beliefs regarding

child behaviour were significantly changed by the professional learning and provide insight into

how these changed beliefs are explicated by educators in their practice. Specifically, these

comments demonstrate post PL beliefs that challenging behaviour is rooted in stress, is not

indicative of a 'problem child' and is not necessarily an intentional act.

As with the beliefs variable, results for the practices regarding child behaviour variable

show both a significant difference at posttest between the PL and control group and also a

significant difference from pretest to posttest within the PL group itself (depicted in Figure 5).

This suggests that those educators who participated in the professional learning were less likely

to report responding to challenging child behaviour with practices that are standardized and

punitive in nature than the control group and their own practices changed significantly following

the professional learning.

This significant finding for the practices regarding child behaviour variable was

supported by the second qualitative theme: *Practices in regards to child behavior mirror*

changes in beliefs and have shifted from a standardized, disciplinary approach to an inquisitive,

individualized approach (reflecting an increased understanding of the role of self and

neurophysiology on child behaviour). Educator comments during focus group and site visits

repeatedly referred to various ways in which their responses to challenging behaviour had

changed following the professional learning. Generally speaking, educators referred to changes

in practice that mirrored their changed beliefs that children are not necessarily "bad" and behave

according to neurophysiological demands. Accordingly, practices in response to behaviour

shifted from punitive and reactive to more patient and aimed toward helping the child. Educator 15 illustrates this change toward a more individualized, thoughtful approach to behaviour in her comment,

> Like before I used to assume and be like "you had a bad day" or "you must be tired" or like I just gave an excuse, but now I just talk to them and we figure it out together. Like I don't assume anymore – we work together and eventually they tell me what's wrong. So I noticed a big difference now that I have more understanding, instead of just labelling them at the start.

Educator 12 reiterated this notion of being more reflective in regards to child behaviour when she said,

> I think now, like when we're in a situation when a child is out of control and in red zone – like before my thoughts would go straight to "Okay how do I make this stop?" but now I think I really dig into figuring what the stressors are and how can I eliminate them before this happens, so I'm always more observant, I guess, of children that I know have self-regulation problems and need help and, like, trying to figure out before it happens what the triggers are and how to eliminate that for next time. I am more responsive, less reactive.

Educator 17 elaborates on this effect of increased reflection by suggesting there is more curiosity and questioning in her responses to challenging behaviour:

> Before if a child was misbehaving, I would just like take that child and redirect the child into a different situation and just ignore the situation and go, "Okay go play over there, play with that toy." But now I kind of look at it and think, "Well why did that

happen and why is it going on?" So now I look deeply and observe and record more I guess.

The comments of PL participants also suggest an increased self-reflection and attention to one's own level of calm when responding to children, reminiscent of the "calm begets calm" discussion that was part of the professional learning. Educator 2 notes paying closer attention to her own bias and mood and its impact on children:

I think I've really looked at my personal bias in what I can do to help to lessen the stressors for the child and really looking at how I'm influencing the behaviour and what my energy is putting out. Because I know if I'm in a difficult mood, I'll put it out then it seems like everyone reacts to that. So it's a kind of a chain reaction. So really I'm more checked into myself.

One focus group participant told about how she responded differently to a boy who was frequently suspended for his 'breakdowns'. She mentioned how during his most recent breakdown she calmly expressed concern for him while educators who had not experienced the professional learning were more typically reactive:

We had a boy yesterday have a complete breakdown in school and this is the second time in two weeks. He's now been suspended and yesterday his mom picked him up from the office and dropped him off with us and he was just a mess, uncontrollable, and when I asked him, you know, "What's going on?" he's like, "I hate the principal and I hate the teacher and I hate Mrs. so and so and I just want to die." I said, "Well that would make me really sad if you did that" and he just was like, "What?" I said, "Well I really like having you in the class and I would be sad if you died" and then he just went and sat on the ground by himself quietly. I said "That's fine if you need time by yourself" but the other

teachers were on pins and needles like, "He's getting up, he's going to hurt someone, he's going to"—"and I was like "Just stay calm. Calm begets calm." (Educator 8).

Further, PL participants often referred to "letting the child write their own story" during focus groups and site visits. This was an idea that was discussed during the professional learning that explained the human tendency to develop narratives, or stories, about children based on assumptions that may or may not be true and the potential of these stories and associated labels, to become entrenched and self-fulfilling. During one site visit, Educator 16 spoke specifically about her new practice of trying to avoid imposing ideas about a child on other educators:

Well, I know a big change for me after coming here for the first day of our workshop, and the supply was coming into my room that had never been in there before and I started telling her about the children and their behaviours and what to look for and then we came here and that's when you said we could be setting them up and you said, "Let them write their own story" and so that is one thing the training changed for me. So if somebody is coming in unless there's something very specific they need to know about that child I'm not going to say anything and if I'm getting a new child, like you said, I don't want to know. I even told her [a parent] when her child was starting kindergarten and she was like, "I should tell the teacher that he might do that".... I'm like, "No don't, don't. Let him write his own story."

Educator 8 reiterated this idea of trying to maintain an open mind by stating how she now avoids labeling a child since she has a new appreciation for the "power of labels" and how they "impact behaviour by limiting perception for the teacher and the child."

Finally, many PL participants noted changes in their practice with regards to working to create a calmer classroom in general. For example, Educator 12 talked about constructing a tent

structure in the room for children to use if they "need to be alone." Educator 11 spoke about bringing in "calming toys" like "stressor balls and little fidget things to handle in transition times." Still others spoke of thinking more about the daily routine and being more mindful of the "stress times.' Educator 17 referred to changed practices with regards to lighting in the room when she said:

> We've started dimming the lights. We did that before but now we think about it more and children help us. We used to say "you can't shut the lights off" when they did it themselves but now I think, "Well maybe they need that."

Overall, these PL participants' comments illuminate the quantitative finding that educator practices regarding child behaviour were significantly changed by the professional learning. Together, they illustrate changes to practice in response to challenging behaviour that reflect increased thoughtfulness, greater consideration for the individual child and their potential stressors, and a trend toward curiosity versus quick judgement. Additionally, educators report introducing practices that reflect a general regard for the impact of the environment on child stress and behaviour.

Question 6. Question 6 asks whether participation in a professional learning course on Self-Reg theory changes early educator reported level of professional stress. As shown in Table 14, there was no statistically significant effect between or within subjects on the emotional exhaustion or personal accomplishment variables suggesting that the professional learning intervention did not significantly impact participant scores on either of these professional stress measures. However, when group means are plotted for these variables as shown in Figure 6 and 7 respectively, a trend is shown that suggests emerging differences between the PL and control group, and within the PL group itself on both of these variables.

Figure 6, which plots the pre and post means for the PL and control group on the

emotional exhaustion variable, shows a slight decrease for the PL group and a slight increase for

the control group from pre to posttest. Moreover, as shown in Figure 7, while scores on the

personal accomplishment variable increased for both groups over time, the increase appears as

more marked for the PL group.
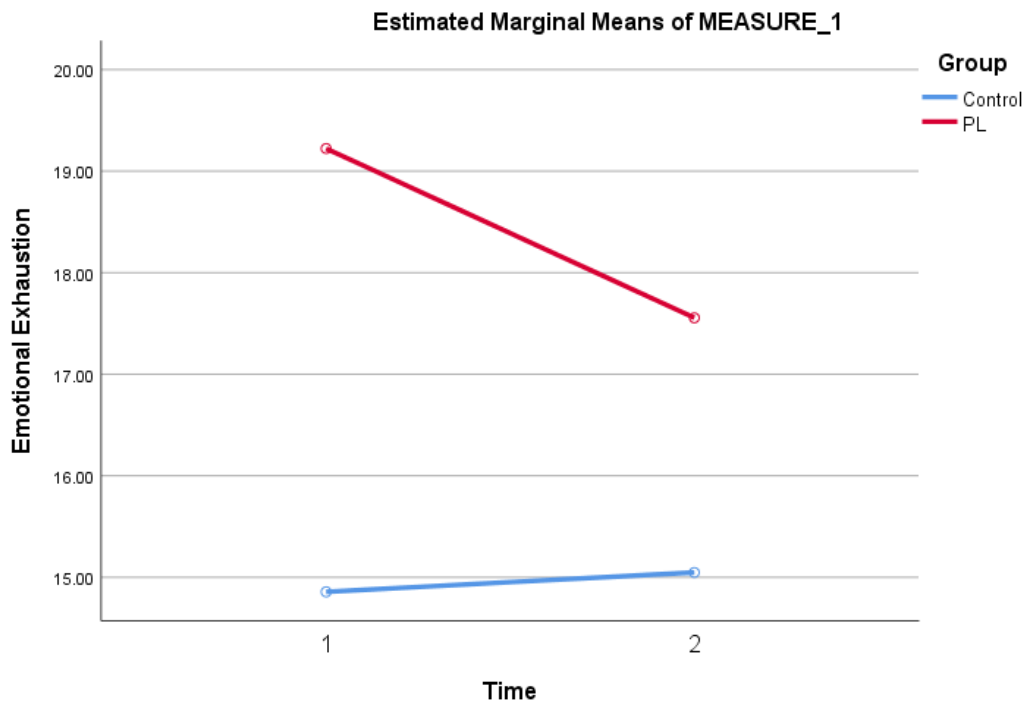
Figure 6. Effects of Group and Time on Emotional Exhaustion Scores
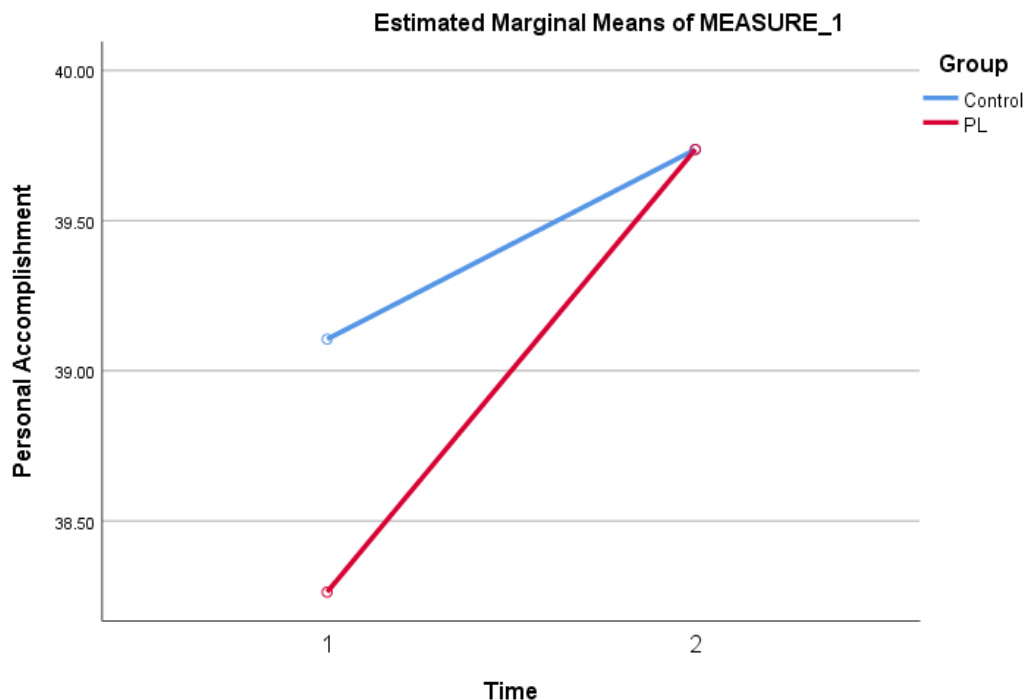
Figure 7. Effects of Group and Time on Personal Accomplishment Scores

The trends depicted in Figures 6 and 7 may be understood in light of the fourth qualitative theme: *Personal reflection on stress of self and others was evoked.* This theme captures the idea that various PL participants noted a change in how they understood themselves and others in their lives as they might be impacted by stress. Educator 2 illustrates the essence of this theme with her comment:

I have really become checked into myself and think what can I do to eliminate this stress—to help me feel better. I know that I am more stressed than I thought I was. Now I know it is stress when I overreact and that I'm not crazy.

Other PL participants mentioned a new awareness of ongoing stressors in the work environment. Educator 4 for example, noted during the site visit that the lack of carpeting in her classroom made it noisy and she hadn't considered this as a stressor in the past: "I've realized

that the room is a stressor for me because it echoes (I hate the noise). If it stresses me, I wonder what it is doing to the kids without their knowing."

This increased personal stress awareness seems to have led to a new awareness of the stress experienced by others. In general, many participants spoke of "seeing others differently" and "being more aware of other people's stresses." During a site visit Educator 3 laughed when she said, "I even see stress in the characters on TV and think that family needs to look at that child's stress." Some participants noted how this new awareness of the stress in others has impacted their work and personal life. For example, Educator 6 noted, "It's helped me with the families of the children to understand their stress" and Educator 7 commented that she now sees "red brain [stress] and blue brain [calm]" in her partner at home.

Finally, as suggested in the discussion of changed beliefs and practices above, educators' references to increased stress awareness were often linked to a changed perception of the child that seemed to have a calming, and even rewarding, effect on the educator. Various PL participants commented on having a new stress lens through which to view children and their behaviour. During the site visit, Educator 3 noted, "After 34 years, it has opened my eyes to seeing our children through a different lens." This notion was echoed by Educator 5 who commented that when she views the child's behaviour through a stress lens she sees "a child having a difficult day, not a difficult child." During the focus group, Educator 7 shared a story of how this new understanding of one child's stress behaviour led to a personally rewarding interaction with his mother:

> I had a meeting with a mom shortly after the training. She was really nervous. I knew she
> was worried that something was wrong with her child. Doctors had spoken of delays and
> stuff. In the meeting, I told her I thought her son was normal but stressed and that we

should look for the stressors that are impacting his behaviour. I could feel the weight lift

from her shoulders. I think it gave her a lot of hope. She almost cried. So did I.

Overall, while the professional learning did not produce a measurable impact on

professional stress as captured by emotional exhaustion and personal accomplishment scores, the

plotted means of PL and control group scores on these variables depict a trend toward positive

change that is corroborated by the qualitative findings. The comments of PL participants in

regards to increased stress awareness in self and others, may lead to quantifiable changes in

professional stress measures over time. This idea that a heightened understanding of stress in

general would lead to decreased professional stress is supported by the following PL participant

comment:

> My stress has gone down because I think I understand it more and like I said before, I
>
> kind of put things in place before hand. You know I recognize for myself a break is
>
> needed or whatever, then in turn, just being aware of stress at work with colleagues or
>
> children or parents, just having that understanding helps. You know why something's
>
> happening with them. So yeah, my stress has gone down (Educator 9).

These comments about increased stress awareness help to illuminate the trend depicted in

Figures 6 and 7 showing reduced emotional exhaustion and increased personal accomplishment

for the PL group following the intervention.

Research Question 5

Question 5 of this study involved the categorical self-regulation variable. This variable

measured whether or not educators regarded self-regulation as being related to stress and energy

consumption. Statistical analysis conducted on this variable was specific to that appropriate for

variables of a categorical nature. Question 5 asked whether or not a professional learning course

on Self-Reg theory changes early childhood educator reported beliefs about the concept of self-regulation. To answer this question, crosstab analyses were conducted to assess changes in the self-regulation variable from pretest to posttest for each group. The results of these analyses are shown in Table 15.

Table 13.

Pre- and Post Definitions of Self-Regulation for PL and Control Groups

	Pre Intervention		Post Intervention	
Group	Stress-based	Other	Stress-Based	Other
Control	8	14	7	15
PL	2	18	11	9

Table 15 shows that within the control group, the number of participants who chose the definition of self-regulation as related to stress dropped from eight to seven from pretest to posttest. For the PL group however, the number of individuals who chose the definition of self-regulation as related to stress rose from two at pretest to eleven at posttest, indicating that, following the professional learning, nine people in the PL group changed their beliefs about the definition of self-regulation to it being a stress-related construct. A McNemar test was then conducted to determine if this change in frequencies within each group over time was significant. The results of the McNemar test are shown in Table 16.

Table 14.

McNemar Test Results Showing Significance of Change in Self-regulation Beliefs by Group

Group		Value	Sig
Control	McNemar Test		
	N of Valid Cases	22	1.000
PL	McNemar Test		
	N of Valid Cases	20	.021

As shown in Table 16, the McNemar result suggests that there was a significant change in the proportion of PL participants who switched their definition of self-regulation from "other" at pretest to that definition which relates to stress. Specifically, 50% of the 18 participants who originally chose another definition of self-regulation changed to the stress definition at post intervention. There was no significant change in the beliefs about the self-regulation variable for the control group.

This quantitative finding that a significant number of PL participants changed their understanding of self-regulation to a definition that explains it as related to neurophysiological stress and energy consumption is supported by various PL participant comments. For example, Educator 4 mentioned how she "hadn't thought of biology being related to regulation before" and Educator 2 commented that she used to think self-regulation was about self-control and now understands it as a "continuous, physiological thing related to stress." During the focus group, Educator 9 explained how she now understood self-regulation as a "body process" and more specifically as how "our body responds to the environment." Educator 7 summed up these various ideas in one statement when she commented, "I thought self-regulation was self-control and that they just needed to stop bad behaviour but now it's more about stress and how you can change the environment and relationships to help."

Qualitative Themes

Analysis of the focus group and site visit data produced five overall themes. Three of these themes (i.e., 1, 2, and 4) were largely addressed in the above discussion of the integrated quantitative and qualitative findings with regards to research questions relating to the impact of the professional learning on beliefs, practices, and professional stress. Two themes (i.e., 3 and 5) that emerged from the qualitative analysis did not directly relate to the study's research questions

and so are not captured in these integrated results. All five themes will be discussed below with some expanded analysis of themes 1, 2 and 4 that are referred to in the results above, and an introduction to themes 3 and 5.

Theme 1. Belief changes about child behavior. As noted above in regard to research question 4, educator beliefs about child behaviour seemed to change following the professional learning. Specifically, beliefs about child behaviour seemed to shift from a fixed, character-based stance to a more open/questioning stance (i.e., asking why, wondering). When speaking about children during the focus groups and site visits, many educators spoke about how before the professional learning they believed children were "being bad" (Educator 7), "crazed" (Educator 7), or "seeking attention" (Educator 8) when they misbehaved. During the focus group, Educator 9 specifically recalled telling a child he was bad when she said, "You are being bad Santiago, now go over there." Similarly, Educator 8 mentioned how she had been quite judgmental in the past with a view of the child that lacked compassion saying, "I used to accuse before and think 'What does this kid have to be angry about?'" After the professional learning, PL participants reported "wondering more" (Educator 7) when a child was being challenging and more specifically, wondering about stressors: "Now I wonder 'Is this misbehaviour or stress behaviour?'" (Educator 7). Educator 3 commented on how she is "taking the time to slow down and think more" based on her new beliefs about child behaviour.

Related to this change in beliefs in regards to reasons for a child's challenging behaviour, some PL participants specifically made reference to the new revelation that "kids don't always misbehave on purpose" (Educator 11). Comments such as those made by Educator 5 who said during a site visit: "I see now how this child is not attached to his behaviour" reflect the idea that challenging child behaviour is not indicative of something inherently wrong with the child but

rather, a behavioural expression in the present moment. This idea was extended upon by Educator 15 who noted, "now when they are freaking out, I know something is wrong" and also Educator 8 who said, "they are trying to express themselves but don't know how, they don't have the ability to figure out what they actually need." One focus group participant summed up the shift from character-based attribution of behaviour to one that is more situationally based when she commented on a girl who found it stressful that the materials in the classroom had been reorganized:

> So I've been more aware with—it's not just the child himself, it's everything else around that, around all children. I have one child who is happy all the time but will have her meltdowns and it's like 'This is new, what's wrong', and you have to see around the big picture what was that stress, and it was the fact that she didn't know where anything went because everything was already mixed-up and it's 'okay I get why you're stressed, that stressed me out too, no big deal we'll work on it together' (Educator 12).

Overall, many PL participants spoke about how after the training "a lot of things started making sense with the new [stress] lens" and how it was "as if a light bulb went off" (Educator 12) that helped them to see a child differently. As might be expected, this shift in beliefs seems to have had a domino effect on PL participant practices in response to child behaviour. This theme is discussed next.

Theme 2. Practice changes regarding child behaviour. As mentioned in regards to question 4 above, educator practices in response to child behaviour also changed after the professional learning. Educators seem to have shifted from a standardized, disciplinary approach to a more inquisitive, individualized approach (reflecting an increased understanding of the role of self and neurophysiology on child behaviour). Changes reflect a general trend toward a

calmer, more compassionate, and more inquisitive approach. This change in practice was discussed by many participants in both the focus group and site visit sessions. For example, in talking about a child she had viewed as "spoiled" before the professional learning, Educator 9 said how in the past she might have secretly thought he needed a "spanking" now she sees how "a spanking would make him even more stressed." She went on to say "I want to understand and be patient and work through it" in reference to the same challenging child.

Many educators mentioned "digging deeper," "trying to figure out what is happening," "pausing more" and asking "why?" in regards to a child's challenging behaviour. Educator 3 for example made the following comment during the site visit: "I am looking over and beyond the child now, you know, and asking what is going on." Educator 16 reiterated this idea saying she is "asking why and why now?" Educator 17 shared a story of how her new calm approach to a child who cries frequently seems to help the child self-regulate:

> Now we ask her, "Do you need anything? Do you want to come sit?" and she'll self-regulate herself and she's only two. She'll go off and she'll take a minute and then she'll come back and we'll say, "Are you ready to go play?" then she'll come and play. But we give her that opportunity, "Do you need a minute?" and stuff, and she self-regulates herself; it's crazy.

Educator 19 commented how she has started "looking for" and "breaking the stress" when a child is having what she described as "a moment." This mention of looking for stress was featured in many PL participant comments during focus group and site visits. For example, Educator 5 commented, "I am looking at the big picture: what is the stress?" and went on to say how "we now organize the room in a way that is not stressful for the kids." During the site visit,

Educator 18 noted a new understanding that "to eliminate red (i.e., stress) brain, you have to figure out the stressors."

Comments regarding changed practices also reflected an increased understanding of the educator's own role in a child's behaviour. Educator 7 captured this idea very clearly when she said, "I have changed my physical self to be more calm. I understand the unconscious transmission of feelings." Related to this increased self-reflection was the general finding with regards to responding to child behaviour that educators reported avoiding labels and blindly adopting the interpretations of other teachers. This was captured by Educator 14 in her comment:

> Um so, I just got a whole new group of kids so with this it actually like—I found myself trying to get to know them before reading about them a lot more now, like it was—like people would try to tell you stuff in the little meetings and stuff like that and I just try to tune it all out now and I'm just like I want to get to know them, and any behaviours I was like, 'Don't tell me about the behaviours' like I want to see it and experience it and see if I can figure out something that might be helpful.

As can be seen from educator comments, these changes in practices are tightly linked to changes in beliefs about the nature of child behaviour as being related to stress that call for a calm, thoughtful and helpful response. These changed educator behaviours, fueled it seems by changed beliefs, may ultimately be linked to the specific new neuroscientific knowledge PL participants commented on. This theme is discussed next.

Theme 3. Increased recognition of brain processes and the neurophysiology of stress. This theme that emerged from the qualitative data captures the overall idea that many participants reported having gained new knowledge from the professional learning, specifically in regards to brain science and the role that the brain plays in stress and behaviour. During focus

groups and site visits, many PL participants referred to how important the new information about brain development and brain science in general had become to their life and work. Various PL participants commented on how the information about the brain was new to them. For example, during a site visit one educator remarked, "Understanding how the brain works blew me away" (Educator 3). Another commented on how she "didn't know how the brain worked before" (Educator 19), and yet another noted how helpful it was to "understand the science of the brain" (Educator 20). Reflecting on how the brain science gave her new insight into the child, Educator 13 commented, "the brain science was fascinating, I now know what is going on in their head." One PL participant summarizes these various ideas in her comment:

> Understanding and knowing the science part of the brain and how one part, like the calm brain can't work as well when the other stress brain is more active…it totally changes everything about how we view things: children and self-regulation. The brain science now actually gives us the why (Educator 1).

In addition to these general remarks about their new knowledge of brain science, several participants noted a more specific new understanding in regards to how the brain coordinates behaviour. Educator 12 summed up her learning about the brain and behaviour this way: "Well self-regulation, I didn't know about this blue brain and red brain, and how the brain works, and when the kid had a problem it was just a problem; and, it's more than that. It's actually stress and you just have to find out what it was." Educator 2 reiterated this idea during the focus group when she said, "I now know that children are guided by functions in the brain and they aren't always able to change the way their brain is functioning." To this, Educator 3 added, "When they are in red brain they have no self-control." Educator 7 went on to comment that based on what

she had learned about the brain, she had "changed my view from misbehaviour to stress behaviour—the child is under stress not misbehaving."

Overall, there was a pronounced tone of enthusiasm that radiated throughout these various comments about the new scientific knowledge PL participants had gained. As evidence of this interest, three educators followed up with the researcher following the professional learning to request resources for further reading on the topic of neuroscience and behaviour and two others requested resources on brain science that they could share with parents.

Theme 4. Personal reflection on stress of self and others was evoked. The overall theme, that the professional learning evoked considerable reflection on stress, both in self and others outside of the workplace, was discussed in regards to question 6 above. As mentioned, PL participants frequently commented on how their new understanding of stress, originally explained to them in terms of child behaviour, had stirred up personal reflection on their own potential stressors and their impact on their own behaviour. For example, Educator 10 remarked, "Yeah I think now when I feel like I'm acting out in my own way, like I'm frustrated or something I'm now realizing 'Okay, I'm stressed.' and that I feel like I'm not focussing on what are my own stressors. What can I do to eliminate this to help me feel better?"

During a site visit, Educator 5 commented, "I see children differently and myself too" and another reiterated this notion when she said, "I've been thinking more about myself than the children to be honest." (Educator 6). Similarly, Educator 17 commented, "I'm thinking, 'Oh my gosh why am I so stressed now?' and not realizing that, you know, I have my own triggers, the things that make me mad and I try to eliminate those things before it kind of happens now."

Educators frequently made the connection between their own stress and the impact it has on the child. For example, Educator 20 noted, "When I'm calm and not having that lens of them

being bad per se, I'm letting them be who they are and helping them figure that out." This idea was repeated by Educator 11 who said "I've been reflecting more on my own stress and the impact it has on the kids."

The idea that professional learning evoked an awareness of stress in others is summed up by Educator 12 who said "I am looking at everyone differently. I see brains." and Educator 17 who said, "I'm just more aware of other people's stress" added, "I can see there is a lot of stress in my house." What is perhaps most remarkable is that this increased stress awareness in self and others was an inadvertent outcome of the professional learning. The significance of this emergent theme will be taken up in Chapter 5.

5. The Self-Reg PL was perceived as a positive and effective experience. This theme captures the general idea that PL participants frequently mentioned that they felt the professional learning had been a very valuable experience. This theme emerged primarily from data gained during the site visits which were less structured than the focus group sessions, allowing discussion to veer in unplanned directions. Overall, there was a general sentiment that the professional learning should be required for all educators and everyone who works with children. This was captured by Educator 9 who said that the "course should be mandatory" and "taught in all centres with all educators."

Other comments pertained to the stimulating nature of the content such as when Educator 4 said, "it was the most interesting workshop I've ever attended, there was genuine new learning and I was so pumped after the training!" To this, Educator 17 added, "I gained so much new learning; it was awesome!"

Remarkably, many PL participants reported that the professional learning had been a life-changing experience. For example, Educator 15 said "There has been a real personal life impact"

and Educator 4 commented that, "Ever since I left there, I have changed the way I am." Educator 3 noted how she felt she had "more empathy in general" following the professional learning and she noted at the end of the site visit with great emotion, "the days with you were like medicine for me." Educator 1 summed up how the professional learning had impacted her personally when she said, "The training totally changed my life. I can honestly say it has changed all of my relationships. It's just had this ripple effect. It's freaking me out a little. I've changed how I am interpreting what is going on. Everything has changed. My husband will thank you."

When educators made references such as these, the researcher frequently asked why they thought the professional learning had such an impact. Their answers provide insight into what participants consider to be important about professional learning experiences in general. For example, Educator 2 commented on the "comfortable" personality of the facilitator saying it "was a big thing" and that the "reason the workshop was great was 50% presenter, 50% content." Educator 3 reiterated this idea, laughing a little as she admitted: "I went into the training thinking 'not this again' but this was different. It was interesting! You [researcher] were just so passionate and into it!" Educator 20 mentioned how the real stories shared by the presenter and participants were "so helpful and meaningful." Finally, Educator 16 commented on the delivery of the scientific information saying, "the way you [researcher] said things really simplified some complicated processes."

While themes 1, 2 and 4 are directly related to the study's research questions that ask about the impact of the professional learning on beliefs, practices, and professional stress, themes 3 and 5 may be seen as playing an underlying, yet operative, role in regards to these findings. The potential contribution of these emergent themes to the overall impact of the professional learning will be addressed in Chapter 5.

CHAPTER 5

DISCUSSION

The impact of a child's relationship with their teacher in the early years on their academic and socio-emotional outcomes is well established. Many years of research on the STR construct have identified child behaviour and educator stress as operative variables in the quality of these early relationships. Despite this knowledge, interventions designed to improve STRs have focused mainly on improving educator knowledge regarding the general importance of relationships or on directly modifying their behaviour toward children (Williford & Sanger Wolcott, 2015). This study proposed that recent explanations of child behaviour as a downstream effect of neurophysiological stress stand to inform STR research by enabling a reframing of child behaviour that is implicated in both educator stress and low quality STRs.

In addition to exploring the known STR variables of challenging behaviour and educator stress, this study introduced measures of educator beliefs about, and practices in regards to, challenging child behaviour. These measures were designed to capture the extent to which educators understand and act on child behaviour as a neurophysiological phenomenon. The status of, and relationships among, all of the STR variables were examined with the aim of shedding new light on the STR construct. A professional learning intervention designed to improve educator understanding of child behaviour as a neurophysiological phenomenon was delivered in order to investigate its potential to impact the STR variables under study.

This chapter will explore the results of this study in the context of the relevant educational, psychological, and neuroscientific literature. Findings from each of the exploratory and intervention phases of the study will be addressed in turn, culminating in a summary discussion of the overall potential of Self Reg PL to impact early student teacher relationships. This will be followed by a discussion of the study's limitations. Finally, the ways in which this work might inform future research, policy, and practice aimed at improving the quality of early STRs will be discussed.

<div align="center">**Exploratory Findings: Insight into the STR Construct**</div>

The exploratory analyses of the STR variables in this study corroborate much of what is known about the variables involved in the STR construct and also provides new insight into the relational dynamics between these variables. Additionally, the new variables of educator beliefs and practices with regards to challenging child behaviour shed fresh light on the STR system by building on the recent research which situates student-teacher relationships in a neurophysiological context. These contributions are discussed below.

Corroboratory Results

Findings from the exploratory analysis of educator survey data examining the relationships among the STR variables under study confirm much of what is known about the interplay between challenging child behaviour, educator stress, and a conflictual STR. First, with regards to the association between challenging child behaviour and conflictual STR, the present study found that more than half of the challenging behaviours (i.e., verbal aggression, severe tantrums, self-injury, and withdrawal) correlated significantly with the conflictual STR variable, substantiating the known association between the two (Sabol & Pianta, 2012; Skalická et al., 2015; Stulman & Pianta, 2002). Further, regression analyses in this study showed conflictual

STR to be a significant predictor of the chosen challenging behaviour variable, verbal

aggression. This finding substantiates previous research findings showing this predictive

relationship (Merritt et al., 2012; Silver, Measelle, Armstrong, & Essex, 2005). These results

support the conclusion that challenging child behaviour and conflictual STR exist in a reciprocal

relationship (Buyse et al., 2008; Merritt et al., 2012; Skalická et al., 2015; Zhang & Sun, 2011).

Second, with regards to challenging child behaviour and educator stress, the present study

found significant correlations between all categories of challenging child behaviour (except child

withdrawal) and the educator emotional exhaustion variable. These correlations support the

longstanding finding in educational research that challenging behaviour is related to educator

stress in the early years of schooling (Blase, 1986; Friedman, 2010; Hastings & Bahm, 2003;

Yoon, 2002).

Finally, educator stress, here measured as emotional exhaustion, was found to correlate

with, and further to predict, conflictual STR. This finding supports previous research in which

educator stress has been associated with the quality of student teacher relationships in general

(Whitaker et al., 2015) and further substantiates Yoon's (2002) more definitive finding that

educator stress operates as a predictor in the conflictual STR construct. Moreover, the present

analyses revealed that conflictual STR was a significant predictor of educator emotional

exhaustion, substantiating the recent work of Gagnon, Huelsman, Kidder-Ashley and Lewis

(2019) who similarly found that a conflictual STR, measured using the STRS scale utilized in the

present study, significantly predicted teaching stress. Finally, regression analyses conducted here

using child verbal aggression as the outcome variable, revealed that educator emotional

exhaustion significantly predicted this challenging child behaviour, although this significance did

not hold in a follow up regression analyses entering only significant variables. Different than the

widely regarded idea that challenging child behaviour is an instigator in educator stress, the preliminary regression analysis examining the predictors of verbal aggression suggests the possibility of a predictive relationship in the opposite direction.

Overall, the present study confirms existing research on the various dyadic relationships between these three widely studied STR variables and offers new perspective into the potentially predictive role of educator stress in the verbal aggression category of challenging child behaviour. Additionally, owing to the simultaneous investigation of challenging child behaviour, educator tress, and conflictual STR, this study is uniquely positioned to forward the idea that these variables are interlocked in a dynamic system, each relating to, and in some cases predicting, the other. However, when these known variables are examined in conjunction with the new variables of educator beliefs and practices regarding child behaviour, and educator beliefs regarding self-regulation, a new view of this dynamic STR system emerges.

New Insight: The Feature Role of Educator Emotional Exhaustion

In addition to corroborating findings regarding known STR variables, the present study shows that in addition to being significantly correlated with all measures of challenging child behaviour (except for withdrawal) and a significant predictor of conflictual STR, educator emotional exhaustion is further implicated in the STR system in that it is a significant predictor of educator practices regarding child behaviour. That is, this study shows that emotional exhaustion predicts a more standardized, punitive educator response, an interaction style known to relate to a conflictual STR (Buyse, et al., 2008; Driscoll & Pianta, 2010). These findings suggest that a conflictual STR may hinge on this emotional exhaustion measure. Namely, emotional exhaustion may be implicated in the conflictual STR, the challenging behaviour that fuels the conflictual STR, and the practices educators employ when responding to challenging

child behaviour. The feature role of educator emotional exhaustion that emerges from the examination of the STR variables in this study may be understood in light of educational, psychological, and neuroscientific research in the areas of stress contagion, stress and perception, and educator perception and beliefs and practice.

Stress contagion. Recent advances in neuroscience and psychiatry citing stress as a contagious phenomenon provide insight into the finding that challenging behaviour relates to educator stress, and suggests how educator stress might operate as a predictor in the child verbal aggression variable. The notion of neuroception, developed by Porges (2011), suggests that in the interest of survival, subcortical areas of the human brain are continuously scanning the environment for clues of danger and safety. When this subconscious threat-detection system detects stress in another person, it triggers a stress response itself under the presumption that danger must be present (Porges, 2011).

Similarly, Tantam (2018) discusses the idea of the "interbrain" between child and adult, describing it as wireless channel of non-verbal communication. Citing brain research showing that a subject's sympathetic nervous system activity increases as a function of the level of sympathetic arousal of the person they are with, Tantam proposes that both physiological and emotional arousal can be transmitted through the interbrain connection. Application of Porges' and Tantam's theories to a classroom setting would suggest that when an educator's stress rises, a stress response in the child is triggered, and likewise, the heightened stress of a child may activate a stress response in the educator. Given the impairing effect that stress has on child behaviour (Blair et al., 2005; Ruttle et al., 2011), Porges' and Tantam's ideas of neuroception and the interbrain, respectively, shed new light on the well-known association between educator

stress and challenging child behaviour, and the specific finding of Oberle and Schonert-Reich (2016) that neurophysiological measures of educator stress relate to child stress.

Emotional exhaustion and perception. The finding that the emotional exhaustion of educators correlates with, and predicts, their practices regarding challenging child behaviour, may be understood in light of research regarding the impact of stress on perception. Robert Thayer (1997), who examines the impact of stress on mood, explicates the association between one's level of exhaustion and their interpretation of the environment. Specifically, utilizing the neurophysiological definition of stress as that which engages the autonomic nervous system and burns energy, Thayer notes that in a stress-induced energy depleted state we are more inclined to see things through a negative lens. This observation is reminiscent of Lazarus and Folkman's (1984) theory of stress and coping in which they outline how behavioural reponses are induced, not by the environment itself but by the individual's perception of the environment in conjunction with their evaluation of personal resources. The finding that stress can impact perception has been corroborated in a recent neuroscientific study by Khosrowabadi (2018) in which EEG studies of the brain revealed that subjects' perception of an emotional audio-visual stimulus presented was different in a stressed versus non-stressed state. Applied to the STR context, this research suggests that in the low energy and high-tension state of emotional exhaustion, educators are neurophysiologically primed to view a child's challenging behaviour as problematic, which in turn motivates a negative response. This research brings neuroscientific validation to the old adage commonly attributed to author Anais Nin (1961) that, "we don't see things as they are, we see things as we are." This connection between the educator's view of behaviour and their own behavioural response is discussed next.

Educator perception, beliefs, and practice. Perception (i.e., what we "see") and beliefs (i.e., what we hold to be true about what we see) are interrelated constructs (Smith, 2001). Therefore, it is presumed that the impact stress has on general perceptions as discussed above, similarly impacts educator beliefs in the present study. A significant correlation has been observed between measures of what educators believe about various educational processes and the practices they engage in. For example, Charlesworth, Hart, Burts and Hernandez (1991), who examined teacher beliefs using the Teacher Beliefs Scale and educator practices using the Instructional Activities Scale, report that developmentally appropriate practices rise as a function of developmentally appropriate beliefs. Similarly, Stipek and Byler (1997) show that teachers who hold child-centred beliefs with regards to programming, engage in practices more conducive to a positive social climate in the classroom. In line with this research, the present study found a correlation between educator beliefs and practices regarding challenging child behaviour. This correlation suggests that when child behaviour is believed to be the consequence of willful intention and within the child's control, as illustrated by a high score on the beliefs scale, practice scores rise, indicating more standardized, punitive responses. This particular finding is similar to work done by Dagnan, Trower, and Smith (1998) who note that when educators attribute challenging child behaviours to "controllable" factors, it provokes negative emotions and punitive responses. Likewise, Nungesser and Watkins (2005) observe a direct association between causal beliefs and educator response in their study which shows that negative beliefs about behaviour lead to educators responding in "reactive" ways, such as using time-out, restraint, and removal of privileges. The correlation between educator beliefs and practices in the present study is illuminated by an examination of aggregate responses on specific items within the beliefs and practices survey scales. For example, 49% of educators in this study "agree" or

"strongly agree" with a belief that children are in control of their behaviour. This belief relates to the finding that 55% report "often" or "always" engaging in standard disciplinary practices that apply equally to all children, with 40% noting they "often" or "always" discipline an aggressive child immediately.

The central role of educator emotional exhaustion in the STR system (considered in light of this research on stress contagion, stress and perception, and beliefs and practice) introduces the possibility of a new system within the STR construct, one that centres on the educator emotional exhaustion variable. Namely, in addition to having a potentially direct impact on challenging behaviour via the neuroceptive and interbrain processes articulated by Porges (2011) and Tantam (2018) respectively, educator stress, measured here as emotional exhaustion, may influence what educators perceive, and ultimately believe, about a child's behaviour. Educator perceptions and beliefs then subsequently govern how they respond. Interestingly, while educator emotional exhaustion emerged as a significant predictor of educator practices regarding child behaviour in the present study, it did not relate significantly to educator beliefs as the reviewed research would suggest it should. Here, beliefs regarding child behaviour may be seen as implicated in educator emotional exhaustion via their role as a predictor of educator practices regarding child behaviour which, in turn predict emotional exhaustion.

Beliefs About Self-regulation and Practice

Dangnan et al.'s (1998) and Nungesser and Watkins' (2005) research highlighting the connection between educator attributions or beliefs about child behaviour and the nature of their response was corroborated in the present study with the finding that educator beliefs about the self-regulation construct produce differences in practices regarding challenging child behaviour. Independent samples *t*-tests showed that whether educators interpreted self-regulation as related

to neurophysiology or not, led to significant differences in their practice scores. Namely, understanding self-regulation as being stress-related led to lower scores on the practices measure suggesting that such understanding led to more emotionally supportive responses to challenging behaviour. Beyond corroborating the association between educator beliefs and practices, this finding is of particular significance in that it highlights the role of neurophysiological measures in the STR construct. Specifically, a neurophysiological view of self-regulation, and by extension, child behaviour, reduces the likelihood of standardized, punitive responses to challenging behaviour. Given the association between insensitive educator practices and conflictual STRs (Buyse et al., 2008; Griggs et al., 2016), this finding suggests that improving educator understanding of self-regulation as a neurophysiological phenomenon may be a viable means to modifying educator response to challenging behaviour and ultimately, a means of shifting the STR system. This idea is further examined in the discussion of the impact of the Self Reg PL below.

Summary of Exploratory Analysis

Overall, the relational analysis of the STR variables in this study corroborate what is known about the contributory roles of challenging child behaviour and educator stress in the conflictual STR construct. However, the simultaneous study of these variables facilitates a new view of the interlocking nature of these variables and highlights the potentially operative role of educator emotional exhaustion in the STR system. Further, this study brings to light an association between educator emotional exhaustion and educator practices and further shows that educator practices relate to educator beliefs about child behaviour. Finally, the specific connection between educator beliefs about self-regulation and educator practices regarding

challenging child behaviour suggests that beliefs about self-regulation may be distinctly relevant in our efforts to promote supportive educator practices and closer STRs.

The Impact of Self Reg Professional Learning

The Self Reg PL in this study was developed as an attempt to investigate the potential of learning about the neurophysiological roots of child behaviour, as framed by Self Reg theory, to influence educator beliefs, practices, stress, and ultimately, relationships with children. The impact of the Self Reg PL on these variables, and other emergent findings are discussed.

Educator Beliefs and Practices

Pre-post analyses of the survey data of PL and control participants in this study show that the two day Self Reg professional learning course aimed at improving educator understanding of the neurophysiological roots of child behaviour significantly impacted educator beliefs and practices regarding challenging child behaviour. This finding was further supported by educator comments during site visits and focus groups. Specifically, survey data showing lower scores for the PL group on the beliefs scale indicate a more contemplative, open, and less "controllable" view of child behaviour than before the PL. Likewise, lower practices scores for PL participants suggest more thoughtful, individualized, and supportive responses to challenging behaviour for this group. These changes were supported by educator comments such as "I used to think they were seeking attention, now I see that kids don't misbehave on purpose," and "Now I think about digging deeper before responding." This significant change in beliefs and practices scores was mirrored in changed beliefs about the concept of self-regulation for PL participants with a significant number of participants changing their chosen definition to one explaining it as a neurophysiological construct. Changes in beliefs about the nature of self-regulation coincided with general changes to beliefs and practices regarding challenging child behaviour. These

changes may be understood in light of PL educator comments such as, "Now I wonder, is this misbehaviour or stress?" and, "Now I look for the stress" which suggest that practice change predicated on a view of child behaviour as stress related. Given the known associations between educator beliefs, practices, and conflictual STRs in general (Dagnan, et al., d1998; Sabol & Pianta, 2012), this finding of changed beliefs about self-regulation taken in conjunction with the finding of changed beliefs and practices regarding challenging child behaviour, suggest that each of these variables is a potentially viable and valuable means to influencing the STR system.

New Knowledge

A second pronounced finding in regards to the impact of the Self Reg PL was educator reported changes in knowledge, particularly with regards to the brain, the neurophysiological roots of behaviour, the influence of stress on behaviour, and the concept of self-regulation. Changes to knowledge regarding the science of behaviour following the Self Reg PL is captured in participant comments such as "I didn't know how the brain worked before" and, "The new brain science was fascinating; I now know what is going on in their head." Further, the interplay between this new knowledge and educator beliefs and practices is captured in the PL comment:

> Understanding and knowing the science part of the brain and how one part, like the calm brain, can't work as well when the other stress brain is more active…It totally changes everything about how we view things; children and self-regulation. The brain science now actually gives us the why.

While the field of education has been working to close the gap between neuroscientific findings and its policies and practices, many front line educators remain uninformed with regards to the neuroscience that might assist them in their daily practice (Ansari, Coch, & De Smedt, 2011; Blair & Raver, 2015;). This might be attributed to the fact that neuroscience can be

inaccessible to educators, in both a literal and cognitive sense. Indeed, in reflecting on this issue, Blair and Raver (2015) called for a "clear and meaningful translation of findings from neurosciences in ways that can remove some of the mystique that surrounds data on brain function and stress" for educators (p. 77). The many references to the science of brain development and stress awareness in site visit and focus group data in this study illustrate PL participants' new knowledge in this area. Indeed, this new knowledge emerged as a theme in qualitative analyses. This finding suggests that the Self Reg PL may represent a viable "translation" of the neuroscience on stress and brain function that has been called for by Blair and Raver (2015).

Personal Impact and Transfer of Learning

In addition to the new knowledge gained, PL participants frequently commented on the personal impact of the Self Reg PL referring to heightened stress awareness in particular. While personal reflection on stress was not an explicit component of the Self Reg professional learning, it emerged as a significant theme in qualitative data. This significance was exemplified in comments such as, "I think focusing on the children's stress actually brings down my own," and "focusing on theirs [stress] helped mine." While it was expected that the PL might reduce professional stress via a new understanding of child behaviour, the transfer of PL learning to personal life, that is, seeing oneself and significant others in a new neurophysiological light was unexpected. This finding supports the suggestion of Dubinsky, Roehrig, and Varma (2013), that by improving educator understanding of the neuroscience that impacts the learning of children, we might ultimately affect how they think about their own learning. In this case, it seems that by improving educator understanding of stress in children, we have improved their understanding of stress in themselves. That is, learning to see child behaviour through a neurophysiological lens

appears to transfer to an understanding of human behaviour in general, including oneself and the significant others in one's life (i.e., "I am looking at everyone differently. I see brains" and "I'm just more aware of other people's stress through this lens").

Overall, this surprising shift in perspective may be a key consideration in understanding the effectiveness of the Self Reg PL in changing beliefs and practices. The many references to self in qualitative data suggest a personal application of the Self Reg PL content. This personal impact and the transfer of content indicates a high level of learning (Byrnes, 1996; Perkins, 1992). Potential reasons for this personal impact, as framed by a discussion regarding what this study offers in regards to effective professional learning, are discussed below.

Effective Professional Learning

While it was not an intended research focus, the qualitative data gathered through focus groups and site visits with participants following the Self Reg PL, contribute to our understanding of what constitutes effective professional learning for early childhood educators. These ideas are considered below.

Sharing versus telling, extension to self, and self-efficacy. During site visits and focus groups, participants frequently mentioned the personality of the presenter, the stories told during the training, and the sharing of personal anecdotes as significant to the overall professional learning experience. These variables speak to the "realness" of the facilitator and of the training itself; a factor noted by Guskey (2002) as critical to effective professional learning. These characteristics of the Self Reg PL seem to have lent to an overall feeling of "sharing" versus "telling" that promoted partnership between facilitator and participants as opposed to an instructor–student relationship (Sheridan et al., 2009). PL participant comments such as "the days with you were like medicine for me" and "I gained so much useful information—it was

awesome!" illustrate how educators felt the PL to be an enjoyable and indeed, supportive learning experience.

The importance of this approach to professional learning has been described by Bills, Giles, and Rogers (2016) who, in their qualitative examination of professional development for teachers in New Zealand, discovered teachers' desire to "feel seen" within a "culture of support" in their professional development experiences. These researchers noted a trend toward teacher rejection of prescribed PL outcomes that they are expected to adopt and, rather, a desire for a more open, co-constructed approach to learning. In line with this, the Self Reg PL was explicitly introduced as a "sharing of knowledge" experience and was not intended to deliver strategies that educators were expected to adopt; rather, it was framed as a learning event whereby the knowledge gained might naturally lead to authentic changes in behaviour. Additionally, the personal stories of educators were invited and incorporated into the learning; in many cases used as starting points to expand upon and apply difficult theoretical concepts. This component of the professional learning reflects the finding of Sheridan et al. (2009) that personal reflection during training for early childhood educators is essential to participant motivation and overall PL effectiveness.

Further, the content of the Self Reg PL included information on the overall significance of the work of ECEs and referenced empirical research showing how ECEs impact a child's long-term development (Baker, 2006; Curby et al., 2009; Griggs et al., 2016; Hamre & Pianta, 2001). Research regarding the influence of early caregivers on child brain development was also shared (Shonkoff & Phillips, 2000; Shonkoff et al., 2009). This research, that speaks to the importance of ECEs to the developmental trajectories of the children they work with, was shared early on the first day of training and, based on educator feedback and their requests for the

specific studies that were discussed, seemed to have had a significant impact. Many educators commented during the PL that, while they always felt they were important to children, they did not know that research existed that empirically substantiated their heartfelt beliefs. Feelings of efficacy that resulted from learning about this research were likely an important motivational force for the deep, personalized learning that occurred in this study (Bandura, 1977). This finding speaks to the importance of incorporating research on the overall value of early years educators in all of their professional learning experiences as a means to promoting engagement. This incorporation of current research in PL may be especially important for early childhood educators who have been practicing for longer than the recent brain research that scientifically validates their role in child development has been available, and whose training therefore, did not include this content. Indeed, 13 of the 20 PL participants in this study had been practicing for more than 10 years and many reported that they were not aware of the brain research that has since served to legitimize their work. To the extent that this research gives credence to their daily practice, it may be regarded as an important means to achieving the relevance that Sheridan et al. (2009) have identified as critical to professional learning for early childhood educators. This study suggests that the incorporation of empirical research illustrating the significance of ECEs to a child's development may be a valuable introductory component of all professional learning endeavours with early childhood educators.

Accessibility of scientific information. Citing the gap between what neuroscience has forwarded about the brain and behaviour and educator knowledge and practice, researchers such as Blair and Raver (2015) have called for the development of professional learning for educators that discusses, in a clear and meaningful way, the application of neuroscience to educational practice (Cozolino, 2013). As discussed, many PL comments during site visits and focus groups

pertained to the "science" they had learned from the Self Reg PL. Qualitative data show a pronounced impact of PL on personal knowledge about the brain, the neurophysiological roots of behaviour, the influence of stress on behaviour, as well as a changed understanding of the concept of self-regulation. Many PL participants commented on how the training simplified these scientific concepts. PL participants' frequent references to "blue brain" and "red brain" (referring to the prefrontal cortex and the limbic system respectively) is one example of how Self Reg PL translates complex neural constructs to simplified, retainable terms. The retention of scientific concepts that was displayed by participants illustrates the possibility of utilizing Self Reg PL as a means of translating complex neuroscientific theory for early childhood educators.

Integration of Exploratory and PL Findings: Can Self Reg PL Change the STR?

This study was grounded in the general interest of finding ways to promote close, emotionally supportive relationships between children and their educators in the early years. The question remains as to whether Self Reg professional learning has the potential to influence early STRs.

While data analysis in this study showed no significant change in educator relationships with children pre and posttest for PL participants and no significant difference between PL and controls posttest, the data did reveal a trend toward an increased number of close relationships for the PL participants following the professional learning. This suggests that perhaps the eight weeks between professional learning and posttest in the present study was not enough time to produce a measurable change in relationships with children.

Additionally, that the Self Reg PL had a significant impact on educator beliefs and practices on both quantitative and qualitative accounts indicates an overall shift toward more open, emotionally supportive perceptions and responses to challenging child behaviour. Given

what is known about the general impact of perception on behaviour and the known association between sensitive interactions and STRs, these changes could be expected to eventually produce positive changes in relationships with children. The significant change in beliefs about self-regulation as a neurophysiological construct is especially significant as it shifts educator attribution of child behaviour away from the idea of "controllability" (which has been shown to lead to punitive response), toward an increased understanding of the impact of the central nervous system on behaviour. This finding of a change in beliefs was supported in educator comments in that they noted a new awareness that when a child exhibited challenging behaviour, the child was not "being bad," but rather was stressed and in "red brain."

Further, the personal impact of the professional learning on participant stress awareness and educator reports of reduced stress following the PL, coupled with the trend toward a reduction in participant scores for emotional exhaustion and increased personal accomplishment, suggest that Self Reg PL has the potential to influence educator stress. Moreover, the fact that educators reported a transfer of learning regarding the stress construct to their personal lives outside of work indicates a high level of content mastery that is likely to be sustained (Byrnes, 1996; Perkins & Salomon, 1992). These reports of personal change when considered in light of quantitative data supporting changed beliefs and practices regarding child behaviour, together forward the idea that for some, the Self Reg professional learning may have had the general effect of impacting the educator's "way of being" (Rogers, 2003) in the classroom and in life beyond. Given the results of the exploratory analysis that suggested educator emotional exhaustion as a central factor in the conflictual STR system, the positive personal impact of the Self Reg PL may be of particular relevance to future research aimed at influencing the STR via this educator stress variable.

Limitations

The findings of this study must be considered in light of its limitations. In terms of threats to internal validity, the effects of history, maturation, self-report (in regards to survey items), and testing are all present in the present study. First, history effects as defined by Shadish, Cook and Campell (2002) refer to "all events that occur between the beginning of the treatment and posttest that could have produced the observed outcome in the absence of the treatment" (p. 56). History effects may have been present in this study as the group that received the professional learning may have developed an interest in the ideas presented on Self-Reg theory, and completed some reading, or been attracted to, information on the subject. Indeed, the present study did not control for, or measure, the spontaneous learning on Self-Reg theory that may have occurred for either the PL or control participants between intervention and posttest. However, none of the PL participants commented on having done any other Self-Reg training or reading during the period between intervention and post intervention data collection.

Additionally, maturation effects, or the natural changes that may occur over time, even in the absence of treatment may have influenced this study's results. While a control group improves the internal validity of the study to a great degree (Campbell & Stanley, 1963), it does not account for the possibility that changes in the educator believed to be owed to the intervention may actually be attributed to the passage of time. Pre and post educator reports of their relationships with students may be particularly susceptible to this maturational effect. Reports of changes to beliefs and practices may also have been subject to the passage of time; as educators become more experienced and more familiar with the children in their classroom, they may naturally become more emotionally supportive and therefore respond more positively to these scale items.

Further, the educator survey instrument in this study relies on educator self-report and is therefore subject to respondent bias (Adams & Lawrence, 2015). Discussing one's relationships with children, particularly if they are negative in nature, can be a sensitive issue. Educators may therefore have been inclined to over-report positive and under-report negative relationships. This may also be the case for reported beliefs and practices regarding child behaviour. Namely, it may have been evident that some items on these beliefs and practices scales were "right" or "wrong" in terms of what is known about best practice in early childhood education leading respondents to choose the response they deem to be "right." This idea may be especially at play in posttest data, where PL participants may have suspected, based on the training, what the "right" answer was. Similarly, a desire to please the researcher, with whom a relationship had been formed by posttest, might have encouraged PL participants to answer in ways they thought would be "right" regardless of their true experience. Additionally, the effect of testing, the idea that taking the survey once might have influenced scores when it was taken again (Shadish et al., 2002), may have been at play in this study. Familiarity with the instrument for example, might have led to less attention or care given at the posttest administration. Prior completion of the survey may have influenced post intervention participant responses to the extent that they were "clued in" to the purpose of the study (Adams & Lawrence, 2015).

Finally, while measures were taken to ensure that PL and control group participants did not work together in the same classroom in order to avoid sharing of PL content, given the relatively small region wherein the study took place, it is possible that some sharing of the PL material may have occurred between participants in these groups. While PL participants commented that they did not knowingly share what they had learned from the PL with their colleagues, the extent to which sharing may have occurred inadvertently as PL participants

employed new practices in their centres, would limit the ability to say that changes in the variables under study following PL were due to the PL alone.

In addition to these threats to internal validity, there are also limitations to the external validity, or generalizability, of this study's findings. First, the fact that all of the study participants were employed by the same umbrella child services organization in rural Ontario may mean that there is something inherent to the policies, procedures, and culture of this organization, or ECEs in this region, that influenced the study outcomes.

Additionally, participants in the intervention component of the study were self-selected and it is possible that individuals who identify a willingness to participate are those who feel confident in their beliefs and practices regarding child behaviour, reducing both the representativeness of the sample and therefore the generalizability of the findings. It is also possible that educators who doubt themselves in these areas and are interested in improvement would self-nominate for extended participation in the study. This would result in more gains than might be expected in the general population of early childhood educators. In both cases, the participants may be more likely to be representative of sensitive, concerned practitioners which might reduce the generalizability of these findings to the general population of early childhood educators.

Future Research

This study adds to the growing body of research that examines early student teacher relationships in a neurophysiological light. Predicated on the notion that what we have learned about the neurophysiological basis of child behaviour might inform how educators understand and respond to the challenging behaviour of the children they serve, this study found that the Self Reg PL program can change the beliefs and practices of educators with regards to challenging

child behaviour and shift stress awareness on the level of the child, the self, and people in general. Likely mediating these effects is the reported new knowledge gained regarding the brain, science, and the neurophysiology of behaviour and the efficacy thus afforded. Despite these contributions, there are ways in which this study may be improved and its findings substantiated in future research. Ideas for replication and expansion of this study and the ways in which its findings may be utilized to inform educational policy and practice are discussed below.

Replication of this Work

In order to ascertain the effectiveness of the Self Reg PL program to impact relationships between students and teachers directly, this study might be replicated with a longer timeframe between intervention and posttest to determine if measurable changes in relationships may occur over time. Further, replication efforts might focus exclusively on educators who report a high percentage of conflictual relationships given the overall negative impact of conflictual STRs in general and the results of the present study as well as past research (Gagnon et al., 2019) that conflictual, but not close STRs, are related to the educator stress variable that emerged as especially significant in this study.

Additionally, this study did not measure the impact of the Self Reg PL on the challenging behaviour of children directly, in part because data on this variable did not allow for aggregation of the various challenging child behaviours into an overall challenging behaviour score. Future research might consider alternate ways of collecting and scoring this data that enable statistical analysis of this measure. Given the known role of challenging child behaviour in conflictual STRs (Ladd & Burgess, 1999; Lei et al., 2016; Jerome et al., 2009; Sabol & Pianta, 2012; Skalická, et al., 2015; Stulman & Pianta, 2002), it would be important to know if the Self Reg PL produces changes in this child behaviour variable.

Further the significant effects of the Self Reg PL on the educators themselves and their personal lives outside of work might be further investigated by more intensive case study research designs wherein a small number of educators are followed qualitatively over an extended period of time. Again, as noted above, an intensive study of this type might focus on educators who are experiencing either especially challenging behaviours, conflictual relationships, or high levels of stress given the well-established significance of each of these variables to the conflictual STR construct and the need, therefore, to fully understand the etiology of each.

Finally, as this Self Reg PL rather incidentally produced changes in educator stress and general stress awareness, a version of this Self Reg PL might be developed with the intention of addressing educator stress directly. This is especially worth considering if the finding regarding the central role of educator stress in the STR that was found here is corroborated in future studies. That is, to the extent that future research substantiates the central role of educator emotional exhaustion and educator stress in the general STR construct, PL aimed at directly influencing this variable should be developed. As the Self Reg PL implemented in this study impacted educator stress awareness and led to some stress reduction according to the reports of some participants, it might serve as a starting point for the development of such a PL program.

Future Area of Focus: Educator Stress

Exploratory analyses of the STR variables under investigation in this study highlight the role of educator emotional exhaustion in the STR system. Supplemental research (on the contagious nature of stress, its influence on perception, and perception's consequent role in educator practices) illuminates how educator stress may be at the core of the conflictual STR. Additional research is needed to explore this proposed system. In particular while psychological

literature suggests that stress influences perception, the lack of correlation between emotional exhaustion and beliefs regarding child behaviour in the present study calls for further examination.

Further, the finding that a conflictual STR predicts educator emotional exhaustion calls attention to the fact that educators are also impacted by a low quality STR. That is, while the STR has typically been examined in terms of its bearing on the child, the connection between conflictual STR and educator emotional exhaustion highlights a need to attend to the ways in which the STR might affect the well-being of the educator. This notion reflects Gagnon et al.'s (2019) statement that the "student-teacher relationship is not exclusively a student concern" (p. 222).

Implications for Policy and Practice

A survey conducted by Hemmeter, Santos, and Ostrosky (2008) showed that professors working in ECE training programs across nine US states reported a belief that their graduates were not prepared to work with children with challenging behaviours. This findings mirror the earlier report by Hemmeter, Corso and Cheatham (2006) that, of all of the training needs identified by 500 surveyed early childhood educators, the need for training to address challenging child behaviour was ranked the highest. State, Kern, Starosta, and Mukherjee (2011) elucidate this training gap with their finding that only 16% of required preservice courses for educators in the US included information on child behavioural problems. This idea was recently expanded on by Flower, Mckenna, and Haring (2017) who found that educator preparation programs focused on universal classroom management strategies rather than the increasingly prevalent specific challenging behavioural needs of children. These researchers suggest that the

under-preparedness of educators in regards to challenging behaviour is leading to significant challenges in the profession (Flower et al., 2017).

Collectively, Flower et al.'s (2017) research, considered in conjunction with the EDI data in Ontario showing an increase in challenging behaviours (Offord Centre for Child Studies, 2017), and the work of Gilliam (2002) in the US reporting the high expulsion rates of preschoolers due to behaviour, suggests an urgent need to develop a means to closing this training gap for early years professionals. The effectiveness of the Self Reg PL in this study offers a potential mechanism by which to address this training need for both preservice and in service early years educators. Training for early years educators might begin with a pilot of the content of the Self Reg PL as a means to improving educator understanding and response to the challenging behaviour of the children they serve.

Finally, Self Reg PL has educational applications beyond those relating to working with challenging behaviour in children. It has been established that there is little agreement among practitioners when it comes to defining self-regulation despite a widely held belief that it is an important construct (Bodrova & Leong, 2006; Raver et al., 2012). This is especially problematic in jurisdictions such as Ontario, where educators formally evaluate a child's self-regulation. The finding that Self Reg PL, in a relatively short time, produced a shared neurophysiological understanding of this construct, suggests that Self Reg PL may serve educational efforts to establish a much-needed common understanding of self-regulation in educational policy and practice. Importantly, this neurophysiological definition of self-regulation dispels the idea that self-regulation is a normative concept. Rather, Self Reg theory frames self-regulation as something that all children engage in naturally in highly individualized ways that reflect their own experience and personal profile of stressors and further promotes the notion that when

identified, maladaptive modes of self-regulation can be replaced with those that are growth promoting. As such, the widespread adaptation of this view of self-regulation might have far-reaching effects on educator and child well being in general. In that it advances educator understanding of the neurophysiological roots of all human behaviour, Self Reg PL may help educators to understand all children and indeed, as shown here, to understand themselves. This aspect of Self Reg PL may be especially relevant to recent efforts to develop "trauma informed" educational practices (Weist-Stevenson & Lee, 2016) which focus on the impact of chronic stress on the brain and the associated learning and behavioural outcomes.

Moreover, when early childhood educators are equipped with the knowledge to appropriately read and respond to stress behaviour in children, a potential ricochet effect on the child's experience in later grades may occur because, when children are understood and supported by their early years educators, they are more likely to enter primary grades with better regulation capacities (Griggs et al., 2009; Merritt et al., 2012). In this way, Self Reg PL with ECEs can positively impact both the child's social and academic outcomes and the likelihood of close STRs in the later grades. On these grounds, Self Reg PL should be widely implemented for in-service educators and considered for adaptation as a standard component of the curriculum for pre-service educator training programs.

Conclusion

Before they understood his body's sensory needs his [educators] were often angry at Ben for being so unruly. They believed he was choosing to purposefully misbehave which strained their relationship with him, diminishing his self-confidence. Now, they felt more compassionate and less blaming. This new perspective provided a fresh lens through

which to view Ben, and it set their relationships with him on a positive trajectory. (Delahooke, 2017, p. 41)

Advancing early childhood educators' understanding of the neurophysiological roots of child behaviour is important; it provides them with a scientific reframe of challenging child behaviour that serves to disrupt the notion that "misbehaviour" is always a willful act and invites a more emotionally supportive response. When we consider what is at stake when challenging behaviour is interpreted and responded to as an entirely "controllable" phenomenon, arguably it becomes what Code (1987) refers to as an "epistemic responsibility" of the educational system to ensure that early years educators are informed of the neurophysiological impact of stress on the behavioural outcomes of children. This study shows that Self-Reg PL is a potential means for meeting this responsibility. This training, that here served to advance educator knowledge regarding the science of child behaviour and resulted in changed beliefs and practices regarding challenging child behaviour, had the further effect of advancing educator understanding of themselves as neurophysiological beings. This unforeseen consequence of the Self Reg PL suggests it is a potential means of addressing the educator stress variable that was shown here to play a feature role in the conflictual STR system.

In seeking only to gently nudge educator knowledge of the neuroscience of behaviour in a non-threatening, meaningful, and story-based fashion, Self Reg professional learning, as developed and delivered in the present study, has the potential to change what educators believe about a child's challenging behaviour and in doing so, to change their response to it. In so far as it might continue to achieve these outcomes in future studies, Self Reg professional learning stands to be a new, neurophysiologically-based means of influencing the ever important student-teacher relationship construct.

References

Adams, K., & Lawrence, E. (2015). *Research methods, statistics, and applications*. Los Angeles, CA: Sage.

Ahnert, L., Harwardt-Heinecke, E., Kappler, G., Eckstein-Madry, T., & Milatz, A. (2012). Student–teacher relationships and classroom climate in first grade: How do they relate to students' stress regulation? *Attachment & Human Development*, *14*(3), 249–263.

Aiken, L. H., & Poghosyan, L. (2009). Evaluation of "magnet journey to nursing excellence program" in Russia and Armenia. *Journal of nursing scholarship: an official publication of Sigma Theta Tau International Honor Society of Nursing*, *41*(2), 166–174.

Ansari, D., Coch, D., & De Smedt, B. (2011). Connecting education and cognitive neuroscience: Where will the journey take us? *Educational Philosophy and Theory*, *43*(1), 37-42.

Arnett, J. (1989). Caregivers in day-care centers: Does training matter? *Journal of Applied Developmental Psychology*, 10, 541–552.

Baily, J. (2008). First steps in qualitative data analysis: Transcribing. *Family Practice*, 25, 127-131.

Baker, J. (2006). Contributions of teacher–child relationships to positive school adjustment during elementary school. *Journal of School Psychology*, *44*(3), 211–229.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioural change. *Psychological Review*, 84, 191-215.

Barnett, W. Jung, K., Yarosz, D., Thomas, J., Hornbeck, A., Stechuk, R., & Burns, S. (2008). Educational effects of the Tools of the Mind curriculum: A randomized trial. *Early Childhood Research Quarterly*, *23*(3), 299–313.

Belsky, J., & de Haan, M. (2011). Annual Research Review: Parenting and children's brain development: The end of the beginning. *Journal of Child Psychology and Psychiatry*, *52*(4), 409–428.

Bills, A. M., Giles, D., & Rogers, B. (2016). 'Being in' and 'feeling seen' in professional development as new teachers: the ontological layer(ing) of professional development practice. *Australian Journal of Teacher Education, 41*(2), 106-121.

Birch, S., & Ladd, G. (1998). Children's interpersonal behaviors and the teacher–child relationship. *Developmental Psychology*, *34*(5), 934–946.

Blair, C., & Diamond, A. (2008). Biological processes in prevention and intervention: The promotion of self-regulation as a means of preventing school failure. *Developmental Psychology, 20*(3), 899-911.

Blair, C., Granger, D., & Peters-Razza, R. (2005). Cortisol reactivity is positively related to executive function in preschool children attending head start. *Child Development*, *76*(3)*, 554–567.

Blase, J. (1986). A qualitative analysis of sources of teacher stress: Consequences for performance. *American Educational Research Journal, 23*(1), 13-40.

Bodrova, E., & Leong, D. (2006). Self-regulation as a key to school readiness. In M. Zaslow & I. Martinez-Beck (Eds.), *Critical issues in early childhood professional development* (pp. 203-224). Baltimore, MD: Brookes Publishing.

Boekaerts, M., & Cascallar, E. (2006). How far have we moved toward the integration of theory and practice in self-regulation? *Educational Psychology Review*, *18*(3), 199–210.

Boeree, G. (1998). *Nondirective interviewing*. Retrieved from http://webspace.ship.edu/cgboer/qualmethfour.html.

Boyd, B., & Pasley, B. (1989). Role stress as a contributor to burnout in child care

    professionals. *Child and Youth Care Quarterly*, *18*(4), 243–258.

Broekhuizen, M., Slot, P., Aken, M., van, & Dubas, J. (2017). Teachers' emotional

    and behavioral support and preschoolers' self-regulation: Relations with social and

    emotional skills during play. *Early Education and Development*, *28*(2), 135–153.

Bronfenbrenner, U. (1977). Toward an experimental ecology of human development.

    American Psychologist, 32(7), 513–531.

Bronfenbrenner, U., & Morris, P. (1998). The ecology of developmental processes. In W.

    Damon & R. M. Lerner (Eds.), *Handbook of child psychology: Theoretical models of*

    human development, Volume 1, 5th Ed. (pp. 993–1028). Hoboken, NJ: John Wiley &

    Sons Inc.

Bronson, M. (2000). *Self-regulation in early childhood*. New York: Guilford Press.

Burman, J., Green, C., & Shanker, S. (2015). On the meanings of self-regulation: Digital

    humanities in service of conceptual clarity. *Child Development*, *86*(5), 1507–1521.

Buyse, E., Verschueren, K., Doumen, S., Van Damme, J., & Maes, F. (2008). Classroom

    problem behaviour and teacher-child relationships in kindergarten: The moderating role

    of classroom climate. *Journal of School Psychology*, *46*, 367-391.

Byrnes, J. P. (1996). *Cognitive development and learning in instructional contexts*. Boston, MA:

    Allyn & Bacon.

Campbell, D., & Stanley, J. (1963). Experimental and quasi-experimental designs for research.

    In N. L. Gage (Ed.), *Handbook of research on teaching* (pp. 1-84). Chicago: Rand

    McNally & Co.

Cannon, W. (1929). *Bodily changes in pain, hunger, fear and rage*. New York: Appleton.

Charlesworth, R., Hart, C., Burts, D., & Hernandez, S. (1991). Kindergarten teachers beliefs and practices. *Early Child Development and Care, 70,* 17-35.

Code, L. (1987). *Epistemic responsibility*. Hanover, NH: Brown University Press.

Connor, C., Son, S., & Hindman, A. (2005). Teacher qualifications, classroom practices, family characteristics, and preschool experience: Complex effects on first graders' vocabulary and early reading outcomes. *Journal of School Psychology*, *43*, 343–375.

Cornelius-White, J. (2007). Learner-centered teacher-student relationships are effective: A meta-analysis. *Review of Educational Research*, *77*(1), 113–143.

Cozolino, L. (2013). *The social neuroscience of education.* New York: W.W. Norton & Company Ltd.

Crosnoe, R., Morrison, F., Burchinal, M., Pianta, R., Keating, D., Friedman, S. L., & Alison, K. (2010). Instruction, teacher–student relations, and math achievement trajectories in elementary school. *Journal of Educational Psychology*, *102*(2), 407–417.

Curby, T., Rimm-Kaufman, S., & Ponitz, C. (2009). Teacher–child interactions and children's achievement trajectories across kindergarten and first grade. *Journal of Educational Psychology*, *101*(4), 912–925.

Creswell, J. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. Boston: Pearson Education.

Creswell, J. W., & Plano Clark, V. L. (2007). *Designing and conducting mixed methods research.* Thousand Oaks, CA: SAGE Publications.

Dagnan, D., Tower, P., & Smith, R. (1998). Care staff responses to people with learning disabilities and challenging behaviour: A cognitive-emotional analysis. *British Journal of Clinical Psychology*, *37*, 59-68.

Delahooke, M. (2017). *Social and emotional development in early intervention.* New York: Pesi Publishing.

de Kloet, E. (2003). Hormones, brain and stress. *Endocrine Regulations*, *37(2),* 51–68.

Dettling, A, Parker, S., Lane, S., Sebanc, A., & Gunnar, M. (2000). Quality of care and temperament determines changes in cortisol concentrations over the day for young children in childcare. *Psychoneuroendocrinology, 25*(8)*,* 819–36.

Diamond, A., & Lee, K. (2011). Interventions shown to aid executive function development in children 4–12 years old. *Science*, *333,* 959–964.

Dignath, C., Buettner, G., & Langfeldt, H. (2008). How can primary school students learn self-regulated learning strategies most effectively?: A meta-analysis on self-regulation training programmes. *Educational Research Review*, *3*(2), 101–129.

Dobbs, J., & Arnold, D. (2009). The relationship between preschool teachers' reports of children's behavior and their behavior toward those children. *School Psychology Quarterly, 24*(2), 95-105.

Domitrovich, C., Bierman, K., Nix, R., Gill, S., & Gest, S. (2012). Improving preschool education with curriculum enhancements and professional development. In C. Howes, B. Hamre & R. Pianta (Eds.), *Effective early childhood professional development* (p. 113-130). Baltimore, MD: Paul H. Brookes.

Domitrovich, C., Gest, S., Gill, S., Bierman, J., & Welsh, D. (2009). Fostering high-quality teaching with an enriched curriculum and professional development support: The Head Start REDI Program. *American Educational Research Journal*, *46*(2), 567-597.

Doumen, S., Verschueren, K., Buyse, E., Germeijs, V., Luyckx, K., & Soenens, B. (2008). Reciprocal relations between teacher-child conflict and aggressive behavior in

kindergarten: A three-wave longitudinal study. *Journal of Clinical Child & Adolescent Psychology*, *37*(3), 588–599.

Downer, J., Jamil, F., Maier, M., & Pianta, R. (2012). Implications of information processing theory for professional development of early educators. In C. Howes, B. Hamre & R. Pianta (Eds.), *Effective early childhood professional development* (pp. 113-130). Baltimore, MD: Paul H. Brookes.

Downer, J., Sabol, T. J., & Hamre, B. (2010). Teacher–child interactions in the classroom: Toward a theory of within- and cross-domain links to children's developmental outcomes. *Early Education & Development*, *21*(5), 699–723.

Driscoll, K., & Pianta, R. (2010). Banking time in Head Start: Early efficacy of an intervention designed to promote supportive teacher–child relationships. *Early Education and Development*, *21*(1), 38–64.

Dubinsky, J., Roehig, G., & Varma, S. (2013). Infusing neuroscience into teacher professional development. *Educational Researcher*, *42*(6), 317-329.

Fisher, P., Kim, H., & Pears, K. (2009). Effects of multidimensional treatment foster care for preschoolers (MTFC-P) on reducing permanent placement failures among children with placement instability. *Children and Youth Services Review*, *31(5),* 541–546.

Flory, J., Yehuda, R., Grossman, R., New, A., Mitropoulou, V., & Siever, L. (2009). Childhood trauma and basal cortisol in people with personality disorders. *Comprehensive Psychiatry, 50*, 34-37.

Flower, A., McKenna, J., & Haring, C. (2017). Behaviour and classroom management: Are teacher preparation programs really preparing our teachers? *Preventing School Failure: Alternative Education for Children and Youth*, *61*(2), 163-169.

Fredericks, J., Blumenfeld, P., & Paris, A. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research, 74*, 59–109.

Friedman, I. (1995). Student behavior patterns contributing to teacher burnout. *The Journal of Educational Research*, *88*(5), 281–289.

Gagon, S., Huelsman, T., Kidder-Ashley, P., & Lewis, A. (2019). Preschool student-teacher relationships and teaching stress. *Early Childhood Education Journal*, *47*, 217-255.

Gallacher, K. (1997). Supervision, mentoring, and coaching: Methods for supporting personnel development. In P. Winton, J. McCollum, & C. Catlett (Eds.)*, Reforming personnel preparation in early intervention: Issues, models, and practical strategies*, (pp. 191-214). Baltimore, MD: Paul H. Brookes.

Garner, P., & Waajid, B. (2012). Emotion knowledge and self-regulation as predictors of preschoolers' cognitive ability, classroom behavior, and social Competence. *Journal of Psychoeducational Assessment*, *30*(4), 330–343.

Gilliam, W. (2002). *Prekindergarteners left behind: Expulsion rates in state prekindergarten programs.* New Haven, CT: Yale University.

Government of Canada (2014). *Canada-Ireland relations*. Retreived from Government of Canada website: h[ttp://www.canadainternational.gc.ca/ireland-](http://www.canadainternational.gc.ca/ireland-)[i](http://www.canadainternational.gc.ca/ireland-)rlande/bilateral_relations_bilaterales/canada-ireland-irlande.aspx?lang=eng.

Green, B., Everhart, M., Gordon, L., & Garcia Gettman, M. (2006). Characteristics of effective mental health consultation in early childhood settings: Multilevel analysis of a national Survey. *Topics in Early Childhood Special Education*, *26*(3), 142–152.

Griggs, M., Mikami, A., & Rimm-Kaufmann, S. (2016). Classroom quality and student behaviour trajectories in elementary school. *Psychology in the Schools, 53*(7), 690-704.

Griggs, M., Gagnon, S., Huelsman, T., Kidder-Ashley, P., & Ballard, M. (2009). Student– teacher relationships matter: Moderating influences between temperament and preschool social competence. *Psychology in the Schools*, *46*(6), 553–567.

Guerin, D., Gottfried, A., Oliver, P., & Thomas, C. (2003). *Temperament: Infancy through adolescence. The Fullerton longitudinal study*. New York: Kluwer Academic/Plenum.

Gunnar, M., Brodersen, M., Nachmias, K., Buss, K., & Rigatuso, J. (1996) Stress reactivity and attachment security. *Developmental Psychobiology*, *29*(3)*,* 191–204.

Gunnar, M., & Hostinar, C., (2015). The social buffering of the hypothalamic-pituitary- adrenocortical axis in humans: developmental and experiential determinants. *Social Neuroscience, 10*(5), 479-488.

Gunnar, M., & Quevedo, K. (2007). The neurobiology of stress and development. *Annual Review of Psychology*, *58*, 145–173.

Gunnar, M., Sebanc, A., Tout, K., Donzella, B., & Dulmen, M. (2004). Peer rejection, temperament, and cortisol activity in preschoolers. *Developmental Psychobiology*, *43*(4)*,* 346-358.

Guskey, T. R. (2000a). *Evaluating professional development*. Thousand Oaks, CA: Corwin.

Hamre, B., & Pianta, R. (2001). Early teacher-child relationships and the trajectory of children's school outcomes through eighth grade. *Child Development*, *72*(2), 625–38.

Hamre, B., & Pianta, R. (2005). Can instructional and emotional support in the first-grade classroom make a difference for children at risk of school failure? *Child Development*, *76*(5), 949–967.

Hastings, R., & Bahm, M. (2003). The relationship between student behaviour patterns and teacher burnout. *School Psychology International, 24*, 115-27

Hayes, A. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York: Guilford Press.

Heffelfinger, A., & Newcomer, J. (2001). Glucocorticoid effects on memory function over the human life span. *Development and Psychopathology, 13*(3)*,* 491–513.

Hemmeter, M., Milagros Santos, R., & Ostrosky, M. (2008). Preparing early childhood educators to address young children's socio-emotional development and challenging behaviour: A survey of higher education programs in nine states. *Journal of Early Intervention*, *30*(4), 321-340.

Hemmeter, M., Corso, R., & Cheatham, G. (2006, February). *Issues in addressing challenging behaviours in young children: A national survey of early childhood educators*. Paper presented at the Conference on Research Innovations in Early Intervention, San Diego, CA.

Hofmann, W., Schmeichel, B. & Baddeley, A. (2012). Executive functions and self-regulation. *Trends in Cognitive Sciences*, *16*(3), 174–180.

Hostinar, C., Sullivan, R., & Gunnar, M. (2014). Psychological mechanism underlying the social buffering of the HPA axis: A review of animal models and human studies across development. *Psychological Bulletin, 140*(1)*,* 256-82.

Hostinar, C., & Gunnar, M. (2013). The developmental effects of early life stress An overview of current theoretical frameworks. *Current Directions in Psychological Science, 22*(5), 400–406.

Howes, C., Phillipsen, L., & Peisner-Feinberg, E. (2000). The consistency of perceived teacher–child relationships between preschool and kindergarten. *Journal of School Psychology*, *38*(2), 113–132.

Hutchings, D. (1963). Early experience and its effect on later behavioral processes in rats: effects of infantile handling and body temperature reduction on later emotionality. *Transactions of the New York Academy of Sciences, 25*, 890–901.

Irish National Teachers' Organization. (2004). *Managing challenging behaviour: Guideline for teachers.* Retrieved from

https://www.into.ie/ROI/Publications/ManagingChallengingBehaviour.pdf.

Iwanicki, E., & Schwab, R. (1981). A cross-validational study of the Maslach Burnout Inventory. *Educational and Psychological Measurement*, *41*, 1167-1174.

Jerome, E., Hamre, B., & Pianta, R. (2009). Teacher–child relationships from kindergarten to sixth Grade: Early childhood predictors of teacher-perceived conflict and closeness. *Social Development*, *18*(4), 915–945.

Jessop, D., & Turner-Cobb, J. (2008). Measurement and meaning of salivary cortisol: a focus on health and disease in children. *Stress: The International Journal on the Biology of Stress, 11*(1), 1–14.

Keil, M. (2012). Salivary cortisol: A tool for bio behavioral research in children. *Journal of Pediatric Nursing*, *27*(3)*,* 287–289.

Khosrowabadi, R. (2018). Stress and perception of emotional stimuli: Long-term stress rewiring the brain. *Basic Clinical Neuroscience*, *9*(2), 107-120.

Kokkinos, C. (2007). Job stressors, personality and burnout in primary school teachers. *British Journal of Educational Psychology*, *77*(1), 229–243.

Kyriacou, C. (1987). Teacher stress and burnout: An international review. *Educational Research*, *29*(2), 146–152.

Kyriacou, C. (2001). Teacher stress: Directions for future research. *Educational Review*, *53*(1), 27–35.

Ladd, G., & Burgess, K. (1999). Charting the relationship trajectories of aggressive, withdrawn, and aggressive/withdrawn children during early grade school. *Child Development, 70*(4), 910-929.

Lapadat, J., & Lindsay, A. (1999). Transcription in research and practice: From standardization of technique to interpretive positionings. *Qualitative Inquiry*, *5*(1), 64–86.

Lazarus, R., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York: Springer.

LeDoux, J. (2015). *Anxious: Using the brain to understand and treat fear and anxiety*. New York: Penguin.

Lei, H., Cui, Y., & Chiu, M. (2016). Affective teacher–student relationships and students' externalizing behavior problems: A meta-analysis. *Frontiers in Psychology*, *7,* 1311.

Levine, S. (1957). Infantile experience and resistance to physiological stress. *Science, 126*(3270), 405.

Li Grining, C., Raver, C., Champion, K., Sardin, L., Metzger, M., & Jones, S. (2010). Understanding and improving classroom emotional climate and behavior management in the "real world": The role of Head Start teachers' psychosocial stressors. *Early Education and Development*, *21*(1), 65–94.

Lovgren, M. (2016). Emotional exhaustion in daycare workers. *European Early Childhood Education Research Journal*, *24*(1), 157-167.

Lupien, S., Fiocco, A., Wan, N., Maheu, F., Lord, C., Schramek, T., & Tu, M. (2005). Stress hormones and human memory function across the lifespan. *Psychoneuroendocrinology*, *30*(3), 225–242.

Lyon, A., Gershenson, R., Farahmand, F., Thaxter, P., Behling, S., & Budd, K. (2009). Effectiveness of teacher-child interaction training (TCIT) in a preschool setting. *Behavior Modification*, *33*(6), 855–884.

MacKinnon-McQuarrie, M., Siegel, L., Perry, N, & Weinberg, J. (2014). Reactivity to stress and the cognitive components of math disability in grade 1 children. *Journal of Learning Disabilities*, *47*(4), 349–365.

Maldonado-Carreño, C., & Votruba-Drzal, E. (2011). Teacher–child relationships and the development of academic and behavioral skills during elementary school: A within- and between-child analysis. *Child Development*, *82*(2), 601–616.

Mantzicopoulos, P. (2005). Conflictual relationships between kindergarten children and their teachers: Associations with child and classroom context variables. *Journal of School Psychology*, *43*(5), 425–442.

Marin, M., Raymond, C., & Lupien, S. (2019). Memory and stress. In G. Fink (Ed.), *Stress: Physiology, biochemistry and pathology* (pp. 69-78). San Diego, CA: Academic Press.

Marotz, L., & Allen, K. (2013). *Developmental profiles pre-birth through adolescence*. Belmont,CA: Wadworth.

Maslach, C., Jackson S., & Leiter, M. (1997). *Maslach Burnout Inventory* (3rd Ed). Palo Alto, CA: Consulting Psychologists Press.

Mathewson, K., Miskovic, V., Cunningham, C., McHolm, A., Boyle, M., & Schmidt, L. (2012). Salivary cortisol, socioemotional functioning and academic performance in anxious and non-anxious children of elementary and middle school age. *Early Education and Development, 23*(1), 74–95.

McCormick, M., O'Connor, E., Capella, E., & McClowry, S. (2013). Teacher child relationships and academic achievement: a multilevel propensity score model approach. *Journal of School Psychology, 51*, 611-624.

McEwen, B., & Seeman, T. (1999). Protective and damaging effects of mediators of stress: elaborating and testing the concepts of allostasis and allostatic load. *Annals of the New York Academy of Sciences, 896*(1), 30–47.

Meaney, M. (2001). Maternal care, gene expression, and the transmission of individual differences in stress reactivity across generations. *Annual Review of Neuroscience, 24*(1), 1161–1192.

Merriam, S., & Tisdell, J. (2016). *Qualitative research: A guide to design and implementation*. San Francisco, CA: Jossey Bass.

Merritt, E., Wanless, S., Rimm-Kaufman, S., Cameron, C., & Peugh, J. (2012). The contribution of teachers' emotional support to children's social behaviors and self-regulatory skills in first grade. *School Psychology Review, 41*(2), 141–159.

Miles, M., Huberman, A., & Saldana, J. (2014). *Qualitative data analysis: A methods sourcebook.* London: Sage.

Murray, C., & Malmgren, K. (2005). Implementing a teacher–student relationship program in a high poverty urban school: Effects on social, emotional, and academic adjustment and lessons learned. *Journal of School Psychology, 43*(2), 137–152.

Nash, P., Schlösser, A., & Scarr, T. (2015). Teachers' perceptions of disruptive behaviour in schools: a psychological perspective. *Emotional and Behavioural Difficulties, 21*(2), 167–180.

Nelson, H., Kendall, G., & Shields, L. (2013). Neurological and biological foundations of

> children's social and emotional development: An integrated literature review. *Journal of*

> *School Nursing, 30*(4), 240-250.

Nin, A. (1961). *Seduction of the minotaur*. New York: Swallow Press.

Nislin, M.,Sajaniemi, N., Sims, M., Suhonen, E., Maldonado, E., & Hyttinen A. (2016).

> Occupational well-being and stress among early childhood professionals: the use of an

> innovative strategy to measure stress reactivity in the workplace. *Review of Educational*

> *Research*, *3*(1), 1-17.

Nungesser, N., & Watkins, R. (2005). Preschool teachers' perceptions and reactions to

> challenging classroom behaviour: Implications for speech-language pathologists. *Speech*

> *& Hearing Services in Schools*, *36*(2), 139-151.

Nurmi, J. (2012). Students' characteristics and teacher–child relationships in instruction: A

> meta-analysis. *Educational Research Review*, *7*(3), 177–197.

Oberle, E., & Schonert-Reichl, K. (2016). Stress contagion in the classroom: The link between

> classroom teacher burnout and morning cortisol in elementary school students. *Social*

> *Science Medicine, 159*, 30-37.

O'Connor, E., & McCartney, K. (2007). Examining teacher–child relationships and

> achievement as part of an ecological model of development. *American Educational*

> *Research Journal*, *44*(2), 340–369.

O'Connor, E., Dearing, E., & Collins, B. (2011). Teacher-child relationship and behavior

> problem trajectories in elementary school. *American Educational Research Journal*,

> *48*(1), 120–162.

Offord Centre for Child Studies. (2017). *EDI in Ontario*. Retrieved from

https://edi.offordcentre.com/partners/canada/edi-in-ontario/.

Ontario Ministry of Education. (2013). *Ontario early years policy framework*. Toronto: Queen's Printer for Ontario.

Ontario Ministry of Education. (2014). *How does learning happen? Ontario's pedagogy for the early years*. Toronto: Queen's Printer for Ontario.

Ontario Ministry of Education. (2016). *Kindergarten program*. Toronto: Queen's Printer for Ontario.

Ontario Ministry of Education. (2013). *Think, feel, act: Lessons from research about children*. Toronto: Queen's Printer for Ontario.

Pallant, J. (2010). *SPSS survival manual*. Berkshire, England: McGraw-Hill.

Patton, M. (2015). *Qualitative research and evaluation methods* (4th ed.). Thousand Oaks: Sage.

Pennings, H. J. M., & Hollenstein, T. (2019). Teacher-student interactions and teacher interpersonal styles: A state space grid analysis. *The Journal of Experimental Education,0*(0), 1–25. DOI:10.1080/00220973.2019.1578724

Perkins, D., & Salomon, G. (1992). *Transfer of learning*. Contribution to the International Encyclopedia of Education. Oxford: Pergamon.

Perry, B. (2017). *The boy who was raised as a dog and other stories from a child psychiatrist's notebook*. New York: Basic Books.

Peters, E., Riksen-Walraven, M., Cillessen, A., & de Weerth, C., (2011). Peer rejection and HPA activity in middle childhood: friendship makes a difference. *Child Development, 82*(6), 1906–20.

Pianta, R. (2001). *STRS: Student-teacher Relationship Scale: Professional manual*. Odessa, TX: Psychological Assessment Resources.

Pianta, R., Hamre, B., & Stuhlman, M. (2003). Relationships between teachers and students. In
    W. Reynolds, & Miller, G. (Eds.), *Handbook of educational psychology* (pp. 199-258).
    Mahwah, NJ: John Wiley & Sons.

Pianta, R. C., Mashburn, A. J., Downer, J. T., Hamre, B. K., & Justice, L. (2008). Effects of
    web-mediated professional development resources on teacher-child interactions in pre-
    kindergarten classrooms. *Early Childhood Research Quarterly*, *23*(4), 431–451.

Pianta, R., & Stuhlman, M. (2004). Teacher-child relationships and children's success in the
    first years of school. *School Psychology Review, 33*(3), 444-458.

Porges, S. (2011). *The polyvagal theory: Neurophysiological foundations of emotions,*
    attachment, communication, self-regulation. New York: Norton.

Powell, D., Diamond, K., & Burchinal, M. (2012). Using coaching-based professional
    development to improve Head Start teachers' support of children's oral language skills.
    In C. Howes, B. Hamre & R. Pianta (Eds.), *Effective early childhood professional*
    development (pp. 13-29). Baltimore, MD: Paul H. Brookes.

Powell, D., Dunlap, G., & Fox, L. (2006). Prevention and intervention for the challenging
    behaviours of toddlers and preschoolers. *Infants and Young Children*, *19(1)*, 25-35.

Quesada, A., Wiemers, S., Schoofs, D., & Wolf, O. (2012). Psychosocial stress exposure impairs
    memory retrieval in children. *Psychoneuroendocrinology, 37*(1), 125–36.

Raver, C., Blair, C., & Li-Grining, D. (2012). Extending models of emotion self-regulation to
    classroom settings: Implications for professional development. In C. Howes, B. Hamre
    & R. Pianta (Eds.), *Effective early childhood professional development* (pp. 113-130).
    Baltimore, MD: Paul H. Brookes.

Rimm-Kaufman, S., & Wanless, S. (2012). An ecological perspective for understanding the early development of self-regulatory skills, social skills, and achievement. In R. Pianta, W. Barnett, L. Justice & S. Sheridan (Eds.), *Handbook of early childhood education* (pp. 299-323). New York, NY: Guilford Press.

Rimm-Kaufman, S., Voorhees, M., Snell, M., & Paro, K. (2003). Improving the sensitivity and responsivity of preservice teachers toward young children with disabilities. *Topics in Early Childhood Special Education*, *23*(3), 151-163.

Rogers, C. (2003). *A way of being*. New York: Mariner.

Roorda, D., Koomen, H., Spilt, J., & Oort, F. (2011). The influence of affective teacher–student relationships on students' school engagement and achievement: A meta-analytic approach. *Review of Educational Research*, *81*(4), 493–529.

Rudasill, K. (2011). Child temperament, teacher–child interactions, and teacher–child relationships: A longitudinal investigation from first to third grade. *Early Childhood Research Quarterly*, *26*(2), 147–156.

Rudasill, K., Reio Jr., T., Stipanovic, N., & Taylor, J. (2010). A longitudinal study of student–teacher relationship quality, difficult temperament, and risky behavior from childhood to early adolescence. *Journal of School Psychology*, *48*(5), 389–412.

Ruttle, P., Shirtcliff, E, Serbin, L., Fisher, D., Stack, D., & Schwartzman, A. (2011). Disentangling psychobiological mechanisms underlying internalizing and externalizing behaviors in youth: Longitudinal and concurrent associations with cortisol. *Hormones and Behavior*, *59*(1), 123–132.

Sabol, T., & Pianta, R. (2012). Recent trends in research on teacher–child relationships. *Attachment & Human Development*, *14*(3), 213–231.

Sameroff, A. (2010). A unified theory of development: A dialectic integration of nature and nurture. *Child Development*, *81*(1), 6–22.

Schachter, R. (2015). An analytic study of the professional development research in early childhood education. *Early Education and Development, 26*(8), 1057-1085.

Scholastic. (2012). *Primary sources report: Americas teachers on teaching in an era of change* (3rd Ed.). Bill and Melinda Gates Foundation. Retrieved from https://www.scholastic.com/teachers/articles/teaching-content/classroom-behavior problems-increasing-teachers-say.

Schore, A. (2012). *The science of the art of psychotherapy*. New York: Norton.

Seidman, I. (2006). *Interviewing as qualitative research: A guide for researchers in education and the social sciences*. New York: Teachers College Press.

Seltzer, L., Ziegler, T., & Pollak, S. (2010). Social vocalizations can release oxytocin in humans. *Proceedings of the Royal Society B: Biological Sciences, 277*(1)*,* 2661–66.

Shadish, W., Cook, T., & Campbell, D. (2002). *Experimental and quasi-experimental designs for generalized causal and inference.* Belmont, CA: Wadsworth Cengage Learning.

Shanker, S. (2012). *Calm, alert and learning: Classroom strategies for self-regulation*. Toronto: Pearson.

Shanker, S. (2016). *Self-reg: How to help you and your child break the stress cycle and successfully engage with life*. Toronto: Penguin.

Sheridan, S., Pope Edwards, C., Marvin, C., & Knoche, L. (2009). Professional development in early childhood programs: Process issues and research needs. *Early Education and Development, 20*(3), 377-401.

Shonkoff, J. & Phillips, D., & National Research Council (U.S.). (2000). *From neurons to neighborhoods: The science of early child development*. Washington, D.C: National Academy Press.

Shonkoff J., Boyce W., & McEwen B. (2009). Neuroscience, molecular biology, and the childhood roots of health disparities: Building a new framework for health promotion and disease prevention. *JAMA*, *301*(21), 2252–2259.

Sims, M., Guilfoyle, A., & Parry, T. (2005). What children's cortisol levels tell us about quality in childcare centres. *Australian Journal of Early Childhood*, *30*(2), 29-37.

Silver, R., Measelle, J., Armstrong, J., & Essex, M. (2005). Trajectories of classroom externalizing behaviour: Contributions of child characteristics, family characteristics, and the teacher-child relationship during the school transition. *Journal of School Psychology*, *4*, 39-60.

Skalická, V., Belsky, J., Stenseng, F., & Wichstrøm, L. (2015). Reciprocal relations between student–teacher relationship and children's behavioral problems: moderation by child-care group size. *Child Development*, *86*(5), 1557–1570.

Skalická, V., Stenseng, F., & Wichstrøm, L. (2015). Reciprocal relations between student-teacher conflict, children's social skills and externalizing behaviour. *International Journal of Behavioural Development*, *39*(5), 413-425.

Smider, N., Essex, A., Kalin, N., Buss, K., Klein, M., Davidson, R., & Goldsmith, H. (2002). Salivary cortisol as a predictor of socioemotional adjustment during kindergarten: a prospective study. *Child Development*, *73*(1)*,* 75–92.

Smith, A. D. (2001). Perception and belief. *Philosophical and Phenomenological Research*, *62*(2), 283-309.

Smith, B. & Fox, L. (2003). *Systems of service delivery: A synthesis of evidence relevant to young children at risk of or who have challenging behavior*. Tampa, FL: University of South Florida, Center for Evidence-Based Practice: Young Children with Challenging Behavior. Retrieved from http://challengingbehavior.fmhi.usf.edu/explore/publications_docs/systems_of_service.pdf.

Spilt, J. L., Hughes, J., Wu, J., & Kwok, O. (2012). Dynamics of teacher–student relationships: Stability and change across elementary school and the influence on children's academic success. *Child Development*, *83*(4), 1180–1195.

State, T., Kern, L., Starosta, K., & Mukherjee, A. (2011). Elementary pre-service teacher preparation in the area of social, emotional, and behavioural problems. *School Mental Health*, *3*, 13-23.

Stipek, D., & Byler, P. (1997). Early childhood education teachers: Do they practice what they preach? *Early Childhood Research Quarterly*, *12*(3), 305-325.

Strauss, A., & Corbin, J. (1998). *Basics of qualitative research: Grounded theory procedures and techniques*. Newbury Park, CA: Sage.

Stuhlman, M., & Pianta, R. (2001). Teachers' narratives about their relationships with children: associations with behavior in classrooms. (Special Topic). *School Psychology Review*, *31*(2), 148.

Tantam, D. (2009). *Can the world afford autism spectrum disorder: Nonverbal communication, asperger syndrome and the interbrain*. London: Jessica Kingsley Publishers.

Tantam, D. (2018). *The interbrain: Embodied connections versus common knowledge*. London: Jessica Kingsley Publishers.

Tarullo, A., & Gunnar, M. (2006). Child maltreatment and the developing HPA axis. *Hormones and Behaviour*, *50*, 632-639.

Teyfur, M. (2015). Undesirable student behaviours encountered by primary school teachers and solution proposals. *Educational Research and Reviews*, *10*(17), 2422–2432.

Thayer, R. (1997). *The origin of everyday moods: Managing tension, energy, and stress*. New York: Oxford University Press.

Thijs, J., & Koomen, H. (2009). Toward a further understanding of teachers' reports of early teacher-child relationships; Examining the roles of behaviour appraisals and attributions. *Early Childhood Research Quarterly*, *24*, 186-197.

Thompson, R. (2014). Stress and child development. *The Future of Children, 24(1),* 41-59.

Townley, K., Thornburg, K., & Crompton, D. (1991). Burnout in teachers of young children. *Early Education and Development*, *2*(3), 197–204.

Travers, C., & Cooper, C. (1996). *Teachers under pressure: Stress in the teaching profession*. New York, NY. Routledge.

Tsigilis, N., Zachopoulou, E., & Grammatikopoulos, V. (2006). Job satisfaction and burnout among Greek early educators: A comparison between public and private sector employees. *Educational Research and Review*, *1*(8), 256-261.

Tsouloupas, C., Carson, R., Matthews, R., Grawitch, M., & Barber, L. (2010). Exploring the association between teachers' perceived student misbehaviour and emotional exhaustion: the importance of teacher efficacy beliefs and emotion regulation. *Educational Psychology*, *30*(2), 173–189.

Valiente, C., Swanson, J., & Lemery-Chalfant, K. (2012). Kindergartners' temperament, classroom engagement, and student-teacher relationship: moderation by effortful control. *Social Development*, *21*(3), 558-576.

Valiente, C., Lemery-Chalfant, K., Swanson, J., & Reiser, M. (2008). Prediction of children's academic competence from their effortful control, relationships, and classroom participation. *Journal of Educational Psychology*, *100*(1), 67.

Webster-Stratton, C., Reid, M.J., & Hammond, M. (2004). Treating children with early conduct problems: Intervention outcomes for parent, child, and teacher training. *Journal of Clinical Child and Adolescent Psychology*, *33*(1), 105–124.

Wiest-Stevenson, C., & Lee, C. (2016). Trauma-Informed Schools. *Journal of Evidence-Informed Social Work*, *13*(5), 498–503.

Wenglinsky, H. (2001). Teacher classroom practices and student performance: How schools can make a difference. *ETS Research Report Series*, *2001*(2), i-37.

Whitaker, R., Dearth-Wesley, T., & Gooze, R. (2015). Workplace stress and the quality of teacher–children relationships in Head Start. *Early Childhood Research Quarterly, 30,* 57–69.

Williford, A., & Sanger Wolcott, C. (2015). SEL and student-teacher relationships. In J. Durlak, C. Domitrovich, R. Weissberg, & T. Gullotta (Eds.), *Handbook of Social and Emotional Learning* (pp. 229 – 243). New York: The Guilford Press.

Wu, J, Hughes, J., & Kwok, O. (2010). Teacher–student relationship quality type in elementary grades: Effects on trajectories for achievement and engagement. *Journal of School Psychology*, *48*(5), 357–387.

Yoon, J. (2002). Teacher characteristics as predictors of teacher-student relationships: Stress, negative affect, and self-efficacy. *Social Behavior and Personality, 30*(5), 485.

Zhang, X., & Sun, J. (2011). The reciprocal relations between teachers' perceptions of children's behavior problems and teacher–child relationships in the first preschool year. *The Journal of Genetic Psychology*, *172*(2), 176–198.

Appendix A

Letter of Access

September 28, 2017

Dear Director,

      I am a Professor of ECE at Sheridan College and I am pursuing a doctorate degree in Education (PhD) at York University. As an educator and a student, I am interested in developing and promoting best practices in early childhood education. I hope that you will agree to allowing the early childhood educators in your organization to participate in my study that aims to survey early childhood educators on their experience with challenging child behaviour, relationships with children, beliefs and practices regarding child behaviour, beliefs regarding self-regulation, and work-related stress and then proposes to offer a professional learning intervention on self-regulation to interested survey respondents. In addition to the survey, those participants who choose to participate in the professional learning component will be visited by the researcher approximately 4 weeks after professional learning to provide any desired support or additional information. The researcher will take notes on the conversations that occur during these visits. Professional learning participants will also be invited to participate in focus group interviews intended to gather information on the participant's experience with the intervention. These group interviews will be audio-recorded and notes will be taken on the proceedings.

Your decision not to participate or to discontinue participation at any time in this research will not influence the nature of your relationship with me or York University either now or in the future. It is hoped that participation in this study will be mutually beneficial as it may provide your organization with useful information and the potential benefits of professional learning program on self-regulation.

All information provided by early childhood educators during the process of this study will be completely anonymous and confidential. All data from the survey will be safely stored in a locked facility and only the researcher will have access to this information. The data will be stored electronically for 5 years and then it will be destroyed by erasing electronic files. Confidentiality will be provided to the fullest extent possible by law.

I appreciate your support of this study.

Yours Sincerely,

By signing this letter, I _____ agree to participate in this study.

Quality Assurance Coordinator, Cooperating Child Services Agency

Appendix B

Procedural Timeline

Pre Intervention

Pilot of Survey {
- When: March 2018
- Who: 100 practicing ECE's (AECEO Members)
- Length: online survey open for 5 days

Survey Administration {
- When: April 2018
- Who: 104 ECEs
- Length: survey open for two weeks

Intervention

Self-Reg Professional Learning {
- When: end June 2018
- Who: 20 PL participants
- Length: two consecutive workdays from 9am - 3pm

Site Visit {
- When: end August 2018
- Who: 20 PL participants
- Length: 20-30 minutes each

Post Intervention

Post Intervention Survey Administration {
- When: early September 2018
- Who: 20 PL, 22 Control partipants
- Length: survey open for two weeks

Focus Group Interviews {
- When: end September (following post survey administration)
- Who: 18 PL participants across two sessions (7 and 11 in each)
- Length: one 60 and one 90 minute session

Appendix C

**Letter of Information and Consent
for Online Educator Survey**

Date: Sept. 28, 2017
Study Name: The Effects of a Self-Regulation Professional Learning Intervention on Early Childhood Educator Beliefs and Practices Regarding Child Behaviour, Relationships with Students, and Professional Stress

Dear Educator,
I am a Professor of ECE at Sheridan College and I am pursuing a doctorate degree in Education (PhD) at York University. As an educator and a student, I am interested in developing and promoting best practices in early childhood education. I hope you will participate in this online survey that is part of my PhD study and is designed to collect information on educators' experience working with children. It includes items related to your experience with challenging child behaviour, your relationships with children, your beliefs and practices regarding child behaviour, your beliefs regarding self-regulation, and your work-related stress. Reflecting on your personal experiences and ideas in these areas may be a little discomforting to you and your participation in this survey is completely voluntary. Your decision not to participate or to discontinue participation at any time will not influence the nature of your relationship you're your employer or the researcher, either now or in the future. In the event that you withdraw from the study, any associated data collected will be immediately destroyed wherever possible.

It is hoped that completion of the survey will provide you with the time to thoughtfully reflect on your ideas regarding your work with children and you may find this reflection to be personally valuable. Also, if you provide your email to the researcher upon survey completion, she will enter you into a draw to win a copy of Dr. Stuart Shanker's book titled *Self- Reg*. This book will be awarded to one participant at the end of the study.

The last item on the survey will ask you about your interest in participating in a professional learning course related to understanding child behaviour. If you participate in the professional learning course, your employer will cover your position in your centre in order for you to take part. If you choose to participate in this professional learning, you will be taken to another page to provide contact information. Linking to this contact page, will close the survey and ensure your survey responses remain anonymous. If you choose not to participate in the professional learning, you can indicate this and this will end your survey and your involvement in the study. Even if you decide to participate in the professional learning, where you will meet the researcher, all information you provide in the survey and as part of the professional learning will be coded and presented in an aggregated form so that no individual person is ever identified. All data from the survey will be safely stored in a locked facility and only the researcher will have access to this information. The researcher acknowledges that the host of the online survey (i.e., Survey Monkey) may automatically collect participant data without their knowledge (i.e., IP addresses). Although this information may be provided or made accessible to the researchers, it will not be used or saved without participant's consent on the researcher's system. Further, because this project employs e-based collection techniques, data may be subject to access by third parties as a

result of various security legislation now in place in many countries and thus the confidentiality and privacy of data cannot be guaranteed during web-based transmission. The data will be stored electronically for 5 years and then it will be destroyed by erasing electronic files. Any hard copy notes will be shredded. Confidentiality will be provided to the fullest extent possible by law.

If you choose to participate in the professional learning course, a second Consent Letter will be sent to you. This part of the study includes a visit from the researcher to your place of work to be scheduled at your convenience approximately 4 weeks following the course, to discuss any questions, comments, or concerns you may have about applying the professional learning content into your practice. These visits will be scheduled for 30 minutes at your convenience and the researcher will make notes on the key ideas that are discussed.

This research has received ethics review and approval by the Delegated Ethics Review Committee, which is delegated authority to review research ethics protocols by the Human Participants Review Sub-Committee, York University's Ethics Review Board, and conforms to the standards of the Canadian Tri-Council Research Ethics guidelines.

I appreciate your support of this study.

Yours Sincerely,

☐ By checking this box, I am indicating consent to participate in this study conducted by Angie Rosati, a PhD student at York University.

Appendix D

Letter of Information and Consent to PL and Control Groups
Professional Learning on Self-Reg Theory Intervention

Date: Sept. 28, 2017
Study Name: The Effects of a Self-Regulation Professional Learning Intervention on Early Childhood Educator Beliefs and Practices Regarding Child Behaviour, Relationships with Students, and Professional Stress

Dear Educator,
Thank you for your interest in participating in the Professional Learning component of this study examining early childhood educator practices. The purpose of this component is to investigate whether a professional learning course on Self-Reg theory might help you in your work with young children. As an interested educator, your name will be selected to participate in either the Professional Learning (PL) or the Control group for this phase of the study.

If you are selected as a June **participant**, you will be released from work to participate in a workshop to be delivered by the researcher over two full days. This professional learning course will include one visit by the researcher to your workplace at a time that is convenient for you to answer any questions related to the application of the training to your practice. The researcher will take notes on the conversations that occur during these visits. You will not be identified as an individual in these notes. Approximately five months following the first administration of the Educator survey and four months following completion of the PL, you will be asked to recomplete the Educator Survey and to participate in a focus group interview that will ask you in a group setting about how the professional learning impacted your practice. This focus group interview will be audio-recorded and a research assistant will take notes on the proceedings.

If you are selected as an October **participant**, you will be asked to recomplete the Educator Survey approximately 5 months after the first administration and you will be invited to receive the Self-Reg professional learning course once the data collection phase of the study is completed.

I do not foresee any risks or discomforts to you from your participation in the professional learning component of this study, and hope that you will find participation beneficial to your practice as an early childhood educator. Your participation in the professional learning component of this study is completely voluntary and you may choose to stop participating at any time for no reason with no consequence. Your decision to do so will not influence your relationship you with York University, the researcher, or your employer. In the event that you withdraw from the study, all associated data collected will be immediately destroyed.

Any information you provide as a participant in this professional learning component of this study will be completely confidential and only viewed by the researcher. You will not be identified as an individual at any time. Data will be numerically coded. The final report of findings will present the data in aggregate form and will not be tied to any particular identifiable person. Your name will not appear in any report or publication of the research. Data from the

group interviews will be collected using a digital recorder and transcribed. Again, individuals will be identified by code in these transcriptions. All data will be stored on a password protected laptop that only the researcher will have access to. Data will be stored for 5 years and will be destroyed on February 1 2023 by erasing electronic files and audio recordings from focus group interview Confidentiality will be provided to the fullest extent possible by law.

Thank you very much for your continued interest in this study.

☐ I consent to participate in the Professional Learning component of the study. I understand that I may be selected to participate in either the June or October group. I further understand that if I am selected for the October group, I will be invited to receive the Professional Learning component at a future date. My signature below indicates my consent. Please contact me at the ☐ email or ☐ phone number provided.

☐ For June participants: I consent to the audio-recording of the focus group interview to take place following the professional learning course.

Signature _____ **Date** _____

Email Address: _____

Telephone number: _____

Appendix E

Professional Learning Agenda

DAY 1: THE BRAIN, STRESS AND SELF-REG THEORY: THE ROOTS OF BEHAVIOR
Theme: *"Behaviour is not about character, it is about biology." –Dr. Stuart Shanker*

Coffee/mini breakfast treats (9:15am)
Welcome and Introduction (9:30-9:45)

Morning (9:45-11:45am)
1. The Brain and the Neurophysiology of Stress
    a. Video
2. The Five Domains of Stress
    a. Video
    b. Handout
    c. Activity

Lunch 11:45-12:30

Afternoon (12:30-2:30)
3. Dynamic Systems Theory of Stress
    a. Video
4. Stress and Child Behaviour
    a. Scenarios

Questions/Comments (2:30-3:00)

Homework: Read Chapter 1 of Self-Reg book

DAY 2 SELF-REG IN PRACTICE: REFRAMING CHILD BEHAVIOUR
Theme: *"Why am I seeing this behaviour and why now?" – Dr. Stuart Shanker*

Coffee/mini breakfast treats (9:15am)
Morning (9:30-11:45am)

Introduction: Discussion and questions regarding Ch. 1 and review of Day 1 learning

1. Self -Reg versus Self-Control
    a. Video
    b. Handout

2. Stress Behaviour versus Misbehaviour
    a. Video
    b. Handout

Lunch 11:45-12:30

Afternoon (12:30-2:45)
3. Stress is Relational: Emotional Support as Stress Mediator
4. Case Studies: Application of Learning to Participant Stories

Questions/Comments (2:45-3:00)

Appendix F

The Educator Survey

Please be reminded that all information you provide on this survey is anonymous and confidential. Your responses to these questions will not be tied to you in any way and it is hoped that you will answer honestly when responding to these items. If you find any of these questions distressing, you may discontinue at any time.

SECTION 1: BACKGROUND INFORMATION

1. This survey will be re-administered to interested respondents in approximately six months. In order to compare responses, but still maintain your anonymity, please create a unique ID Code by following the prompts below.

Enter the first letter of your
first name (A-Z)

Enter the first letter of your
father's first name (A-Z)

Enter the first letter of your
mother's first name (A-Z)

Enter the day of your birth
as two digits (01-31)

Enter the month of your
birth as two digits (01-12)

2. Are you currently practicing as an ECE?
   - ☐ Yes
   - ☐ No

3. Please indicate whether you are, or have ever, participated in any professional learning on Stuart Shanker's theory of self-regulation that discusses self-regulation according to 5 domains and 5 steps?
    - ☐ Yes
    - ☐ No

4. What is your gender?
    - ☐ Male
    - ☐ Female

5. Do you have a two-year diploma in Early Childhood Education?

   ☐ Yes

   ☐ No

6. How many years of experience do you have working as an early childhood educator?

   ☐ 0-5

   ☐ 5-10

   ☐ 10-15

   ☐ 15-20

   ☐ 20+

7. Please indicate the age grouping of children you are currently working with:

   ☐ Infant
   ☐ Toddler
   ☐ Preschool
   ☐ Before/After School Program
   ☐ Kindergarten

8. Please indicate the number of children in your current classroom. _____

9. It is normal for educators to have relationships that vary in closeness and conflict with children in their classroom. Reflecting on the current group of children in your classroom, please indicate the number of students in each relationship category. **Please consider all children so that the total across the 4 categories equals the number of children in your classroom as indicated in the question above**. It may be helpful to go through a class list coding students as one of the four following categories as you go.

   —— I have a _**very close**_ relationship with them (e.g., you would _strongly agree_ with these ideas in regards to the children in this category: I have a warm and affectionate relationship with him/her it is very easy to be in tune with what he/she is feeling; he/she seeks comfort from me when upset; he/she values their relationship with me; when I praise him/her, he or she beams with pride; he/she openly shares their feelings with me)

   —— I have a _**close**_ relationship with them (e.g., you _agree_ with these ideas in regards to the children in this category: I have a warm and affectionate relationship with him/her it is very easy to be in tune with what he/she is feeling; he/she seeks comfort from me when upset; he/she values their relationship with me; when I praise him/her, he or she beams with pride; he/she openly shares their feelings with me)

— I have a ***conflictual*** relationship with them (e.g., you *agree* with these ideas in regards to the children in this category: he/she can be sneaky or unpredictable; he/she continues to be angry and resistant after being reprimanded; he/she drains my energy; he/she easily becomes angry with me; his/her feelings toward me can be unpredictable or changing; I always seem to be struggling with this child; he/she is uncomfortable with physical affection or touch from me; when he/she is in a bad mood, I know we are in for a long and difficult day)

— I have a ***very conflictual*** relationship with them (e.g., you *strongly agree* with these ideas in regards to the children in this category: he/she can be sneaky or unpredictable; he/she continues to be angry and resistant after being reprimanded; he/she drains my energy; he/she easily becomes angry with me; his/her feelings toward me can be unpredictable or changing; I always seem to be struggling with this child; he/she is uncomfortable with physical affection or touch from me; when he/she is in a bad mood, I know we are in for a long and difficult day)

10. Reflecting on the current group of children in your classroom, please indicate the approximate number who exhibit challenging behaviour in the following areas (Note: a child may be included in more than one category). Please answer in numerical format. If no children exhibit the behaviour, please enter 0.

   — Disrupted sleeping and eating routines

   — Physical aggression (e.g., temper tantrums, kicking, pushing, hitting, running away)

   — Verbal aggression (e.g., screaming, yelling, swearing, lying)

   — Property destruction

   — Severe tantrums

   — Self-injury

   — Non-compliance

   — Withdrawal

   — Other _____

SECTION 2: EDUCATOR BELIEFS REGARDING CHILD BEHAVIOUR

Educators have various beliefs regarding child behaviour. Please read the following 15 statements and think about whether you agree. Please indicate your level of agreement from Strongly Disagree to Strongly Agree for each statement. Please consider your beliefs regarding child behavoiur <u>in general</u>.

Level of Agreement	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
	1	2	3	4	5

	Agreement Level	Statements
1.	_____	I believe that children are generally in control of their behaviour.
2.	_____	I believe that a child's behaviour is related to biological processes.
3.	_____	I believe that a child's ability to behave appropriately is based on their willpower.
4.	_____	I believe that emotional support can positively impact a child's ability to behave appropriately in the classroom.
5.	_____	I believe that behaviour is a choice; when children behave appropriately or inappropriately, they are choosing to do so.
6.	_____	I believe that children who behave badly have lost self-control.
7.	_____	I believe that behaviour can be a consequence of brain and body systems that operate beyond a child's control.
8.	_____	I believe that a child's misbehaviour is intentional most of the time.
9.	_____	I believe that it is possible for a child to be totally unaware of why he/she behaved a certain way.
10.	_____	I believe that a child's ability to be calm is dependent on the child choosing to be calm.
11.	_____	I believe that misbehaviour is a form of disobedience.
12.	_____	I believe that misbehaving is something a child chooses to do.
13.	_____	I believe that a child's misbehaviour is largely a result of the environment that the child is in at the moment.

14.	_____	I believe that a child's misbehaviour can be a subconscious expression of need.
15.	_____	I believe that a child's behaviour can change without their intention as a result of a change in situation.

SECTION 3. EDUCATOR PRACTICES REGARDING CHILD BEHAVIOUR

Educators engage in various different practices in response to child behavior. Please read each statement carefully and decide how frequently it applies to you. Please indicate how frequently the practice applies to you from <u>Never</u> to <u>Always</u> for each item.

Level of Agreement	Never	Rarely	Occasionally	Often	Always
	1	2	3	4	5

	Agreement Level	Statements
1.	_____	I have standard disciplinary practices that I apply equally to all children in order to be fair.
2.	_____	My discipline practices involve isolating children who are displaying challenging behaviour.
3.	_____	When children display challenging behaviour, I stop and ask myself why before reacting.
4.	_____	When a child is displaying challenging behaviour, I offer emotional support.
5.	_____	When a child is off-task or disengaged, I help them to understand why they might be off-task or disengaged.
6.	_____	When a child is misbehaving in a way that is disruptive, my first response is to approach them calmly.
7.	_____	When a child expresses oppositional behaviour either verbally or physically, I get angry with him or her.
8.	_____	When a child displays challenging behaviour, I wonder what has prompted it.

9. _____ When a child is aggressive either physically or verbally, I discipline the child immediately

10. _____ When children display challenging behaviour, I see it as an attempt for attention and I ignore the behaviour.

11. _____ When a child is off-task or disengaged, I respond by reminding the child what they should be doing.

12. _____ In general, I search for reasons for challenging behaviour in children.

13. _____ I have a set of clear and logical consequences for child misbehaviour. For example, misbehaviour that does not stop may mean that child will have to stay in during the outdoor play period.

14. _____ If the classroom is significantly disrupted by a child's behaviour, I will have the child exit the classroom and go to another room, or to the supervisor's office, or home.

15. _____ I speak with irritation in my voice when addressing a child who is misbehaving so that he/she understands I am angry.

SECTION 4: BELIEFS REGARDING SELF-REGULATION

1. Please select which of the following definitions of self-regulation best captures your belief about the concept. Please choose **ONLY ONE.**

☐ Self-regulation is the ability to feel in charge of one's choices and behaviours.

☐ Self-regulation is the extent to which a person is able to exhibit self-control; their ability to control impulses.

☐ Self-regulation is the ability to monitor and control emotions.

☐ Self-regulation is the ability to be aware of oneself and to be self-reflective in regards to behavioural and emotional responses.

☐ Self-regulation is a personality trait related to self-esteem and conscientiousness.

☐ Self-regulation is the ability to be aware of energy use in response to stress and to recover from stress-related energy depletion.

☐ Self-regulation is the ability to adjust one's behaviour for specific types of social situations.

☐ Self-regulation is the ability to develop plans for learning and to stay on task.

SECTION 5: PROFESSIONAL STRESS: THE MASLACH BURNOUT INVENTORY (MBI)

Please read each statement carefully and decide if you ever feel this way about your job. If you have never had this feeling, write the number "0" (zero) in the space before the statement. If you have had this feeling, indicate how often you feel it by writing the number (from 1 to 6) that best describes how frequently you feel that way.

How Often	0	1	2	3	4	5	6
	Never	A few times a year or less	Once a month or less	A few times a month	Once a week	A few times a week	Everyday

	How Often	Statements
1.	_____	I feel emotionally drained from my work.
2.	_____	I feel used up at the end of the workday.
3.	_____	I feel fatigued when I get up in the morning and have to face another day on the job.
4.	_____	I can easily understand how students feel about things.
5.	_____	I feel I treat some students as if they were impersonal objects.
6.	_____	Working with people all day is really a strain for me.
7.	_____	I deal very effectively with the problems of my students.
8.	_____	I feel burned out from my work.
9.	_____	I feel I'm positively influencing other people's lives through my work.
10.	_____	I've become more callous since I took this job.
11.	_____	I worry that this job is hardening me emotionally.
12.	_____	I feel very energetic.
13.	_____	I feel frustrated by my job.
14.	_____	I feel I am working too hard on my job.
15.	_____	I don't really care what happens to some students.
16.	_____	Working with people directly puts too much stress on me.
17.	_____	I can easily create a relaxed atmosphere with my students.
18.	_____	I feel exhilarated after working closely with my students.

19. _____ I have accomplished many worthwhile things in this job.

20. _____ I feel like I'm at the end of my rope.

21. _____ In my work, I deal with emotional problems very calmly.

22. _____ I feel students blame me for some of their problems.

SECTION 6: FURTHER PARTICIPATION AND DRAW ENTRY

1. I am interested in participating in a two-day professional learning opportunity for which I will be released from work that will be related to the ideas presented on this survey.

   ☐ Yes   ☐ No

2. If you answered yes, please follow this link xxxxxxxxxxxxx to provide an email and telephone number where you can be contacted (this will close the survey and will ensure your responses remain anonymous).

Appendix G

Qualitative Categories with Exemplary In-vivo Comments

1. **Previous Beliefs About Child Behavior as Character-Based: Fixed Stance**

   "I thought 'he's just getting on my nerves"

   "I thought 'she just doesn't want to be in childcare'"

    "I used to think 'what does a kid have to be angry about?'"

2. **Changed Beliefs about Child Behaviour as Changeable: Open Stance**

   2.1 New Understanding of Behaviour

   "They are trying to express themselves but don't know how"

   "Kids don't misbehave on purpose"

   "Now I think about digging in deeper"

   2.2 Role of Neurophysiology in Child Behaviour (Brain and Stress)

   "Behavior has to do with the brain"

   "They aren't always able to change the way their brain is functioning"

   "Children are guided by physiological experiences"

3. **Changed Beliefs in Regards to Self**

   3.1 Understanding of Self/Personal Stress

   "I know that I am more stressed than I thought I was"

   "Now I know it is stress when I overreact and that I'm not crazy"

   "I think now I am acting out in my own way, I'm frustrated or something and I'm

   realizing I'm stressed and I feel I'm not focusing on my own stressors"

   3.2 View of Others in Life

   "I am looking at everyone differently"

"I even see stress in the characters on TV" and think "that family needs to look at that child's stress"

"I see red brain/ blue brain in my partner"

4. Changed Practices in Regards to Child Behaviour

4.1 New Ways of Addressing Behaviour

"He doesn't need a spanking that would make him even more stressed"

"Let's see what he can do when given the right guidance"

"I am looking over and beyond the child, you know, and asking what is going on"

4.2 Less Labelling

"Don't tell me what you think about a child. Let him write his own story"

"What I say has a huge effect on how the child may see themselves – I need to avoid the label"

"I understand the power of labels and how they impact behaviour by limiting perception of the teacher and child"

4.3 Role of Self in Child Behaviour and Changed Relational Practices

"I am taking this relationship information to heart"

"I have changed my tone of voice and quieted myself down"

"I am more compassionate"

4.4 General Classroom Practices

"I used to say "you can't shut the lights off" when they did it themselves but now I think "well maybe they need that"

"We brought in calming toys, stressor balls and little fidget toys" to play with in transition times"

"I find myself looking ahead at schedule, routines, to predict stress"

5. Knowledge Development

5.1 New Knowledge about the Brain

"I didn't know how the brain works"

"I didn't know the blue brain-red brain stuff"

"Understanding and knowing the science part of the brain – that one part can't work as well when the other is more active" – it totally changes everything about how we view things; children and self-regulation"

5.2 New Knowledge about Self-Regulation

"Self-reg is not a program, it's a body process"

"I thought self-regulation was self-control but I have a new understanding now that it's a continuous thing physiological thing"

"Self-regulation is biological and its lifelong, I wouldn't even think of biology before"

6. Effectiveness of Professional Learning

"The way you said things, really simplified complicated processes"

"The stories were so helpful and meaningful"

"It was the most interesting workshop I've ever attended"

Appendix H

Results of t-test Analyses for Pre-Intervention Differences Between PL and Control Groups on Variables Involved in Impact of PL Questions

STR Variable	PL		Control			
	M	*SD*	*M*	*SD*	*t*	*p*
Close STR	.85	.15	.75	.28	1.50	.140
Conflictual STR	.14	.13	.15	.15	.17	.869
Beliefs	36.65	8.91	36.95	5.86	.129	.898
Practices	37.20	5.75	35.90	6.39	-.681	.500
Emotional Exhaustion	18.30	11.60	14.86	11.01	-.974	.336
Personal Accomplishment	38.65	6.14	39.11	7.43	.209	.836