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The quality of parenting, in particular mother-child interactions, is important for children's development. Sensitive and responsive interactions between the mother and child are linked to children's language, emotion and behavioral regulation, brain development, and activity in the stress response system (NSCDC, 2007; Mintz et al., 2011, Gunnar & Quevedo, 2007). For mothers, low-quality parenting may be linked to high levels of cortisol, higher depression and anxiety. Parenting classes are an important instrument for parents as they have been shown to increase positive parenting practices such as positive communication, parent-child interactions, and rule-making/discipline strategies (Arkan et al., 2013; Borden et al., 2010; Reid et al., 2002. These classes have also been shown to decrease mother's negative health behaviors such as anxiety, stress, and depression (Garner, 2006; Hutchings et al., 2007; Marcynyszyn et al., 2010). The aim of the current study is to see if participation in an Oregon Parenting Education Collaborative (OPEC) parent education series is associated with changes in characteristics of maternal behaviors and maternal stress reactivity

Twenty mothers and their children were recruited from the OPEC parenting education classes. Data was collected at two time points, the second and final week of the parenting series. During each session, mother and child participated in a videotaped play task, which included a challenging clean-up task (child asked to sort

and pick up complex toys before playing) and a free play task. The mother also gave two saliva samples, one before the task began and thirty minutes after the task was completed, to observe changes in cortisol levels. The clean-up and free play task were coded using 3 scales from an adapted version of the Early Head Start 24-Month 3-Bag Scales. Characteristics of mother behaviors were rated on a 5 point Likert scale.

T-test were executed in order to test changes in behavior and cortisol. Analysis showed that most characteristics of maternal behaviors (i.e. maternal sensitivity and detachment) and maternal cortisol did not change as a result of participation in the parenting education series. Maternal stimulating environment ($p = 0.06$) did provide some evidence that this behavior may change. Further investigation needs to be conducted in order to understand how family characteristics may explain differences in mother behavior.

This study furthers our understanding of how parenting classes may be beneficial to at-risk mothers and their children. Parenting education has been shown to positively influence a variety of characteristics of maternal behaviors (Gross et al., 2003; Homem et al., 2015; Webster-Stratton, 1998) and well-being (Hutchings et al., 2011; Marcynyszyn et al., 2010). By examining these maternal characteristics, it provides greater knowledge of how maternal participation within parenting education can impact maternal and child well-being.

Maternal Play Behaviors and Stress Response within a State-Based Parenting Education Program

by
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I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

Staci W. Ebadirad, Author

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Chapter 1. Introduction

Social science research has demonstrated the importance of understanding the role mothers play in the well-being of their families. Mothers play a crucial role in the development of their child and the quality of mother-child interactions in early childhood are related to a host of child and maternal outcomes. For example, sensitive and responsive mother-child interactions affect children's brain development (Harvard University Center on the Developing Child, 2007), behavior (Mintz, Hamre, & Hatfield, 2011), and stress reactivity (Gunnar & Quevedo, 2007). During mother-child play, maternal engagement, sensitivity, and strategies for stimulating learning are essential ingredients for promoting children's learning and development (Duncan & Brooks-Gunn, 1997; NICHD, 1999; Pettit, Bates, & Dodge, 1997; Ryan, Martin, & Brooks-Gunn, 2006).

Beyond child outcomes, mothers who consistently display more sensitive behaviors toward their children report higher marital quality (Easterbrooks & Emde, 1988) and satisfaction with their parenting (Erel & Burman, 1995). There are also associations between maternal health and well-being and parenting behaviors. For instance, mothers with depressive symptoms are likely to demonstrate negative mother-child interactions and lower overall engagement with the child (Lovejoy, Graczyk, O'Hare, & Neuman, 2000). Additionally, mothers who exhibit increased signs of depression and anxiety are less likely to provide positive, nurturing interactions with their children (Reid et al., 2007), and this often leads to increased risk of similar outcomes in their children (Goodman & Gotlib, 1999).

In addition to the associations between maternal parenting behaviors and social and mental health outcomes, several studies have investigated the relationship between the hypothalamic-pituitary-adrenocortical (HPA) axis and parenting behaviors. A great deal of the

research examining the associations between maternal physiological responses and characteristics of maternal behaviors are conducted during pregnancy and postpartum. Research has demonstrated that mothers' physiological responses, measured via cortisol levels during mother-child interactions, are related to characteristics of maternal behaviors toward infants such as sensitivity and engagement in affectionate behavior (Krpan, Coombs, Zinga, Steiner, & Fleming, 2005; Olza-Fernandez, Gabriel, Gil-Sanchez, Garcia, & Angeles, 2014). Mothers with higher levels of plasma cortisol were also more affectionate toward their infants (Fleming, Steiner, & Anderson, 1987). On the contrary, other studies have shown that cortisol is negatively associated with observed maternal responses such as sensitivity (Finegood, Blair, Granger, Hibel, & Mills-Koonce, 2016; Thompson & Trevathan, 2008). Maternal cortisol may also interact with factors such as maternal and child behavior (Kiel & Buss, 2013: Martorell & Bugental, 2006). Finally, some research has shown that higher levels of salivary cortisol in teen mothers is associated mental and physical health (Krpan et al., 2005). Thus, the available research regarding the relation between mother's activity in the HPA axis and mother-child interactions presents mixed findings, which leads to the need for further investigation.

Parent education programs are one mechanism that afford an increase in parenting quality and the likelihood of positive child, parent, and family outcomes. Many parenting education curricula (e.g., Incredible Years, Nurturing Parenting) focus on improving the quality of parent-child interactions, increasing parents' knowledge about child development, and decreasing parent stress (Bavolek, 2005; Saks, Hyman, Reilly, & Rusch, 1997; Webster-Stratton, 2011). Participation in parent education programs increases mother's parenting effectiveness such that mothers use more praise toward their children and more appropriate discipline strategies (Hurlburt, Nguyen, Reid, Webster-Stratton, & Zhang, 2013; Letarte, Normandeua, & Allard,

2010; Linares, Montalto, MinMin, & Oza, 2006; Webster-Stratton & Shoecraft, 2009). Participation has also shown increase child health and development (Barth et al., 2005; Hurlburt, Barth, Leslie, & Landsverk, 2007).

In addition to changes in parent and child behaviors, changes in parent stress and depressive symptoms are also linked to participation in parenting education programs (Hutchings et al., 2011; Marcynyszyn, Maher, & Corwin, 2010). Parents who participated in a parenting education series guided by the Make Parenting a Pleasure curriculum reported a reduction in depressive symptoms (Swartz, Seeley, Gau, Singer, & Schroeder, 2016). Other parenting interventions, not parenting education curricula, focused on reducing parent depression through early intervention and preventative care and these researchers also report decreases in parent stress (Kaaresen, Ronning, Ulvund, & Dahl, 2006) and depressive symptoms (Berkule et al., 2014). Given the links between depression and anxiety to cortisol levels in adults (Dienes, Hazel, & Hammen, 2013; Hek et al., 2013), participation in parenting education may also support physiological health. To date, associations between parent participation in commercial parenting education curricula and mother or father physiological health have not been investigated.

The aim of the current study is to examine if participation in a parenting education series is associated with changes in observed characteristics of mother's play behaviors toward the child and mother's cortisol reactivity in a stressful event during play. This study, to the author's knowledge, is the first to examine parenting education and its association with both characteristics of maternal play behaviors and maternal stress reactivity. Additionally, this study focuses on a variety of observed characteristics of play: maternal sensitivity, negativity, stimulation of learning environment, and detachment; the latter two dimensions are less studied in parenting education research. The next chapter provides a theoretical framework and reviews

research to describe how characteristics of maternal play behaviors and maternal cortisol reactivity may be affected by participation in a parenting education series

Chapter 2. Literature Review

Theoretical Framework

Social learning theory. Social learning theory (SLT), led by the efforts of Albert Bandura, moved the field from traditional behaviorism in which behavior could only be learned through conditioning, direct reinforcement, and/or punishment, to the notion that behavior could also be modified through observation (Bandura, 1999). Bandura's hallmark contribution is that individuals have the ability to learn new behaviors through social experiences, such as learning through observation and discussion (Grusec, 1992). Parenting education classes rely on learning through social experiences via discussions, modeling, and direct instruction. In the section below, key tenets of Bandura's SLT are discussed and then are situated in the context of parenting education.

Social learning theory is built upon a triadic reciprocity in which personal attributes, observed patterns of behavior, and environmental factors influence one another to shape the development of new behaviors (Bandura, 1999). These triadic reciprocity determinants are bi-directional in nature and impact the individual's ability to learn new behaviors (Green & Piel, 2010). The first determinant within the model, personal attributes, refers to the individual's personality characteristics, beliefs, and past learning, which can support or hinder the learning experience. Within the personal attribute determinant is the concept of *self-efficacy*, the individual's belief about his or her ability to succeed in learning the new behavior (Bandura, 1993). The stronger self-efficacy one has, the more willing one is to set larger goals and have greater commitment to obtain those goals (Bandura, 1991). The second determinant, observed patterns of behavior, refers to the new behavior that is being observed. This determinant takes into account the complexity of the behavior and skills involved to learn the new behavior (Green

& Piel, 2010). Behaviors vary in complexity such that some behaviors may take more time and effort to effectively learn. For example, adjusting current behavior may be less difficult to do than learning a new behavior. The final determinant within the model, environmental factors, refers to the context (e.g., social organization such as a parenting class) in which the behavior is observed. The determinants within SLT help to understand how parent education may influence characteristics of parent behaviors. The ability for a parent to learn new behaviors results from the interactions between parental personal attributes, the type of behavior being observed or discussed, and particular context that the behavior is introduced.

The primary component of SLT that guides this study is the mechanism of change. To explain how behaviors are learned, Bandura described a change mechanism that consists of two phases, the acquisition phase and the performance phase (Bandura, 1986; Green & Piel, 2010). Within the two phases, there are two cognitive processes that occur. The *acquisition phase* describes the phase in which the behavior is learned. The two cognitive processes within the acquisition phase are called the attentional process and the retention processes. The *attentional process* describes how learned behaviors could provide desirable outcome(s) for the individual. If the individual sees the outcome(s) of the behavior as desirable, the more likely the individual will actively seek to learn the behavior. For example, in parenting education curricula, effective parenting behaviors are often presented as a way to improve child behavior, a desired outcome for many parents (Webster-Stratton, 2011; Webster-Stratton & Herman, 2010). The *retention process* requires the individual to encode the observed behavior into mental representations (i.e., rules or concepts). This allows the individual to process the new mental representations and transform what he or she has learned into actions (e.g., more sensitive parenting behaviors). New

behaviors can be adopted through various methodologies such as observation and discussion, and teaching tools utilized in parenting education curricula.

The second phase of Bandura's change mechanism is the performance phase (Bandura, 1986; Green & Piel, 2010). The *performance phase* describes the phase in which the behavior is demonstrated. The performance phase is split into two cognitive processes, the production process and the motivational process. The *production process* describes the ability for the individual to transform their newly learnt skills into context-appropriate behaviors. This transformation includes self-monitoring and self-correcting his or her own behavior in order to accurately match their mental representation. The final process within Bandura's mechanism of change is the *motivational process*. This process describes the incentive behind the individual to continuously perform the learned behavior. Although the individual may learn the behavior, he or she may or may not perform the behavior based upon whether or not he or she will continually be incentivized to do so.

The mechanism of change can be applied to understand how parents' behavior may change as a result of participation in a parenting education series. The goal of the social cognitive perspective of learning is the ability of the individual to understand his or her behavior and repercussions of that behavior, and to develop new patterns of behavior (Bandura, 1986). For learning to occur within the parenting class, the parent must believe that desirable outcomes are possible if his or her behavior is altered; this occurs in the attentional process. For example, the parent may observe that increased responsivity and sensitivity toward a child could lead to more positive parent-child interactions and subsequently a reduction in children's challenging behaviors. The parent may be more incentivized to learn how to become more responsive and sensitive due to the positive outcomes from the interactions. Then, in the retention process, the

parent can practice the learned behavior, but this is based upon his or her motivation. Ideally, the parent then moves into the performance phase of learning, where the new behaviors are practiced in context.

Many parenting education programs, such as the Incredible Years and Nurturing Parenting, are built upon some principles of the SLT. These parenting curricula use a collaborative learning format to discuss a number of topics, which include praising the child, positive discipline, limit-setting, and rewarding (Bavolek, 2005; Webster-Stratton, Reid, & Hammond, 2004). These programs aim at strengthening parent's skills in order to enhance parent-child relationships through various modes of instruction (Furlong & McGilloway, 2014) such as modeling, role-play, group discussion, and use of video vignettes (Bavolek, 2005; Webster-Stratton et al., 2004). These instructional methods help parents to practice new strategies (acquisition phase) and implement new parenting skills (performance phase) within their families (e.g., Webster-Stratton & Hancock, 1998).

This study does not aim to test SLT, but utilizes the change mechanism to illustrate how parenting skills may improve after participation in a parenting education series. Specifically, the principles within the acquisition and performance phases are used to frame this study to understand how mother's behaviors and stress reactivity may change after participation in a parenting education series. If changes in mother behavior and physiology occur, then it is likely that mothers are in the performance phase as they are able to practice new skills in the context of play. Note that characteristics that contribute to these change mechanisms (e.g., self-efficacy) are not explored in this study, which is a limitation.

Social learning theory suggests that behavior can change as a result of learning new information. Much of the research examining parenting education to parent outcomes has

focused on parental report of parenting behaviors (Webster-Stratton et al., 2004) and observed maternal behaviors (Berlin, Brady-Smith, & Brooks-Gunn, 2002; O'Connor, Matias, Futh, Tantam, & Scott, 2013). Few, if any studies have examined physiological outcomes for parents associated with parenting education, yet changes in behavior should yield subsequent changes in biological structures and responses (e.g., Andreassi, 2000). The biosocial theoretical framework stresses the importance of examining both behavioral and biological outcomes to provide a greater understanding of family processes, including mother-child interactions.

Biosocial framework. The biosocial framework focuses on the importance of exploration of biological and social characteristics that affect families (Booth, Carver, & Granger, 2000; D'Onofrio & Lahey, 2010). This framework integrates various areas of research and academic disciplines including, but not limited to, biology, psychology, sociology, and behavior genetics. The biosocial model links psychological (e.g., behaviors) factors with biological (e.g., genes) factors of the family to better understand the processes that are occurring within families. D'Onofrio and Lahey (2010) express the need for family studies to embrace the measurement of social and biological outcomes. In line with this, the current study examines behavioral and physiological changes in mothers after participation in a parenting education series.

The biosocial model of the family conceptualizes families as "systems affected by, and effecting change in, reciprocal influences among social, behavioral, and biological processes" (Booth et al., 2000, pg.1018). Participation with a parent education program may influence both psychological (e.g., maternal behaviors) and physiological factors (e.g., maternal stress reactivity). The behaviors and stress reactivity of the parent influence children's developmental outcomes and behavior (Crnic, Gaze, & Hoffman, 2005; Malmberg, Lewis, West, Murray, Sylva,

& Stein, 2016) and therefore, it is important to understand the role of parent education. Although the biosocial framework conceptualizes individual family members as bidirectionally affecting one another, this study focuses solely on the mother.

Social learning theory provides the foundation for the theory of change: that the new skills learned through participation in a parenting education may change mother behavior and physiology. The biosocial framework supports the inclusion of behavioral and physiological measurements. If mothers have reached the performance phase, they will demonstrate this by showing positive changes in the interactions with their child and lower cortisol responses to a stressor. Parents who have not reached the performance phase in SLT are not likely to show these changes. The next section outlines components of parenting education programs to describe the skills that mothers may acquire during participation in these programs.

Parenting Education Programs

The overall goal of parenting education is to enhance parents' ability to effectively parent by providing information and skills that support stress management and increase parental knowledge of child development (Webster-Stratton & Herbert, 1994). The foundation of parenting education programs is built upon the premise that knowledge can be taught in social situations, which is in line with SLT. With respect to parent skills and behaviors, research suggests these are malleable and that participation in parenting education programs result in increases in positive behaviors. Praise and positive parent affect directed toward the child are likely to increase, while harsher demands placed upon the child are likely to decrease (Arkan, Ustun, & Guvenir, 2013; Reid, Webster-Stratton, Beauchaine, 2001). Participation in parenting education increases in the quality of parent-child interactions (Arkan et al., 2013) as well as decreases negative parenting practices, such as use of harsh discipline (Borden, Schultz, Herman,

& Brooks, 2010; Letarte et al., 2010). Participation is also associated with a decrease in maternal anxiety, stress, and depression (Hutchings et al., 2011; Marcynyszyn et al., 2010).

Generally, parenting education programs aim to change characteristics of parenting behaviors in order to affect parent(s) well-being, family functioning, and child outcomes. Many parent education programs are evidence-based, such as the Incredible Years, and focus on characteristics of positive (i.e., nurturing, sensitive parenting) and negative (i.e., negative, harsh parenting) parenting behaviors that may positively influence children's behavior problems (Homem, Gaspar, Santos, Azevedo, & Canavarro, 2015; Hurlburt et al., 2013; Reid et al., 2003). Three popular parenting education curricula, Incredible Years, Nurturing Parenting, and Make Parenting a Pleasure, have been tested for their effectiveness in changing parent and child behaviors (Cowen, 2001; Devall, 2004; Gross et al., 2003; Homem et al., 2015; Saks et al., 1997; Swartz, Seeley, Gau, Singer, & Schroeder, 2016; Webster-Stratton et al., 2004).

Parenting education curricula.

Incredible Years. The Incredible Years (IY) is a parent education course that serves families and their children, ages 0-12, in more than 10 countries. The overarching goals of the IY include the prevention of child conduct problems and aggressive behavior, promotion of children's social competence and academic readiness, promotion of the parent-child relationship, and prevention of harsh parenting (Webster-Stratton, 2011). The program aims to reach these goals through teaching parents specific behaviors regarding positive parent-child communication, developmentally appropriate expectations for their children, effective rule-making strategies, and parents' emotional regulation. The IY program is an evidence-based parenting education program that impacts characteristics of parent and child behaviors (Pidano & Allen, 2015). Studies using the IY program have shown to improve parents' use of positive

behaviors such as positive affect toward their children (Homem et al., 2015; Webster-Stratton, 1998) and effective discipline and praise (Reid, Webster-Statton, & Hammond, 2003) as well as reduce criticism and negative discipline (Gross et al., 2003; Webster-Stratton, 1998; Webster-Stratton et al., 2004).

Many studies conducted within the IY framework use both self-report and observational methods to determine changes in parenting. Mothers and fathers report changes in parenting behaviors after participation in an IY parenting series. In a study conducted by Webster-Stratton (1998), parents (86% mothers) who attended an IY parenting education series were more likely to report increases in positive parenting strategies than parents who did not participate in the IY program. Dosage also played a role, as parents who attended 50% or more of the parenting classes reported significant increases in sensitivity (e.g., positive affect and nurturing) and reductions in negative parenting behavior. Changes in observed parenting behaviors are also linked to IY. Mothers that participated in a parent training drawn from the IY framework demonstrated significant observed and self-reported decreases in negative parenting strategies such as harsh and inappropriate discipline and number of critical statements the mother made toward the child (Webster-Stratton et al., 2004). Similarly, Homem et al. (2015) observed increases in mother's positive parenting behaviors (i.e., labeled praise, positive affect) when they interacted with their children in a lab-based setting; these results remained stable over time. Notably, this sample included Portuguese children with high-levels of symptoms consistent with Oppositional Defiant Disorder. Finally, Gross and colleagues (2003) found that mothers and fathers who participated within the IY program reported a reduction of negative behaviors such as harsh criticism and negative discipline techniques.

Nurturing Parenting Programs. Nurturing Parenting Program (NPP) has served over 1.5 million people (Nurturing Parenting FAQ, nurturingparenting.com). The NPP has a variety of programs that agencies may choose from in order to serve particular populations of interest. The NPP philosophy includes developing a new parent-child bond, promoting parental self-awareness and self-worth, employing effective discipline strategies, and teaching developmental milestones of children and youth (Bavolek, 2005). Evaluations of NPP have focused on parent report as the primary assessment of changes in parenting skills and behaviors. Compared to pre-participation scores, parents reported higher empathy toward their children and increased knowledge of appropriate expectations for children. These parents also reported a decrease in their beliefs about corporal punishment (Cowen, 2001; Devall, 2004). In a sample of parents suspected of child abuse or neglect, parents reported decreases in harsh parenting behaviors such as abusive or neglectful practices when compared to parents who only attended a few NPP sessions (Maher, Marcynszyn, Corwin, & Hodnett, 2011).

Make Parenting a Pleasure. Make Parenting a Pleasure (MPAP) is a part of a larger organization, Parenting Now!, which was previously called Birth to Three. Parenting Now! has served over 9,000 individuals and their children (Parenting Now!, 2013). The purpose of the MPAP curricula is to educate parents on the importance of their health and well-being in order to effectively parent. The MPAP curriculum focuses on key concepts that include stress and anger management, positive communication with the child, building a support network, effective discipline strategies, parental self-care, and greater knowledge of children's development (Saks et al., 1997). One randomized control trial investigated the effectiveness of MPAP on improving outcomes in parents and children (Swartz et al., 2016). Swartz and colleagues (2016) found that mothers and fathers who attended the series reported having higher knowledge of child

development and lower rates of depression compared to those participants who did not attend the class.

Overarching topics in parent education curricula. The parent education curricula discussed above have three overarching themes: (1) knowledge of children's development, (2) positive parent-child communication, and (3) parent stress and anger management. However, the curricula also vary in focal topics. For example, NPP also focuses on parenting resilience and building social connections, but IY and MPAP do not focus on these specific topics (Bavolek, 2005). Additionally, parenting education programs using these curricula may alter their topics based on the population they are serving (e.g., IY curricula varies by child age and child's challenging behaviors). Thus, even within a parenting education series using the same curricula, participants may be exposed to slightly different topics.

Even with this possible variation in topics, current evaluation research indicates that these popular parenting education curricula influence parent-child interactions as evidence through decreased negativity and increased engagement and sensitivity. Evaluation studies vary in the methods utilized to determine changes in parent behavior as a result of completing parenting education program. Some researchers use measures of self-report (Cowen, 2001; Devall, 2004; Maher et al., 2011; Swartz et al., 2016) while others use observational methods (Gross et al., 2003; Homem et al., 2015; Webster-Stratton et al., 1998; Webster-Stratton et al., 2004) to assess change. Few studies have examined how parent's use of behaviors that cognitively-stimulate children's learning and development may change through participation in parenting classes. There is also evidence that parents who participate in parenting education programs show reductions in stress and improvement in anger management strategies (Fetsch, Schultz, & Wahler, 1999; Sanders & McFarland, 2000; Zubrick et al., 2005). However, to date, it is unclear

how this may manifest in the parent's stress response system. The next section outlines the importance of (1) four types of maternal responses to children and (2) maternal activity in the stress response system.

Mother-Child Interactions in the Context of Play

The characteristics of mother-child and father-child play display similarities and differences in early childhood. Both mothers and fathers are highly invested in children's play, but the type of parental engagement in play may differ. For example, mothers engage in more sedentary activities with their children (Rooparine & Davidson, 2015), such as building with blocks. Mothers are also more likely to use toys while fathers play tends to be more physical in nature (Lamb 1977; Weinraub & Frankel, 1977). Possibly due to these play style differences in mothers and fathers a structured play task, which is play based and sedentary, is often used to observe mother and child behavior.

Observed mother-child interactions are assessed most often in the context of a structured play task. Large-scale research projects, such as the NICHD Study of Early Child Care and Youth Development, Early Head Start Impact Study, and the Early Childhood Longitudinal Study-Birth Cohort have employed this assessment strategy. The structured play sessions often include a free play task and a challenging task. In the free play task, the mother and child are provided open-ended toys, such as blocks, and are instructed to play as they normally would. The challenge task often manifests as a clean-up or an impossible task (e.g., asking the child to complete an impossible puzzle). Within these tasks, characteristics of maternal responses are rated on a variety of dimensions, including sensitivity, stimulation of the environment, negativity, and detachment. The following sections address four characteristics of maternal behaviors: sensitivity, stimulation of the environment, negativity, and detachment.

Maternal sensitivity can be described as the ability of the mother to perceive her child's signals and respond appropriately to those signals (Nicholls & Kirkland, 1996). In play, the core component of maternal sensitivity is that the mother is highly responsive toward her child and the mother allows her child to guide the focus on their interactions (Crittenden & Claussen, 2000). Research suggests that children of mothers displaying low maternal sensitivity are at higher risk of developing externalizing behaviors during early childhood (Crnic, Gaze, & Hoffman, 2005). Lower maternal sensitivity also impacts children's cognitive and language development (Malmberg, Lewis, West, Murray, Sylva, & Stein, 2016; Martin, Ryan, & Brooks-Gunn, 2007), suggesting that maternal sensitivity serves as the foundation for high-level mother-child interactions (e.g., stimulation of learning). As evidenced by previous work (e.g., Homem et al., 2015; Reid et al., 2003), characteristics of maternal sensitivity increase after participation in a parenting education series. The mechanism is likely due to the focus on positive communication and interaction between the mother and child within popular parenting education curricula (Kaminski, Valle, Filene, & Boyle, 2008; Saks et al., 1997).

Maternal negativity can be described as the mother's expression of hostility or harshness toward the child (Brady-Smith, O'Brien, Berlin, Ware, & Brooks-Gunn, 1999). Maternal negativity has been associated with suboptimal child behaviors such as conduct disorders (Hill, 2002) and other challenging behavior problems in children (Larsson, Viding, Rijsdijk, & Plomin, 2008; Wade et al., 2011). Maternal negativity is also associated with well-being. For example, maternal depression is related to negativity (i.e., irritability and hostility towards child), and the strongest effects are found when the symptoms are current (Lovejoy, Graczyk, O'Hare, & Neuman, 2000). By decreasing maternal negativity, such that the parent is less hypercritical (e.g., issues fewer commands), optimal parenting practices may increase (Reid, Webster-Stratton, &

Beauchaine, 2001). Parent education curricula often focus on positive communication between mother and child, and this may lead to learning new behaviors that decrease negativity yet also increase sensitivity. As previously discussed, reductions in maternal negativity are also linked to participation in parenting education (e.g., Borden et al., 2010; Letarte et al., 2010).

The final two characteristics of maternal behaviors that are examined in this study, maternal detachment and stimulation of learning, are less evident in the parenting education and mother-child interaction research areas. The operationalization of stimulating learning is rooted in the work of Vygotsky, particularly on his definition of scaffolding and his theory of zone of proximal development within children (Vygotsky, 1978). For example, when a mother engages in promoting children's learning, she is likely to use conversation and strategies to scaffold children's learning (Brady-Smith et al., 1999). These behaviors, such as asking open-ended questions, are crafted to meet the individual needs of child to best support growth in their cognitive skills. A mother scaffolds her child's learning as she models tasks to her child that the child may be unfamiliar with (e.g., writing the child's name). Parenting education curricula often focuses on increasing participant's knowledge of child development. Through this instruction and subsequent acquisition of new skills, mothers are likely to be better equipped to promote children's learning and development. The instructional methods taught within parenting education programs help parents to practice new strategies and implement new skills within their interactions within their children (e.g., Webster-Stratton & Hancock, 1998).

Finally, maternal detachment is conceptualized as the lack of mother's awareness of, attention to, and engagement with the child, which can manifest as a disconnect between the mother and child (Brady-Smith et al., 1999). A meta-analysis conducted by Lovejoy and colleagues (2000) suggested a moderate association between maternal disengagement and

maternal depression. When the mother is disengaged, she may exhibit minimal instances of involvement and may not react contingently to her child's needs. Thus, a lack of maternal detachment would be necessary for the mother to engage in sensitivity, negativity, or stimulation of learning—there must be presence of engagement, or lack of detachment, for these behaviors to occur. There is a limited amount of research regarding maternal detachment or unresponsiveness from which to draw hypothesis.

Based on SLT (Bandura, 1986), mothers who participate in parenting education programs are likely to learn new strategies. As reviewed above, popular parenting education curricula focus on decreasing parent harshness, increasing parent sensitivity, knowledge of child development, and strategies to manage child misbehavior. Empirical evidence suggests that after participating in these programs, parents both report and display a decrease in negative and an increase in positive parenting behaviors. Further, the biosocial approach highlights the importance of including environmental (e.g., interactions) and biological factors that are related to parenting and family functioning (Booth, Carver, & Granger, 2000). Given that parenting education curricula also focuses on reducing parent stress, it is possible that participation in a parenting education program may support a healthy stress response system.

Maternal Stress Response System

The primary purpose of the stress response system is to help the body cope with everyday experiences and stressors (Gunnar & Quevedo, 2007). In a typical day, the stress response system follows a predictable pattern of activity (Dedovic & Duschesne, 2012; Gunnar & Quevedo, 2007). The stress response system includes the HPA axis, the parasympathetic, and the sympathetic system. When activated, the three components engage in a cascaded release of supports. Specifically, the HPA axis is activated only if the parasympathetic and sympathetic

responses are not sufficient to return the system to a state of homeostasis. The HPA axis provides a more substantial response to help the individual recover from a stressor (Del Giudice, Ellis, & Shirtcliff, 2011; Gunnar & Quevedo, 2007). An individual's perception of a stressor varies, but stress and stressors are generally defined as "situations which [pose] a real or implied threat to an organism and leads to a set of physiological responses" (Dedovic & Duschesne, 2012, pg. 28).

The HPA axis produces cortisol, a steroid hormone; this hormone serves a biomarker of the body's response to stress in the HPA axis (Dedovic & Duschesne, 2012; Gunnar & Quevedo, 2007). The average cortisol level within an adult's saliva is 0.553 μg/dL in the morning to around 0.217 μg/dL in the evening. The HPA axis is the final arm of the stress response system it is the last system to deploy support to the body to cope with a stressor. Through the additional release of cortisol from the adrenal gland, the HPA axis aims to aid in the restoration of and return to homeostasis after an emotional or physical stressor. To measure an individual's response to a stressor, change in an individual's cortisol level from baseline to post stressor is assessed. A change, or reaction, in an individual's cortisol level from their baseline level (pre-stressor) would suggest a physiological response. The increase of cortisol in one's body can usually be detected 15-30 minutes after the psychological or environmental stressor has occurred (Dedovic & Duschesne, 2012). In a meta-analysis, time of collection was not associated with differences cortisol reactivity levels in adults (Michaud, Matheson, Kelly, & Anisman, 2008).

It is important to note that a stressor can by physical (e.g., exercise; Perna, Schneiderman, & LaPerriere, 1997), social (e.g., within an interaction; Laurent, Ablow, & Measelle, 2012; Thompson & Trevathan, 2008), and/or cognitive (e.g., high-input to working memory; Roozendaal, 2002). The operationalization of these stressors has important implications for how stress may manifest after completion of a parenting education program. Current research

suggests that overall parenting stress, not physiological stress, decreases and psychological well-being increases after participation in a parenting education class. These outcomes (e.g., lower depression) are related to lower activity in the HPA axis (Dienes, Hazel, & Hammen, 2013; Hek et al., 2013) and thus it is likely that physiological changes are also present. In a parenting education program, parents learn new strategies to improve the quality of their interactions with their child as well as strategies to decrease parenting stress and anger. In a challenging mother-child interaction, it is possible that mothers may show a reduction in stress reactivity *or* an increase in reactivity after completion of the program, due to this increase in knowledge. Specifically, mothers may demonstrate a reduction in stress reactivity after completion of the program because they are newly equipped with new skills and are less likely to experience child misbehavior as a social stressor. However, the execution of these newly learnt skills may also lead mothers to experience a cognitive stressor. This study examines maternal physiological stress via cortisol reactivity within a challenging play task (i.e., requesting that the child pick up the toys prior to playing) to understand how reactivity may change through participation in a parenting education program.

Several studies have shown that social stress can impact physiological responses (e.g., cortisol, adrenocorticotropic hormone, heart rate) in individuals (Allen, Kennedy, Cryan, Dinan, & Clarke, 2014; Kudielka, Schommer, Hellhammer, & Kirschbaum, 2004; Laurent et al., 2012; Yim, Quas, Chill, & Hayakawa, 2010). In mother child play, requesting that a child clean up before playing may serve as a social stressor, as the mother will likely have to use various strategies to convince her child to pick up the toys with which the child would rather play (Laurent et al., 2012). The mother's physiological response depends on the skills the parent has to manage a child's behavior. Research conducted by Morelius, Brostrom, Westrup, Sarman, and

Ortenstand (2010) suggest that mothers who do not experience a change in salivary cortisol levels after a perceived stressful event (i.e., diaper change), may be due to the mother's control of the situation in that mothers are better able to predict their child's behaviors. In other words, the mother's control of a stressful situation reduces the magnitude of the social stressor and may lead to the mother's lack of a physiological response. The ability for the mother to control the situation has demonstrated that she has surpassed the acquisition phase and is in the performance phase of SLT. The mother is exhibiting various techniques of learned behavior through previous interactions with her child and is applying it into her control of the environment around her.

On the other hand, learning and implementing new skills may also induce a reaction in the stress response system as a cognitive stressor. Adults engaging in artificial (lab-induced) or naturally occurring cognitive stressors are likely to demonstrate a physiological reaction (e.g., cortisol, adrenocorticotropic hormone, heart rate; de Kloet, Vermetten, Rademaker, Geuze, & Westenberg, 2012; Delaney & Brodie, 2000; Neupert, Soederberg-Miller, & Lachman, 2006). Cognitive overload (Sweller, Ayres, & Kalyuga, 2011) may occur in the mother after participation in the parenting series as they now have the knowledge for effective parent-child interactions but may lack the in-person experience to effectively apply these new skills. Cognitive stress may overwhelm an individual's thinking abilities and impair in individual's ability to complete a challenging task. This cognitive overload may lead to a response in the individual's stress physiology and an increase in cortisol production (Gaillard, 2012). This type of stressor may also indicate that the parent has not reached the performance phase of SLT. To date, there is no published research examining the link between mother's stress reactivity, cognitive or social stressors, and participation in parenting education.

In a parenting education series, the information provided creates a new set of expectations regarding child development (e.g., context-appropriate behaviors, developmentally appropriate expectations) and parent behaviors (e.g., positive communication with the child, effective rule-making strategies). This information may better equip the mother to handle a challenging task, which may result in a decrease in reactivity (i.e., no longer a social stressor) or an increase (i.e., applying new knowledge is a cognitive stressor). It is possible that mothers will not experience the challenging task as a social stressor as they are now better prepared to handle the event. It is also possible that mothers will experience a rise in cortisol associated with practicing new skills that are still in working memory. This study aims to provide some insight on how maternal stress physiology may change due to participation in a parenting education series, through which new, developmentally appropriate parenting practices are presented.

Current Study

The Oregon Parenting Education Collaborative (OPEC) offers a variety of parenting education series that can help improve positive parenting practices and decrease negative parenting practices. Specifically, parents that participated in OPEC-sponsored series reported increases in affectionate behavior toward their child and knowledge of child development. Parents also reported they had more strategies to cope with daily stressors associated with parenting (Sektnan & Rennekamp, 2015). Over 95% of the parents who participated in an OPEC-sponsored parenting series stated that they found the class material helpful and would continue using the information in their daily lives (Sektnan & Rennekamp, 2015). Self-reports are both advantageous and disadvantageous in that they are rich in information and overall practicality (i.e., efficient and inexpensive), but they may also be inaccurate due to self-preservation (Paulhus & Vazire, 2007). Observational methods are likely to represent the most

genuine form of the parent's behavior although the intrusion of researcher may impact the behavior (Lindahl, 2000). Prior to this study, observed changes in parenting or parent stress had not been investigated within OPEC-sponsored parenting education series.

OPEC funds a variety of parent education courses for parents; the most popular parenting education series utilize IY, NPP, or MPAP curricula. This study does not aim to investigate the effectiveness of a particular curriculum. The structure of OPEC provides parenting hubs flexibility in choices such as curricula, and flexibility is a critical aspect of scalability (Hamre & Hatfield, 2012). Thus, this study explores whether the efforts of the OPEC-sponsored parenting education using many curricula is associated with observed changes in the characteristics of maternal behaviors and maternal physiological response to stress. Social learning theory suggests that skills can be taught through direct instruction and observational learning in social experiences (Grusec, 1992). Further, the biosocial framework emphasizes the need to examine social and biological outcomes within the family system.

Based upon the existing research, I hypothesized that maternal sensitivity would increase and maternal negativity would decrease as a result of the mother's participation in the OPEC-sponsored parenting series. This study also examined two aspects of mother's behaviors, stimulation of learning and detachment, which are largely absent from literature examining the benefits of parenting education. I hypothesized that mother's ability to stimulate learning and be engaged on a basic level with her child (i.e., lower detachment) would increase as a result of the mother's participation in the OPEC-sponsored parenting series. Due to the inconsistent and limited evidence regarding maternal stress reactivity as applied to parent behavior eliciting a social or cognitive stressor, the hypothesis regarding this is exploratory. It is possible that

reactivity may increase, decrease, or remain stable after participation in an OPEC-sponsored series.

Chapter 3. Materials and Methods

Participants

Twenty (n = 20) mother-child dyads were recruited the first week from parenting education series sponsored by the OPEC. The dyads were recruited from six OPEC hubs in Oregon and California. At the first parenting education class, a member of the research team presented information about the study. If mothers were interested, they submitted an informed consent for and an eligibility survey. Members of the research team reviewed the surveys to identify eligible participants. Parents were eligible if they met the following criteria: (a) mothers were 18-years-old or older and the child's biological, step, or adoptive mother, (b) mothers had children between the ages of 36 to 60 months, (c) both the mother and child spoke and understood English, and (d) the child was not a ward of the state. Fathers were excluded from this study as the adapted version of the Early Head Start (EHS) 24-Month 3-Bag Scales (Brady-Smith et al., 1999) has only been validated for mothers. Fathers were also excluded because fathers and mothers differ in play styles.

Out of the 27 parents who consented, 20 were eligible to participate. All consented parents were contacted to confirm enrollment (i.e., parents were selected or not selected). Eligible participants were asked if they had additional questions and a 30-minute block of time for data collection with the mother and child before or after the next parenting class (pre/2nd week of the series) was scheduled. Approximately midway through the parenting education series, the mother and child were contacted and posttest data collection (last week of the parenting series) was scheduled. Eighteen mothers completed pretest data collection and 17 mothers completed posttest data collection. At pretest, one of the mothers within the 20 dyads was unable to bring her child and the other was a late enrollee to the class and was not able to

schedule data collection. At posttest, the three mothers with missing data were no longer participating in the parenting education series and did not respond to requests to schedule posttest data collection.

The children's ages ranged from 36 to 56 months (M = 48.2; SD = 6.5); twelve were female. Most children were identified by their mothers as Caucasian. Mothers' ages varied from 18 to 44 years (M = 31.5; SD = 6.9). Most were married, and educational attainment varied. Table 1 includes descriptive characteristics.

Procedures

At pretest and posttest, mothers provided saliva samples, participated in a structured play task with their child, and completed questionnaires. First, a saliva sample was collected from the mother. Then, the mother and child were directed toward the research toys (Lincoln Logs, Tinker Toys, and toy vehicles) to complete a 15-minute standardized play task that would be recorded and coded by research team at a later date (see section below for further details about the play task). Two segments of this task are utilized in this study: clean up (three minutes) and free play (six minutes). The third task is a six-minute book reading segment. First, the mother and child participated in the challenging task. The child was asked to clean-up and sort the toys into specified containers. After three minutes, the researcher returned, dumped out the toys, and requested that the mother and child play with the toys however they would like. Finally, the mother was instructed to read a book to their child. After completion of the play task, the mother completed surveys (e.g., demographic surveys). While the mother completed surveys, the team member completed a variety of child assessments. Once the mother completed the questionnaires, a final saliva sample was collected.

Measures

Mothers completed a set of questionnaires during the first and second data collection. The questionnaires given to the mother included items related to family demographics, maternal depression, household chaos, family functioning, and child behavior. Only demographic items are used in the current study.

Maternal play behaviors in a play task. Four scales examining maternal behaviors were used from an adapted version of the Early Head Start (EHS) 24-Month 3-Bag Scales (Brady-Smith et al., 1999). This study used a five-point Likert scale for Maternal Sensitivity, Stimulating Environment, Maternal Negativity, and Maternal Detachment. The scales range from 1 to 5. A score of a 1 indicates that the mother exhibited very low levels of the behavior; a 5 indicates the mother displayed very high levels of the behavior. Maternal Sensitivity measures the extent to which the parent positively responds to her child's cues for attention. Stimulating Environment measures the extent to which the mother facilitates play within the task and provides opportunities to further the child's learning and development. Maternal Negativity measures the extent to which the mother expresses anger or hostility toward the child. Maternal Detachment is the extent to which the mother engages with her child during the play task, without considering the quality of the engagement.

The principal investigator trained the lead coder (author) on the coding scheme. The PI created two master coded clips for each setting (clean-up and free play), and the lead coder was trained to exact agreement. Then, the lead coder trained one undergraduate research assistant; the research assistant achieved a 100% on the master coded videos. Videos were randomized for coding purposes; all videos were double coded. First the coders watched the videos and took

notes. Immediately after the coders rated maternal behaviors on the five-point Likert scale. Later, the coders met to discuss their scores and consensus scores were obtained.

Maternal cortisol reactivity. All research staff were trained to collect saliva by the principle investigator. Before and after the play task, the mother placed an oral swab (Salimetrics™ adult swab) under her tongue for two minutes. Saliva samples were transported and stored below 0°F until shipped. Frozen samples were shipped overnight on dry ice to Institute for Interdisciplinary Salivary Bioscience Research Center at Arizona State University. Cortisol assays were conducted in duplicate.

The parenting education classes were offered at various times of day and thus saliva collection time varied for each participant. Time of first saliva collection occurred mid-day (11:00 to 15:00; $n_{pretest} = 5$, $n_{posttest} = 3$), mid to late afternoon (15:01 to 19:00; $n_{pretest} = 11$, $n_{posttest} = 13$) or late evening (19:01 to 21:00; $n_{pretest} = 2$, $n_{posttest} = 1$) for mothers. Contrary to other metrics of cortisol (e.g., cortisol awakening response), which need to account for differences in collection time, evidence suggests that time of collection is not predictive of cortisol reactivity (Tollenarr, Beijers, Jansen, Riksen-Walraven, & De Weerth, 2011), or is not considered as a factor in analyses (Raz & Leykin, 2015). However, the association between time of collection and cortisol values were examined. First, one-way ANOVAS were conducted to determine if time of day (mid-day, mid to late afternoon, or late evening) predicted mother's change in cortisol (cortisol reactivity) during the play task. Results indicated that time of day did not predict cortisol reactivity at pre ($F(2,15) = 0.26$, $p = 0.77$) or post ($F(2,14) = 0.17$, $p = 0.85$). Second, time of first saliva collection was regressed on cortisol reactivity for pretest and then posttest data collection. Results indicate that time of saliva collection did not predict mother's

cortisol reactivity at pretest (b = 0.00, $t(16)$ = -0.02, p = 0.98) or posttest (b = 0.02, $t(16)$ = 0.81, p = 0.43).

On average, the time between the challenging task (the stressor) and the final saliva collection of the mother was 14 to 52 minutes (M = 30.07 minutes; SD = 10.6 minutes). Fifteen to thirty minutes, is considered an acceptable time frame to measure cortisol reactivity in humans (e.g., Dedovic & Duschesne, 2012) and studies with adults often use a latency period of 20 minutes (Raz & Leykin, 2015). In line with previous work (e.g., Tollenarr et al., 2011) a variable for stress reactivity was created subtracting collection #1 from collection #2; this reactivity variable was created for pretest and posttest. To examine possible differences in elapsed time between collections related to time of day, ANOVAS were executed. Results indicated that time of day is not predictive of elapsed time between collections at pretest ($F(2,14)$ = 0.67, p = 0.53) or posttest ($F(2,14)$ = 0.64, p = 0.54).

Data Analysis

The data were analyzed using Stata 13 (StataCorp, 2013). First, descriptive statistics (e.g., means, standard deviations) and bivariate correlations were estimated. There was no variation in maternal negativity, all mothers displayed very low negativity; thus change in negativity was not explored. To identify the appropriate statistical test for changes in behavior and reactivity, distributions of all variables were examined. Visual inspection of histograms and the Shapiro-Wilk normality test were employed. Visual inspection is error prone with small samples, but the Shapiro-Wilk test is a reliable indicator of non-normality with small samples (Ghasemi & Zahediasl, 2012). A second normality test available in STATA, sktest, was also employed to determine skewness and kurtosis. The Shapiro-Wilk test and the sktest were used to examine the normality of the data.

Pretest and posttest maternal stress reactivity was not normally distributed. Before log transformation could be executed on maternal stress reactivity, the negative values needed to be eliminated. One common method is to add a constant value (i.e., +1) to each value in the data prior to running a log transformation (Steiner & Norman, 2014). After this constant was applied, log transformations were conducted on maternal stress reactivity. After transformation, results indicated that reactivity had one outlier, defined as over three SDs above the sample mean (Gordis, Granger, Sussman, Trickett, 2008; Hatfield, Hestenes, Kintner-Duffy, & O'Brien, 2013), in both pretest and posttest; the outliers were from two mothers. In the analyses, the highest value (three SDs above the mean) was substituted for the outlier, in accordance with other studies managing outliers in salivary cortisol (Gordis et al., 2008; Hatfield et al., 2013). Note that these mothers also had outliers at posttest collection #2 (n = 1) and pretest collections #1 and #2 (n = 1). These values were replaced with the highest value as described above and subsequently utilized in descriptive and correlational analyses. A t-test was executed to examine changes in reactivity from pretest to posttest utilizing the transformed reactivity variable with the outliers replaced. Analyses were also executed with the outliers dropped, and the pattern of results did not change.

For characteristics of maternal behaviors, results from the normality test indicated that one outcome, maternal facilitation of stimulating environment in both clean-up and free play, was normally-distributed (Table 2). In order normalize the distributions, log transformations were conducted on maternal detachment and maternal sensitivity. Then, paired t-tests were executed to estimate changes in all outcomes. Separate tests were executed to estimate changes in the four characteristics of maternal behaviors in play from pretest (2nd week of parenting series) to posttest (last week of parenting series).

The missing data ($n_{pretest}$ = 2; $n_{posttest}$ = 3) were managed with pairwise deletion. A disadvantage of this method is the reduction of the sample size and statistical power (Roth, 1994). Although considered a disadvantageous method, it is still used in research (Eekhout et al., 2012), particularly within small sample experimental designs. Further, the sample size (n = 15 with pretest *and* posttest data) is not well suited for imputation or full information maximum likelihood (Graham, 2009). To investigate patterns of missingness, t-tests were executed to examine if maternal age or income predicted missingness on the outcome variables. Two mothers were missing all pretest data (observed behaviors and cortisol samples) and three mothers were missing all posttest data. Therefore, one binary variable was created to identify missing data (1) or no missing data (0). Results indicated that maternal age ($t(17) = -0.40$, $p = 0.70$) and income ($t(17) = 1.21$, $p = 0.23$) did not predict missingness within the sample.

Table 1
Sample Characteristics of Families

Characteristics	*n*	*Mean* (SD)	%
Child Gender			
Male	8		40
Female	12		60
Child Age (in months)	18	48.2 (6.5)	
Child Race/Ethnicity	1		
Caucasian	12		63.2
Latino/Hispanic	3		15.8
Native American	3		15.8
Black/African American	1		5.3
Maternal Age (years)		31.5 (6.9)	
Maternal Relationship Status			
Married, living together	11		61
Not married, living with partner	4		21.1
Divorced	2		10.5
Single, never married	1		5.3
Maternal Race/Ethnicity			
Caucasian	15		78.9
Latino/Hispanic	3		15.8
Native American	1		5.3
Maternal Education			
Some high school, no diploma	4		21.1
High school equivalent or GED	3		15.8
Some college, no degree	6		31.5
Two-year degree	2		10.5
Four-year degree	4		21.1
Maternal Income			
Less than $500/month	3		15.8
$500-$999/month	2		10.5
$1,000-$1,999/month	4		21.1
$2,000-$3,999/month	2		10.5
$4,000-$5,999/month	4		21.1
$6,000-$7,999/month	4		21.1
Number of People in Household			
Children under 18 years of age		2.2 (1.4)	
Total		4.2 (1.4)	

GED = General Education Development

Chapter 4. Results

First, results focused on maternal play behaviors are presented, then, results for maternal stress reactivity are described. For each outcome variable (i.e., characteristics of maternal play and stress reactivity), non-transformed descriptive and correlational results are presented first. These are followed by results focused on the examination of change in maternal behaviors and stress reactivity that utilized the transformed variables when applicable.

Maternal Play Behaviors

Mothers were sometimes observed to display characteristics of sensitive behaviors and behaviors that encouraged a stimulating environment (Table 4) as scores were in the mid-range. Mothers were not observed to display characteristics of maternal negativity as results indicated no variation; all mothers displayed very low negativity ($M = 1$). Mothers were observed to display limited amounts of maternal detachment (Table 4) as scores were in the low range.

Correlations were conducted for characteristics of maternal play behaviors, both pretest and posttest scores, in order to examine the associations between one another (Table 3). Pretest and posttest scores of maternal sensitivity were strongly, positively associated in the clean-up and free play tasks. For example, pretest maternal sensitivity demonstrated a strong, positive correlation with post maternal sensitivity in the clean-up task as well as the free play task (Table 3). The correlations of pretest stimulating environment at pre and post showed a moderate, positive relation in each setting. There were no significant correlations for pretest or posttest detachment. Correlational analyses also explored mothers' consistency between tasks, and the characteristics of maternal behaviors demonstrated some distinctions between settings. Maternal stimulation of the learning environment was moderately correlated between free play and clean up at pretest and posttest (only pre showed a significant correlation). A similar pattern was

observed for maternal detachment. Maternal sensitivity however, displayed a low, non-significant correlation between settings at pretest, but a large correlation between settings at posttest. Finally, correlations revealed some evidence of uniqueness between the maternal behaviors, particularly with stimulation of learning. The mother's observed ability to stimulate a learning environment for the child displayed a weak correlation ($r < 0.30$) or moderate ($r < 0.70$) with all other dimensions of maternal behaviors.

Paired t-tests were executed in order to test the changes in observed maternal behaviors, specifically maternal encouragement of a stimulating environment, maternal sensitivity, and maternal detachment (Table 4). In the clean-up tasks, results indicated a non-significant increase of 0.53 for maternal stimulation of environment, a non-significant increase of 0.06 for maternal sensitivity, and a non-significant decrease of -0.18 for maternal detachment from pre to post. In the free play tasks, results indicated a non-significant increase of 0.40 for maternal stimulation of environment, a non-significant increase of 0.04 for maternal sensitivity, and a non-significant decrease of -0.13 for maternal detachment from pretest to posttest.

Maternal Stress Reactivity

On average, mothers had lower cortisol levels after the challenging task ($M = 0.09$, $SD = 0.07$) compared to baseline levels at pretest ($M = 0.11$, $SD = 0.05$). However, mothers had higher cortisol levels after the challenging task ($M = 0.12$, $SD = 0.29$) compared to baseline ($M = 0.12$, $SD = 0.07$) at posttest participation in the parenting class. Finally, on average mothers did not experience a rise in cortisol that was related to the challenging task at pretest or posttest (Table 4).

Bivariate correlations were determined for maternal stress reactivity (Table 5). At pretest (second week of the parenting series), the cortisol levels for time 1 and time 2 collection

demonstrated a strong, positive association (Table 5); a similar association was evident at posttest (final parenting class). There were significant correlations between mother's baseline and post stressor cortisol as well as the overall change in cortisol at pretest. Mother's baseline, post-stressor, or reactivity levels of cortisol at pretest were not associated with cortisol levels at posttest. To estimate changes in pretest and posttest stress reactivity, a paired t-test was employed. The paired t-test did not reveal any significant changes in maternal stress reactivity from pretest to posttest (Table 4).

Table 2
Distribution of Outcome Variables

	Skewness	Kurtosis	adjχ^2	Shapiro-Wilks	
				W	p-value
Clean up					
Maternal Sensitivity (pre)	0	1.53	5.77*	0.99	0.99
Maternal Sensitivity (post)	0.21	1.72	3.53	0.97	0.88
Stim. of Environment (pre)	0.15	2.61	0.12	0.97	0.77
Stim. of Environment (post)	0.57	2.73	1.69	0.97	0.82
Maternal Detachment (pre)	1.07	3.37	5.40*	0.86	0.01
Maternal Detachment (post)	1.15	2.96	5.19*	0.86	0.01
Free play					
Maternal Sensitivity (pre)	-0.51	1.77	4.11	0.96	0.56
Maternal Sensitivity (post)	-0.54	2.53	1.41	0.96	0.56
Stim. of Environment (pre)	0.44	2.54	0.96	0.94	0.32
Stim. of Environment (post)	-0.61	2.58	1.80	0.94	0.33
Maternal Detachment (pre)	1.50	4.77	9.66*	0.82	0.00
Maternal Detachment (post)	1.23	3.45	6.21*	0.77	0.00
Maternal Stress Reactivity					
Change in Cortisol (pre)	-2.61	10.54	21.43**	0.68	0.00
Change in Cortisol (post)	3.54	14.07	27.73**	0.42	0.00

**$p < 0.01$; *$p < 0.05$

Table 3
Pre and Post Maternal Play Behaviors Correlations

Variables	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. (C) Pre Stim. Env.	-										
2. (C) Post Stim. Env.	0.36	-									
3. (C) Pre Sensitivity	0.44	0.32	-								
4. (C) Post Sensitivity	0.46	0.49	0.80**	-							
5. (C) Pre Detachment	-0.49	-0.30	-0.69**	-0.80**	-						
6. (C) Post Detachment	-0.26	-0.62*	-0.12	-0.38	-0.34	-					
7. (F) Pre Stim. Env.	0.66**	0.61*	0.26	0.52*	-0.69**	-0.38	-				
8. (F) Post Stim. Env.	0.10	0.42	0.43	0.74**	-0.74**	-0.41	0.52*	-			
9. (F) Pre Sensitivity	0.23	0.44	0.20	0.55*	-0. 67**	-0.20	0.76**	0.69**	-		
10. (F) Post Sensitivity	0.36	0.63	0.56*	0.87**	-0.83**	-0.53*	0.71**	0.83**	0.77**	-	
11.(F) Pre Detachment	-0.40	-0.35	-0.53*	-0.69**	0.83**	0.30	-0.73*	-0.56*	-0.66**	-0.74**	-
12.(F) Post Detachment	0.02	-0.34	-0.25	-0.63*	0.58*	0.45	-0.41	-0.90**	-0.61*	-0.69**	0.49

(C) = Clean-Up, (F) = Free Play; Stim. Env. = Stimulation of Environment; non-transformed variables were employed.
**$p < 0.01$; *$p < 0.05$

Table 4
Results of Paired T-tests for Maternal Play Behaviors and Stress Reactivity

	Before Parenting Education		After Parenting Education			95% CI for Mean Difference		
Task	*M*	*SD*	*M*	*SD*	*n*		*t*	*p*
Clean-Up								
Stim. of Environ.	2.80	1.01	3.33	0.90	15	-0.02, 1.08	2.09	0.06
Sensitivity	1.20	0.37	1.26	0.27	15	-0.08, 0.21	0.92	0.37
Detachment	0.47	0.49	0.29	0.43	15	-0.47, 0.10	-1.40	0.18
Free Play								
Stim. of Environ.	2.93	0.80	3.33	1.04	15	-0.10, 0.90	1.70	0.11
Sensitivity	1.27	0.39	1.31	0.30	15	-0.07, 0.16	0.83	0.42
Detachment	0.51	0.54	0.38	0.51	15	-0.42, 0.15	-1.01	0.33
Stress Reactivity	-0.03	0.11	-0.02	0.03	15	-0.07, 0.04	-0.66	0.52

Table 5
Maternal Stress Reactivity Correlations

Variables	1	2	3	4	5	6
1. Pre Cortisol Change	-					
2. Pre Cortisol Baseline	-0.82**	-				
3. Pre Cortisol Post Stressor	-0.61**	0.95**	-			
4. Post Cortisol Change	0.59*	-0.62	-0.55*	-		
5. Post Cortisol Baseline	-0.32	0.33	0.30	-0.01	-	
6. Post Cortisol Post Stressor	-0.02	0.02	0.02	0.45	0.83**	-

***p* < 0.01*; *p* < 0.05; outliers replaced for two participants, defined as +/- 3 *SD*s from *M*.

Chapter 5. Discussion

This pilot study is one of the first to examine parenting education and its influence on characteristics of maternal play behaviors and maternal stress reactivity. The aim of this study was to examine whether mother's participation in a flexible, state-wide parent education series was associated with changes in characteristics of maternal play behaviors and maternal stress in the context of a play task. Parenting education classes relied on learning through social experiences via discussions, modeling, and direct instruction, and SLT supports the notion that new behaviors can be learned through these teaching methodologies (Bandura, 1986). It was hypothesized that, related to participation within a parenting education series, characteristics of positive maternal play behaviors (maternal sensitivity and stimulation of environment) would increase while characteristics of negative maternal play behaviors (maternal negativity and detachment) would decrease. In regards to the maternal stress response, this was an exploratory study to examine if changes occur in maternal cortisol reactivity within parenting education. Overall, results indicate that mothers did not demonstrate change in their behaviors or stress reactivity after participation in an OPEC-sponsored parenting education series.

Maternal Play Behaviors

Contrary to the hypotheses, characteristics of maternal behaviors in play did not improve in either the free play or clean up (challenging task) setting after participation in the parenting series. Specifically, maternal sensitivity did not show significant improvement after participation in the parenting education series and detachment did not decrease. Maternal negativity in play did not change, as mothers displayed no negativity, as defined in the coding scheme, at pre or post. Finally, maternal stimulation of environment did not change in free play setting, but demonstrated a trending ($p = 0.055$) finding for the clean-up task.

Although there were no significant changes in maternal play behavior, results from the t-test indicated that within the clean-up task, stimulation of environment had a p-value of 0.055. Some researchers have suggested that significance threshold should be reconsidered when interpreting a pilot study. McHugh (2008) suggested that pilot studies could use p-values of 0.10 rather than convention methods that use p-values of 0.05 and lower because decreases the possibility of eliminating potentially vital areas of new research; however, 0.05 was set as the critical value in this study. A variety of pilot studies from other areas of research have used a p-value of 0.10 in determining significance of their results (Blumenkrantz et al., 2004; Heim, Stang, & Ireland, 2009). Thus, the results tentatively indicated that mother's ability to simulating learning in play may improve after participating in a parenting education program. This is a novel contribution to the literature as previous work has often neglected to measure this dimension of maternal behavior.

Overall, the results indicated that there were no changes in maternal sensitivity or negativity over the course of the parenting education series even though a great deal of literature supports the hypotheses (e.g., Cowen, 2001; Devall, 2004; Gross et al., 2003; Maher et al., 2011; Reid et al., 2007; Webster-Stratton, 1998; Webster-Stratton et al., 2004). There were also no significant changes in detachment. The lack of significant results in this study concerning maternal behavior may be related to differences in the type of study population, the parent's motivation for participating in the parent education series, the fidelity of implementation of the parent education curricula, and other maternal and child characteristics.

Some studies examining the effectiveness of parenting education on maternal behaviors focus on families of children with challenging behaviors such as conduct disorders (Reid, Webster-Stratton, & Hammond, 2003; Webster-Stratton, 1998; Webster-Stratton, Reid, &

Hammond, 2004) as well as families who are considered at-risk (i.e., low-income, education level, lack of social support, substance-abuse; Cowen, 2001; Devall, 2004). This study did not include family's at-risk families such as those with children displaying high levels of children's challenging behaviors or those with high levels of substance-abuse of families. Even though family's income and education level were measured and the sample did vary in both the small sample size did not warrant exploration of how these characteristics may influence changes in maternal behaviors and stress reactivity related to participation in a parenting education series.

Another possibility for the lack of replication is that mothers were not asked the reasoning behind their motivation to participate in the parent education series. For some mothers, their participation may have been voluntary, but other mothers might have been court-mandated to participate. The reasoning behind their participation within the course could impact what mothers are willing to learn and subsequently move into the performance phase of SLT. On the other hand, mothers that participate voluntarily within the parent education course may be more willing to move from the acquisition phase to the performance phase, applying these newly learned behaviors it in the context of their lives.

The ability of the facilitator to adhere to the parenting education curricula, or the fidelity of implementation, may also play a role in non-significant findings. This study did not examine the extent to which the program facilitator adhered to the specific components of each program's curricula when teaching material to families. Within OPEC, programs must monitor facilitators to support fidelity of the specific curricula. OPEC provides program facilitators with guidelines for curriculum implementation to help ensure that each facilitator is teaching the curricula as it was intended by the developers (OPEC, 2015). These guidelines allow adaptations for curricula that include, but are not limited to, translating or modifying vocabulary, replacing cultural

references, and replacing images that identify more closely to the target population (OPEC, 2015). However, OPEC does not allow adaptations of curricula such as reducing the number or length of sessions, altering key topics, using untrained staff, or altering the theoretical approach. Although OPEC tries to ensure the fidelity of the parenting education programs it funds, it is possible alterations were made that compromise fidelity, and possibly lead to reductions in exposure to key content. Due to this, the mothers may not have been exposed the level of learning required to surpassed the acquisition phase.

The lack of significant results in this study concerning maternal behavior may also be related to differences in methodology and coding schemes. Studies vary in the way they measure parenting behaviors; some use self-report (Cowen, 2001; Devall, 2004; Maher et al., 2011) while others use observational methods (Gross et al., 2003; Homem et al., 2015; Webster-Stratton et al., 1998; Webster-Stratton et al., 2004). Studies using self-report cite changes in characteristics of parent sensitivity (i.e., empathy) as well as parental negativity (i.e., decrease beliefs of corporal punishment, abusive practices) reported by the parent (Cowen, 2001; Devall, 2004; Maher et al., 2011). However, parent report is subject to reporter bias (Paulhus & Vazire, 2007), and one alternative to this method is observation of behavior. Webster-Stratton et al. (2004) assessed the quality of parenting through in-home observations of mother-child play and surveys and found reductions in negativity following participation in an IY parenting series. In home observations may afford the most genuine assessment of behavior, although the intrusion of a researcher may impact the behavior (Lindahl, 2000). Notably, Webster-Stratton and colleagues (2004) did not rely on only observational or survey data, but instead used a composite score that combined the scores. In a population of children with Oppositional Defiant Disorder symptoms, Homem and colleagues (2015) utilized a 25- minute lab- task, based on the Dyadic Parent–child

Interaction Coding System (DPCICS; Robinson & Eyberg, 1981) protocol, which includes free play, to observe mother-child interactions. Results indicated an increase in positive parenting behaviors (i.e., increased praise and positive affect) after participation in IY. Even though Homem et al. (2015) found positive results using a lab play task, lab observations take place in artificial environments but participants are usually on his or her best behavior (Lindahl, 2001). In comparison with Homem et al. (2015), the current study measured characteristics of maternal behavior in two different tasks-- the clean-up task, which lasted 3-minutes, and the free play task lasted 6-minutes. Further, it is possible that the current study's observational tasks were too short in order to assess changes in maternal behaviors as Homem et al., (2015) observed the dyad for 25 minutes.

The operationalization of maternal behaviors may also contribute to the non-significant findings. The current study utilized a modified version of the Early Head Start (EHS) 24-Month 3-Bag Scales (Brady-Smith et al., 1999), which measures the quality and intensity of characteristics of maternal responses to the child in play. This protocol has been used in other studies examining mother-child interactions and demonstrates significant links between observed behaviors and child outcomes. Studies using this coding scheme have found differences in parenting behaviors between teenage and older mothers where older mothers were more supportive, less intrusive, and less hostile (Berlin, Brady-Smith, & Brooks-Gunn, 2002). Studies have also shown that mother supportive parenting (i.e. sensitivity, positive regard, cognitive stimulation) were associated with children's outcomes such as language and cognitive development (Tamis-LeMonda, Shannon, Cabrera, & Lamb, 2004). Similarly, research found that cohesive mother-child interactions are associated with children's higher self-regulation abilities (Raikes et al., 2007). While this coding scheme has been used in basic research, to the

author's knowledge this is one of the first studies to use this coding scheme within parenting education research.

Many parenting education studies utilize the Dyadic Parent–Child Interaction Coding System (DPCICS) developed by Robinson and Eyberg (1981), which focuses on the frequency of mother behaviors versus the quality of the behaviors (the focus of the EHS scales). Studies that have used the DPCICS have revealed increases in positive parenting behaviors (Reid et al., 2007; Webster-Stratton, 1998) and decreases in negative parenting behaviors (Gross et al., 2003; Webster-Stratton, 1998). Researchers found that mothers that participated in parent training were more positive in their interactions with their children, offering more praise and being less critical of their children's behavior (Reid et al, 2007) as well as showing more positive affect and nurturing behaviors (Webster-Stratton, 1998). Parent education curriculums have also been successful in reducing negative parenting behaviors such as use of harsh and critical statements, punitive practices, and parent-child conflicts (Borden et al., 2010; Reid et al., 2002). Thus, the lack of significant findings in the current study may be due to differences in methodology (e.g., survey) setting (e.g., home observation) or coding schemes.

Finally, it is possible that other factors influenced the characteristics of maternal behaviors observed in this study that were not accounted for, in particular maternal characteristics (e.g., well-being, maternal personality) and child behavior. For example, factors related to maternal well-being (e.g., depressive symptoms) were not accounted for in this study but are linked to negative mother-child interactions and lower maternal engagement (Lovejoy et al., 2000) as well as less positive, nurturing relationships with children (Reid et al, 2007). Additionally, other factors such as child behavior may interact with maternal characteristics to influence maternal behaviors. Clark, Kochanska, and Ready (2000) examined the interaction

between mother's self-reported personality (i.e., neuroticism, extraversion, openness, agreeable, and conscientiousness) and toddler's temperament and the impact on parenting behavior. Results indicated that mothers with low empathy and children with high negative emotionality predicted lower maternal responsiveness. Other child characteristics such as intellectual disability are associated with maternal stress and depression (Eisenhower, Baker, & Blacher, 2005; Hauser-Cram et al., 2001), which can negatively impact maternal behaviors.

Maternal Stress Reactivity

This is an exploratory study regarding how parenting education influences the maternal physiological response to stress as measured via change salivary cortisol after exposure to a stressor. Two mechanisms were proposed in order to explain changes in mother's physiological response to the stressor: asking the child to clean up and sort the toys before playing. The first proposed mechanism suggested that the mother's rise in cortisol may decrease from pre to post as a result of her participation in the parenting education series. The second proposed mechanism suggested that the mother's physiological response may increase from pre to post as a result of cognitive load, the practicing of newly-learnt skills. Both of these hinge on the assumption that mothers reach the performance phase in SLT; that the mothers are actively practicing these skills in everyday contexts. However, the results did not find support for either mechanism. Instead, the mothers, on average, did not experience the stressor as one that led to activation of their HPA axis and thus increase in cortisol levels. On average, the mother's cortisol levels decreased in the second week (M = -0.02; SD = 0.05) and increased last week (M = 0.05; SD = 0.24) of the parenting series, although the difference was not significant. The lack of change in maternal cortisol may be due to the mother's perception of the stress task, the type of stress test given to the mother, and associations with maternal and children's behaviors.

The results indicated that maternal stress reactivity did not change over the course of the parenting education series. It is possible that the mothers did not perceive the clean-up task as a stressor. It is also possible that other measures of stress (i.e., salivary alpha-amylase [sAA]) are critical to measure. Laurent et al. (2012) examined maternal stress response trajectories (i.e., cortisol and sAA) across two types of social stress sessions (i.e. attachment stressor and clean-up stressor). Researchers indicated that cortisol trajectories were higher during the attachment stressor while sAA was higher during the clean-up stressor. Laurent et al. (2012) suggested that these findings may indicate differences in perceived stress and control for mothers. Other research has suggested that there is variability in the way individuals perceive stress (Ellis, Jackson, & Boyce, 2006), which suggests that some individuals might perceive a task as stressful while others do not. The mothers in this study may not have experienced the clean-up task as a stressful event. It is also possible that some of these mothers have experienced prolonged exposures to family and ecological stressors. Prolonged exposure to these stressors can change an individual's baseline of stress reactivity, resulting in blunted, or lack of physiological response to stressors (e.g., Barr et al, 2004; Flinn, Quinlin, Turner, Decker, & England, 1996). As a result, the hyper stress response as well as the hypo stress response systems of these individual's may not activate in the same manner that an average individual's stress system may activate. However, the participants in this sample were not screened for indicators (e.g., abuse) that would indicate prolonged exposure to family or ecological stressors.

Although the current study's method of the stress test (i.e., clean-up task) did not show significant results, it is possible that other stress tests such as the Trier Social Stress Test (Kirschbaum, Pirke, & Hellhammer, 1993) could be used to study changes in parent physiological stress after participation in a parenting education series. The Trier Social Stress

Test is an examining of induced psychobiological stress within a laboratory setting in which researchers measure a variety of biological responses such as cortisol, heart rate, and prolactin. Researchers used stressors such as having the subject deliver a speech or do mental arithmetic in front of an audience. Results indicate that this test can reveal multitude of stress responses of each subject which can contribute to interindividual variation in the stress response system (Kirschbaum, Pirke, & Hellhammer, 1993).

Positive maternal behaviors and attitudes may also affect maternal stress reactivity. Previous research has suggested mothers who have naturally higher stress reactivity might more-readily attend to their infants. A study conducted by Fleming, Steiner, and Anderson (1987) examined the relationship between positive maternal attitudes during pregnancy and maternal cortisol during puerperium (i.e., 6-weeks after childbirth) and found a positive correlation. Evidence suggested that the more positive attitudes the mother had, the higher the plasma cortisol response. Mothers with higher levels of cortisol also engaged in more affectionate behaviors with their infants. However, some research also indicates that positive parenting is related to lower, more typical cortisol levels (Finegood et al., 2016; Thompson & Trevathan, 2008).

Additionally, there are also associations between cortisol reactivity and negative maternal behavior and depressive symptoms. For mothers, cortisol may be affected particularly when the mother's perceived control or power over a stressful situation is low. Martorell and Bugental (2006) examined the relationship between cortisol and perceived maternal power, child temperament, and maternal harshness. The authors found that increases in maternal cortisol reactivity predicted higher frequency of maternal harshness even after controlling for the effects of child temperament and maternal perceived power. Maternal depressive symptoms may also

influence maternal stress reactivity. Some studies have found that maternal cortisol levels are associated with maternal depression although the magnitude of the association can depend upon the severity of the symptoms and the timing of depression (i.e., perinatal depression; Belanoff, Gross, Yager, & Schatzberg, 2001; Seth, Lewis, & Galbally, 2016). Their results suggest that the measurement of maternal attitudes, well-being, and responsiveness may predict changes in cortisol within a parenting education program, a possibility that was not addressed in this study. Additional research should be conducted to more clearly identify the interactions between reactivity and parenting strategies.

Mother's stress reactivity may also be a product of the interaction of maternal characteristics (i.e., overall well-being and parenting practices) and child behaviors. Kiel and Buss (2013) examined the relationship between maternal cortisol reactivity, intrusive maternal behavior, and toddler inhibited temperament. Researchers found that mothers displayed more intrusive behaviors (e.g., verbally or physically forceful) when their toddlers displayed more inhibited temperaments but only when the mothers had high cortisol reactivity compared to average maternal reactivity. When the mother had increased cortisol reactivity and had an inhibited toddler, the more likely she was to display more intrusive behavior during the novelty tasks.

Limitations

This study's findings must be interpreted with caution due to the study's limitations. One of the most significant limitations in this study is the relatively small sample size (n = 15), which may have not been large enough to detect any changes in maternal behaviors and stress reactivity. The small sample size limits generalizability to a national sample. A larger sample size could reveal more significant associations between maternal characteristics and changes in

maternal play behaviors and stress reactivity. Studies that have found significant increases in positive parenting behaviors and decreases in negative parenting behaviors within parenting education have used sample sizes of 100 or more mothers and families (Homem et al., 2015; Gross et al., 2003; Reid et al., 2007; Webster-Stratton, 1998). By increasing the sample size of the current study, there would have been more power to identify significant relations.

A second limitation of this study was the absence of an experimental design. The design limits the ability to draw casual links between parent education and its influence on characteristics of maternal play behaviors and stress reactivity as it cannot be determined if other factors played a role in the changes observed (Murnane & Willett, 2011). In studies using experimental designs (i.e., control groups), intervention groups show significant increases in positive parenting behaviors and decreases in negative parenting behavior when compared to the control group (Gross et al., 2003; Homem et al., 2015; Webster-Stratton; 1998).

A third limitation of the study was neglecting to measure the mother's attendance rate or level of engagement within the parenting education class. Social learning theory discusses the importance of engagement in order to learn new behaviors (Bandura, 1986). Previous work has suggested that dosage may play a role in positive and negative parental behaviors as parents who attended 50% or more of the parenting classes showed significant increases in characteristics of sensitivity and reductions in negative parenting behavior (Webster-Stratton, 1998). Mendez, Carpenter, LaForett, and Cohen (2009) examine parental engagement and barriers to engagement within intervention work and found that structural barriers (i.e., work schedule conflict, transportation, child care) are associated with parental attendance within intervention programs. The OPEC-sponsored programs in this study offered free child care for all parenting education participants.

A fourth limitation of this study includes the inter-rater reliability as low kappa values and exact percent agreement was low in sensitivity and detachment. The inter-rater reliability is the degree of agreement among coders and the researchers generally prefer scores of 0.70 and higher for kappa values and 80% or higher for exact percent agreement (McHugh, 2012). Within this study, maternal sensitivity and maternal detachment in both clean-up and free play had the kappa values that ranged from 0.51 – 0.69 and exact percent agreements that ranged from 71% agreement to 77% agreement. The low kappa values suggest inadequate agreement between the coders. The low percent agreement suggests that a large portion of the data misrepresents the research data. Thus, even though consensus scores were utilized in analyses, these suggests that the results should be interpreted cautiously for these two dimensions of mother's behavior.

A fifth limitation of this study was the flexibility given to the mothers regarding saliva collection procedures. The study did not ask mothers to report on their consumption of food, beverages other than water, cigarette smoking, or caffeine an hour before their saliva samples were collected. Mothers were only asked to abstain from food and beverages. Research has shown that food consumption and cigarette smoking can influence cortisol responses and should be avoided to maintain accurate cortisol assays (Nicolson, 2008).

A sixth limitation in the study was not examining the fidelity of implementation. It is possible that the curricula were altered and did not reflect was the creators had intended to teach. The mothers may not have learned particular components within the curricular that could have led to changes in their behaviors. Other characteristics of fidelity, such as participant satisfaction and engagement (Berkel, Mauricio, Schoenfelder, & Sandler, 2011) were not measured. This could account for the nonsignificant findings within both maternal behaviors and stress reactivity.

A seventh limitation within this study was researchers not collecting all final saliva samples within the optimal 20 to 30-minute range after the stressor has occurred. The final saliva sample was collected when mothers completed the questionnaires given to them and some mothers took longer than others to complete the questionnaires. As reported above, the average time between the challenging task and the final saliva collection of the mother was 30.07 minutes (*SD* = 10.6 minutes) but the collection times ranged 14 – 52 minutes. It is possible that the mothers who took longer to complete the questionnaires may have begun to "recover" from the challenging task as it is outside the latency period of 20 minutes (Raz & Leykin, 2015).

Finally, the current study did not measure the type and extent of learning opportunities given to the mothers within the parenting education series as defined by SLT. This limitation afforded a limited use of SLT, and this study did not measure key components of social learning theory, the first determinant of triadic reciprocity, personal attributes, and the two steps of the and acquisition of skills. One of SLT's key constructs of personal attributes is self-efficacy, the individual's belief about his or her ability to succeed in learning the new behavior (Bandura, 1993). Self-efficacy has been examined within parenting education (Gross, Fogg, & Tucker, 1995; Letarte et al., 2010). These researchers used a self-report to determine the general confidence both mothers and fathers had as well their ability to effectively parent (i.e. setting limits for children, problem-solving with children). Gross et al. (1995) revealed significant increases in maternal self-efficacy in mothers but not in fathers after participation within parenting education. However, Letarte et al. (2010) revealed no significant findings with changes in self-efficacy within either mothers or fathers. This study also did not operationalize the acquisition phase and the performance phase. It is possible that some of the mothers in this study did not reach the performance phase, described as the phase in which the mother is

demonstrating the new behaviors she has learned. It is possible that the mothers of the study were not incentivized to continue demonstrating the learned behaviors and therefore, did not continue to demonstrate the behaviors. Not reaching the performance phase limits the ability to detect changes in the characteristics of mother's behaviors in play and changes in cortisol levels.

Chapter 6. Conclusion

The current study aimed to examine changes in characteristics of maternal behaviors and stress reactivity after participation in an OPEC-sponsored parenting education series. Although the results revealed no significant findings, previous research has found have that participation in parenting education have changed parent sensitivity and negativity. Two characteristics of maternal behaviors, stimulating environment and detachment, have not been examined within parenting education studies, and therefore adds some knowledge to the parenting education literature. In particular, the results indicate that the quality of mother's encouragement of a stimulating environment may increase after participation in a parenting education series. Future work could continue to examine maternal stimulation of environment and maternal detachment not only within larger samples, but also within different study environments (e.g., lab or home-based setting) to determine if participation within parenting education influences these behaviors similarly to maternal sensitivity and maternal negativity.

Although physiological and biological indicators are encouraged when examining family interactions (Booth et al., 2000), maternal stress reactivity has not been examined within the context of parenting education. This was an exploratory study examining how maternal stress reactivity may change as a result of participation within parenting education. Previous research has demonstrated that participation in parenting education, as well as other parenting interventions, have influenced psychological factors such as symptoms of depression (Berkule et al., 2014; Hutchings et al., 2011; Marcynyszyn, Maher, & Corwin, 2010). It is possible that the parenting education has the potential to influence physiological characteristics of mothers such as stress reactivity, but this was not observed in the current study. Future work should examine

interactions between maternal characteristics, such as depression, and stress reactivity to better represent the biosocial framework.

Future work could also examine the fidelity of each program sponsored by the OPEC. This study did not account for the type of curricula each mother-child dyad participated in. The type of curricula largely influences the type of context the mothers are exposed to and could impact the types of play behaviors the mothers may or may not begin to demonstrate.

Mothers play a vital role in their children's health and development. A host of characteristics of maternal behaviors are associated with children's learning and development (Malmberg et al., 2016; NSCDC, 2007; Wade et al., 2011), and it is important to examine how scaled-up parenting education programs may influence maternal behaviors and stress reactivity. Generally, parenting education programs aim to modify characteristics of parenting behaviors in order to positively affect parents' well-being and child outcomes. Parenting education has also been shown to positively influence a variety of characteristics of maternal behaviors (Gross et al., 2003; Homem et al., 2015; Webster-Stratton, 1998) and well-being (Hutchings et al., 2011; Marcynyszyn et al., 2010). By examining these maternal characteristics, provides greater knowledge of how maternal participation within parenting education can impact maternal and child well-being.

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