

MOTHER-CHILD VERBAL COMMUNICATION AND SELF-REGULATION IN FOUR-YEAR-
OLDS

by

DIAN YU

(Under the Direction of Hui-Chin Hsu)

ABSTRACT

This study aims to explore the association between the pragmatic function of maternal verbal communication (i.e., message) and their 4-year-olds' self-regulation and the moderation effect of child sex on this association. Eighty-three children (45 boys) and their mothers participated in this study. Mother-child verbal communication was observed during a game. Maternal verbal communication was transcribed and classified as collaborative (e.g., support) and non-collaborative (e.g., control) acts. In a series of laboratory procedures, children's emotion regulation (affective expression and behavioral regulatory strategies) and inhibitory control (IC) were assessed to index self-regulation. Overall, results showed that maternal collaborative acts were unexpectedly associated with more negative and less neutral affective expressions (i.e., poorer emotion regulation skills). As expected, more maternal non-collaborative acts were related to poorer IC. Additionally, the association between maternal non-collaborative acts and IC were stronger for girls than boys. Limitations of this study and suggestions for future studies were discussed.

INDEX WORDS: self-regulation, preschool, mother-child communication

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DIAN YU

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DIAN YU

Major Professor:
Committee:

Hui-Chin Hsu
Margaret O Caughy
Geoffrey Brown

Electronic Version Approved:

Suzanne Barbour
Dean of the Graduate School
The University of Georgia
May 2017

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CHAPTER 1

INTRODUCTION

Imagine a 4-year-old child sees an expensive toy behind a store window while walking in a shopping mall with his mother. He wants the toy, but his mother refuses to buy it for him. This little boy responds to the refusal with crying and screaming. In a similar situation, another boy quietly accepts his mother's request to leave the toy behind. These two children's different reactions reflect the differences in their self-regulatory abilities. Self-regulation is a child's ability to modulate behavior according to the cognitive, emotional, and social demands of a particular situation (Calkins & Fox, 2002). It operates at several different levels, including physiological, attentional, emotional, cognitive, and behavioral levels (Bell & Deater-Deckard, 2007). Starting from infancy, the ability for a child to self-regulate develops rapidly during the first several years of life (Kopp, 1982; McClelland & Cameron, 2012).

Self-regulatory skills are crucial for adaptive psychosocial outcomes for preschool-aged children (Bell & Deater-Deckard, 2007). Children need adequate self-regulation to establish peer relationship (Blair, 2002) and for school readiness (Ursache, Blair, & Raver, 2012). The ability to self-regulate also predicts later school outcomes, including academic achievement, positive relationships with teachers, and positive classroom behaviors (Liew, 2011; Montroy,

Bowles, Skibbe, & Foster, 2014; Payton et al., 2008; Sawyer, Miller-Lewis, Searle, Sawyer, & Lynch, 2015).

Self-regulation has social origins. Parenting practice partly explains individual differences in self-regulation in early childhood (Thompson, 1994). Socialization and attachment theoretical frameworks have been used to explain the effect of parenting on the development of self-regulatory skills. Briefly, according to Socialization Theory, a child develops his or her self-regulation through a range of parental socialization practices (Thompson, 2015). Attachment theory also explains how parental behaviors have an impact on child self-regulation. According to attachment theory, children form an internal working model from day-to-day interactions with their caregivers (Cassidy, 1994). The internal working model offers a guide to the child to regulate themselves in different social contexts.

Previous studies have mainly focused on the role of parenting in early self-regulation development by investigating the influence of parenting style (e.g., as assessed using parental self-reports) and/or parenting behavior (e.g., as assessed via objective observation of behavioral sensitivity). High-quality parenting behavior such as sensitive parenting, responsive parenting, guidance and parental support foster the development of self-regulation, while harsh parenting and excessive parental control can undermine the development of self-regulation. However, relatively few studies have studied the role of parent-child verbal communication in self-regulation development. Verbal communication includes three components: semantics (i.e., content expressed by words), syntax (i.e., grammar structure), and pragmatics (i.e., meaning

interpreted). No early research has investigated the association of parent-child speech pragmatics with self-regulation development in preschool-age.

A social pragmatic perspective of communication centers on the intended meaning of the sent message (Sung & Hsu, 2014). Communication acts are social and used to convey message during social interaction (McTear & Conti-Ramsden, 1992). Leaper and his colleagues (1996, & 2000) classify communication acts in two broad dimensions: affiliation (i.e., emotional distance) and assertion (i.e., degree of influence and directiveness). Collaborative communication acts are those high in assertion and affiliation (e.g., guide and support), which express clear goals and expectations for the partner as well as close emotional distance. In contrast, non-collaborative communication acts are those high or low in assertion, but low in affiliation (e.g., direct by giving orders) and avoid expressing uncertainty).

The proposed study aims to achieve two goals. The first goal of the study is to explore the association of collaborative and non-collaborative communication acts by mothers with self-regulation in their preschool-aged children. The second goal of this study is to explore child sex as a moderator in altering the relation between maternal communication acts and child self-regulation.

CHAPTER 2

REVIEW OF LITERATURE

Development of Self-regulation in Early Childhood

Self-regulation is a child's ability to modulate behavior according to the cognitive, emotional, and social demands of a particular situation (Calkins & Fox, 2002). Starting from infancy, the ability for a child to self-regulate develops rapidly during the first years of life (Kopp, 1982; McClelland & Cameron, 2012). With age, the characteristics of self-regulation also demonstrate changes (Bronson, 2000). For example, although infants suck on their fingers to self-soothe distress (Tronick, 1989), their success in stress regulation depends heavily on the help from their caregivers (Calkins & Fox, 2002). Caregivers often serve as the external regulator for infants (Sroufe, 2000). In toddlerhood, children gain greater independence and control as well as an identity separate from that of their caregiver (Calkins & Fox, 2002), requiring less external regulation by caregivers. As prechoolers acquire more advanced self-regulatory skills and gain more flexibility in control, they start to meet changing situational demands independently (Kopp, 1982). In sum, children's self-regulatory skills mature as they grow older during early childhood.

Self-regulatory skills are crucial for adaptive psychosocial outcomes for preschool-aged children (Bell & Deater-Deckard, 2007). For instance, children who enter kindergarten

without adequate self-regulation are found to be at high risk for peer rejection (Blair, 2002). Self-regulation is also found to be essential for school readiness (Ursache, Blair, & Raver, 2012) and later school outcomes, including academic achievement, positive relationships with teachers, and positive classroom behaviors (Liew, 2011; Payton et al., 2008). A lack of self-regulation is consistently associated with more behavioral problems and undermines interpersonal relationships among school-aged children (Montroy, Bowles, Skibbe, & Foster, 2014; Sawyer, Miller-Lewis, Searle, Sawyer, & Lynch, 2015). On the other hand, improvements in self-regulation during preschool years predict less behavioral problems later in middle childhood (Sawyer, Miller-Lewis, Searle, Sawyer, & Lynch, 2015).

Self-regulation operates at several different levels, including physiological, attentional, emotional, cognitive, and behavioral levels (Bell & Deater-Deckard, 2007). Emotion regulation (ER) and executive functions (EFs) are two key components of self-regulatory skills (Bell & Deater-Deckard, 2007).

ER is the process of initiating, avoiding, inhibiting, maintaining, or modulating the occurrence, form, intensity, and/or duration of internal affects, and emotion-related behaviors (Eisenberg & Spinrad, 2004). Affect expressions and behavioral regulatory strategies are two salient indicators for ER development. Previous studies found that preschool-aged children attempted to mask their external negative emotion expression when disappointed (Campos, Campos, & Barrett, 1989). Preschoolers expressing more negative emotion during laboratory challenge tasks were more poorly adjusted and less socially competent than those expressing less

negative emotion (Calkins, Dedmon, Gill, Lomax, & Johnson, 2002; Cole, Martin, & Dennis, 2004; Silk, Shaw, Forbes, Lane, & Kovacs, 2006). Moreover, preschoolers at higher-risk for disruptive behavior disorders showed more intense and prolonged negative affect relative to lower-risk preschoolers (Cole, Zahn-Waxler, & Smith, 1994). On the contrary, children between 3 to 5 years of age with better effortful control did not change the amount of neutral and positive emotions when receiving a desirable gift relative to an undesirable gift, whereas those with poorer effortful control decreased neutral and positive emotions. In addition, studies found passive styles of ER, such as passive waiting and self-soothing, were less effective for regulating negative emotions as compared to active strategies, such as active self-distraction (Grolnick, McMenemy, & Kurowski, 2006). Together, these studies suggest that less negative affect expression, more neutral and joy affect expression, less use of passive style of ER strategies and more use of active style of ER strategies are signs of better ER.

Increased ER is associated with young children's increased social competence and decreased behavior problems (Cole, Teti, & Zahn-Waxler, 2003). Adaptive ER strategies, such as self-distraction and seeking comforts from adults, can help young children regulate their intensified negative emotions (Cole, Teti, & Zahn-Waxler, 2003). In contrast, a lack of adaptive ER strategies can contribute to adjustment difficulties characterized by uncontrolled or even over-controlled emotion expression (Calkins & Hill, 2007; Hill, Degnan, Calkins, & Keane, 2006). Use of more adaptive ER strategies is also related to the decreased problem behaviors in both preschool- and school-aged children (Gilliom, Shaw, Beck, Schonberg, & Lukon, 2002).

Moreover, better ER at preschool-age contributes to more advanced social competence and academic achievement longitudinally at school age (Eisenberg et al 1995; Grolnick, Kurowski, & Gurland, 1999).

EFs are adaptive, goal directed cognitive skills that enable individuals to override more automatic or established thoughts and responses (Garon, Bryson, & Smith, 2008; Lezak, 1995; Mesulam, 2002). It is a critical skill for solving problems, especially novel problems (Garon, Bryson, & Smith, 2008; Lezak, 1995; Mesulam, 2002). Similar to ER, EFs develop rapidly between infancy and preschool period. As the foundation of higher cognitive processes, EFs play a critical role in early personality and social behavior and other complex self-regulation tasks (Garon, Bryson, & Smith, 2008). Poor EFs are related to more externalizing problems among preschoolers (Anderson, McNamara, Andridge, & Keim, 2015; Schoemaker, Mulder, Dekovic, & Matthys, 2013). Furthermore, a meta-analysis shows that better EFs right before school-entry is associated with better academic achievements at school age (Duncan et al., 2007).

EFs have been theorized as a multifaceted construct with the dimensions of attentional flexibility, working memory, and inhibitory control (Bell & Deater-Deckard, 2007; Happaney, Zelazo, & Stuss, 2004; McClelland & Cameron, 2012; Zhou, Chen, & Main, 2011). Attentional flexibility is defined as the ability to shift focus of attention according to internal goals and ignore irrelevant information in the environment (Garon, Bryson, & Smith, 2008). It helps children to narrow their attention focus (Posner & Raichle, 1995). Working memory is an ability to maintain short-term memory on-line in the presence of interference or response competition

(Bell & Deater-Deckard, 2007). Young children need the ability to hold information in mind in order to finish complex tasks (Garon, Bryson, & Smith, 2008). Inhibitory control (IC) refers to a child's ability to inhibit a dominant response to engage in a subdominant behavior (Kochanska, Murray, & Coy, 1997). For example, when given a candy and asked not to eat it, a child's delay of putting it away and not eating it would be a successful inhibitory control. Among the three components of EFs, IC is the most widely studied at preschool-age (Garon, Bryson, & Smith, 2008). IC supports preschoolers' successful emotion regulation and voluntary behavioral control (Kopp, 1989). Better IC mechanism contributes to better young children's social competencies and school performance (Liew, 2011). This study focuses on preschoolers' IC development.

In sum, adequate self-regulatory abilities reflected in ER and EFs during the preschool age are essential for positive developmental outcomes. Preschoolers need ER and IC skills to establish positive interpersonal relationships and get ready for school. Given its developmental significance, it is crucial to understand the development of individual differences in self-regulation, specifically, ER and IC, among young children.

Parenting and Individual Difference in Self-Regulation

Parenting has been suggested to be the social origin of individual differences in preschoolers' self-regulation (Thompson, 1994). Starting in toddlerhood, external regulation by parents gradually becomes internalized (Kopp, 1982). Two theoretical frameworks, namely socialization and attachment, have been used to explain how parenting shapes the development of self-regulatory skills.

First, according to socialization theory, a child develops his or her self-regulation with help from a range of parental socialization practices (Thompson, 2015). Although very young children are not able to regulate themselves independently and depend heavily on their caregiver's external regulation, they are able to gradually internalize independent self-regulatory skills with their caregiver's help (Calkins & Fox, 2002). Through responding to their children's emotions, parents help their children learn to interpret and appraise their feelings, control their feelings, and acquire social expectations and strategies for emotion regulation (Thompson & Meyer, 2007). Moreover, caregivers' use of sophisticated emotion-regulatory skills provides models for their children. Children's IC competence also develops with the help of parental socialization through the mechanisms such as contingent response and modeling.

It has been repeatedly found that supportive parenting behaviors that express agreement, encouragement, and praise are related to better ER and IC. For example, maternal support during infancy is associated with better infant emotion regulation (e.g., increased positive affect after a maternal still-face challenge) and physical regulation (e.g., decreased salivary cortisol after a maternal still-face challenge) (Martinez-Torteya et al., 2014). During toddlerhood, more parental support is linked to better emotion regulatory skills (e.g., seeking support from parents when distressed), as well as higher rates of growth in ER between toddlerhood and preschool age (Bocknek, 2009; Dumas & LaFreniere, 1993; Feng et al., 2008). Parental support at age 2 predicted greater IC at ages 3 and 4 years (Lunkenheimer et al., 2008). It was also found that high levels of parental support were associated with faster inhibitory

control growth between ages 2 and age 4 years (Moilanen et al., 2010). In contrast to parental responsiveness and support, harsh parenting is characterized by negative affect and use of physical and psychological control. Harsh parenting has been consistently found to be related to poor child development outcomes. Harsh parenting undermines the development of self-regulation in young children (Chang, Schwartz, Dodge, & McBride-Chang, 2003). For example, maternal harsh parenting is associated with less advanced child IC skills (Lucassen et al., 2015; Moilanen, Shaw, Dishion, Gardner, & Wilson, 2010) and more intense negative emotion in preschoolers during stressful situations (Fabes, Leonard, Kupanoff, & Martin, 2001 & Martin, 2001). Furthermore, the negative influence of harsh parenting on preschoolers' externalizing problems has been demonstrated to be similar across different cultures (Olson et al., 2011).

In addition to socialization theory, attachment theory also explains how parental behaviors have an impact on child self-regulation. According to attachment theory, children form an internal working model from day-to-day interactions with their caregivers at a very young age (Cassidy, 1994). The internal working model represents children's expectation of whether their emotional signals will be responded by caregivers. Research shows that children experiencing greater attunement and smoothness in interactions with their mothers establish secure attachment with their mothers and have better self-regulatory abilities (Calkins, Smith, Gill, & Johnson, 1998; Cassidy, 1994; Garner & Spears, 2000; Sroufe, 2000). Previous studies also reveal that secure mother-child attachment during toddlerhood is associated with better EFs during kindergarten (Bernier, Beauchamp, Carlson, & Lalonde, 2015; Heikamp et al., 2013). When

preschoolers are securely attached to their mother, they demonstrated a more stable parasympathetic nervous system activity, a key indicator of physiological regulation (Smith, Woodhouse, Clark, & Skowron, 2016), as well as better behavioral regulatory skills (Sroufe, 2000; Water et al., 2010).

It has been argued that caregivers' flexible responsiveness appropriate to the context helps a child develop a flexible internal working model and learn how to use different self-regulatory skills in dealing with different social situations (Bronson, 2000; Calkins & Fox, 2002). Empirical findings indicate that higher maternal responsiveness observed during infancy predicts better ER during toddlerhood (Kim & Kochanska, 2012). Better maternal responsiveness at age 2 years is also associated with better overall self-regulation at ages 2 and 3 years (Eiden, Colder, Edwards, & Leonard, 2009). On the contrary, parental unresponsiveness contributes to the lack of self-regulation in young children. For example, maternal unresponsiveness in stressful social situations is related to poorer ER in toddlers (Rodriguez et al., 2005).

In sum, based on attachment and socialization theories, qualitative differences in parent-child interaction can contribute to the differences in children's self-regulation. Besides parent-child interaction, maternal education is also repeatedly related to child self-regulation. For example, higher maternal education is associated with better EFs for children at age 5 years (Bindman, Hindman, Bowles, & Morrison, 2013). Moreover, higher maternal education is related to better ER among 4- to 6-year-olds (Altan-Aytun, Yagmurlu, & Yavuz, 2013).

Parent-Child Verbal Communication and Self-Regulation

Different aspects of parenting have different and unique independent associations with child developmental outcomes (Davidov & Grusec, 2006; Demers, Bernier, Tarabulsky, & Provost, 2010). Studies reviewed above document the role of parenting in early self-regulation development primarily focusing on overall parenting style (as assessed via parental self-reports) and/or nonverbal parenting behaviors (as assessed by objective observations). As early as in infancy, maternal verbal stimulation predicts infants' social-emotional and cognitive development, and its effect is above and beyond maternal sensitivity (Page, Wilhelm, Gamble, & Card, 2010). When investigating the longitudinal associations between parenting quality in infancy and subsequent child EF in toddlerhood, maternal mind-mindedness speech (use mental terms while talking to the child) together with sensitivity and autonomy support are all found to be related to better child EF (Bernier, Carlson, & Whipple, 2010). Moreover, parental verbal scaffolding (i.e., utterances that elaborated on the child's course of action) is related to child concurrent and subsequent EF performance at ages 2 and 4 years (Bibok, Carpendale, & Müller, 2009; Hughes & Ensore, 2009). Parental verbal communication is expected to play an important role in the development of self-regulation among young children.

Parent-Child Verbal Communication and Self-Regulation Development. Verbal communication is composed of content-focused semantics (e.g., words and phrases), structure-focused syntax (e.g., grammars), and meaning-focused pragmatics (i.e., messages). A large body of research documents the importance of the semantics of parental verbal communication to

child outcomes. For example, mothers' greater use of mental-state talk with words (i.e., semantics), such as want, desire, feel, and think, is associated with secure attachment in their infants and toddlers (McElwain, Booth-LaForce, & Wu, 2011; Meins, Fernyhough, Fradley, & Tuckey, 2001) as well as better emotion understanding in their toddlers (Taumoepeau & Ruffman, 2006). More maternal mental-state talk at age 2 years even predicts later more advanced theory of mind development (i.e., ability to understand that people have different desires, emotions, and beliefs) in children at school age (Ensor, Devine, Marks, & Hughes, 2014).

Previous studies have also linked maternal mental-state talk to child self-regulation. For example, more maternal mental-state talk is related to better ER in toddlers (Brophy-Herb, Stansbury, Bocknek, & Horodyski, 2012). Parental verbal emotion socialization strategies, including discussion about emotions, explanation about emotions, acknowledgment and validation of children's emotions as well as guidance on how to manage intense or negative feelings, can foster ER development in young children. For example, higher amount of maternal emotional coaching is related to better ER in preschoolers (Ellis et al., 2014; Ellis & Alisic, 2013; Laible & Panfile 2009). Moreover, mothers' explanations of emotions promote their preschoolers' ability of emotion recognition, which is an important indicator for better ER skills (Garner, Carlson Jones, Gaddy, & Rennie, 1997; Garner, Sunsmore, & Southam-Gerrow, 2008)(Garner, Carlson Jones, Gaddy, & Rennie, 1997). Finally, more maternal mental-state talk is associated with better IC in children ages 4 to 6 years, even after controlling for child gender and

age as well as maternal education (Baptista et al, 2016). Furthermore, elaborative conversation style by parents, where parents ask a lot of question during discussion of children's past experience, is related to better IC abilities in preschoolers (Waters et al., 2010). Finally, several studies have reported that higher verbal ability is associated with children's better performance in EF tasks among toddlers and preschoolers (Carlson, Mandell, & Williams, 2004; Carlson, Moses, & Claxton, 2004; Hughes & Ensor, 2007; Kirkham, Cruess, & Diamond, 2003; Miller & Marcovitch, 2011). Taken together, studies reviewed above show the importance of semantics in parent-child verbal communication and child language skills to SR development in young children.

Communication Acts and Self-Regulation Development. In addition to relying on explicit words, people also express their thoughts and feelings through the intended meaning of sent message (i.e., pragmatics) embedded in verbal communication. The message conveyed in verbal communication is interpreted and received in light of contextual (e.g., play or discipline) and nonverbal cues (e.g., tone of the voice and facial expression). For example, when a nervous 4-year-old is about to get a flu shot at the doctor's office, when his mother asks him the question "are you scared?" with a warm look and a caring voice, the intended message is understanding and support. However, if the mother asks the same question "are you scared?" with a surprised tone of voice and an annoyed facial expression, the message conveyed is disapproval of the child's feelings.

Recent studies have provided empirical support for the developmental significance of social pragmatics in mother-child conversation to child outcomes. For example, the study by Ensor and Hughes (2008) demonstrated that when mothers' utterance is semantically related to their children's previous turn, such pragmatic connection is concurrently and longitudinally associated with their children's better performance in mind, emotion, and social understanding at ages 2, 3, and 4 years. Furthermore, mother-child conversation connectedness is a stronger predictor for better understanding of mind and emotion than maternal semantics-focused mental-state talk. In another study by Sung and Hsu (2014), which was specifically designed to examine the contribution of pragmatic functions of mother-toddlers verbal communication to later theory of mind development in preschool-aged children, found that maternal and child speech utterances conveying different messages (i.e., collaborative versus non-collaborative in nature) at age 2½ years were differentially associated with later theory of mind development at age 4 years. This association remained to be significant even after adjustment for several covariates, including levels of maternal education, child and maternal overall language sophistication, and child and maternal pretend speech sophistication (see more discussion below). To date, no research has shown whether and how mother-child verbal communication contributes to SR development. Thus, by focusing on social pragmatics (i.e., message and meaning conveyed in speech), the present study aims to explore the association of mother-child verbal communication with the development of self-regulation in preschoolers.

Collaborative and Non-Collaborative Communication Acts. A social pragmatic perspective of communication centers on the intended meaning of the sent message (Sung & Hsu, 2014). Communication acts refer to social and communication actions used to convey a message during social interaction (McTear & Conti-Ramsden, 1992). Leaper and his colleagues (1996, & 2000) classify speech communication acts according to two broad dimensions: affiliation (i.e., emotional distance) and assertion (i.e., degree of influence, and directiveness). Collaborative communication acts are those high in assertion and affiliation, which express clear goals and expectations for the partner as well as close emotional distance with the partner. Collaborative communication acts contain the messages intended to guide (i.e., suggestion for joint activity, clarifications, re-orientation or correction in order to help), support (i.e., show understanding, encouragement, reassurance, agreement and shared amusement), inform (i.e., provide descriptive information that is related to the joint activity), and/or make a request (i.e., ask for guidance or support) from the partner. Often used for information exchange and construction of joint activities (Leaper & Gleason, 1996), collaborative communication acts help conversation partners understand each other's desires and intentions, establish mutual coordination, increase openness and accuracy in the interpretation of each other's actions and intention, and arrive solutions for problems (Haslett, 1983; Hughes et al. 2006). In contrast, non-collaborative communication acts are those high or low in assertion, but low in affiliation, such as direct (i.e., give orders or commands), negate (i.e., express criticism, disapproval, hostility or defensiveness), avoid (i.e., ignore the partner, express uncertainty, or get distracted from joint

activity), and submit (i.e., passively go along with the partner's lead). Results from the study by Sung and Hsu (2014) suggest that more frequent collaborative communication acts by mothers and their toddlers at 2½ years of age are associated with more advanced theory of mind in children at age 4.

Although relatively little is known about the role of communication acts in the development of self-regulation in preschoolers, early studies on parental verbal guidance and control communication offer hints to the impact of collaborative and non-collaborative communication acts on self-regulation. For example, similar to collaborative communication acts, verbal guidance by parents offers suggestions and encouragement to children in different social contexts (Karreman, van Tuijl, van Aken, & Dekovic, 2006), which tends to be emotionally close, clear in the intention, but not demanding. Previous studies have found that maternal communication of guidance predicts more advanced ER and EF in young children (Calkins & Johnson, 1998; Calkins et al., 1998; Lengua, Honorado, & Bush, 2007). Contrary to guidance, parental verbal control conveys assertive and directive messages (Karreman et al., 2006). Even though the messages are clear and direct, they tend to be emotionally distant or sometimes even harsh and critical (Karreman et al., 2006). Therefore, controlling communication delivers non-collaborative messages. Parental behaviors characterized by high control but low in clear discipline are associated with poorer IC in children ages between 2 and 8 years (Roskam, Stievenart, Meunier, & Noël, 2014). Similarly, controlling communication has been found to be related to poorer self-regulation in toddlerhood and preschool period (Karreman et al., 2006;

Mathis & Bierman, 2015). Featured by high control, parental direction management language (e.g., explicit commands) is also associated with poorer child EFs at age 3 years (Bindman, Hindman, Bowles, & Morrison, 2013).

Sex differences in Self-Regulation and Parent-Child Verbal Communication

Self-regulation. Previous studies have demonstrated significant sex differences in self-regulation among preschoolers, with girls being more skilled than boys (Jusiene, Breidokiene, & Pakalniskiene, 2015). For example, several studies find that girls out-perform boys in IC from toddlerhood to preschool age (Lowe et al., 2014; Mileva-Seitz et al., 2015; Moilanen et al., 2010). Moreover, girls out-perform boys in their compliance to parental commands, specifically, in committed compliance (e.g., willingly follow mother's commands), which is an indicator of self-regulation competence (Kochanska, Coy, & Murray, 2001). Sex differences in self-regulation performance are also found at age 8 years (Jusiene et al., 2015; Piotrowski, Lapierre, & Linebarger, 2013). Even in a clinical sample of boys and girls who exposed to domestic violence, girls also exhibit superior ER and EF skills over boys (Samuelson, Krueger, & Wilson, 2012).

Parent-Child Verbal Communication. Child sex dictates the way parents and children communicate in social contexts. Leaper and his colleagues (1996) find that mothers and daughters tend to communicate with more affiliation than fathers and sons, whereas fathers and sons tend to communicate with more assertion than mothers and daughters. These results are replicated in another parent-child interaction study. Fathers act more assertively than mothers

and children are generally more assertive with their mothers than fathers (Leaper, 2000). In a study of communication between peers, gender-typed communications patterns are more likely at the middle childhood than the early childhood age. Older females tend to use more collaborative acts than males and older males tend to use more controlling acts than females (Leaper, 1991).

Child Sex as a Moderator. Differential impacts of parenting on boys and girls have been documented in the literature. Research suggests that girls are more sensitive to parenting practices. For example, parental emotion socialization practices (e.g., emotion coaching) were found to be associated with better ER in preschool girls but not boys (Denham, Bassett, & Wyatt, 2010). However, more studies found that boys were more sensitive to parenting practices. Researchers also found that securely attached boys had better communication quality with their mothers (Etzion-Carasso & Oppenheim, 2000) and self-regulation (Viddal et al., 2015), but these effects were not significant for girls. In addition, parental sensitivity and responsiveness at preschool age predict better IC among school-aged boys, but not girls (Chang, Olson, Sameroff, & Sexton, 2011). Additionally, corporal punishment at preschool age predicts poorer IC among school-age boys, but not girls (Chang, Olson, Sameroff, & Sexton, 2011). Overall, child sex may serve as a moderator alters the relationship between parent-child verbal communication and child self-regulation. This proposed study attempts to explore the role of child sex in moderating the relationship between maternal communication acts and child SR.

Covariates. In addition to children's sex, it has been documented in the literature that several maternal (i.e., education) and child characteristics (age, language skills) are associated

with SR development in preschoolers. As discussed above, children are more advanced ER and IC when their mothers have higher education (Altan-Aytun, Yagmurlu, & Yavuz, 2013) and when they are older and more skilled in language (Roben, Cole, & Armstrong, 2013; Vallotton & Ayoub, 2011). As a result, maternal education, child sex, age, and language skills as indexed by communication acts are included as covariates in this study.

CHAPTER 3

RESEARCH QUESTIONS

The literature reviewed above indicated that verbal communication between parents and children, particularly its pragmatic function (i.e., communication acts), may be an important factor of preschoolers' self-regulation development. Given the paucity of related research on different types of parental communication acts and their associations with boys' and girls' SR development, this study examined the following research questions:

1. Are maternal communication acts related to ER and IC among preschoolers? It was hypothesized that after controlling for covariates (child sex and age, maternal education as well as child communication acts):
 - a. Maternal collaborative communication acts would be associated with better ER and IC skills among preschoolers; and
 - b. Maternal non-collaborative communication acts would be associated with poorer in ER and IC competence among preschoolers.
2. Does child sex moderate the association of maternal communication acts with self-regulation in preschoolers? It was hypothesized that after controlling for covariates (child sex and age, maternal education, as well as child communication acts):

- a. The positive association of more frequent maternal collaborative communication acts with better ER and IC skills would be significant for boys, but not girls; and
- b. The negative association of more frequent maternal non-collaborative communication acts with poorer ER and IC skills would be significant for boys, but not girls.

CHAPTER 4

METHODS

Participants

This research is part of a larger longitudinal project spanning from infancy to preschool-age investigating the role of mother-child communication in children's socio-emotional development. This study focuses on children's self-regulation development at 4 years of age (207 weeks to 259 weeks). Eighty-three children (45 boys) and their mothers participated in the data collection at age 4. The majority of the mothers were Caucasians (83%) and had a college degree (88.7%) ($M = 16.5$ years of education). Most of the mothers (92.8%) were married.

Procedures

Children and their mothers were invited to a university lab room. After the research assistant informed the mother and the child the purpose of the study, they were asked to engage in a series of activities mimicking everyday situations. Interactions between mother-child dyads were observed and videotaped. For this study, mother-child interaction was observed during the Grocery Shopping game, which involved a paper board with toy items simulating a miniature grocery. This game was for mothers to help their child find grocery items according to the "shopping lists" and specific shopping rules provided. A toy truck was used as the shopping cart.

the children, children responding to the mothers by doing what was told) were also noted. This was because although speech was used to convey pragmatic messages, body language could be used as a cue for interpreting message.

Maternal and child utterances were first segmented into speech turns. Utterances (including complete sentences, sentence fragments and single sounds) within each turn were further separated into communicative acts based on intonation contour or pauses (1 second or greater). Each communication act was coded using a revised Psychosocial Processes Coding Scheme (Leaper, 1991; Leaper & Gleason, 1996). See Appendix A for the definitions and examples for different communication acts. This coding system classifies communication acts into two categories: collaborative or non-collaborative.

Collaborative communication acts convey the message of inform (e.g., giving or relating information), guide (e.g., giving suggestions), request (e.g., asking for information), or support (e.g., expressing positive affect). Non-collaborative communication acts express the intent of direct (e.g., controlling), avoid (e.g., withdrawal), and negate (e.g., disapproval), or submit (e.g., passively going along with the partner). To adjust for variations in the length of shopping game, after the frequency of collaborative and non-collaborative communication acts by mothers and children were tallied separately, and they were computed as rates per minute (i.e., the total frequency of communication act divided by the total duration of the Grocery Shopping game).

To make an accurate judgment of the message conveyed, the assignment of codes for communication acts was done on the basis of utterances in a typed transcript while simultaneously viewing the corresponding video segment. This was because facial expressions, tones of voice, and body languages were all very important cues for interpreting messages. Also, because of the difficulty of identifying and classifying the pragmatic meaning of communication acts, a team coding method was used. Two coders first coded communication acts independently and then worked together as a team for comparing codes. All disagreements in coding were resolved through discussion between the two coders before one final decision was made. Twenty-two percent ($n=18$) of the study sample was double coded separately by another two-coder team for reliability ($kappa = .81$).

Self-Regulation. Children's behavioral responses during ER and IC tasks were coded from videos. First, children's ER was tested in a Disappointing Gift Task.

Disappointing Gift. This procedure was to assess children's emotion regulatory abilities. Two research assistants carried out this task. The first research assistant played a Dog Race game with the child and lost the game to the child for him/her to win a prize. Before starting the race game, the assistant asked the child to select a preferred toy as the winning prize from a tray, which contained a variety of small attractive toys together with a broken toy. After losing the game to the child, the research assistant told the child that she was to retrieve the prize from next door. A second research assistant returned and presented a broken toy, hence, the disappointing gift, to the child as the winning prize. The second research assistant stayed

with the child for approximately 60 seconds until the first research assistant returned with the prize selected by child previously. When waiting, the second assistant avoided eye contact with the child and ignored all communication attempts by the child.

Children's facial and vocal affect as well as emotion regulatory behaviors after receiving the disappointing gift were coded separately. These coding schemes were adapted from those used by Cole et al. (1994) and Saarni (1984). A 10-second time sampling coding strategy was used.

For affect coding, four different affective expressions were identified, including: (1) joy, indicated by curl-up lips, laughing/giggling, and high pitch of voice; (2) sadness, marked by down-turned lip corners, eye brows, and tone and volume at the end of talking; (3) anger, indicated by squared lips, up-turned ends of eye brows, and up-turned tone and volume at the end of talking, and (4) neutral, which is marked by are relaxed and tone and voice remaining the same throughout talking. See Appendix B for the coding scheme and instructions. In order to reduce the numbers of codes, sadness and anger were combined as negative affect.

Five emotion regulatory behaviors were coded: (1) active self-regulation, where a child active engages in play and/or exploration of the disappointing gift or any attempt to change the situation (e.g., playing with the broken toy, asking about the promised gift or trying to fix the broken toy); (2) passive tolerance behavior, where the child sits quietly or staring at the disappointing gift without engaging in any overt activity (e.g., staring at the gift with hands on the lap); (3), behavioral self-distraction, where a child exhibits behavior directed toward self or

object other than the disappointing gift to keep oneself occupied (e.g., walking around in the room, moving their head and look around or tapping the table); (4) attentional self-distraction, where a child maintains a sustained focus of visual attention on an object other than the disappointing gift for at least 2 seconds without any concurrent behavioral response; and (5) disruptive behavior which included behaviors that are typically regarded as inappropriately aggressive and disruptive (e.g., screaming at the research assistant, throwing the broken toy on the ground or trying to leave the room). See the coding scheme and instructions in Appendix C.

A graduate student served as the primary coder. An undergraduate research assistant was trained as the reliability coder. The inter-coder reliability for affective expression and emotion regulatory behaviors was computed separately. Twenty-two percent ($n = 18$) of the sample was coded by the reliability coder independently for affect ($kappa = .72$) and 24% ($n=20$) for emotion regulatory behaviors ($kappa = .64$).

To reduce the number of ER behavioral strategies, a principal components analysis with a Varimax rotation exploratory factor analysis was performed. The rotated solution suggested three factors with Eigenvalues that were greater than 1.0 and explained a total of 85% of variance (see Table 1): (1) Active Regulation, which included Active Self-Regulation and Behavioral Self-Distraction, represented a problem-solving oriented strategy; (2) Passive Regulation, which included Attentional Self-Regulation and Passive Tolerance Behavior, reflected a lack of actions in regulating emotion; (3) Disruptive Behavior, which consisted only

one behavioral measure of Disruptive Behavior, indicated inappropriate venting behavioral response.

Table 1

Means, Standard Deviations, and Factor Loadings for Emotion Regulatory Behaviors

Measure	Mean (SD)	Factor 1 <i>Active Regulation</i>	Factor 2 <i>Passive Regulation</i>	Factor 3 <i>Disruptive Behavior</i>
Active self-regulation	.41 (.31)	.90	-.41	-.14
Behavioral self-distraction	.42 (.30)	-.90	-.39	-.18
Attentional self-distraction	.12 (.22)	-.07	.85	.17
Passive tolerance behavior	.03 (.09)	.06	.70	-.27
Disruptive behavior	.02 (.86)	.03	-.04	.96
Eigenvalue		1.65	1.53	1.06
Variance Explained (%)		32.64	30.82	21.34

Children's IC was tested in two different experimental procedures: Mean/Good Puppet and Animal Stroop.

Mean/Good Puppet Game. The research assistant held a puppet on each hand. The child was told that one was a good puppet and the other a mean puppet. The child must do what the good puppet said (e.g., "touch your nose"), but not what the mean puppet said as quickly as possible. The child's response to each of the 12 trials was coded as correct (i.e., a right reaction was provided immediately), self-correct (i.e., a wrong reaction was given first, but a self-correction was made immediately), delayed self-correct (i.e., a wrong reaction was given first, but a self-correction was made with some delay), and incorrect (i.e., a wrong reaction was provided without any correction). A correct reaction was worth three points. A self-correct reaction was worth two points. The delayed self-correct reaction was worth one point. And the incorrect reaction was worth zero points. A total score was computed by summing up across all

12 trials, the weighed score range was 0 to 36. Twenty-four percent ($n = 20$) of the videos were coded by a reliability coder, and the inter-rater reliability indexed by *kappa* was .97

Animal Stroop. In this task, children were asked to name the animals whose bodies and head did not match. The research assistant helped the children went through some practices by naming normal animal pictures and animal bodies without heads. Then the children were shown a series of pictures of animals, whose heads and bodies did not match. They were asked to first name the animals based on the bodies as quickly as possible, and again based on the heads. The child's response to each of the 12 trials was coded exactly the same as those described above for scoring. A total score was computed by summing across all 12 trials, the weighed score range was 0 to 36. Twenty-four percent ($n = 20$) of the videos were coded by a reliability coder, and the inter-rater reliability indexed by *kappa* was .93.

Because of the significant correlation ($r = .45, p < .001$) between the Puppet Game and Animal Stroop scores, the sum of the standardized score for the two tasks was computed and used as the index for IC.

CHAPTER 5

RESULTS

Descriptive Statistics

Frequencies, means, and standard deviations for child sex, child age in weeks, maternal education in years, child communication acts, maternal communication acts, ER scores, and IC score were computed. See Table 2 for descriptive statistics.

T-tests showed that both mothers, $t(82) = 41.85, p < .01$, and children, $t(82) = 37.58, p < .01$, used collaborative communication acts more frequently than non-collaborative communication acts during the grocery shopping games.

Table 2

Descriptive Statistics for Study Measures

Measure	<i>N</i>	<i>Frequency (%)</i>	<i>M</i>	<i>SD</i>
Demographics				
Child sex				
Boy	45	54.21	-	-
Girl	38	45.79	-	-
Child age (weeks)	83	-	219.46	11.55
Maternal education (years)	80	-	16.49	2.81
Communication acts (rate per minute)				
Maternal collaborative acts	83	-	12.99	2.34
Maternal non-collaborative acts	83	-	1.69	1.05
Child collaborative acts	83	-	10.95	2.07
Child non-collaborative acts	83	-	.91	.86
Emotion regulation				
Affective expressions (proportions)				
Negative	81	-	.20	.28
Neutral	81	-	.71	.29
Joy	81	-	.09	.16

Table 2

Continued

Measure	<i>N</i>	Frequency (%)	<i>M</i>	<i>SD</i>
Emotion regulation				
Behavioral strategies (factor scores)				
Active regulation	82	-	.00	1.00
Passive regulation	82	-	.00	1.00
Disruptive behavior	82	-	.00	1.00
Inhibitory control				
Mean/good puppet game	83	-	30.69	7.15
Animal stroop	83	-	24.36	8.61
Composite score (<i>z</i> score)	83	-	-.01	1.70

Relation between Maternal Communication Acts and Child Self-Regulation

To answer the first research question whether more maternal collaborative communication acts were associated with better ER and IC (Hypothesis 1a), and more maternal non-collaborative communication acts were associated with poorer ER and IC (Hypothesis 1b), bivariate correlations based on the total sample were computed.

With respect to child affective expressions, none of the correlations for the whole sample were significant, with the exception that maternal collaborative acts were positively correlated with more display of negative affect during the disappointing gift task (see Table 3). With respect to behavioral regulatory strategies, none of the correlations for the whole sample were significant. With regards to IC, whereas the correlations with maternal collaborative acts were not significant, more frequent maternal non-collaborative acts were significantly correlated with poorer IC in children (see Table 3). Taken together, these correlational findings suggested that Hypothesis 1a was not supported, and Hypothesis 1b was only partially supported.

Table 3

Bivariate Correlation between Maternal Communication Acts and Child Self-Regulation

Measure	Collaborative			Non-Collaborative		
	Total Sample	Boys	Girls	Total Sample	Boys	Girls
Emotion regulation						
Affective expressions						
Negative	.23*	.20 ^t	.27 ^t	-.18 ^t	-.28*	-.02
Neutral	-.15 ^t	-.16	-.15	.18 ^t	.26 ^t	.03
Joy	-.12	-.05	-.24 ^t	.00	.00	-.02
Behavioral strategies						
Active regulation	.09	-.11	.32*	.05	.04	-.04
Passive regulation	.17 ^t	.25*	.06	-.18 ^t	-.22 ^t	-.05
Disruptive behavior	.07	.01	.22 ^t	-.11	-.24 ^t	.08
IC (composite score)	-.01	-.11	.18	-.34**	-.25 ^t	-.50**

Note. IC = Inhibitory Control.

^t $p < .10$. * $p < .05$. ** $p < .01$.

To control for the covariates (i.e., child age and sex, child collaborative and non-collaborative communication acts, as well as maternal education) and simultaneously consider the effects of maternal collaborative and non-collaborative communication acts, multiple linear regression analysis was further applied with each of the measures for ER and IC as the dependent variable. Results based on standardized regression coefficients (β 's) are shown in Table 4. With respect to affective expressions, the regression analysis revealed that greater maternal collaborative acts were related to more frequent display of negative affect and less frequent display of neutral affect during disappointing gift task but not with display of joy. Moreover, neither maternal collaborative acts nor maternal non-collaborative acts were significantly related to the use of behavioral strategies, with the exception that the negative association between maternal non-collaborative communication acts and disruptive behavior approached significance. Finally, whereas maternal collaborative acts were not significantly associated with IC

performance, more frequent use of maternal non-collaborative acts were related to poorer IC performance in children. Together, similar to results based on correlational analysis, these findings did not support Hypothesis 1a but partially supported Hypothesis 1b.

Table 4

Multiple Linear Regression: Predicting Children's Emotion Regulation and Inhibitory Control

	Affective Expressions			Behavioral Strategies			IC
	Negative	Neutral	Joy	Active Regulation	Passive Regulation	Disruptive Behavior	
Child age	.01	-.02	.02	.17	.19	.05	.11
Child sex	.05	-.05	.01	-.14	-.02	-.26*	.08
Maternal ED	.10	-.04	-.09	-.12	.02	-.16	.10
Child CA	-.24	.35	-.22	.38 ^t	-.48*	-.05	-.05
Child NCA	-.10	.16	-.10	.11	.04	.12	.09
Maternal CA	.45*	-.44*	.01	-.13	-.13	.13	.09
Maternal NCA	-.08	.03	.09	-.07	-.21	-.29 ^t	-.36*

Note. CA = Collaborative Acts, NCA = Non-collaborative Acts, ED = Education, IC = Inhibitory Control.

^t $p < .10$. * $p < .05$. ** $p < .01$.

Moderating Role of Child Sex in the Association between Maternal Communication Acts and Child Self-Regulation

In order to answer the second question, whether the positive associations of maternal collaborative communication acts with better child ER and IC (Hypothesis 2a) and the negative associations of maternal non-collaborative communication acts with poorer child ER and IC (Hypothesis 2b) would be only significant for boys, but not girls, bivariate correlations were first computed separately for boys and girls.

With respect to affective expressions, the results showed that there were no significant correlations of maternal collaborative and non-collaborative acts with boys' or girls' affect displays, with the only exception that more frequent maternal non-collaborative acts were related to less negative affect expressions in boys, but not girls (see Table 3). Several of the correlations approached significance: (1) more frequent maternal collaborative acts were related to more display of negative affect for both boys and girls; (2) more frequent maternal collaborative acts were related to less frequent display of joy for girls, but not boys; (3) more frequent maternal non-collaborative communication acts were related to more frequent display of neural expression by boys, but not girls (see Table 3).

With respect to behavioral ER strategies, more frequent maternal collaborative communication acts were related to greater active regulation by girls, but not boys, whereas they related to more passive regulation by boys, but not girls (see Table 3). In addition, there were several correlations approached significance: (1) more frequent maternal collaborative acts were associated with more frequent disruptive behavior by girls, but not boys; (2) more frequent

maternal non-collaborative acts were related to more frequent passive regulation by boys, but not girls, (3) more frequent maternal non-collaborative communication acts were associated with more frequent disruptive behaviors by boys, but not girls (see Table 3).

With respect to IC, maternal collaborative acts were not significantly correlated with boys' or girls' performance. By contrast, more frequent maternal non-collaborative acts were related to better IC performance in girls. With boys, the negative association only approached significance (see Table 3).

Taken together, the above findings provided only partial support to both Hypothesis 2a and Hypothesis 2b.

To further examine the moderating effect of child sex, hierarchical linear regression was conducted to control for the four covariates (i.e., child age, sex, child communication acts, as well as maternal education), together with the main effect of maternal collaborative (or non-collaborative) communication acts and its interaction with child sex as the predictors and each of the measures for ER and IC as the dependent variable. In each set of analysis, the covariates were entered into the model first, followed by the interaction term of maternal (non-) collaborative acts \times child sex. Because of the relative small sample size, the main effect of maternal collaborative or non-collaborative acts and its interaction with child sex were entered into the model separately. Also, maternal collaborative and non-collaborative acts were centered before creating the interaction terms.

Maternal collaborative acts. With respect to affective expressions, the interaction between maternal collaborative communication acts and child sex was not a significant predictor

for negative, neutral, or joy affect expressions, active, passive, or disruptive behavioral regulatory strategies, or IC performance (see Table 5). In sum, child sex did not moderate the association of maternal collaborative acts with ER and IC. Thus, Hypothesis 2a was rejected after adjustment for covariates.

Maternal non-collaborative acts. Results from the regression analysis indicated that although the interaction between maternal non-collaborative acts and child sex did not significantly predict any of the affect expressions or behavioral regulatory strategies, its contribution to IC performance approached significance (see Table 6). Simple slope analysis further revealed that the regression coefficient for girls was significant, $B = -1.20, p < .01$. More frequent maternal non-collaborative acts were significantly associated with poorer IC performance among girls (see Figure 2). However, this relation among boys only approached significance, $B = -.41, p = .06$. Based on the findings above, Hypothesis 2b was not supported after adjustment for covariates.

Table 5

Hierarchical Regression with Maternal Collaborative Communication Acts: Predicting Children's Emotion Regulation and Inhibitory Control

Predictors	Affective Expressions						Behavioral Strategies						Inhibitory Control	
	Negative		Neutral		Joy		Active Regulation		Passive Regulation		Disruptive Behaviors			
	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
Child age	.05	.03	-.06	-.06	.03	.06	.15	.10	.21 ^t	.26	.03	.02	.12	.08
Child sex	.10	.10	-.10	-.10	.01	.01	-.14	-.13	.05	.04	-.26*	-.22 ^t	.18	.19
Maternal ED	.12	.13	-.06	-.06	-.10	-.12	-.11	-.09	.06	.04	-.15	-.18	.18	.20
Child CA	-.18	-.20	.26	.26	-.15	-.12	.30 ^t	.25	.44*	.48**	.12	.14	-.14	-.18
Maternal CA	.41*	.37*	-.39*	-.38*	-.03	.04	-.10	-.21	-.11	-.01	-.28*	-.41*	.13	.04
Maternal CA×Sex		.08		-.01		-.13		.23		-.20		.22		.18

Note. S1 = Step 1, S2 = Step 2, CA = Collaborative Acts, NCA = Non-collaborative Acts, ED = Education. Standardized regression coefficient of each predictor is shown.

^t $p < .10$. * $p < .05$. ** $p < .01$.

Table 6

Hierarchical Regression with Maternal Non-Collaborative Acts: Predicting Children's Emotion Regulation and Inhibitory Control

Predictors	Affective Expressions						Behavioral Strategies						Inhibitory Control	
	Negative		Neutral		Joy		Active Regulation		Passive Regulation		Disruptive Behaviors			
	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
Child age	-.01	-.02	-.04	-.04	.09	.10	.07	.07	.05	.04	.07	.06	.11	.14
Child sex	.02	.03	-.03	-.04	.01	.01	-.13	-.13	-.01	.00	-.22	-.19	.08	.04
Maternal ED	.11	.10	-.05	-.05	-.11	-.10	-.10	-.10	.05	.04	-.20	-.22	.10	.12
Child CA	-.06	-.06	.06	.05	.01	.01	-.05	-.05	-.18	-.17	.13	.14	.10	.08
Maternal CA	-.10	-.13	.08	.10	.02	.04	.02	.02	-.07	-.10	-.27	-.36*	-.37*	-.23
Maternal CA×Sex		.05		-.04		-.03		.00		.04		.16		-.22 ^t

Note. CA = Collaborative Acts, NCA = Non-collaborative Acts, ED = Education. Standardized regression coefficient of each predictor is shown.

^t $p < .1$. * $p < .05$. ** $p < .01$.

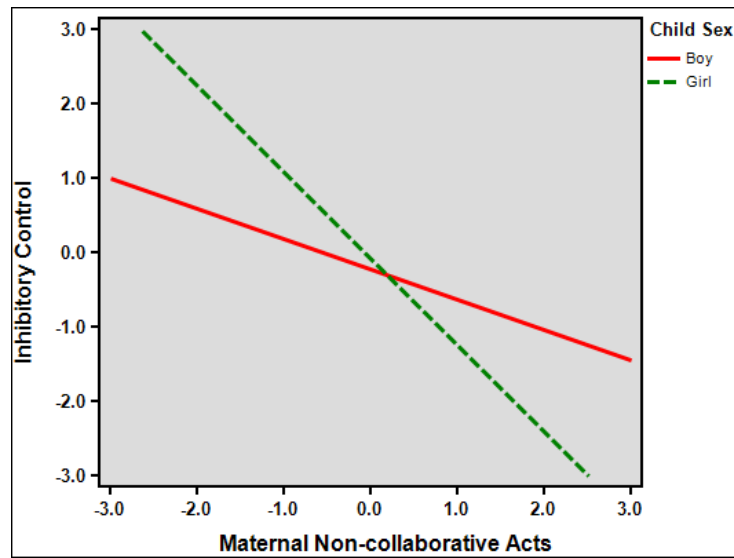


Figure 2. The moderation effect of child sex on the association between maternal non-collaborative acts and child inhibitory control

CHAPTER 6

DISCUSSION

The purpose of this study was 1) to investigate the association of maternal collaborative and non-collaborative communication acts with SR as indexed by ER and IC in 4-year-olds; and 2) to test the role of child sex in altering the association between maternal communication acts and SR. It was hypothesized that more maternal collaborative communication acts would be related to better child ER and IC and that more maternal non-collaborative communication acts would be related to poorer child ER and IC. Moreover, it was hypothesized that the positive association of more frequent maternal collaborative communication acts with better ER and IC skills would be significant for boys, but not girls, and the negative association of more frequent maternal non-collaborative communication acts with poorer ER and IC skills would be significant for boys, but not girls. The findings of this study are discussed below.

Maternal Collaborative Communication Acts and SR in Four-Year-Olds

The first goal of this study was to determine whether more maternal collaborative acts would be positively related to better child ER and IC. With respect with ER as indexed by affective expression, maternal collaborative communication acts were found to be positively related to negative affective expression and negatively related to neutral affective expression,

even after controlling for the covariates. More expression of negative affect has been seen as a sign of poor ER in many studies. For example, children with poor self-regulation tend to express more negative affect when receiving disappointing gift (Kieras, Tobin, Graziano, & Rothbart, 2005). With respect to behavioral ER strategies, there was no significant correlation with maternal collaborative communication acts. However, the positive association between maternal collaborative communication acts and passive regulation approached significance. Moreover, maternal collaborative acts were not found to be significantly associated with IC either. Therefore, these findings did not support the hypothesis that maternal collaborative acts would be associated with better ER and IC skills in children.

These finding were not consistent with previous studies. For example, more parental support, which involves greater collaborative communication speech by parents, was related to better ER (e.g., more positive affect and more use of effective regulatory behaviors) in infancy and toddlerhood (Bocknek, 2009; Dumas & LaFreniere, 1993; Feng et al., 2008; Martinez-Torteya et al., 2014). There are several possible explanations for the null findings. First, as most of the participants were from middle-class families, the gifts might not have been attractive to them. It is plausible that the disappointing gift procedure did not present a sufficiently strong emotional challenge to children, and thus, failed to evoke strong disappointment or other negative emotions in them. The lack of strong affective reactions, consequently, failed to elicit a variety of behavioral ER strategies. As such, this study did not find a significant link between maternal communication acts and child SR competence. Alternatively, this study only identified

child affect with different valances (e.g., positive and negative) in frequency without considering their intensities. The intensity in emotional response to a challenging situation might be a better indicator of emotion regulatory competence in preschool-aged children. For example, although negative emotions are often thought as destructive or socially inappropriate actions in response to a challenge, mild negative affective expressions of typically development preschool-age children have been often found to be associated with appropriate actions, such as problem-solving and self-distraction (Dennis, Cole, Wiggins, Cohen, & Zalewski, 2009). In future research, real-time (i.e., second by second) coding of the intensity of negative affect should be considered when assessing the levels of emotion regulation versus dysregulation.

However, there were several other plausible explanations for the findings that more maternal collaborative acts were associated with more negative affective expression and less neutral affective expression. First, these patterns may suggest a child-driven effect. Mothers of children with high emotion negativity may try to help their children regulate emotions by using more collaborative communication acts. The messages communicated to children may simply reflect parental expectations for their children. Experimental studies are needed to test the direction of the causality between maternal verbal communication and child SR. Second, based on attachment theory, securely attached children are more likely to express their emotions in a more flexible way (Cassidy, 1994; Berlin & Cassidy, 2003). In line with this theory, mothers who used more collaborative communication acts in this study had securely attached children who were more willing to express their negative emotions openly. Lastly, most of the

participants were from White, middle class families. It is well documented that middle-class mothers are likely to use child-centered emotion socialization, encouraging children to express their positive and negative emotions (Brown, Craig, & Halberstadt, 2015).

Maternal Non-Collaborative Communication Acts and SR in Four-Year-Olds

Another goal of this study was to examine the hypothesis that maternal non-collaborative communication acts would be associated with poorer ER and IC in 4-year-olds. With regards to affective expression, after controlling for covariates, maternal non-collaborative communication acts were no longer significantly related to any of the ER outcomes. These results are inconsistent with previous findings that harsh and over-controlling parenting behaviors, which share similar features with non-collaborative communication acts, such as giving commands and criticisms, were related to poorer SR in toddlers and preschoolers (Bindman et al., 2013; Karreman et al., 2006; Lucassen et al., 2015; Mathis & Bierman, 2015; Moilanen, Shaw, Dishion, Gardner, & Wilson, 2010). As mentioned above, design and methodological issues may be the possible explanations for the null findings. The disappointing gift procedure may not present a sufficiently strong emotional challenge to children and fail to elicit the use of a variety of behavioral ER strategies by children. Moreover, emotion intensity was not considered when coding different affect expressions as the index for emotion regulation. Future studies need to address these methodological issues and consider biological markers of emotion regulation such as cortisol and heart rate variability.

Maternal collaborative acts were not significantly associated with IC in this sample of 4-year-olds, whereas maternal non-collaborative acts were significantly associated with poorer IC. This pattern may be explained by the negativity bias theory in social-emotional development, which argues that young children tend to use and learn from negative information far more than positive information (Vaish, Grossmann, & Woodward, 2008). Negative parenting have been consistently found to be influential to child development. For example, maternal unresponsiveness in stressful social situations is related to poorer ER in toddlers (Rodriguez et al., 2005), and maternal harsh parenting is associated with less advanced child IC skills (Lucassen et al., 2015; Moilanen, Shaw, Dishion, Gardner, & Wilson, 2010). It has been theorized that children's negative arousal heightens their awareness and vigilance about negative emotions or interactions (Dunn, 1988). Similarly, the 4-year-olds in this study were expected to be more sensitive to maternal non-collaborative than collaborative communication acts. Children's greater sensitivity and attention to the negative messages sent by their mothers' non-collaborative acts during verbal communication would have a significant effect than their collaborative acts on IC development.

Child Sex as a Moderator

The second research question of this study was to assess whether the relation between maternal communication acts and child ER and IC differed by child sex . It was hypothesized that the positive associations between maternal collaborative acts and better ER and IC would be present for boys but not girls. Bivariate correlation showed that maternal collaborative

communication acts were positively related to boys' negative affect expression but not girls'.

With respect to behavioral regulatory strategies, maternal collaborative communication acts were positively related to girls' active regulation but positively related to boys' passive regulation.

These findings did not provide strong support to the hypothesis. After controlling for covariates, no child sex moderation effect was found. The null findings might be due to the relatively small sample size for testing a moderation effect.

With regards to IC, the bivariate correlation revealed that maternal non-collaborative communication acts was negatively related to inhibitory control among girls but not boys. After controlling for covariates, this interaction approached significance. Contrary to our hypothesis, the negative association between more frequent maternal non-collaborative communication acts and better child IC performance was stronger for girls than boys. Although this pattern was not consistent with previous findings, it is in line with some early studies on linking positive parenting to ER. For example, parental emotion socialization practices (e.g., emotion coaching) were found to be associated with better ER in preschool girls but not boys (Denham, Bassett, & Wyatt, 2010). Future research is needed to discern the role of child sex as a moderator in the relation between maternal non-collaborative communication acts and IC.

Study Strengths and Limitations

This study has the several strengths. First, this study used observational methods to measure both mother-child verbal communication and SR skills in children. Compared to studies using parental reports as the sole source for both parenting and child SR, the inflated association

due to common method bias was avoided. Moreover, a two-coder team approach was used in classifying the pragmatic meaning of maternal and child verbal communication acts. In spite of being time consuming and labor intensive, this approach was believed to improve the accuracy and reduce biases in the identification and classification of messages conveyed by mothers and children in their verbal communication.

Finally, covariates, including maternal education, child age, sex, and communication acts, were considered in the multivariate analyses, which increased the rigor of the findings in addressing the research questions. Although some covariates, such as maternal education and child age, did not emerge as significant confounding factors, child communication acts, particularly, collaborative acts, were significant when predicting passive ER regulatory strategy. Although the role of child verbal communication was not the focus of this study, this pattern is consistent with previous research that child language plays a significant role in the development of SR. For example, both toddlers' spoken vocabulary and talkativeness predicted better SR (Vallotton & Ayoub, 2011) and also more advanced children's language skills at 18 months was related to better anger regulation at 48 months (Roben, Cole, & Armstrong, 2013). Future studies may further explore whether and how child communication acts may serve as a moderator altering the association of maternal communicative acts with SR development in preschool-aged children.

This study also had several limitations. First, it was a cross-sectional study. Both maternal communication acts and child ER and IC were measured during the same lab visit.

Thus, it was impossible to determine the causal relation between maternal verbal communication and child SR. Secondly, maternal verbal communication was only observed in a game playing context (i.e., grocery shopping game). Maternal verbal communication in different contexts, such as teaching and discipline, may have different influences on preschoolers' SR development. Future studies should observe mother-child verbal communication in multiple contexts. Moreover, the sample of this study was mainly from middle-class white families, and the majority of the mothers had a college degree or higher. There was little variation in the ways different mother-child dyads communicate. Thus, the generalizability of the study was limited. Future studies should include parents and children with minority backgrounds or from disadvantaged families. Finally, according to family systems theory, a child's self-regulation is an outcome of the dynamic processes of the entire family (Cox, Mills-Koonce, Propper, & Gariépy, 2010). This study put emphasis on the dyadic verbal communication between mothers and their children without considering the role of fathers. Future studies should consider the contribution of father-child, mother-father, and mother-father-child verbal communication to SR development in preschoolers.

Conclusions

Self-regulation is crucial for adaptive psychosocial outcomes for preschool-aged children (Bell & Deater-Deckard, 2007). Children need adequate self-regulation to establish peer relationships (Blair, 2002), school readiness (Ursache, Blair, & Raver, 2012) and later school achievement (Liew, 2011; Montroy, Bowles, Skibbe, & Foster, 2014; Payton et al., 2008;

Sawyer, Miller-Lewis, Searle, Sawyer, & Lynch, 2015). By focusing on the pragmatics of verbal communication between mothers and their preschoolers, this study examined the messages conveyed through collaborative and non-collaborative communication acts by mothers and their links to SR in 4-year-olds. Although the findings failed to support the positive contribution of maternal collaborative acts to child SR development, they highlighted that maternal non-collaborative communication acts may undermine the development of IC in preschoolers. To promote SR development, particularly, IC skills, in preschool-aged children, intervention programs may be designed and implemented to teach mothers how to avoid using non-collaborative acts in verbal communication with their children.

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APPENDIX A

Mother/Child Communicating Act Coding Scheme




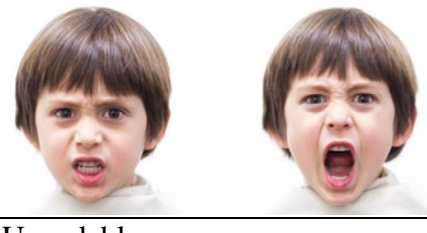
Communication Act	Definition
Collaborative	
Guide	<ul style="list-style-type: none"> • Provide suggestion or proposal for joint activity in a non-demanding manner. • Correct or give commands with an intent to help • Clarify or re-orient the partner in shared activity or topic
Support	<ul style="list-style-type: none"> • Give praise, reassurance, encouragement, or comfort • Express agreement, understanding, apologies, trust/confidence, confirmation, or emotional support • Express shared amusement with positive facial expression or laughter • Willingly go along with the partner's guidance and direction or join the partner with a current task
Inform	<ul style="list-style-type: none"> • Give or relate descriptive information • State opinion, wish, desire, or decision in a non-dogmatic manner • Answer questions aimed at providing information (including head nodding as "yes" or shaking head as "no")
Request	<ul style="list-style-type: none"> • Seek help by asking for information, directions, suggestions, decisions, or evaluation from the other person • Seek emotional support, approval, confirmation, or clarification.
Non-collaborative	
Direct	<ul style="list-style-type: none"> • Give orders to the partner without a dogmatic or hostile manner • Issue commands with an intent to control or influence the partner's behavior (typically with rigid or abrupt and the tone of voice) • Direct the partner's behavior with more interest in task completion than task assistance
Negate	<ul style="list-style-type: none"> • Give unilateral demands, disagreements, disapproval, criticisms • Express skepticism, sarcasm or resistance to the partner's position • Direct the partner with dogmatic, hostile, or frustrated tone • Correct the partner in a way that emphasizes the error
Avoid	<ul style="list-style-type: none"> • Ignore or does not reply to the partner by word or action • Express uncertainty or indecision; offers irrelevant response • Change topic or attempts to distract the partner • Act distracted, apathetic, or bored (e.g., yawning)
Submit	<ul style="list-style-type: none"> • Passively goes along with the partner's directions • Changes opinion to go along with the partner

Instructions for Communication Act Coding

- Maternal or child ***communication act*** (i.e. message or pragmatic function) is identified at the level of information and/or feeling that is being conveyed during social interaction.
 - A communicative act is utterances (including complete sentences, sentence fragments and single sounds) bounded by their intonation contour or a pause (1 s or greater).
 - A communication act may also be a nonverbal action, which include:
 - (a) conventional gestural signals, such as pointing, nodding, or head shaking;
 - (b) vocalizations, such as laugh or cry, and
 - (c) gaze.
 - Classification of communication acts is based on verbal content, tone of voice, facial expressions, overall intent of the speaker, and/or pause.
 - The pragmatic function of each communication act is classified separately for the mother and the child.
- Nonverbal actions without accompanied speech should also be coded for communication act

APPENDIX B

Disappointing Gift Task Affect Coding Scheme

Code Number	Affect	Description
0	Neutral 	Face: Facial muscle relaxed, with eye brows and lip corners in a neutral position Voice: Talking volume, tone and volume remain the same level throughout talking
1	Joy 	Face: Lip corners pulled up with cheek raised and/or crinkling around eyes Voice: Light, lilting quality; higher pitch; laughing, giggling
2	Sadness 	Face: Lip corners turned down with lower lip depressed, inner brows raised and lowered in oblique shape, and eyelids drooped Voice: Decreasing volume, soft voice, dropping off at end
3	Anger 	Face: Eyelids tighten or narrow and lips pressed or tightened; open mouth is squarish; teeth clenched Voice: Harsh, insistent quality; pitch, volume increase
9	Uncodable	The child is quiet and his/her face cannot be seen. When it is impossible to identify and classify the child's affect based on voice or contextual information, the "uncodable" is applied.

Coding rules:

1. Different affect codes are mutually exclusive. In each 10s time sample, only one affect code can be applied.
2. As long as one of face cue and voice cue is showing affect, we can choose the affect code. Face cue and voice cue do not have to appear synonymously.
3. Negative affect is at higher hierarchy than positive affect. When both positive and negative affects appear in a 10s time sample, choose the negative affect as the dominant affect code.
4. If both sadness and anger appear in a time sample, choose the more intense one as the affect code for the time sample.
5. “Uncodable” can be applied only when it is absolutely impossible to figure out the child’s affect. For example, the child sits quietly with neutral affect both before and after the time interval where child’s face cannot be seen, it is obvious that there is no change in the child’s affect, the code of “neutral” should be applied, rather than “uncodable”.
6. See LoBue & Thrasher (2015) for examples of children’s facial expressions.

APPENDIX C

Disappointing Gift Task Behavioral Response Coding Scheme

Code Number	Behavioral Configuration	Description
1	Active self-regulation	Child actively attempts to change the situation, for example, (a) actively playing/exploring the disappointing gift (even when the child is not looking at the item) including asking about the item (b) trying to fix the broken disappointing gift , and/or (c) asking about the prize s/he wanted.
2	Behavioral self-distraction	Child exhibits behavior directed toward self or object other than the disappointing gift to keep oneself occupied. For example, (a) looking under the table, smiling at the cameras, tapping on table, playing with chair/clothing, sucking on chair, patting oneself, (b) combining behaviors such as looking at the toy shelf while tapping cheeks, or looking at the clock while rhythmically tapping legs on the chair (the physical movements can be very small, like playing with the hair or nail, etc.), (c) engaging in distant exploration by looking around the room or objects in the room without sustained focus (i.e., < 2 seconds), or (d) leaving the table to avoid the disappointing gift by running around the room or playing the toys on shelves (e) Talking about some other topic rather than the disappointing item
3	Attentional self-distraction	Child maintains a sustained focus of visual attention on an object other than the disappointing gift for at least 2 seconds without any concurrent behavioral response (see 2b above) (When the child just turns his/her head around to focus on a different thing, it should be coded as attentional self-distraction)
4	Passive toleration	Child passively tolerates the situation by looking at the disappointing gift while sitting quietly and the child may or may not make neutral comments about the disappointing gift
5	Disruptive behavior	Child exhibits inappropriate aggression, for example: (a) breaking or throwing the disappointing gift, (b) making hostile or rude remarks to the experimenter), and/or (c) limit testing, such as flicking lights on and off, trying to open locked windows, trying to open the door to leave the room, and touching non-play objects in the room such as a camera
9	Uncodable	(a) The child is quiet and his/her face cannot be seen. When it is impossible to identify and classify the child's behavior based on voice or contextual information, the "uncodable" is applied. (b) When the child is crying and not using any strategy

Coding rules:

1. Different behavioral configurations are mutually exclusive. In each 10s time sample, only one behavioral configuration can be applied.
2. When two behavioral codes appear in one time block, the following rules are applied:
 - a. Choose disruptive behavior if any kind of disruptive behavior appears
 - b. When both behavioral and attentional distraction appear in one time block, choose behavioral over attentional.
 - c. Choose the one that last longer in time
 - d. If the different behavioral codes last about the same time, choose the one that appears first
3. “Uncodable” can be applied only when it is absolutely impossible to figure out the child’s affect. For example, the child sits quietly with neutral affect both before and after the time interval where child’s face cannot be seen, it is obvious that there is no change in the child’s affect, the code of “neutral” should be applied, rather than “uncodable”.