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## THE RELATIONSHIP BETWEEN CO-SLEEPING AND SELF-REGULATION IN EARLY CHILDHOOD

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THE RELATIONSHIP BETWEEN CO-SLEEPING AND  
SELF-REGULATION IN EARLY CHILDHOOD

BY

BIE-SHUEIN CHU

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE  
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OF  
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## **ABSTRACT**

Co-sleeping has been considered as a dangerous sleeping practice for infants by some parents and pediatricians. However, past research found that co-sleeping in early childhood has a positive influence on both physical and mental development as well as the parent-child relationship, which suggests that co-sleeping may have a positive influence on self-regulation development. This study aims to investigate the relationship between co-sleeping and two self-regulation constructs: socioemotional control and cognitive control by analyzing data from the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B). After excluding the unqualified cases and weighing the sample size with adjusted DEFF weight, the final analytic sample contained 1,130 cases. The findings suggest that sleep arrangement was not a significant predictor for socioemotional control but was able to marginally predict cognitive control of preschool children. The sleep-alone children were found to have higher self-regulation than co-sleeping children. The findings were not consistent with the expectation that co-sleeping will have a positive influence on self-regulation but limitations in the data collection and design may explain this. Future studies regarding co-sleeping and self-regulation development are needed to investigate the nature of co-sleeping further.

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## TABLE OF CONTENTS

<b>ABSTRACT.....</b>	<b>ii</b>
<b>ACKNOWLEDGEMENTS .....</b>	<b>iii</b>
<b>TABLE OF CONTENTS .....</b>	<b>iv</b>
<b>LIST OF TABLES .....</b>	<b>v</b>
<b>CHAPTER 1.....</b>	<b>1</b>
<b>INTRODUCTION .....</b>	<b>1</b>
<b>CHAPTER 2.....</b>	<b>9</b>
<b>METHODOLOGY .....</b>	<b>9</b>
<b>CHAPTER 3.....</b>	<b>14</b>
<b>RESULTS .....</b>	<b>14</b>
<b>CHAPTER 4.....</b>	<b>18</b>
<b>DISCUSSION .....</b>	<b>18</b>
<b>BIBLIOGRAPHY.....</b>	<b>30</b>

## LIST OF TABLES

TABLE	PAGE
Table 1. Sleep Arrangement of Children, Race/Ethnicity, Attachment Style, Family Socioeconomic Status, and Self-regulation Variables: Descriptive Statistic.....	25
Table 2. Family Socioeconomic Status (SES), and Self-regulation Variables: Correlation .....	26
Table 3. Summary of Multiple Regression Analysis for Variables Predicting General Self-regulation.....	27
Table 4. Summary of Multiple Regression Analysis for Variables Predicting Socioemotional Control .....	28
Table 5. Summary of Multiple Regression Analysis for Variables Predicting Cognitive Control .....	29

## CHAPTER 1

### INTRODUCTION

Co-sleeping has been a crucial issue within the parenting practice research. The term “co-sleeping” refers to the sleeping practice in which a parent and an infant share the same bed or sleep in the same room but not on the same surface. Research suggests that co-sleeping in early childhood has a positive influence on both physical and mental development as well as the parent-child relationship. In addition, research shows that co-sleeping increases the child’s cognitive competence (Okami, Weisner, & Olmstead, 2002) and parent-child intimacy (Ball, Hooker, & Kelly, 2000). Despite these positive outcomes from co-sleeping practice, there is little research exploring the effect of co-sleeping on behaviors in early childhood, such as self-regulation. According to Beijers, Riksen-Walraven, and de Weerth’s (2013) study, infants who co-slept with their parents had higher cortisol regulation in childhood than infants who did not co-sleep, which suggests that the child will have a higher resilience for dealing with stress. The purpose of the current study is to examine the relationship between early co-sleeping practice in toddlerhood and two aspects of later self-regulation, cognitive control and social-emotional control, in preschool age children.

There has been controversy over whether parents should co-sleep with their infants in terms of the risk of fatal accident. McKenna and McDade (2005) found that some researchers and pediatricians suggest that parents and infants sharing the same bed is an unsafe parental practice, which will put infants at serious risk. Many co-sleeping studies are about the risk of causing Sudden Infant Death Syndrome (SIDS). Kemp, Unger, and



Wilkins (2000) retrospectively reviewed death-scene information and medical examiners' investigations of deaths and concluded that all types of bed-sharing increase the chance of SIDS. Scheers, Rutherford, and Kemp (2003) also suggested that bed-sharing with an infant increases the chances of SIDS 20-40% compared to crib sleeping. Nevertheless, most of the research that demonstrates a correlation between co-sleeping and SIDS has methodological problems. These studies leave other risk factors out of consideration, such as maternal smoking and/or drug abuse. Use of incomplete data, such as the data reported by police officials, without other detailed information, sleeping position, or information on breast-feeding also limit the usefulness of the research findings (McKenna & McDade, 2005). Therefore, the results from these studies may lead parents and pediatricians to misunderstand the benefits and detriments to co-sleeping.

A national survey showed that the number of parents co-sleeping with infants either all night or part of the night was 50 percent in the U.S. during 1999-2000 (Willinger, Ko, Hoffman, Kessler, & Corwin, 2003). It also showed that there was an increased trend of the proportion of infants usually co-slept by parents between 1993 and 2000, from 5.6% to 12.1%. In addition, there is also a trend that the range of the co-sleeping infant's age has been extended throughout the last two decades. The proportion of co-sleeping infants age 16 weeks or older between 1993 and 2000 increased from 4.9% to 11.8%. The evidence indicates that co-sleeping has become more common, and parents are more likely to prolong the time of co-sleeping with their infants as well. This is evidence that parents in the U.S. are more likely to be co-sleeping in recent years.

There are also benefits to co-sleeping. Research suggests that co-sleeping has a positive influence on infant's cognitive (Beijers et al., 2013) and physical development (Richard, & Mosko, 2004) as well as parent-child intimacy (Ball, Hooker, & Kelly, 2000).

In terms of research and theory about the influence of co-sleeping on these domains, co-sleeping may be related to the development of self-regulation in similar ways. Self-regulation generally refers to the ability to control and direct one's attention, emotion, thought, and action (Kochanska, Coy, & Murray, 2001). The regulation of distress and behavior shifts from external to internal control throughout childhood (Kopp, 1982), and co-sleeping may play an important role in self-regulation development. Co-sleeping may promote the feeling of closeness between parent and infant dyads. Parents may be more likely to interact with the infant, and the infant may have more access to external regulation resources, such as social-emotional regulation and cognitive regulation, from parents. Research has shown that co-sleeping has a positive influence on parent-child intimacy (Ball et al., 2000). There is limited research about the long-term advantage of co-sleeping on the development of self-regulation.

The effects of co-sleeping on social-emotional development and cognitive development (Okami et al., 2002) may contribute to the development of self-regulation. Through the process of socialization from the interaction, it may promote self-regulation development based on Kopp's (1982) self-regulation development theory. The topic of co-sleeping is important to explore, and more comprehensive information about co-sleeping will be useful to parents and pediatricians. The current study examines the relationship between early co-sleeping experience with parents and later self-regulation in childhood.

### **Theory of Self-regulation Development in Early Childhood**

Kopp (1982) reviewed the literature on the cognitive development of children and developed a theory about self-regulation development from infancy to childhood. She described the process of the change of the locus of control of emotions and behavior from

external to internal. She suggested that between the ages of 9 and 12 months, children are able to initiate, maintain, and cease behaviors. They are aware of social demands and caregiver's requests, but are more likely to be regulated by external controlling factors such as adults and the environment. By the age of 24 months, children obtain the ability to delay behaviors based on requests. Moreover, they acquire the ability to control their impulses, in that they are able to restrain their behavior relative to the context. At this age children are developing autonomy but are still led by external control. Between the ages of 3 and 4 years, children begin to self-regulate. They have the capability to internalize social conduct, including expression of emotions, and to inhibit motor reactions. Kopp (1982) suggested that self-regulation is a process of socialization; children learn to regulate their thoughts, emotions, and actions through interaction with others.

**Co-sleeping and parent-child intimacy.** Parental beliefs about bonding and feeling secure have influence on co-sleeping practices. Parents who co-sleep with their infant report that they believe their infant will feel more secure when sleeping beside them (Ball, Hooker, & Kelly, 1999). Moreover, fathers who co-slept with their infants reported that they perceived a more intimate relationship with their infants (Ball et al., 2000). In Ateah and Hamelin's (2008) bed-sharing experience study, over 70% of the participants who bed-share with the infant reported that it was natural for mothers and infants to sleep together and share the same sleeping surface. Some of the participants said they felt comfortable knowing the infant was next to them, and some of the mothers believed that sleeping next to the infant helped build the bond between mother and infant. Moreover, the previous experience of the parents has an impact on their choice to co-sleep as well. Research suggested that early co-sleeping experience in their childhood is a predictor for co-sleeping practice in parenthood, which reflects preservation of a family cultural

tradition (Cortesi, Giannotti, Sebastiani, & Vagnoni, 2004).

There is evidence that infant attachment style predicts later self-regulation (Pearson, 2013). Pearson (2013) suggested that securely attached children have higher self-regulation than insecurely attached children. Ball, Hooker, and Kelly (1999) conducted a study on new and experienced parents' attitudes toward co-sleeping and found that although new parents were usually unaware of the psychological and physical development benefits accruing from co-sleeping, they felt less anxious about caring for their infant at night while co-sleeping with infants. Co-sleeping allowed these parents to attend to their infant's safety at night, provided easier access to soothe their baby, and facilitated a feeling of closeness to their infant. The close physical contact during co-sleeping may enhance the feeling of intimacy within the parent-infant relationship as well as promoting the infant's secure attachment to the caregiver due to a supportive caregiving style. The securely attached infant exhibits confidence on exploring novel environments when feeling supported by the caregiver. Confidence on exploring novel environment and interacting with others may increase the opportunity for the infant to reach external regulation resources and be socialized through the interaction with environment and other people, which may lead to a positive development of independence and a feeling of competence in controlling one's ability. Therefore, co-sleeping may relate to self-regulation in terms of the intimate relationship between parent and infant dyads. Because the effects may more likely to be correlational than causal, studies that examine co-sleeping should take into account attachment status and its relationship to co-sleeping.

**Co-sleeping and cognitive regulation.** Research shows that co-sleeping increases the child's cognitive competence (Okami et al., 2002). Okami and his colleagues (2002)

conducted a long-term co-sleeping study in order to examine the impact of co-sleeping on children's cognitive development. The researchers collected bed-sharing data at 5 months and 3, 4, and 6 years old from children who lived in California. Cognitive competence was a summary factor extracted from multiple assessments; the assessments included Wechsler Intelligence Scale for Children-Revised, a visual motor test, Children's Apperception Test, reading recognition test, and a picture vocabulary test. The cognitive competence data were collected at age 6. They found that the child who co-slept with their parent for a longer time showed a higher cognitive competence score, even after controlling gender and socioeconomic status of the child's family.

Sleeping with parents may lead infants to obtain a regular pattern of sleeping and result in an orderly lifestyle during early childhood, which is a crucial period for cognitive development. Therefore, based on the results of previous research, we may assume that co-sleeping may promote cognitive development because being regular, experiencing low stress, and sleeping well in early childhood may be ideal conditions to facilitate cognitive development and lead children who experience longer parental co-sleeping to be equipped with higher cognitive competency than their counterparts with shorter parental co-sleeping experience.

**Co-sleeping and physical regulation.** A physical sensory difference was found between co-sleeping and solitary sleeping infants. Richard and Mosko (2004) found that infants have a lower heart rate during co-sleeping as comparing to infants who usually sleep in a room alone, and Richard, Mosko, and McKenna (1998) suggested that the frequency of periodic breathing of the infants who co-slept increased in the co-sleeping environment as compared to sleeping in a non-co-sleeping environment. Periodic breathing is the cycle of infant's breathing in which it gets progressively faster and deeper

at the beginning, and then slower and shallower. The implication is that parent's breathing pattern will directly impact the infant's periodic breathing, and it becomes a reminder for infants to keep breathing (Richard et al., 1998; McKenna, 2000). The study results indicate that co-sleeping practice provides a protection from apnea during sleep through arousing the breathing events of infants. Both studies indicate that the co-sleeping environment has a direct influence on the infant's physical development.

If infants with parental co-sleeping have better physical sensory development during infancy, there is a possibility that these infants may obtain better capability in controlling their physical processes in childhood, which may result in a higher physical self-regulation development of the child. According to Beijers and his colleagues' (2013) study, infants with parental co-sleeping have higher cortisol regulation in childhood than infants who did not co-sleep, which suggests that the infant will have a higher resilience for dealing with stress. It indicated that co-sleeping infants may develop better self-regulation in early childhood because cortisol regulation during co-sleeping may be internalized by the infant into an emotional control ability, which may lead the infant to better social-emotional regulation in childhood.

**Co-sleeping and self-regulation.** One study supports the idea that co-sleeping might have a positive influence on later self-regulation. Keller and Goldberg (2004) found that children at preschool age who co-slept with parents were more self-reliant and were more socially independent than their counterparts who did not co-sleep with their parent. Self-reliance in this study refers to the ability to fall asleep alone and sleep through the night. Social independence refers to the capability of relying on oneself rather than on parents, such as dressing oneself, entertaining oneself with books or toys, and working out problems with playmates. Children with higher self-reliance likely have

higher self-regulation in terms of the maturation of the ability to control their action regarding situational context. Therefore, a child with early co-sleeping experience may be more likely to exhibit some forms of greater self-regulation.

### **The present study**

There is limited research about the long-term advantage of co-sleeping practice such as how sleep arrangement will influence the development of self-regulation in early childhood. Past research about the benefits of co-sleeping in parent-child intimacy, cognitive, and physical development during infancy indicates that co-sleeping may be related to self-regulation competency in preschool age children. This study builds on previous research by examining the effects of sleep arrangement in toddlerhood on self-regulation at preschool age. Specifically, it examined the aspects of self-regulation that are likely influenced by co-sleeping. In addition to physical regulation, other social-emotional control may be influenced by co-sleeping such as anger and frustration, physical aggression, social interactions with other children, and body control. This study aims to contribute knowledge in the area of co-sleeping and more comprehensive information about co-sleeping for parents and pediatricians.

## CHAPTER 2

### METHODOLOGY

The relationship between co-sleeping practice at two years and self-regulation at preschool age was examined by analyzing data from the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B) study. The dataset was chosen because of its nationally representative size and longitudinal nature. This dataset was designed by the National Center for Education Statistics (NCES) to provide information about early home experience, health, physical well-being, and how young children's early experiences relate to their later development, learning, and experiences in school (Andreasson & West, 2007).

#### **Sample**

The ECLS-B used a specific complex cluster sample design to produce a sample of 14,000 children born in 2001 in the United States (Najarian, Snow, Lenon, Kinsey, & Mulligan, 2010). The ECLS-B followed the sample from infancy through the start of kindergarten and collected data from parent interviews, direct child assessment, and early care providers and teacher questionnaires. There were five waves of data collection covering four ages: at ages 9 months (wave 1), two years (wave 2), preschool (wave 3), Kindergarten 2006 (wave 4), and Kindergarten 2007 (wave 5). This study used the data from the two years (wave 2) and preschool (wave 3) waves because the variable related with co-sleeping practice was only collected in the two years wave data. The sample of the preschool waves included a total sample size of 8,900 children.



In the present study, children were excluded who were diagnosed with mental disability, physical disability, ADHD, autism, epilepsy, seizures, heart defect, oppositional defiant disorder (ODD), if they required special services, or were extremely low birth weight. In addition, children who were missing all self-regulation functioning assessments were excluded from the sample. Finally, children without sleeping arrangement information were also excluded from the sample. A series of t-tests and chi-square tests were carried out to examine differences between the general analytic sample (n=3,600) and the children dropped from the sample (n=5,300). No significant differences were found between two groups of children in sleep arrangement, socioeconomic status, attachment style, and self-regulation. After excluding cases, the final sample contained 3,600 children with demographics similar to the full sample. In terms of sleeping arrangement, 56% of children in the sample slept alone, and 44% of whom were co-slept by parents.

## **Variables**

**Independent variable.** Sleep arrangement was measured by parent report using one item on a questionnaire that was administered through an interview. Parents were asked where the child usually sleeps and had nine options. For this study, these options were combined into two levels for a co-sleeping practice variable: co-sleeping and no co-sleeping. Parents who reported that children slept “in own room”, “alone in living room”, or “alone in other room” were defined as sleep-alone children. Parents who reported that children slept “with parent, in room”, “with parent, in bed”, and “with parent and other children in room” were defined as co-sleeping children.

**Dependent variable.** Self-regulation was measured by 14 items used to assess children’s self-regulated functioning. Each item described a behavior which ranged from

children's physical behavior to internal focus. These items used to assess self-regulation were extracted from the Preschool and Kindergarten Behavior Scales (PKBS-2) and Social Skills Rating System (SSRS). PKBS-2 was identified as a potential instrument to assess socioemotional construct; however, the full PKBS-2 was too long to be utilized in ECLS-B study. Some socioemotional items from SSRS were used to support the assessment of socioemotional construct as well. A trained interviewer asked the early care and education providers to rate how often they had seen the child acted the particular behavior in the past three months on a Likert scale from 0 (never) to 4 (very often).

In a factor analysis of these items as well as other self-regulatory items, Dice, Shim, Hamilton-Jones, and Hicks (August, 2013) found three factors, cognitive control, social-emotional control, and prosocial behavior, in the preschool wave data. For the present study, two of the three factors in the factor analysis, cognitive control and social-emotional control, were defined as the two constructs of self-regulation because they are most related to previous research. There are seven items categorized as cognitive control: pays attention well, overly active, works and plays independently, difficulty concentrating, keeps working until finished, eagerness to learn, and restless and fidgety. There are seven items categorized as social-emotional control: accepted by other children, has temper tantrums, physically aggressive, annoys other children, disrupts others, shares with others, and acts impulsively. The internal consistency of items was estimated in each self-regulation construct. The socioemotional control items showed a coefficient alpha of .84, and the cognitive control items showed a coefficient alpha of .84. Both coefficient alphas suggest a high reliability of the two constructs.

In each self-regulation construct, some items were asked in negative directions, such as "the child has temper tantrums" and "the child acts impulsively." These were reversely

recoded to indicate a higher self-regulation score. After recoding, scores of two self-regulation constructs were summed respectively. General self-regulation score was created by summing the scores of both self-regulatory constructs.

**Covariates.** Gender, ethnicity, socioeconomic status, and attachment style of children were the covariates in the study. Socioeconomic status has been found to relate to self-regulation development in that children from higher socioeconomic status families showed better self-regulation in early childhood (Miech, Essex & Goldsmith, 2001). Family socioeconomic status was originally measured by three parental response items: parents' education level, parents' occupation, and household income (National Center for Education Statistics, 2005). In ECLS-B study, family socioeconomic status was categorized into five levels, from 1 to 5 by recoding, standardizing, and adding the three variables. The lower number indicates a lower socioeconomic status of the family. The present study utilized the family socioeconomic status data from ECLS-B study.

In addition, research supports that secure attachment is positively related to emotional regulation while insecure attachment is related to negative emotional coping strategies (Crugnola, Tambelli, Spinelli, Gazzotti, Caprin, & Albizzati, 2011). The attachment style of children was also controlled in terms of the relationship between attachment style and self-regulation. The attachment style was measured using the Toddler Attachment Sort-45 during the home visit at age two years and was assessed by the researcher (Bimler & Kirkland, 2002). Children were classified into three categories: Avoidant attachment, Secure attachment, and Ambivalent attachment.

## **Analyses**

ECLS-B data were analyzed using the Statistical Package for the Social Sciences (SPSS). The ECLS-B dataset requires the use of weighting variables to account for

oversampling of certain groups and for the complex sampling design. A weight (W33J0) was chosen based on the waves used and data collection methods. After excluding unqualified children from the original sample, the analytic sample of 3,600 cases were used to calculate a weight that was adjusted for design effects (DEFF). This adjusts for the complex sampling design and reduces the likelihood of a Type I error. To calculate this, the weight (W33J0) was inserted to the Normalized Weight formula: Normalized Weight = weight\*(sample n/ Population N) [W33J0\*(3,600/3,021,100)]. Then, the DEFF Adjusted Weight was calculated with the formula: Normalized Weight/DEFF [Normalized Weight/2.1577]. DEFF was calculated by squaring the DEFT of 1.4689 because the user manual of ECLS-B only provides the DEFT but not the DEFF. This produced the final weighted sample of 1,113 cases.

## CHAPTER 3

### RESULT

#### Preliminary Analyses

Descriptive information about sleep arrangement of children, socioemotional control score, cognitive control score, race/ethnicity, family socioeconomic status, and attachment style of the analytic sample is presented in Table 1. Fifty-six percent of children in the sample usually slept alone, and 44% were usually co-slept. In the analytic sample, up to 69% of children were securely attached. Table 2 shows the correlation between variables. Family socioeconomic status was found to be significantly correlated with socioemotional control and cognitive control. In addition, in order to see the differences in gender, race/ethnicity, and attachment style between the co-sleeping group and the sleep-alone group, preliminary chi-square tests were conducted. The results show that there is no difference by gender for sleeping arrangement; however, sleeping arrangement was found to be significantly associated to races and ethnicity,  $\chi^2(7, N = 1113) = 232.08, p < .001$ . By comparing the percentage of co-sleeping children among each races and ethnicity, Black, Hispanic, and Asian parents are more likely to co-sleep their children at preschool age than White. Moreover, sleeping arrangement was found to be related to attachment style. Within the sleep-alone group, more of the children were securely attached compared to the group of co-sleeping children,  $\chi^2(2, N = 1113) = 12.49, p = .002$ . Seventy-six percent of children who slept alone were securely attached children, and 66% of children who were co-slept were securely attached children.

A series of t-tests were conducted to examine the difference between the co-sleeping

group and the sleep-alone group in socioeconomic status and general self-regulation functioning. The result shows that co-sleeping children ( $M = 2.55$ ,  $SD = 1.32$ ) have a lower family socioeconomic status,  $t(1000) = 16.11$ ,  $p < .001$ , than the group of children sleeping alone ( $M = 3.78$ ,  $SD = 1.19$ ). In addition, in general, sleep-alone children ( $M = 56.21$ ,  $SD = 8.75$ ) have higher self-regulation than co-sleeping children ( $M = 54.64$ ,  $SD = 8.53$ ),  $t(1100) = 3.13$ ,  $p = .002$ . In addition to general self-regulation, sleep-alone children ( $M = 27.60$ ,  $SD = 4.85$ ) have a higher cognitive control score than co-sleeping children ( $M = 26.49$ ,  $SD = 4.78$ ),  $t(1100) = 3.85$ ,  $p < .001$ . There is no difference in socioemotional control between sleep-alone children and co-sleeping children.

### **Primary Analysis**

Three sets of multiple regression tests were carried out to determine the strength of relationship between sleep arrangement and self-regulation functioning controlling for the covariates: gender, race/ethnicity, attachment style of the child, and family socioeconomic status. The first set of multiple regressions examined the relationship between sleep arrangement and the general self-regulation functioning in preschool age children controlling for the covariates. It shows that the model was able to significantly predict general self-regulation,  $F(9, 900) = 6.98$ ,  $p < .001$ , but it can account for a very small portion of the general self-regulation,  $R^2 = .068$ . Sleep arrangement was a significant predictor of the general self-regulation but in the opposite direction than hypothesized. Sleep-alone children were found to have higher general self-regulation than co-sleeping children,  $b = 2.2$ ,  $t = 3.76$ ,  $p < .001$ , but the effect size of sleep arrangement is relatively small, partial  $\eta^2 = .005$ . In addition, in the model, gender is a significant predictor of general self-regulation,  $b = -3.28$ ,  $t = -5.69$ ,  $p < .001$ , but race/ethnicity, attachment style, and family socioeconomic status were not significant predictors of general self-regulation.

The results are presented in Table 3.

Another two sets of multiple regressions were carried out to examine the relationship between sleeping arrangement and each type of self-regulation. The model with one construct of self-regulation as dependent variable and all other variables was tested. The second set of multiple regressions was used to test the relationship between sleep arrangement and socioemotional control while controlling for cognitive control and the other covariates. The results are showed in Table 4. Only cognitive control was able to significantly predict socioemotional control. Therefore, a modified model in which cognitive control was taken out was tested using multiple regression. In this model, the results show that sleep arrangement at age 2 was not a significant predictor of socioemotional control at preschool age.

The final set of multiple regressions tested the relationship between sleep arrangement and cognitive control while controlling for socioemotional control and the other covariates. The results are presented in Table 5. This model showed that only children's gender and socioemotional control were significant predictors of cognitive control. Nevertheless, sleep arrangement is found to be a marginally significant predictor for cognitive control. Sleeping-alone is a more effective predictor of cognitive control score than co-sleeping,  $b = .56$ ,  $t = 1.82$ ,  $p = .068$ . Another multiple regression was conducted to examine the strength of the relationship between sleep arrangement and cognitive control by controlling only children's gender because, in the previous model, other covariates were not able to significantly account for cognitive control. Socioemotional control was removed from the model as well because of the high correlation with cognitive control. This modified model is statistically significant,  $F(2,900) = 29.53$ ,  $p < .001$ , but it can only account for a small portion of variance of

cognitive control,  $R^2 = .061$ . Sleep arrangement is a significant predictor of cognitive control, and sleeping-alone was more likely to be an effective predictor of cognitive control than co-sleeping,  $b = 1.43$ ,  $t = 4.49$ ,  $p < .001$ . However, sleep arrangement can only account for a marginally proportion of cognitive control in the model, partial  $\eta^2 = .022$ .



## **CHAPTER 4**

### **DISCUSSION**

This study aims to examine if a child's sleeping arrangement in toddlerhood has an impact on later self-regulation functioning in preschool age. In addition, the study examined which self-regulation construct is more likely to be influenced by sleeping arrangement. The results of the study show that children who slept alone in toddlerhood have higher later self-regulation functioning in cognitive control than their counterparts who co-slept with parents, but there is no significant difference in socioemotional control between two groups of children.

The study found that, overall, children who sleep alone were rated higher in self-regulation than co-sleeping children. Literature suggests that co-sleeping practice fosters children's physical regulation (Richard et al., 1998; McKenna, 2000), cortisol regulation (Beijers et al., 2013) as well as cognitive development (Okami et al., 2002). However, the result is not consistent with the assumption that co-sleeping children might have higher self-regulation than sleep-alone children. One explanation for the inconsistency is that the sleep arrangement data may lack detailed information. The sleep arrangement data were collected through asking parents where the child usually sleeps. The data did not contain the information about whether or not parents accompany children when they fall asleep, whether or not the child will go to the parents' room at night, or asking the parents if they have ever co-slept their children before. Kopp (1982) suggested that self-regulation development is a process of internalization. Children learn the ability to self-regulate from external regulation. Therefore, the information about

keeping the child company while falling asleep and whether or not children need their parents' company at night provides researchers with a more comprehensive view about whether or not the child had received external regulation regarding to sleeping practice.

The second explanation of the inconsistency in the results is that the data were collected for children aged 2 and may not be informative enough to reflect the early co-sleeping experience of children. One study suggests that about 50% of the U.S. parents are likely to co-sleep their babies either all night or part of the night, and the parents are likely to co-sleep their babies before age 16 weeks (Willinger et al., 2003). Taking this into account, it may be that some of the children in the analytic sample who were reported as sleep-alone children may have been co-slept before, resulting in a better self-regulation. If the child who had an earlier co-sleeping experience acted self-regulated, parents may have been less likely to co-sleep them when they were age 2. It is also possible that parents are less worried about the child sleeping alone if the child showed self-regulated behaviors; by contrast, children with lower self-regulated capability and have trouble self-regulating may be more likely to be co-slept with parents. This may be the reason why co-sleeping children who were age 2 have a lower self-regulation score than sleep-alone children. The study did not look at the change in self-regulation over time; however, the findings may reflect that the relationship between sleep arrangement and self-regulation changes over time. The relationship between sleeping arrangement in toddlerhood and later self-regulation may be not as strong as the relationship between sleeping arrangement in infancy and later self-regulation. It is possible that the power of co-sleeping on self-regulation development may be wiped out with an age increase.

Another major finding of the study is that sleeping arrangement in toddlerhood was not a significant predictor for socioemotional control, but it was a marginally significant

predictor for cognitive control. Okami and his colleagues (2002) found a significant correlation between co-sleeping at age 5 months and cognitive competency at 6 years old. Children who co-slept at 5 months showed higher cognitive competency at age 6. Although the results show an opposite direction than the literature suggested, these may be attributed to the data collection process because the data on co-sleeping were not collected at a young enough age. In addition, the study found that sleeping arrangement associates with cognitive control but not socioemotional control. It indicates that sleeping arrangement at age 2 may have a stronger association with cognitive development than with socioemotional development at preschool age.

Attachment style was found to be correlated with sleeping arrangement. The literature suggested that parents who co-slept their babies who were around 10 weeks old reported they perceived a more intimate relationship with their infant (Ball et al., 1999). Although there is little evidence about the relationship between sleeping arrangement and infants' attachment style, based on the literature, sleeping arrangement is suggested to be a predictor of attachment style. Co-sleeping infants were more likely to become securely attached infants than sleep-alone infants. However, the results of the study show that more securely attached children in the analytic sample were sleep-alone children than co-sleeping children. The inconsistent result comparing with literature may be attributed to the data collection which did not collect co-sleeping data at a young enough age of children.

Nevertheless, it may also suggest that there is an interaction effect among children's age, attachment style, and sleeping arrangement in self-regulatory development. In infancy, securely attached children may be more likely to co-sleep with parents, while insecurely attached children may be less likely to co-sleep with parents. This sleeping

arrangement in infancy may influence self-regulatory development so that securely attached children develop higher self-regulation than insecurely attached children. Going into toddlerhood, parents with securely attached children may stop co-sleeping because their babies are likely to be highly self-regulated; on the other hand, parents with insecurely attached children may be more likely to continue their original sleeping arrangements, or they may start co-sleeping their children because their babies are likely to have difficulty regulating themselves during bedtime. Therefore, the attachment style of children may be a predictor of sleeping arrangement in infancy, and the early sleeping arrangement may be the indicator for self-regulatory development.

The study also revealed that there is a cultural difference in co-sleeping practice. The result shows that the Black, Hispanic, and Asian parents are more likely to co-sleep with their children than the White parents. This result may be utilized to explain one of the findings that lower socioeconomic status parents are likely to co-sleep with their children. The literature also suggests that the co-sleeping practice varies among cultures (Barajas, Martin, Brooks-Gunn, & Hale, 2011). However, the motivations for parents to co-sleep with their children in different cultures are still unclear. There may need to be more in-depth cross-cultural studies about the impact of different motivations toward co-sleeping on child development.

The literature suggested that co-sleeping practice have positive influence on children's physical development on periodic breath (Richard et al., 1998), cortisol regulation (Beijers et al., 2013), and cognitive competency (Okami et al., 2002), which indicate that co-sleeping practice may have positive influences on self-regulatory development. The study found that sleep arrangement has a marginal influence on cognitive control. Even though the result is inconsistent with the literature, the

inconsistency may be attributed to the use of secondary dataset that the data were not collected at a young enough age of children.

### **Limitation**

Using a secondary dataset restricts the existing study design and data collection procedures. The objectives of the study may not be consistent with the aims of the research used to construct the dataset. The study used ECLS-B secondary dataset for data analyses, and it has three major drawbacks and limitations which may have impact on the validity of the studies.

First, the sleep arrangement data were only collected at wave 2 in which children were age 2, and the data were collected through parental report of the question “where your child usually sleeps.” Utilizing this question to categorize children into sleep-alone children or co-sleeping children may not be highly effective. The data did not provide any information about whether they co-slept their children before age 2. Therefore, the sleep arrangement variable may have poor validity. It may not be able to reflect the co-sleeping experience of the child, resulting in a limitation of the study.

The second limitation of the study is that there were too many children in the original sample who did not receive the assessment of self-regulation. Over one-third of the children in the original sample were dropped due to the lack of a self-regulation score. Therefore, the representativeness of the analytic sample may be problematic. It may only contain the child who was sent to an early child care program at age 2.

The third limitation of the study is that the self-regulation of children was reported by early child care and educational providers’ retrospectives instead of observing and evaluating the child’s behaviors in certain time periods. The early child care provider’s perception towards the child may have had an impact on rating the child’s self-regulation

functioning, resulting in a bias of the data. Moreover, items used to evaluate self-regulation functioning emphasize problem behaviors more than positive behaviors. For example, the item used to assess children's concentration was stated as "the child has difficulty concentrating" rather "the child can concentrate well." Utilizing the negative direction items on the assessment may guide teachers and care providers to emphasize the child's problem behaviors instead of their self-regulation functioning, and it may cause a validity problem with the evaluation.

### **Implications for future study**

This study explores the effect of sleeping arrangement in toddlerhood on self-regulation functioning in preschool age children. Some of the findings of the study are worth more future investigation. Two main directions on sleeping arrangement research for future study are given regarding the findings.

First, the study found that there is a culture difference in co-sleeping practice. Future research about the cultural differences in the co-sleeping practice can focus on the motivation for co-sleeping practice among different cultures. Identifying how and why different cultural societies practice co-sleeping may facilitate our understanding of the nature of co-sleeping. Moreover, the discussion of the relationship between co-sleeping and child development may be brought to a deeper level through recognizing whether co-sleeping behavior per se or the motivation for co-sleeping, such as increasing parent-infant intimacy, has greater impact on child development.

Second, based on the literature, co-sleeping practice at infancy is assumed to have a direct influence on children's self-regulatory development. The study's inconsistent result with the literature indicates that the relationship between sleeping arrangement and self-regulatory development may be wiped out with time. Future research regarding

sleeping arrangement and self-regulatory development is encouraged to focus on parents' perspective on the sleeping arrangement transition from co-sleeping to putting children to sleep alone. Identifying the reason why and when parents decide to put their children to sleep alone would lead to more in-depth understanding of parent perceptions towards co-sleeping as well as the impact of early co-sleeping experience on child development.

In conclusion, maybe due to the quality of data and limitations of the use of secondary dataset, this study only found a weak relationship between sleeping arrangement in toddlerhood and cognitive control in preschool age children. However, this exploratory study on sleeping arrangement and self-regulation brought out valuable directions for future study. Many parents and pediatricians hold a misunderstanding about co-sleeping and believe that co-sleeping behavior may jeopardize their infants during sleeping. This study reviewed the literature about benefits of co-sleeping and provided a comprehensive view on how co-sleeping practice may have a positive impact on self-regulatory development. As a matter of fact, this study found that sleeping arrangement is associated with self-regulatory development, but more efforts are needed to be made in this area of study to recognize the effect of co-sleeping. The nature of co-sleeping is still a topic that needs to be explored. Through understanding the relationship between co-sleeping and development, health care providers will be able to provide useful suggestions and information on parenting regarding sleep practice to parents.

## TABLES

Table 1

*Sleep Arrangement of Children, Race/Ethnicity, Attachment Style, Family Socioeconomic Status, and Self-regulation Variables: Descriptive Statistic (N=1113)*

Variables	<i>Frequency</i>	<i>Percentage</i>	<i>M</i>	<i>SD</i>	<i>Range</i>	<i>α</i>
<i>Sleep Arrangement<sup>a</sup></i>					<i>0-1</i>	
Sleep-alone	626	56				
Co-Sleeping	487	44				
<i>Race/Ethnicity<sup>b</sup></i>					<i>1-5</i>	
White	634	57				
Black	159	14				
Hispanic	243	22				
Asian	28	3				
Other	48	4				
<i>Attachment Style<sup>c</sup></i>					<i>1-3</i>	
Type A, Avoidant	196	18				
Type B, Secure	767	69				
Type C, Ambivalent	107	10				
Family SES			3.25	1.39	1-5	
Socioemotional Control			28.52	4.62	0-35	.84
Cognitive Control			27.11	4.85	0-35	.84

<sup>a</sup>Sleep arrangement: 0 = sleep-alone, 1 = co-sleeping;

<sup>b</sup>Race/Ethnicity: 1 =White, 2 =Black, 3 =Hispanic, 4 =Asian, 5 =Other

<sup>c</sup>Attachment style: 1 = Type, A Avoidant; 2 = Type, B secure; 3 = Type, C Ambivalent



Table 2

*Family Socioeconomic Status (SES), and Self-regulation Variables: Correlation (N=1113)*

Variables	1	2	3
1. SES	–		
2. Socioemotional control	.091**	–	
3. Cognitive control	.141**	.663*	–

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

Table 3  
*Summary of Multiple Regression Analysis for Variables Predicting General Self-regulation (N = 1113)*

Variable	Model		
	<i>b</i>	<i>SE</i>	<i>partial</i> $\eta^2$
Sleep arrangement			
Sleep-alone	1.517*	.699	.005
Co-sleeping	0		
Gender			
Male	-3.275*	.575	.036
Female	0		
Race/Ethnicity			
White	.299	1.965	.000
Black	-1.281	2.144	.000
Hispanic	.176	2.035	.000
Asian	7.280	8.659	.001
Other	0		
Attachment style			
Avoidant	-2.311*	1.121	.005
Secure	-.899	.966	.001
Ambivalent	0		
SES	.368	.248	.003
<i>R</i> <sup>2</sup>			.068

\**p* < .01

Table 4

Summary of Multiple Regression Analysis for Variables Predicting Socioemotional Control ( $N = 1113$ )

Variable	Model 1			Model 2		
	<i>b</i>	<i>SE</i>	<i>partial</i> $\eta^2$	<i>b</i>	<i>SE</i>	<i>partial</i> $\eta^2$
Sleep - Sleep-alone	.008	.296	.000	.578	.380	.003
Sleep - Co-sleeping	0	.	.	0	.	.
Gender - Male	-.291	.247	.002	-1.419*	.313	.023
Gender - Female	0	.	.	0	.	.
Race/Ethnicity - White	.153	.830	.000	.208	1.068	.000
Race/Ethnicity - Black	.479	.905	.000	-.186	1.165	.000
Race/Ethnicity - Hispanic	.854	.859	.001	.598	1.106	.000
Race/Ethnicity - Asian	.978	3.657	.000	3.359	4.706	.001
Race/Ethnicity - Other	0	.	.	0	.	.
Attachment style - Avoidant	-.851	.474	.004	-1.403*	.609	.006
Attachment style - Secure	-.378	.408	.001	-.575	.525	.001
Attachment style - Ambivalent	0	.	.	0	.	.
SES	.094	.105	.001	.198	.135	.002
Cognitive Control	1.607***	.025	.822			
$R^2$		.834			.043	

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

Table 5

Summary of Multiple Regression Analysis for Variables Predicting Cognitive Control ( $N = 1113$ )

Variable	Model 1			Model 2		
	<i>b</i>	<i>SE</i>	<i>partial</i> $\eta^2$	<i>b</i>	<i>SE</i>	<i>partial</i> $\eta^2$
Sleep - Sleep-alone	.560 <sup>a</sup>	.307	.052	1.433***	.319	.022
Sleep - Co-sleeping	0	.	.004	0	.	.
Gender - Male	-.928***	.255	.015	-1.911***	.314	.039
Gender - Female	0	.	.	0	.	.
Race/Ethnicity - White	-.045	.861	.000			
Race/Ethnicity - Black	-.973	.939	.001			
Race/Ethnicity - Hispanic	-.812	.892	.001			
Race/Ethnicity - Asian	1.722	3.795	.000			
Race/Ethnicity - Other	0	.	.			
Attachment style - Avoidant	.009	.493	.000			
Attachment style - Secure	.052	.423	.000			
Attachment style - Ambivalent	0	.	.			
SES	.041	.109	.000			
Socioemotional Control	.654***	.027	.397			
$R^2$		.442			.061	

<sup>a</sup> $p = .068$ . \*\*\* $p < .001$ .

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