

VILNIUS UNIVERSITY

Rima Breidokienė

THE BIOLOGICAL AND PSYCHOSOCIAL FACTORS OF EARLY SELF-
REGULATION

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Scientific supervisor:

Assoc. Prof. Dr. **Roma Jusienė** (Vilnius University, Social Sciences, Psychology–06S)

The dissertation defense is at the Vilnius University Council for Research in Psychology.

Chair:

Prof. Dr. **Gintautas Valickas** (Vilnius University, Social Sciences, Psychology–06S)

Members:

Assoc. Prof. Dr. **Gražina Gintilienė** (Vilnius University, Social Sciences, Psychology–06S)

Assoc. Prof. Dr. **Audronė Liniauskaitė** (Klaipėda University, Social Sciences, Psychology–06S)

Assoc. Prof. Dr. **Dalia Nasvytienė** (Lithuanian University of Educational Sciences, Social Sciences, Psychology–06S)

Assoc. Prof. Dr. **Liuda Šinkariova** (Vytautas Magnus University, Social Sciences, Psychology–06S)

Opponents:

Assoc. Prof. Dr. **Rasa Barkauskienė** (Vilnius University, Social Sciences, Psychology–06S)

Prof. Dr. **Rita Žukauskienė** (Mykolas Romeris University, Social Sciences, Psychology–06S)

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Rima Breidokienė

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Mokslinė vadovė:

Doc. dr. **Roma Jusienė** (Vilniaus universitetas, socialiniai mokslai, psichologija–06S)

Disertacija ginama Vilniaus universiteto Psichologijos mokslo krypties taryboje:

Pirmininkas:

Prof. dr. **Gintautas Valickas** (Vilniaus universitetas, socialiniai mokslai, psichologija–06S)

Nariai:

Doc. dr. **Gražina Gintilienė** (Vilniaus universitetas, socialiniai mokslai, psichologija–06S)

Doc. dr. **Audronė Liniauskaitė** (Klaipėdos universitetas, socialiniai mokslai, psichologija–06S)

Doc. dr. **Dalia Nasvytienė** (Lietuvos edukologijos universitetas, socialiniai mokslai, psichologija–06S)

Doc. dr. **Liuda Šinkariova** (Vytauto Didžiojo universitetas, socialiniai mokslai, psichologija–06S)

Oponentai:

Doc. dr. **Rasa Barkauskienė** (Vilniaus universitetas, socialiniai mokslai, psichologija–06S)

Prof. dr. **Rita Žukauskienė** (Mykolo Romerio universitetas, socialiniai mokslai, psichologija–06S)

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INTRODUCTION

Relevance of the topic. A substantial body of recent research shows that self-regulation is one of the major achievements in childhood (Bronson, 2000). Thus it is an important developmental construct, associated with psychosocial development, academic performance, and psychopathology. Individual differences in self-regulation are apparent early in life and refer to inter-related abilities of a child to regulate his arousal, attention, behavior, and emotions in response to internal and external requirements (Calkins & Fox, 2002; Blair & Razza, 2007). There is a growing consensus that children with higher self-regulatory abilities are better at managing behavior, attention and emotions, thus they are linked to behavior more constructively and in a socially appropriate way in social interactions (Eisenberg & Fabes, 1992; Dennis, Brotman, Huang & Gouley, 2007). The majority of studies also found the concurrent and longitudinal significant negative links between self-regulation and related constructs and externalizing problems (e.g., Eiden, Edwards & Leonard, 2007; Eisenberg et al., 2005). Children who are better at regulating their behavior, attention, and emotions are able to adjust to contextual and situational changes flexibly and spontaneously, and, when necessary, to delay (control) their reactions (Eisenberg et al., 2001). The findings of the research show that self-regulation is linked to social competence (Eisenberg et al., 2003; Spinrad et al., 2007), compliance and moral development (Kochanska, Coy & Murray, 2001), and academic achievements (Blair & Razza, 2007; McClelland et al., 2007). Emerging evidence also highlights that self-regulation is a significant factor that mediates the effect of parenting behavior on a child's psychosocial adjustment (Schatz, Smith, Borkowski, Whitman & Keogh, 2008; Eiden et al., 2007; Hardaway, Wilson, Shaw & Dishion, 2012). Thus, self-regulatory abilities have a great significance for a child's optimal development and so far it is important to explore which of the biological and psychosocial factors are associated with individual self-regulatory differences. One of the major tasks of developmental psychology in the last few decades was to understand why these individual differences are emerging and how to help children with self-regulatory problems (Thompson, 2009).

According to P. Karoly (1993), self-regulation refers to internal and transactional processes that enable an individual to guide his or her goal-directed activities over time

and across changing contexts. It is known that self-regulatory abilities emerge early in life and are shaped by a child's nature and experience (Kopp, 1982, Kochanska, Murray & Harlan, 2000; Posner & Rothbart, 2000). If 30 years ago it was used to self-regulatory problems were believed to represent inefficient parenting practices, today researchers know much more about the origin of self-regulatory competence in brain development, early social experience, and temperamental individuality (Thompson, 2009). The origins of self-regulatory problems are also better understood. But there are still unanswered questions. It might be that different risk factors have a different impact on child self-regulation in different developmental stages. At which stage psychosocial factors have the strongest impact? Is it in infancy when self-regulation is dyadic in nature and depends on the quality of mother-child interaction? Or is it during the 2nd and 3rd years of life when a child's self-differentiation and autonomy are developing and a child is learning to internalize requirements and values of adults? Which of the factors—inborn, e.g. temperamental characteristics, or external, e.g. maternal parenting practices or her emotional well-being, are more important for a child's self-regulatory abilities? Is self-regulation a unidimensional or multidimensional construct? If it is a multidimensional construct, which of the dimensions are the best at accounting for its structure? Are the predictors of these different self-regulatory dimensions the same or different? What is the expression of these self-regulatory dimensions in the sample of typically developing children from families without serious risk factors? What accounts for individual differences in this sample? The analysis of the results of the longitudinal study, implemented for four years, will help to answer part of these questions.

Despite a substantial body of research, the picture of early development of self-regulation is partly fragmented and inconsistent. The reason may be the different operationalization of self-regulation depending on the theoretical approach. Also, many researchers analyzed the links between separate self-regulatory abilities and particular external factors not taking into account the effect of mediating or moderating variables like gender differences, a child's neonatal functioning, or individual maternal characteristics as attitudes toward child-rearing or a maternal sense of self-efficacy. The psychosocial context, where a child grew up, e.g. maternal emotional state in pregnancy, the early postpartum period, or the quality of parental relationships, were also considered

only in part of the studies. In other words, there is a lack of research aiming to study not only single factors of self-regulation, but considering a broad spectrum of factors—psychosocial and biological, also interactions among these factors.

Different theoretical models and empirical data show that self-regulatory abilities are apparent and stabilize in childhood and adolescence (Kopp, 1982; Kochanska et al., 2000). The evidence highlights that the foundation for self-regulation is laid during the first three years and the abilities that are gained during this period have a long-term effect on the development of child self-regulation (Raikes, Robinson, Bradley, Raikes & Ayoub, 2007). Self-regulatory abilities stabilize around the fourth years of life (Murphy, Eisenberg, Fabes, Shepard & Guthrie, 1999), thus it is an important period to examine self-regulation and the factors that shape its development.

Scientific and practical novelty. Several aspects of this study are relevant and novel. First, little research with infants and young children has examined interactions between biologically-based and relationship-based processes in emerging self-regulation (Calkins & Fox, 2002). Usually only biological (e.g. child's gender, temperamental traits) or psychosocial factors (e.g. maternal emotional state or her parenting behavior) were considered; however, the effects of both of these groups of factors on self-regulation are under-researched. The longitudinal design of the current study makes it possible to explore causal relationships among early biological and family environment factors and to examine the effect of these factors on child self-regulation.

Temperamental reactivity is attributed to biological factors in the current study. Another group of biological factors refers to a child's neonatal health and birth conditions. It is important to stress that little research has examined the effects of a child's birth conditions (e.g. delivery mode) on the further development of self-regulation in early childhood. The majority of this research focused on risk group infants like children born preterm (e.g., Poelmann, Schwichtenberg, Bolt & Dilworth-Bart, 2010), neglecting the potential effects of delivery mode on child self-regulation in the sample of typically developing children. The effect of delivery mode might be direct (e.g. in the case of highly complicated delivery because of hypoxia or other adverse conditions the brain structures involved in self-regulation might be impaired), or indirect (maternal factors might be mediators). Several pieces of research suggest that emergency

Caesarean delivery mode increases the risk of postpartum depression (Boyce, Stubbs & Todd, 1993; Hannah, Adams, Lee, Glover & Sandler, 1992; Petrosyan, Armenian & Arzoumanian, 2010) and posttraumatic stress symptoms (Leeds & Hargreaves, 2008). These symptoms might have a negative effect on maternal interaction with infants and on parenting behavior. This may be the reason for complication of optimal development of self-regulation. So far the current study aims to examine, whether birth conditions have a significant impact on self-regulation in early childhood.

Another new aspect of the current work is the exploration of the specific factors, related to *hot* and *cool self-regulation*. Emerging evidence highlights the value of distinguishing dimensions of self-regulation to understand its developmental correlates and implications. A number of studies have reported data suggesting the distinction of hot and cool dimensions of self-regulation. Generally, “hot” self-regulation is the dimension of self-regulation requiring a control of activities with a salient emotional component (typically, an affectively positive or negative consequence), “cool” self-regulation is the dimension of self-regulation requiring the control of emotionally neutral activities (Allan & Lonigan, 2011; Brock, Rimm-Kaufman, Nathanson & Grimm, 2009; Kim, Nordling, Yoon, Boldt & Kochanska, 2013). Research suggests that different parts of the brain are involved in hot and cold self-regulation (Denham, Warren-Khot, Basset, Wyatt & Perna, 2012). Some studies show that hot and cool self-regulation may differentially predict developmental outcomes and may have different predictors. Cold self-regulation significantly predicts a child’s cognitive functioning (Hongwanishkul, Happaney, Lee & Zelazo, 2005) and hot self-regulation is linked to attention and activity problems (Willoughby, Kupersmidt, Voegler-Lee & Bryant, 2011). Thus, hot self-regulation is related to a child’s socio-emotional development and cool self-regulation—to cognitive development. Despite the growing evidence of two factors of self-regulation (hot and cool dimensions) and differential developmental outcomes (this is very purposeful in planning early prevention and intervention of self-regulatory problems) there is a lack of research on whether the same or different factors predict hot and cool self-regulation. The current work aims to examine the latent structure of the self-regulation construct and to investigate if a two factor hot/cool model is suitable to

describe this structure. It also aims to examine the specific antecedents of hot and cool self-regulation.

In terms of *transactional developmental theory* (Sameroff & Fiese, 2000), the developmental outcomes are better predicted by examining the accumulation of risk factors rather than focusing on single indicators. Empirical evidence shows that the experience of more than one risk factor is related to less optimal outcomes on a child's health, cognitive, and behavioral development (e.g. Sameroff, Bartko, Baldwin, Baldwin & Seifer; Larson, Russ, Crall & Halfon, 2008). The majority of risk factors are inter-related, e.g. young maternal age, low maternal education, and single parenthood; thus, it is purposeful to accumulate them. The recent research analyzed the effects of cumulative risk on child self-regulation (e.g. Lengua, 2002; Lengua, Honorado & Bush, 2007; Lengua et al., 2013), though usually they focused on socio-demographic or psychosocial cumulative risk rather than on biological neonatal risk. So far one of the objectives of the current study is to test whether cumulative risk is more related to self-regulation in early childhood than single factors. It might be that some self-regulatory abilities are better predicted by specific risk factors and other self-regulatory abilities are better predicted by cumulative risk.

One more new aspect of the current study is using a *person-oriented approach* in order to understand how self-regulation is related to risk factors in different ecological levels. A person-oriented approach will be used to distinguish children's groups, or latent class, sharing the similar cumulative risk characteristics. A person-oriented approach can provide unique information how an individual's entire spectrum of risk factors interact to predict negative outcomes (Cicchetti & Rogosch, 1993). A person-oriented approach also has important practical implications, as it makes it possible to discriminate children's groups, sharing particular constellations of risk factors, and refining and targeting preventive interventions for these groups.

It is worth mentioning that the current study is focusing on exploration of antecedents, related to individual differences in self-regulation, in typically developing and low risk children's sample. The majority of recent research focuses on problem samples such as low-income families (e.g. Li-Grining, 2007, Lengua et al., 2013) or children born preterm (e.g. Poehimann et al., 2010). It is not clear if it is possible to

generalize the findings of the studies of risk samples and apply them for typically developing, no-problem samples. Thus the participants of the current study are typically developing children from families with low risks.

The current work is based on transactional developmental theory and ecological theory. *Ecological theory* emphasize that an individual in the course of time is affected by multiple levels of context (Bronfenbrenner, 1986). A growing body of empirical research points to the importance of dynamic interactions between children's biologically-based characteristics, parenting and the larger social context in predicting children's health and development (Bronfenbrenner & Ceci, 1994). Children's proximal and distal processes or factors are recognized. The development is more affected by proximal factors, emerging in a person's immediate context and mediating the effects of distal factors (Bronfenbrenner & Ceci, 1994). The theoretical background of the current work is constructed based on the assumption that self-regulation in early childhood is better predicted by factors of proximal environment (e.g. parenting behavior), that mediate the link between self-regulation and distal factors (e.g. socio-demographic environment of family).

So far taking into account the purpose of the doctoral work—to reveal biological and psychosocial predictors of early self-regulation—we distinguish two groups of factors: ***biological and family environment factors***. The self-regulation in the current study is measured in two ways: using the maternal reports and direct observational measures.

The biological factors in the current study are delivery mode, child neonatal functioning, measured in Apgar scores at 1 and 5 min, child's gender, age, cognitive functioning, and indicators of temperamental reactivity (e.g. crying in infancy, problem behavior, negative affectivity, and extraversion). ***The family environment factors*** consist of family emotional and socio-demographic environment and maternal parenting practice (behavior). *Family emotional and socio-demographic environment* is described by these variables: 1) socio-demographic variables—family composition, maternal and paternal education, maternal age; 2) maternal emotional health in pregnancy and the postpartum period; 3) pregnancy planning and its emotional acceptance; 4) subjective evaluation of relationships with a husband/partner. Based on the ecological theory and

the findings of empirical research, we make an assumption that the effect of family emotional and socio-demographic environment is indirect and evident through particular *maternal parenting practice* with children. The variables of maternal parenting practice in this study are maternal child-rearing attitudes, maternal self-efficacy and maternal responses toward children’s negative emotions. The theoretical model of the current doctoral work is presented in Figure 1.

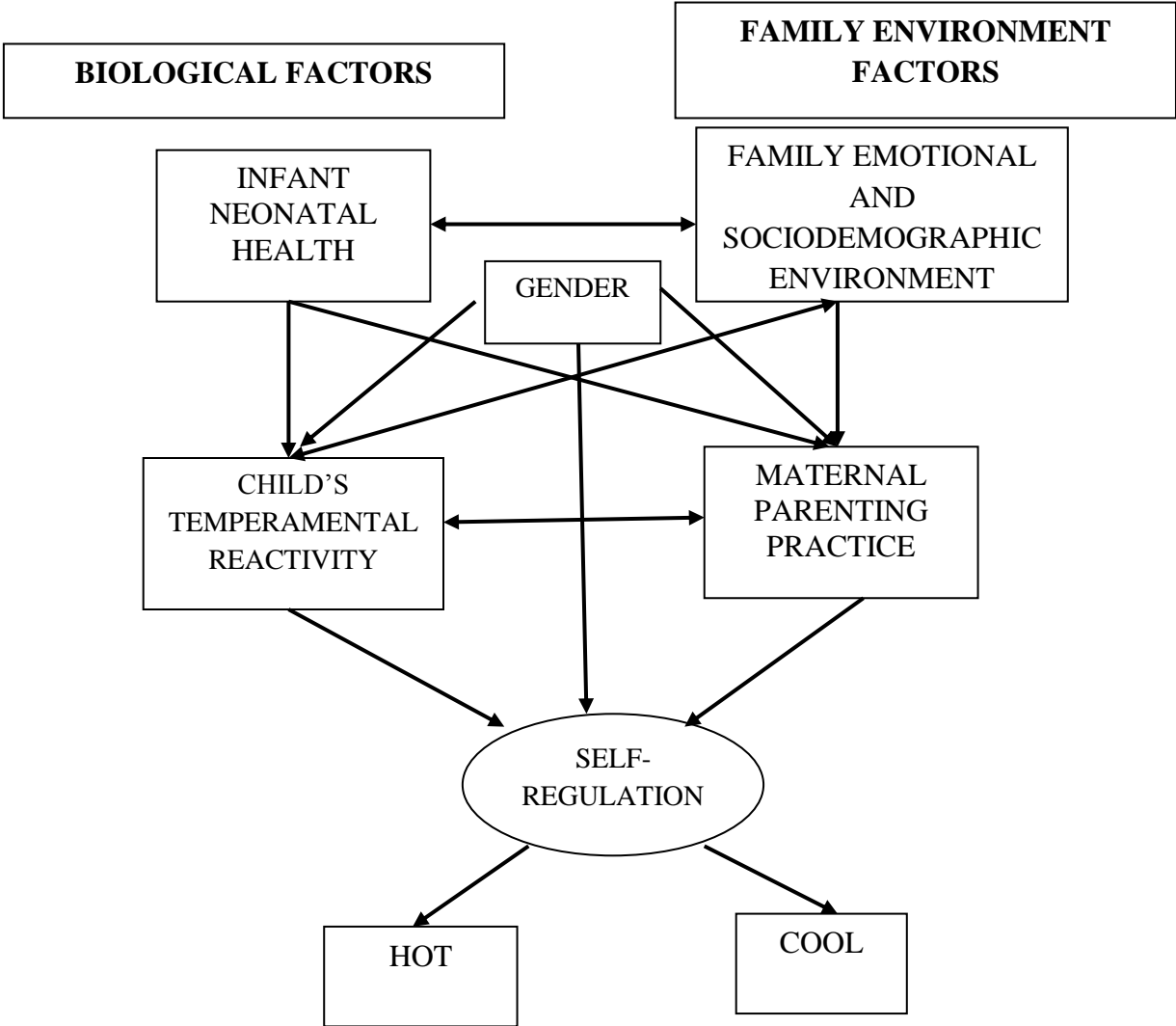


Figure 1. The theoretic model of the current work

In terms of this theoretic model, self-regulation, which has two dimensions (hot and cool dimensions), is directly predicted by child temperamental reactivity and maternal parenting practice. Infant neonatal health and family emotional and socio-demographic environment have an indirect effect. Biological factors and family environment factors are inter-related. A child’s gender has a direct impact on child temperamental activity and parenting practice. In other words, boys and girls differ in

their temperamental traits. Moreover, maternal practice with a child can differ depending on a child's gender. Child self-regulation is also affected by his or her age: self-regulatory abilities improve with age.

This model fits well with the modern concept of self-regulation: though individual self-regulatory differences are attributed to genetic or inborn temperamental characteristics (Eisenberg et al., 2003, Rothbart & Bates, 1998), self-regulation development is also shaped by the social and physical environment the child lives in. Such a thorough view of factors of self-regulation provides a unique insight about targets and objectives of practical interventions and preventions.

The results of the current work allow clarifying risk factors of self-regulatory problems and in such a way have practical implications for psychologists and other mental health specialists, working with young children and their parents. The specialists, who understand the mechanisms of self-regulatory problems, are better at planning individual help plans for children taking a complex of different factors into consideration: a child's temperament, family emotional and socio-demographic environment, and parenting behavior. The discovery of potentially modifiable direct and indirect factors can contribute to more effective implementation of prevention and intervention programs of self-regulatory problems.

Goal of the study

The object of the doctoral work is four years old children's self-regulation and its factors.

The aim of the doctoral work is to explore the main biological and psychosocial (family environment) factors of self-regulation, which of them account for self-regulatory abilities at the age of four years.

Objectives:

1. Test the structure of self-regulation at the age of four and the ability to describe hot and cool dimensions.
2. Identify children's profiles using a person-oriented approach (subgroups) according to the expression of hot and cool self-regulation and to make a comparative analysis of factors related to these profiles.

3. Explore which of the biological factors are significant for different self-regulatory abilities of four year old children.
4. Explore which of the family environment factors are significant for different self-regulatory abilities of four year old children.
5. Explore which biological and family environment factors predict hot and cool self-regulation.
6. Identify children's profiles using a person-oriented approach (subgroups) according to their cumulative risk in different ecological levels and to compare the self-regulatory abilities of the identified profiles.

Defended statements:

1. The two factor model is suitable to describe the structure of self-regulation at the age of four: hot self-regulation, referring to delay of gratification abilities, and cool self-regulation, referring to motor control, attention focus, cognitive control, and planning abilities. Children differ in expression of their hot and cool self-regulation.
2. Hot self-regulation is related to a child's gender and maternal emotional state, and cool self-regulation is related to the child's reasoning abilities, age, parental education, and parental behavior.
3. A child's temperamental reactivity and maternal parenting practice are direct predictors of self-regulation, whereas the impact of infant neonatal health and maternal emotional and socio-demographic environment is indirect.
4. Higher self-regulatory abilities are linked to lower socio-demographic, neonatal, maternal emotional health, and parenting behavior cumulative risk. Children differing in their cumulative risk in different ecological levels differ in their self-regulatory abilities.

METHOD

The participants of the study

Participants were 142 children (50% female) and their mothers. They have been taking part in the ongoing longitudinal study since 2009. Participant mothers gave birth to full term newborns (≥ 37 weeks) in one of the main clinics in Lithuania. The data of the doctoral dissertation were obtained while implementing several research group projects. The doctoral dissertation is a part of the research group project “Early development of self-regulatory skills” (the project is supported by Research Council of Lithuania, agreement no. MIP-014/2012).

The mean age of children participating in the study is 50.27 months ($SD = 1.53$); 65.5% of the mothers have a high level of educational; 92.3% are married; and, 53.2% of the children are first-borns.

The procedure of the study

The study is longitudinal in design. We report the data collected on the second or third day after delivery ($N = 142$), 3 months ($N = 116$), 6 months ($N = 116$), 12 months ($N = 113$), 18 months ($N = 118$), 2 years ($N = 115$), 3 years ($N = 109$) and 4 years ($N = 142$). The first stage was performed in the clinics, and included the collection of medical data about delivery and newborn functioning, as well as the collection of data from the mothers during their stay at hospital. At the other stages, except the last one stage, the questionnaires were sent to the mothers via e-mail or regular mail. At the last stage the battery of observational laboratory self-regulatory tasks and Raven’s Colored Progressive Matrices (CPM) was administered by trained researchers (interviewers). All the observational sessions were videotaped for future coding.

Of all the children, 37.6% participated in all 8 study stages. The analysis showed that the participant mothers of the recent study were more likely to have a higher education ($\chi^2 = 7.47$, $p = 0.024$). The participants don’t differ from non-participants according to maternal age ($t = 1.57$, $p = 0.123$), child gender ($\chi^2 = 0.01$, $p = 0.914$), paternal education ($\chi^2 = 1.01$, $p = 0.603$), family status ($\chi^2 = 0.65$, $p = 0.420$), or residential area ($\chi^2 = 0.65$, $p = 0.420$). Of the mothers who participated in all 6 stages

80.8% have a higher education. Thus, we can say that mothers with a higher education are more motivated to participate in all stages of the longitudinal study.

Measures

Assessment of biological factors

Delivery mode and Apgar scores 1 and 5 minutes after birth were identified at child's birth.

Infant problem behaviors were measured with the Women's Perception of Infant's Difficult Behaviors scale (Bornstein, Putnick, Suwalsky & Gini, 2004). The internal consistency (Cronbach α) coefficients at the age of 3 and 6 months were 0.64 and 0.60 respectively.

Child Extraversion and Negative Affectivity were assessed using the Children's Behavior Questionnaire Short Form (Rothbart, Ahadi & Hershey, 1994; Rothbart, Ahadi, Hershey & Fisher, 2001). This instrument contains 94 items describing the behavior of the child (aged 3 to 7 years old) within specific contexts (e.g. "My child gets angry when told he or she needs to go to bed"), and ratings refer to the degree to which statements accurately describes the child (*extremely untrue, quite untrue, slightly untrue, neither true nor untrue, slightly true, quite true, or extremely true*). Cronbach α is 0.87 for Extraversion, 0.80 for Negative affectivity.

The child's reasoning abilities at 4 years were measured by Raven's Colored Progressive Matrices Test. Raven's colored progressive matrices test consists of 36 matrices divided equally into three sets (A, AB, B). In each matrix there are six choices (answer alternatives). The correct answer is given a score of one whereas the wrong answer is given zero. Thus, the raw score on the colored progressive matrices test ranges between zero and 36. The psychometric properties of the test are acceptable in most of the studies (Raven, Court & Raven 1990, 2002). The reliability coefficient of the split-half method in the sample of four year olds is acceptable ($r = .70$) (Butkienė & Gintilienė, 2011).

Assessment of family environment factors

The participants were also asked whether the pregnancy was planned or not-planned in order to evaluate *pregnancy planning*. *The emotional reactions toward pregnancy* were evaluated by asking, “Which statement best reflects your reaction toward pregnancy?” with possible answers “happy,” “conflicting feelings,” “upset,” or “other.”

Maternal negative emotional experiences (distress) were evaluated on the 2nd and 3rd day after delivery, at 3 months, and 2 years after child birth by questions on how often during pregnancy they experienced emotions such as irritability/bad temper, feeling low and feeling nervous; mothers were given the possibility to choose one of five statements for each emotion: “almost daily,” “more often than once a week,” “almost every week,” “almost every month,” and “seldom or never” evaluated from 1 to 5 points. The total score was used to evaluate negative emotional experience, where a lower sum score indicates a more frequent negative emotional state. Cronbach alphas for this measure were .80 to .90 in our study.

Maternal difficulty to understand the infant’s crying reasons was assessed at 3 and 6 months using the scale from 1 (it is very difficult to understand crying) to 4 (it is very easy to understand crying).

The quality of the couple’s relationship was subjectively evaluated by mothers using the Likert scale, rating from “very good relationship” (1 point) to “very bad relationship” (5 points). Mothers were asked to evaluate the relationship with their husband or partner before and during pregnancy, and at the age of 3 months, 12 months, 18 months, 2 years, and 3 years.

Maternal depression was measured on the 2nd and 3rd day after delivery, and 3 months and 3 years after childbirth using the Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden & Sagovsky, 1987; Lapkienė et al., 2004). Cronbach alphas for this measure ranged from .81 to .89 in our study.

Maternal self-efficacy was assessed using the Leiden Parental Efficacy Questionnaire (Van Ijzendoorn, Bakermans-Kranenburg & Juffer, 1999) 18 months after childbirth (T3) rated on a 5 point scale (from *I certainly cannot*, to *I certainly can*). Cronbach alpha of scale in this study was .89.

To evaluate *stressful and traumatic experiences during pregnancy* women were asked whether or not they had experienced any stressful and traumatic events during pregnancy, as well as after 3, 6, 12, and 18 months, and 2 and 3 years.

Maternal attitudes toward infant care were assessed 3 months postpartum using the Infant-Rearing Attitudes and Beliefs Scale (Zeifman, 2003). The measure was used to assess the extent to which individuals hold “infant-centered” versus “parent-centered” views regarding infant care. Respondents were asked to indicate how much they endorse the viewpoint expressed in each of the eight statements on an 8 point scale ranging from *very strong agreement* to *very strong disagreement*. Cronbach’s alpha for this measure was 0.74.

Maternal responses to children’s negative emotions were assessed using the Coping with Children’s Negative Emotion Scale (CCNES; Fabes, Eisenberg & Bernzweig, 1990) 3 years after childbirth. This is a self-report measure where mothers respond to 12 hypothetical situations in which her child expresses distress (e.g., “If my child loses some prized possession and reacts with tears, I would...”). Based on previous research, two aggregates of strategies, e.g. supportive (problem-focused, emotion-focused, expressive encouragement) and non-supportive (distress, minimizing, punitive) responses, were calculated as averages of the subscales (Fabes, Poulin, Eisenberg & Madden-Derdich, 2002). Cronbach alphas in this study for supportive and non-supportive aggregates were .87 and .88 correspondingly.

Assessment of child self-regulation

Maternal reports

Child effortful control was assessed at 3 years of age using the Children’s Behavior Questionnaire Short Form (Rothbart, Ahadi & Hershey, 1994; Rothbart, Ahadi, Hershey & Fisher, 2001). Cronbach alpha of this scale is 0.70.

Child self-regulation was assessed at 4 years using the Self-regulation and Organizing of Activity Subscale from the Lithuanian scale of adaptive behavior (Černiauskaitė, 2002). The scale aims to evaluate a child’s everyday functioning in different spheres. The Cronbach alpha of the scale is high (0.86).

Observational measures

Attention and impulse control was assessed using the PSRA Assessor Report Form; Smith-Donalt, Raver, Hayes & Richardson, 2007). This is a 28 item scale aimed to assess a child's emotions, behavior, and impulsiveness throughout the assessor-child interaction. The Cronbach alpha for the attention and impulse control subscale is very high (0.91). Inter-rater reliabilities were calculated on the basis of a random selection of 11.97% of the sample that was coded independently by 2 coders. Intra-class correlation (ICC) for impulse and attention control subscale is high (0.87).

Snack Delay (Kochanska, Murray, Jacques, Koenig & Vandegest, 1996). Snack Delay taps a child's delay of gratification. In the Snack delay the child was asked to place his hands flat on a table and then asked to withhold from eating a candy placed in front of them. During six trials (0, 10, 20, 30, 40, and 60 seconds in length), children were instructed to delay eating until the interviewer rang a bell. Coders judged the extent to which children attempted to eat the candy on the scale of 1 (*eats the candy*) to 7 (*child waits successfully*). Additional points were added for keeping hands on the table: from 0 (*doesn't keep the hands on the table*) to 3 (*keeps the hands on the table 90-100% of the time*).

Gift Wrap (Kochanska et al., 1996). Gift Wrap taps a child's delay of gratification. In the Gift Wrap task, interviewers told children that they would be receiving presents but they could not peek at the presents while the presents were being wrapped. The interviewers then noisily wrapped the presents for 60 seconds behind the children's backs. The Gift Wrap task yielded three measures including latencies to turn and peek (ranging from 0 to 60 seconds) and a peek score (from 1 = turns body around to look and never returns fully forward to 5 = never turns around to peek). The peek score and latency measures were significantly inter-correlated (mean $r = 0.52$). Thus, a composite peeking score was created by averaging the standardized peek score and latencies to turn and peek. A high score on this composite indicated that the child was less likely to peek and better able to keep attention away from the tempting gift.

Walk-a-Line (Kochanska et al., 1996). The Walk-a-Line assessment situation taps gross-motor control. The children were asked to walk a line (6 feet long, 6 inches wide) first at normal speed, then two times slower from one end of the line to the other. Slow

trials were averaged and compared to the baseline trials in order to determine whether and how much child slowed down.

Circles (Kochanska et al., 1996). In *Circles* the children were asked to draw a circle between a larger and a smaller circle first at normal speed, second as quickly as possible, and third as slowly as possible. Comparing slow trials to baseline trials gives an indication of how well a child can slow down his fine motor activity.

Head and Feet (McCabe, Rebello-Britto, Hernandez & Brooks-Gunn, 2004). In the *Head and Feet* assessment children were asked to touch their feet when the interviewer said “feet” and to touch their head in response to a “head” command. Children were first taught to play the game, and then were given at least two practice trials. Practice trials were followed by 10 test trials. Children’s behaviors on individual trials were scored as 0 (*incorrect*), 1 (*switch to incorrect*), 2 (*switch to correct*), 3 (*correct*).

Truck Loading (Fagot & Gauvain, 1997; Carlson, Moses & Claxton, 2004). The task taps children’s planning abilities. In this task, children played the role of a mail carrier who needed to deliver party invitations. An inverted U-shaped street with arrows was drawn on a large piece of cardstock. The colors of the five houses matched the colors of five invitations. Children were asked to deliver the invitations to the houses using a small truck while adhering to four rules, namely a) the street is one-way and so one can drive in only one direction, b) one can drive around the block only once because invitations need to be delivered as quickly as possible, c) the color of the invitation must match the color of the house, d) invitations must be taken only off the top of the pile from the back of the truck. These rules were introduced one or two at a time to the children, with corresponding practice trials. There were four possible levels: from two houses to five houses on the street. Children were given two trials at each level, and their score corresponded to the highest level they achieved, for a total score of 0 to 4.

Attention focusing during the CPM B subtest. The children’s ability to focus and keep attention was measured during the last subtest of CPM. The subtest is too difficult for 4 year old children and provides low sensory stimulation, thus children have to pay attention voluntarily. Coders judged the extent to which children attempted to focus on the scale from 1 (*the child during all or almost all the episode provides haphazard*

responses, is inattentive, is not interested in accuracy) to 3 (*child takes time to look at pictures and make thoughtful choices*).

Inter-rater reliabilities were calculated on the basis of a random selection of 21.13% of the sample that was coded independently by 2 coders. Intra-class correlation (ICC) was used for continuous variables and Cohen's kappa for categorical variables. ICC in the study ranged from 0.74 to 0.95. Cohen's kappa for peeking score is 0.80.

Later, because tasks were scored on different scales, we rescaled them on a common scale (0-100; Cohen, Cohen, West & Aiken, 2003). The following formula was used: $N = 100 \times (I - \text{possible minimal score}) / (\text{possible maximal score} - \text{possible minimal score})$, where N is a new scale scores and I is old score. This transformation obtains the original shape of distribution while allowing for meaningful differences in variation to be studied (Cohen et al., 2003).

Cumulative risk

Risk is captured in a dichotomous fashion, with *the presence of risk* coded as 1 and *the absence of risk* coded as 0. The dichotomous risk indicators then are added to reflect the total number of stressors.

Socio-demographic cumulative risk. Five self-reported risks reflected socio-demographic cumulative risk in our study. A risk factor for maternal and paternal education indicated whether mother and father had low education status (Li-Grining, 2007). For family structure, single parenthood (i.e. mothers were alone, not married or cohabiting) and living with four and more minors were coded as risk factors (Deater-Deckard et al., 1998; Ackerman et al., 1999). In order to capture the challenges of early motherhood, young maternal age at child's birth (i.e. less than 21 years) was considered a stressor (Li-Grining, 2007).

Neonatal health cumulative risk. The following risk factors of the newborn's neonatal health were recorded: 1) low birth weight (i.e. lower than 2500 g.); 2) the child was delivered by emergency Caesarean section; 3) a low Apgar scores indicating the newborn's neonatal functioning (i.e. 7 and lower); 4) resuscitation of the newborn was administered.

Maternal emotional state cumulative risk. Three self-reported factors reflected maternal emotional state cumulative risk in our study: 1) maternal emotional state for

four years, 2) maternal emotional response to pregnancy. Mothers were coded as being at risk for depression if EPDS scores were at or above the clinical cutoff of 12 (Cox et al., 1987). Maternal emotional response to pregnancy was coded as 0 if it was positive (“happy” response) and coded as 1 if it was conflicted and upset.

Parenting cumulative risk. Three self-reported indices reflected parenting cumulative risk: 1) maternal attitudes toward child’s rearing (coded as 1, if the estimate at or below 1.5 SD); 2) low maternal self-efficacy (coded as 1, if the estimate is at or below 1.5SD); 3) non-supportive maternal response to child’s negative emotions (coded as 1, if the estimate was at or above 1.5 SD); 3) supportive maternal responses to child’s negative emotions (coded as 1, if the estimate was at or below 1.5 SD).

RESULTS

The structure of self-regulation

Three models for self-regulation tasks were examined using CFA. Model 1 was a single-factor model in which all self-regulation tasks were explained by a single factor. Model 2 was a two factor model in which the Hot factor consisted of Delay Snack and Wrap Gift tasks, and the Cool factor consisted of Head and Feet, Walk-a-Line, Circles, Truck Loading and Attention focusing during CPM B subtest tasks. Model 3 was a three-factor model in which the Delay factor consisted of Delay Snack and Wrap Gift, the Motoric factor consisted of Walk-a-Line and Circles tasks, and the Cognitive factor consisted of the rest tasks.

CFAs were conducted with MPlus version 6.0 using the rescaled data. The Satorra-Bentler Scaled Chi-square (S-B χ^2) difference test was used to determine if the model provided a significantly better fit than the alternative models. In the models, a comparative fit index (CFI) and Tucker-Lewis fit index (TLI) greater than .95 and a root-mean-square error of approximation (RMSEA) less than .05 (Hu & Bentler, 1998, Browne & Cideck, 1993) indicate a well fitting model.

Table 1. Good Fit Indices and Model Comparisons for Confirmatory Factor Analyses Models

Model	χ^2	DF	P	CFI	TLI	RMSEA	Factor Loadings	S-B χ^2 Difference
Model 1: 1 Factor	12.09	14	.60	1.00	1.05	.000	.42-.57	
Model 2: Hot/Cool	11.97	13	.53	1.00	1.03	.000	Hot: .44 -.49 Cool: .42 -.57	$\Delta\chi=1.02$; $\Delta df=1$; $p>.05$ Compared to Model 1
Model 3: Delay/Motoric/Cognitive	10.61	11	.48	1.00	1.01	.000	Delay: .42-.50 Motoric: .33-.35 Cognitive: .46-.57	$\Delta\chi=1.59$; $\Delta df=3$; $p>.05$ Compared to Model 1

Fit indices for the three models (see Table 1) revealed that all three models fit the data well, the S-B χ^2 test indicates that they don't differ significantly. However the factor loadings of the Model 3 are not sufficient, thus this model was rejected. As Model 1 and Model 2 don't differ, we propose that the two-factor structure of self-regulation, consisting of hot and cool dimensions, fit the data well in line with our theoretical presumptions. The rescaled scores of Snack Delay and Gift Wrap were aggregated into a total hot self-regulation score, and the rescaled scores of the rest self-regulation tasks were aggregated into a total cool self-regulation score.

The latent classes of hot-cool self-regulation

In order to investigate profiles of children according to the expression of their hot and cool self-regulation, we conducted Latent Class Analysis (LCA). LCA is conceptually similar to cluster analysis, but is based on a measurement model much like factor analysis. LCA is a model-based procedure in which models with different numbers of classes (e.g. one versus two, two versus three, etc.) can be compared by using parameter estimates, fit statistics, and model information criteria to determine the most parsimonious summary of all observed patterns of responses (Lanza, Rhoades, Nix, Greenberg & the Conduct Problems Prevention Research Group, 2010).

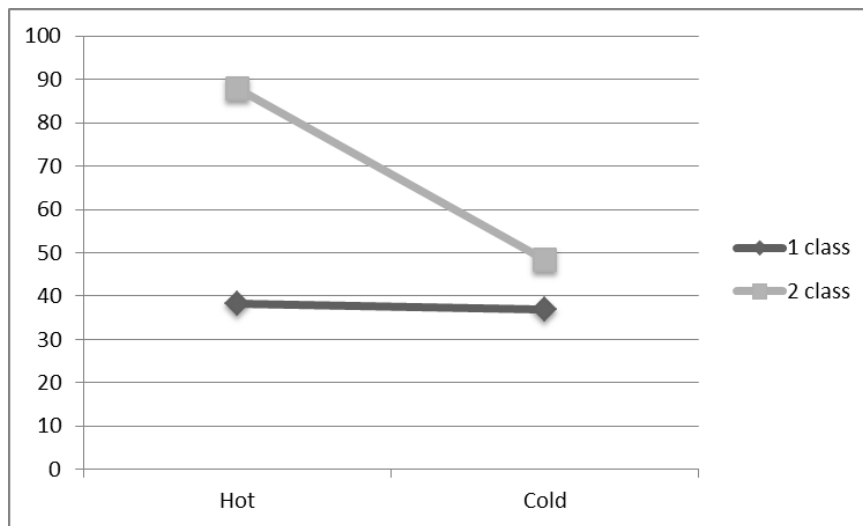


Figure 2. The identified latent classes of hot-cool self-regulation.

Two children’s classes were identified using an LCA: below average hot and cool self-regulation group (16.5% of children) and high hot self-regulation–average cool self-regulation (83.5% of children) (BIC = 2423.68, SSABIC = 2401.54, AIC = 2403.09, entropy = 0.927). High hot self-regulation-average cool self-regulation group scores were higher in maternal reports of child self-regulation at the age of four ($t = -2.64, p = 0.009$) and in maternal depression on the 2rd and 3rd day after delivery (Mann-Whitney $U = 523.00, p = 0.007$). There are more mothers among these children who have a university-type education ($\chi^2 = 12.18, p = 0.002$).

The biological and psychosocial factors related to child self-regulation

The socio-demographic factors related to child self-regulation. According to the research findings, the children’s age is significantly correlated to cognitive control ($r_s = 0.18, p < 0.05$), fine motor control ($r_s = 0.23, p < 0.01$), planning ($r_s = 0.26, p < 0.01$), cool self-regulation ($r_s = 0.31, p < 0.01$), attention and impulse control ($r_s = 0.21, p < 0.01$) and maternal reports of self-regulation ($r = 0.18, p < 0.05$). The children of mothers with different educational levels differ in their delay of gratification, measured by the Snack delay task ($\chi^2(2) = 8.80, p = 0.012$), cool self-regulation ($\chi^2(2) = 8.01, p = 0.018$), planning ($\chi^2(2) = 8.31, p = 0.016$) and attention and impulse control ($\chi^2(2) = 8.56, p = 0.014$): the children whose mothers have a university-type education have the highest scores. The children whose mothers’ husband/partner have a university-type education also scored higher in attention focusing during CPM B subtest ($\chi^2(2) = 10.03, p = 0.007$),

planning ($\chi^2(2) = 8.96, p = 0.011$) and cool self-regulation ($\chi^2(2) = 14.96, p = 0.001$). Maternal age and family structure are not related to child self-regulation.

The biological factors related to child self-regulation. The findings of the study reveal gender differences in child self-regulation. Girls scored higher in delay of gratification measured by the Gift Wrap task (Mann-Whitney U = 1790.00, $p = 0.006$), and hot self-regulation (Mann-Whitney U = 1923.00, $p = 0.037$), and also in maternal reports of effortful control ($t = 3.00, p = 0.003$). Children's reasoning abilities are significantly correlated to attention focusing ($r_s = 0.19, p < 0.05$), fine motor control ($r_s = 0.30, p < 0.01$), planning ($r_s = 0.23, p < 0.05$), cool self-regulation ($r_s = 0.31, p < 0.05$), and attention and impulse control ($r_s = 0.33, p < 0.05$). Children delivered by different modes differ in their delay of gratification measured by Gift Wrap ($\chi^2(2) = 8.16, p = 0.017$), planning ($\chi^2(2) = 8.43, p = 0.015$), and hot self-regulation ($\chi^2(2) = 7.08, p = 0.029$): children delivered by emergency Caesarean section have the highest scores. Children's extraversion at the age of 3 years is negatively related to attention and impulse control ($r_s = -0.26, p < 0.05$), also maternal reports of effortful control ($r = -0.38, p < 0.01$) and self-regulation ($r = -0.28, p < 0.01$). Children's negative affectivity is not related to observational measures of child self-regulation. It is negatively linked to maternal reports of self-regulation ($r = -0.21, p < 0.05$).

The family environment factors related to child self-regulation. The findings of the study reveal that maternal depression on the 2nd and 3rd day after delivery is positively related to delay of gratification measured by Gift Wrap ($r_s = 0.20, p < 0.05$) and gross-motor control ($r_s = 0.20, p < 0.05$). Maternal distress at 3 months is negatively related to planning ($r_s = -0.21, p < 0.05$) and positively related to the Snack delay task ($r_s = 0.26, p < 0.05$), hot self-regulation ($r_s = 0.24, p < 0.01$), and maternal reports of self-regulation ($r = 0.21, p < 0.05$). Children also differ in their self-regulation depending whether their mothers experienced stressful and traumatic events. The children whose mothers experienced stressful and traumatic events at 6 months scored lower in cognitive control (Mann-Whitney U = 342, $p = 0.016$) and higher in planning (Mann-Whitney U = 489.00, $p = 0.023$). Children whose mothers had stressful and traumatic events at 18 months after child's birth scored lower in delay of gratification measured by Gift Wrap (Mann-Whitney U = 511.50, $p = 0.007$), and children whose mothers had stressful and

traumatic events at 2 years after childbirth scored lower in delay of gratification (Mann-Whitney $U = 511.50$, $p = 0.007$) and higher in planning (Mann-Whitney $U = 460.00$, $p = 0.030$). Child self-regulation also differs depending on whether the pregnancy was planned. If so, children scored higher in cognitive control (Mann-Whitney $U = 1118.50$, $p = 0.036$), planning (Mann-Whitney $U = 1216.00$, $p = 0.019$), and cool self-regulation (Mann-Whitney $U = 1258.00$, $p = 0.041$). If maternal emotional reaction toward pregnancy was positive, children scored higher in cognitive control (Mann-Whitney $U = 805.50$, $p = 0.029$) and maternal reports of self-regulation ($t = 2.21$, $p = 0.029$). The findings of the study reveal a significant negative link between maternal difficulties to understand the reason for an infant's crying at 3 months and the child's planning at 4 years old ($r_s = -0.27$, $p < 0.01$), and a negative link between maternal difficulties to understand the reason for an infant's crying at 6 months and the child's cognitive control at 4 year old ($r_s = -0.25$, $p < 0.05$). Maternal self-efficacy is not significantly related to observational measures of self-regulation, though it is positively related to maternal reports of effortful control ($r = 0.41$, $p < 0.01$) and self-regulation ($r = 0.39$, $p < 0.01$). The results of the study also show significant links between child self-regulation and maternal subjective evaluation of the quality of the couple's relationships. Children's planning is negatively related to the evaluation at 18 months ($r_s = -0.24$, $p < 0.05$) and 2 years ($r_s = -0.24$, $p < 0.05$). There is a negative link between cool self-regulation and the quality of the couple's relationship at 12 months ($r_s = -0.22$, $p < 0.05$) and at 18 months ($r_s = -0.22$, $p < 0.05$). Child-centered maternal attitudes toward infant care, measured at 3 months old, are related to lower scores in delay of gratification ($r_s = -0.24$, $p < 0.05$), planning ($r_s = -0.28$, $p < 0.01$), cool self-regulation ($r_s = -0.21$, $p < 0.05$) and attention and impulse control ($r_s = -0.22$, $p < 0.05$).

Correlations between child self-regulation and maternal responses to children's negative emotions depending on the level of children's negative affectivity and extraversion are presented in Table 2. We can see that in the group of children with lower negative affectivity there are no significant links between child self-regulation and maternal responses. In the group of children with higher negative affectivity supportive maternal responses are negatively associated with cognitive control; planning and cool self-regulation and non-supportive responses are positively correlated with delay of

gratification. In children with lower extraversion supportive maternal responses are negatively related to cognitive control, planning, cool self-regulation and attention and impulse control, and non-supportive maternal responses. In children with higher extraversion there is a positive link between non-supportive maternal responses and delay of gratification.

Table 2. Correlations between child self-regulation and maternal responses to children's negative emotions in children with higher and lower negative affectivity and extraversion.

Tasks/maternal response	PF	EF	EE	SR	DR	MR	PR	NR
<i>Children with lower negative affectivity (n = 53)</i>								
Snack Delay	-0.11	-0.04	0.18	0.13	0.05	0.03	0.23	0.12
Gift Wrap	-0.23	-0.03	-0.25	-0.21	0.05	0.02	-0.01	-0.01
Head and Feet	-0.05	0.13	-0.14	-0.03	0.03	0.09	-0.10	0.02
Attention focusing	-0.07	0.03	-0.01	-0.04	-0.04	-0.03	0.10	-0.06
Walk-a-Line	0.02	0.27†	0.10	0.17	-0.12	0.11	-0.18	-0.09
Circles	0.01	0.13	-0.04	0.01	-0.21	-0.03	-0.22	-0.16
Truck Loading	-0.22	0.03	-0.09	-0.13	0.02	-0.10	-0.08	-0.06
Hot self-regulation	-0.19	-0.02	-0.11	-0.08	-0.05	-0.07	0.06	0.00
Cool self-regulation	-0.10	0.14	-0.07	-0.06	-0.06	-0.05	-0.14	-0.12
Attention & impulse control	0.00	0.00	-0.04	-0.05	-0.08	0.04	0.01	-0.04
<i>Children with higher negative affectivity (n = 52)</i>								
Snack Delay	-0.12	0.01	0.06	0.01	0.21	0.28	0.57**	0.40**
Gift Wrap	-0.16	-0.24	0.16	-0.04	0.03	0.10	0.24	0.15
Head and Feet	-0.21	0.03	-0.45**	-0.34**	0.14	-0.14	0.09	0.01
Attention focusing	0.07	-0.18	0.05	0.01	-0.06	0.29†	0.31*	0.24
Walk-a-Line	-0.12	-0.18	-0.13	-0.17	-0.17	-0.18	0.06	-0.11
Circles	-0.01	-0.06	-0.12	-0.12	-0.02	-0.06	0.08	-0.01
Truck Loading	-0.29†	-0.20	-0.39**	-0.36*	-0.05	-0.05	0.13	-0.02
Hot self-regulation	-0.19	-0.17	0.16	-0.01	0.10	0.19	0.39**	0.27
Cool self-regulation	-0.20	-0.19	-0.37*	-0.35*	-0.09	-0.07	0.14	-0.02
Attention & impulse control	-0.16	-0.23	-0.09	-0.18	-0.01	0.18	0.23	0.15
<i>Children with lower extraversion (n = 53)</i>								
Snack Delay	-0.13	0.06	-0.04	-0.01	0.02	0.11	0.23	0.12
Gift Wrap	-0.14	-0.06	-0.08	-0.11	0.13	-0.07	0.14	0.05
Head and Feet	-0.17	-0.11	-0.31*	-0.28†	0.10	-0.19	-0.14	-0.10
Attention focusing	-0.20	-0.36*	0.02	-0.13	-0.14	0.02	0.12	0.00
Walk-a-Line	-0.17	-0.05	-0.11	-0.11	-0.14	-0.10	-0.07	-0.14
Circles	-0.26†	0.00	-0.16	-0.18	-0.11	-0.15	-0.11	-0.16
Truck Loading	-0.39**	-0.18	-0.43**	-0.42**	-0.13	-0.29†	-0.19	-0.24
Hot self-regulation	-0.17	-0.03	-0.09	-0.11	0.05	-0.10	0.14	0.01
Cool self-regulation	-0.42**	-0.28**	-0.39**	-0.49**	-0.07	-0.24	-0.12	-0.18
Attention & impulse control	-0.39**	-0.23	-0.22	-0.33*	-0.04	-0.04	0.09	0.00

<i>Children with higher extraversion (n = 52)</i>								
Snack Delay	-0.07	-0.07	0.26	0.12	0.20	0.20	0.47**	0.36**
Gift Wrap	-0.22	-0.18	-0.08	-0.18	-0.07	0.15	0.05	0.05
Head and Feet	-0.09	-0.24	-0.22	-0.07	0.04	0.18	0.27†	0.21
Attention focusing	0.25	0.19	0.12	0.19	-0.04	0.22	0.03	0.07
Walk-a-Line	0.04	0.09	0.12	0.12	-0.05	0.05	0.12	0.05
Circles	0.25†	0.05	0.08	0.14	-0.10	0.02	0.02	-0.03
Truck Loading	-0.14	-0.10	-0.01	-0.05	0.15	0.16	0.36*	0.25
Hot self-regulation	-0.17	-0.03	-0.09	-0.11	0.05	-0.10	0.14	0.01
Cool self-regulation	0.06	0.18	0.02	0.06	-0.04	0.16	0.20	0.11
Attention & impulse control	0.26†	-0.03	0.06	0.09	-0.10	0.25	0.20	0.14

Notes: 1) PF–problem-focused, EF–emotion-focused, EE–expressive encouragement, SR–supportive responses, DR–distress response, MR–minimizing response, PR–punitive response, NR– not-supportive responses; 2) † p < 0.10, *p < 0.05, **p < 0.01

Predictors of self-regulation

In regression models we involve only factors that are significantly related or are approaching a significant relation to child self-regulation. The regression model of hot self-regulation’s predictors provides an adequate fit to the data ($\chi^2 (7) = 18.16, p = 0.01, CFI = 1.00, TLI = 1.00, RMSEA = 0.00$). As we can see from Table 3, higher hot self-regulation is predicted by emergency Caesarean section delivery mode.

Table 3. Predictors of hot self-regulation

Predictors	β	S.E.	p	R ²
Child’s gender (1–boys)	-0.06	0.11	0.550	0.24
Delivery mode (1–emergency Caesarean section)	0.26	0.07	0.000	
Maternal distress (2 years)	0.19	0.12	0.091	
Maternal stressful events (2 years; 1–experienced stressful events)	-0.20	0.14	0.151	
Maternal attitudes to child care	0.21	0.13	0.111	
Punitive response	0.20	0.11	0.072	
Problem-focused response	0.11	0.12	0.360	

The regression model of cool self-regulation’s predictors also provides an adequate fit to the data ($\chi^2 (10) = 25.36, p = 0.005, CFI = 1.00, TLI = 1.00, RMSEA = 0.00$). As we can see from Table 4, higher cool self-regulation is predicted by how old the children are.

The results of the hierarchical regression analysis predicting maternal reports of effortful control (Table 5) show that higher child effortful control is predicted by lower child extraversion, better maternal evaluation of her relationships with the husband/partner at 2 years, and higher maternal supportive responses.

Table 4. Predictors of cool self-regulation

Predictors	β	S.E.	p	R ²
Child's reasoning abilities	0.28	0.14	0.054	0.47
Child's age	0.26	0.13	0.040	
Maternal education (1–high)	0.10	0.16	0.526	
Paternal education (1–high)	0.14	0.12	0.223	
Delivery mode (1–emergent Caesarean section)	0.04	0.11	0.748	
Pregnancy planning (1–planned)	0.18	0.10	0.083	
Maternal distress (3 months)	-0.06	0.14	0.708	
Maternal stressful events (1–experienced stressful events)	0.16	0.11	0.165	
Maternal evaluation of the couple's relationship at 12 months	-0.16	0.13	0.222	
Maternal evaluation of the couple's relationship at 18 months	-0.23	0.13	0.075	
Expressive encouragement response	-0.13	0.11	0.216	

Table 5. Predictors of maternal reports of effortful control: the results of the hierarchical regression analysis (only the final model is presented).

Predictors	β	F	p	R ²	ΔR^2	p
Child's gender (1–boy)	-0.12	3.94	0.001	0.43	0.05	0.041
Maternal education (1–high university type)	0.06					
Child's extraversion (3 years)	-0.42**					
Maternal EPDS (3 years)	0.23†					
Maternal stressful events (3 months, 1–experienced stressful events)	-0.19					
Maternal difficulty understanding why the infant cries (3 months)	0.06					
Maternal difficulty understanding why the infant cries (6 months)	0.13					
Maternal evaluation of the couple's relationship (2 years)	-0.25*					
Maternal supportive responses	0.26*					

Note. † $p < 0.10$, * $p < 0.05$; ** $p < 0.01$

The results of the hierarchical regression analysis predicting maternal reports of self-regulation at 4 years old show (Table 6) that higher self-regulation is predicted by an older child's age, lower extraversion, and higher maternal self-efficacy.

Table 6. Predictors of maternal reports of self-regulation: the results of the hierarchical regression analysis (only the final model is presented).

Predictors	β	F	p	R ²	ΔR^2	p
Child's gender (1–boy)	-0.19					
Child's age	0.24*					
Child's extraversion	-0.32*					
Child's negative affectivity	-0.25†					

Maternal distress (2 years)	0.19	4.47	<0.001	0.58	0.00	0.619
Maternal stressful events (3 months; 1–experienced stressful events)	0.18					
Maternal emotional reaction to pregnancy (1–negative)	-0.12					
Maternal difficulty understanding why the infant cries (3 months)	0.09					
Maternal self-efficacy	0.29*					
Maternal evaluation of the couple’s relationship before pregnancy	0.12					
Maternal evaluation of the couple’s relationship during pregnancy	0.07					
Maternal supportive responses	0.07					

Note. † $p < 0.10$, * $p < 0.05$; ** $p < 0.01$

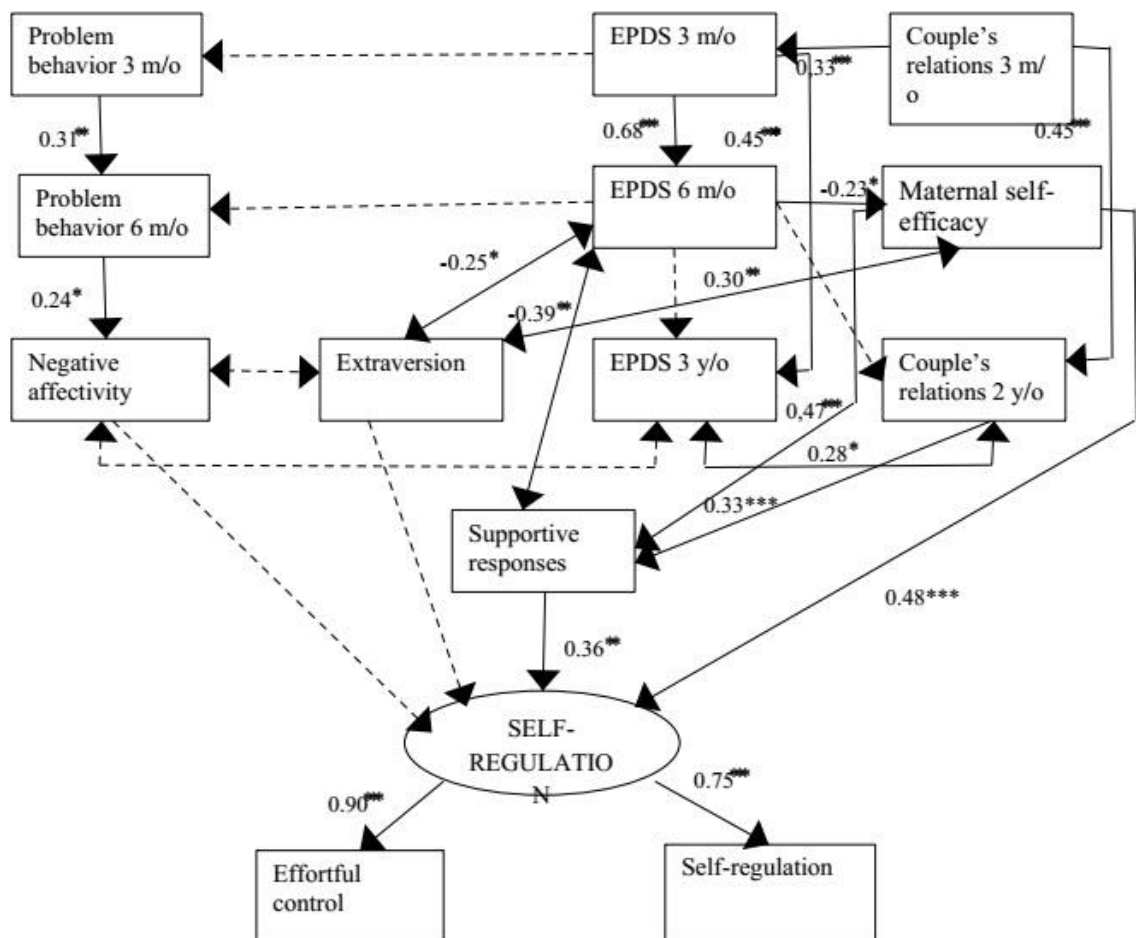


Figure 3. The structural equation model of predictors of maternal reports of self-regulation. Notes: 1) significant standardized regression coefficients are presented; 2) * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

In line with theoretical assumptions and empirical findings we constructed the structural equation model of the predictors of maternal reports of self-regulation (Figure 3). The models with hot self-regulation and cool self-regulation don't fit adequately with the data (for hot self-regulation $\chi^2 = 70.44$, $df = 48$, $p = 0.019$, $RMSEA = 0.067$, $TLI =$

0.87, CFI = 0.83 and for cool self-regulation $\chi^2 = 69.18$, $df = 48$, $p = 0.024$, RMSEA = 0.065, TLI = 0.83, CFI = 0.87). The model for maternal reports of self-regulation fits adequately with the data ($\chi^2 = 67.22$, $df = 54$, $p = 0.107$, RMSEA = 0.048, CFI = 0.951, TLI = 0.930). As we can see from Figure 3, the latent factor of self-regulation is directly predicted by maternal supportive responses and maternal self-efficacy. Maternal emotional state has an indirect impact on child self-regulation: maternal self-efficacy mediates the link between maternal EPDS at 6 months old and maternal self-efficacy. Maternal evaluation of the couple's relationship also predicts maternal supportive responses. The child's negative affectivity is predicted by his or her early problem behavior in infancy.

The Cumulative Risk Associated With Hot and Cool Self-regulation

The correlations between multiple cumulative risks and hot and cool self-regulation are presented in Table 7. The results show that higher hot self-regulation is correlated with higher neonatal cumulative risk, and higher cool self-regulation is correlated with lower socio-demographic cumulative risk, higher neonatal cumulative risk, and lower maternal parenting cumulative risk.

Table 7. Correlations between the cumulative risks and hot and cool self-regulation

	Hot self-regulation	Cool self-regulation
Socio-demographic cumulative risk	-.17	-.32**
Neonatal cumulative risk	.21*	.24**
Maternal emotional state cumulative risk	.08	.10
Maternal parenting cumulative risk	-.01	-.25*

In order to investigate multiple risk profiles, representing a sufficient heterogeneity in the sample, we conducted LAC. The results showed that the lowest estimates of BIC, SSABIC and AIC indices supported the 4-classes solution (BIC = 801,57, SSABIC = 728,80, AIC = 733,58, entropy = 0,967). The estimated latent classes of multiple cumulative risks are presented graphically in Figure 4. The first class accounts for 8,1 % of the data and is described by high sociodemographic risk and low neonatal, maternal emotional state and parenting risk. The second class accounts for 69,3 % of the data. It is described by the low risk in all four ecological levels. The third class

accounts for 6,3 %. The children of this class are characterized by low sociodemographic and parenting risk, average neonatal risk and high maternal emotional state risk. The fourth class accounts for 16,2 % of the data and is characterized by low neonatal risk, average sociodemographic and maternal emotional state risk and high parenting risk.

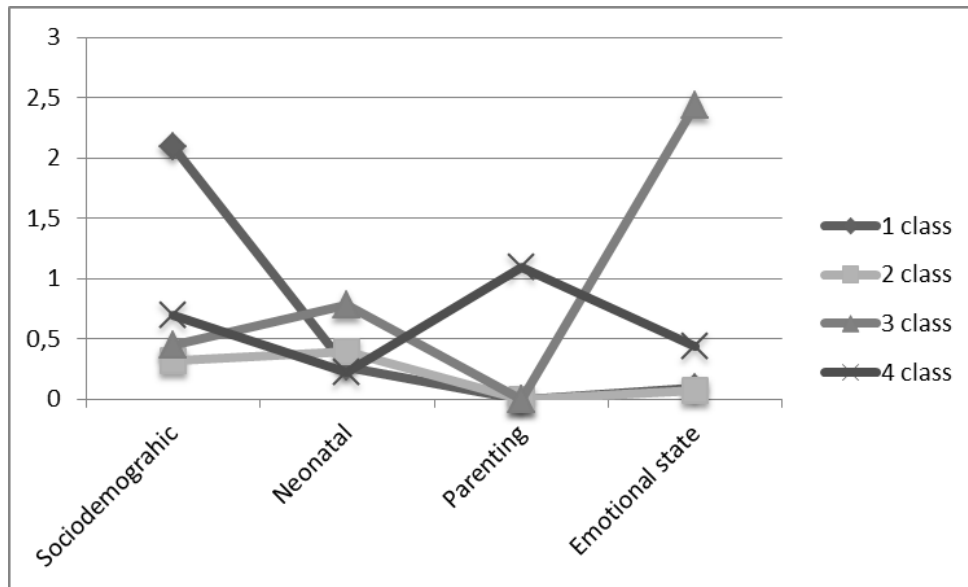


Figure 4. The estimated latent classes of multiple cumulative risks.

Next, we compared self-regulation of four cumulative risk classes. The results showed that the groups differ in maternal reports of self-regulation ($F = 4.50, p = .005$): children in the fourth class (high parenting risk) had the lower estimates, than children in the second class (low risk) and third class (high maternal emotional state risk).

DISCUSSION

The current study revealed several important findings. First of all, the tasks designed to measure self-regulation were well described by the single factor model and by hot (affectively salient) and cool (affectively neutral) dimensions. These results are in line with the findings of other studies. Allan & Lonigan determined that the hot-cool model didn't provide a better fit with the data than the single model. However, the studies of Brock and colleagues (2009) and Willoughby and colleagues (2013) showed the best fit of the hot-cool model. The results of the current study showed the availability of the hot-cool model, so far it is purposeful to distinguish two separate dimensions (hot and cool) and to explore related factors.

One of the assumptions of the current study was that the children would differ in the expression of their hot and cool self-regulation. Using LCA we identified two classes of children: children with high hot self-regulation and average cool self-regulation and children with lower than average hot and cool self-regulation. The majority of the children (82%) belong to the high hot self-regulation class–average cool self-regulation. This might show that the sample of the typically developing children from low-risk families is quite homogeneous according to the expression of hot and cool self-regulation. It might also show the importance of environmental factors for the development of self-regulation.

Summing up the results of the study we can say that hot and cool self-regulation is shaped in part by the same and in part by different biological and family environment factors. Hot self-regulation is related to such biological factors such as child gender and delivery mode. Girls and children born by emergency Caesarean section scored higher in hot self-regulation. The unexpected effects of the emergency Caesarean section could be explained by the more intensive maternal investment into early child's training and education. Good maternal health during the 2nd and 3rd years of life, when autonomy and self-differentiation are developing, is important for the optimal development of hot self-regulation. Higher cool self-regulation, referring to self-regulation in affectively neutral situations, is related to the child being older, higher parental education, higher reasoning abilities and pregnancy planning. Moreover, cool self-regulation is susceptible to parenting risk and quality of the couple's relationship. Thus, we can summarize that hot self-regulation is susceptible to the maternal emotional state, and cool self-regulation—to socio-demographic and parenting risk, as well as child cognitive abilities. Cumulative risk models are no more beneficial than analysis of single factors related to child self-regulation. For prevention and intervention it is more useful to analyze particular risk and protective factors than to accumulate them together.

The findings of the study also suggest that parenting might have a differing impact on certain children. In the current study, positive links between maternal punitive responses and hot self-regulation and negative links between maternal supportive responses and cool self-regulation are identified only in the group of children with higher negative affectivity. In the group of the children with higher extraversion there is a

positive link between snack delay abilities and maternal non-supportive responses. Supportive responses, usually associated with positive outcomes, may not be “positive” parenting for all children. As well, non-supportive responses, usually associated with negative outcomes, sometimes produce an effect that is considered desirable. This is in line with the findings of other studies. For example, Arcus (2001) found that infants high in negative emotion were less likely to show behavioral inhibition at 14 months if their mothers were high in limit setting. He suggested that mild frustrations and challenges might facilitate the development of self-regulatory abilities among emotionally reactive children. Stanevičiūtė (2010) and Jusienė (2014) also determined that lower scores of caregivers-teachers’ reports of children externalizing problems are related to higher parental control. This might show that children who are linked to negative affectivity and impulsivity may need more active parental control and limits setting.

The results of the study also revealed a low agreement between maternal reports of self-regulation and observer ratings using laboratory methods. A lack of agreement was found in other studies as well (e.g. Seifer, Sameroff, Barret & Krafchuk, 1994). Recent research is studying the reasons for a lack of agreement and analyzing the validity of parental and observer reports (Seifer, Sameroff, Dickstein, Schiller & Hayden, 2004; Stifter, Willoughby, Towe-Goodman & the Family Life Project Key Investigators, 2008). The reasons for low correspondence may vary from the effect of social desirability to limitations of laboratory-based assessment, when a child is observed in a not-natural and unusual situation. In the future it would be beneficial to analyze factors impacting a higher or lower correspondence between maternal and observer reports.

The strengths of the current study are its longitudinal design, multi-method approach in assessing child self-regulation, and a broad range of risk and protective internal and external factors. However, there are some limitations that should be taken into account. First of all, the majority of the participant mothers were married with a higher educational, so the sample is not representative and conclusions could not be drawn upon child self-regulation in a broader social, economic context. Second, we used only maternal reports of parenting behavior. In the future it would be beneficial to use observer reports of maternal behavior in laboratory or home settings. In the current study

child self-regulation was measured only once. In future research it would be useful to study trajectories of self-regulation's development in early childhood and to deepen the analysis of the factors, predicting different dimensions of self-regulation.

CONCLUSIONS

1. The two factor model was suitable to describe the structure of self-regulation at the age of four: hot self-regulation, referring to delay of gratification abilities, and cool self-regulation, referring to motor control, attention focusing, cognitive control, and planning abilities.
2. According to the expression of hot and cool self-regulation two classes were identified: 1) children with high hot and average cool self-regulation; 2) children with less than average hot and cool self-regulation. The children with high hot and average cool self-regulation were characterized by higher maternal reports of self-regulation, higher maternal education, and higher maternal depression on the 2nd and 3rd day after delivery.
3. Socio-demographic factors are related to self-regulatory abilities of four year old children:
 - 3.1. Higher maternal education was related to higher delay of gratification, planning and attention, and impulse control.
 - 3.2. Higher education of the mother's husband/partner was related to higher child attention focusing and planning.
4. Biological factors were related to child self-regulatory abilities at the age of four.
 - 4.1. Child gender emerged as an important factor in the ability to self-regulate. Girls scored higher in delay of gratification and maternal reports of effortful control than boys.
 - 4.2. For older children age was positively related to cognitive control, fine motor control, planning and attention and impulse control.
 - 4.3. Higher reasoning abilities were linked to higher fine motor control, planning, attention focusing, and attention and impulse control.
 - 4.4. Children delivered by emergency Caesarean section had the highest scores of delay of gratification and planning.

5. Family environment factors were related to children's self-regulatory abilities at the age of four:
 - 5.1. Less maternal distress during the 2nd and 3rd years of child's life was related to higher children's delay of gratification.
 - 5.2. Pregnancy planning and positive maternal response toward pregnancy were linked to the child's higher cognitive control and planning.
 - 5.3. Higher maternal reports of the couple's relationship were associated with higher planning abilities at the age of four.
 - 5.4. Maternal non-supportive responses to negative emotions were related to higher delay of gratification, planning and attention, and impulse control, but only among children with higher negative affectivity.
6. Higher hot self-regulation was related to female gender, delivery by emergency Caesarean section, and better maternal emotional state during the 2nd and 3rd years of the child's life. Hot self-regulation was predicted by emergency Caesarean section delivery.
7. Higher cool self-regulation was related to greater age, higher parental education, higher child's reasoning ability, pregnancy planning, and better evaluated quality of a couple's relationship. Cool self-regulation was predicted by child age.
8. Maternal reports of self-regulation are directly predicted by maternal supportive responses and maternal self-efficacy, though the maternal early depression had an indirect effect and affected maternal self-efficacy. Maternal supportive responses also emerged as a mediator between child self-regulation and maternal reports of the quality of the couple's relationships as the child turned two.
9. Children with high parenting risk were characterized by lower scores of maternal reports of self-regulation as compared to low risk children and children with high maternal emotional state risk.

ANKSTYVOSIOS SAVIREGULIACIJOS BIOLOGINIAI IR PSICHOSOCIALINIAI VEIKSNIAI

Santrauka

1. ĮVADAS

1.1. Tyrimo aktualumas, mokslinis ir praktinis naujumas

Pastarųjų kelių dešimtmečių aktyviai atliekami tyrimai rodo, kad savireguliacija yra vienas iš esminių konstruktų, paaiškinančių individo funkcionavimą vaikystėje ir suaugus (Bronson, 2000), todėl savireguliacijai ir su ja susijusiems konstruktsams daug dėmesio yra skiriama raidos psichologijos ir psichopatologijos srityje. Individualūs savireguliacijos skirtumai išryškėja labai anksti gyvenime ir padeda paaiškinti vaikų psichosocialinio prisitaikymo ir pažintinės raidos padarinius. Tyrimai rodo, kad vaikams, pasižymintiems geresniais savireguliacijos gebėjimais, yra lengviau valdyti savo elgesį, dėmesį ir emocijas, todėl vykstant socialinei sąveikai jie linkę elgtis konstruktyviu, socialiai tinkamu būdu (Eisenberg & Fabes, 1992; Dennis, Brotman, Huang, & Gouley, 2007). Daugelyje tyrimų taip pat yra nustatytas neigiamas savireguliacijos ir su ja susijusių konstruktų bei esamų ar buvusių elgesio sunkumų ryšys (pvz., Eiden, Edwards, & Leonard, 2007; Eisenberg et al., 2005). Taigi savireguliacijos gebėjimai yra labai svarbūs optimaliai vaiko raidai, todėl svarbu aiškintis, kokie veiksniai – biologiniai ir psichosocialiniai yra susiję su individualiais vaiko savireguliacijos skirtumais.

Žinoma, kad savireguliacijos gebėjimai atsiranda labai anksti, juos formuoja ir vaiko prigimtis, ir patirtis (Kopp, 1982; Kochanska, Murray, & Harlan, 2000; Posner & Rothbart, 2000). Prieš 30 metų buvo įprasta manyti, kad vaikų savireguliacijos sunkumai pirmiausiai rodo neefektyviai taikomą tėvystės praktiką, o šiais laikais tyrėjai jau žino kur kas daugiau apie savireguliacijos raidą ankstyvojoje vaikystėje, neurobiologinį jos pagrindą, ankstyvojo socialinio patyrimo ir įgimtų temperamento skirtumų svarbą (Thompson, 2009).

Nepaisant gausių tyrimų, savireguliacijos raidos vaizdas vis dar yra iš dalies fragmentiškas ir ne visai nuoseklus. Tą galėjo lemti skirtingas savireguliacijos sąvokos operacionalizavimas priklausomai nuo teorinės paradigmos ir tai, kad daug tyrėjų analizavo tam tikrų savireguliacijos gebėjimų ir išorinių veiksnių ryšį neįvertindami tokių šalutinių arba netiesioginių kintamųjų: vaikų lyčių skirtumai, vaiko neonatalinė

adaptacija arba individualios mamų savybės, įtakos, pvz., vaiko auginimo nuostatos arba jų pasitikėjimas savo motinystės kompetencija. Taip pat ne visada buvo atsižvelgiama į psichosocialinio konteksto, kuriame auga vaikas, ypatumus, pvz., kokia buvo motinos emocinė būseną nėštumo metu arba ankstyvuojų pogimdyminiu laikotarpiu arba kokia yra tėvų santykių kokybė. Kitaip sakant, mažai tyrimų, kai buvo tirti ne pavieniai su savireguliacija susiję veiksniai, bet atsižvelgta į platų veiksnių – psichosocialinių ir biologinių spektrą, taip pat į abipusį šių veiksnių ryšį.

Įvairūs teoriniai modeliai ir empiriniai duomenys rodo, kad savireguliacijos gebėjimai atsiranda ir stabilizuojasi vaikystėje ir paauglystėje (Kopp, 1982; Kochanska et al., 2000). Tyrimų duomenimis, sėkmingos savireguliacijos pamatas yra dedamas pirmuosius trejus metus, o šiuo laikotarpiu įgyti įgūdžiai turi ilgalaikį poveikį vaikų savireguliacijos raidai (Raikes, Robinson, Bradley, Raikes, & Ayoub, 2007). Savireguliacijos gebėjimai stabilizuojasi apie ketvirtus gyvenimo metus (Murphy, Eisenberg, Fabes, Shepard, & Guthrie, 1999), todėl būtent šiuo laikotarpiu svarbu tirti juos formuojančius veiksniai.

Šis darbas yra aktualus ir naujas keliais aspektais. Pirma, mažai ankstyvosios raidos tyrimų analizavo biologiškai grįstų ir santykiškai grįstų procesų sąveiką savireguliacijos raidoje (Calkins & Fox, 2002). Dažniausiai buvo atsižvelgiama arba į biologinius (pvz., vaiko lytis, temperamento bruožai), arba į psichosocialinius veiksniai (pvz., motinos emocinė savijauta, jos taikoma motinystės praktika), tačiau ne į abiejų šių veiksnių reikšmę ankstyvajai vaiko savireguliacijos raidai. Longitudinis šio tyrimo dizainas leidžia ieškoti priežastinio ankstyvųjų biologinių ir šeimos aplinkos veiksnių ryšio bei tirti šių veiksnių reikšmę vaiko savireguliacijai.

Prie biologinių veiksnių šiame darbe yra priskiriamas ne tik temperamento reaktyvumas (jis tradiciškai yra priskiriamas prie biologiškai determinuotų savireguliacijos veiksnių), bet ir vaiko neonatalinė sveikata ir jo gimimo aplinkybės. Svarbu pažymėti, kad mažai tyrimų analizavo vaiko gimimo aplinkybių reikšmę jo savireguliacijai ankstyvojoje vaikystėje. Vaiko gimimo būdas gali veikti savireguliaciją tiek tiesiogiai (pvz., komplikuoto gimdymo metu dėl hipoksijos ar kitų nepalankių veiksnių gali būti pažeistos smegenų struktūros, atsakingos už savireguliaciją), tiek ir

netiesiogiai, t. y. per motinos veiksnius. Šiuo tyrimu ir siekta atskleisti, ar vaiko gimimo aplinkybės turi reikšmės savireguliacijai ankstyvojoje vaikystėje.

Kitas svarbus šio darbo naujumo aspektas – specifinių veiksnių, susijusių su „karšta“ (angl. hot) ir „šalta“ (angl. cold) savireguliacija, išryškinimas. Per kelis pastaruosius metus vis didesnio mokslininkų susidomėjimo sulaukia dviem savireguliacijos faktoriais pagrįstas modelis: „karšta“ ir „šalta“ savireguliacija. „Karšta“ savireguliacija rodo ryškų emocinį komponentą (paprastai emociškai teigiamą arba neigiamą padarinį) turinčios veiklos kontrolę, o „šalta“ savireguliacija rodo emociškai neutralios veiklos, nesusijusios su padariniais vaiko elgesiui, kontrolę (Brock, Rimm-Kaufman, Nathanson, & Grimm, 2009; Allan & Lonigan, 2011). Nors vis daugėja tyrimų, patvirtinančių dviejų faktorių struktūrą ir tų faktorių skirtingą reikšmę vaiko raidai (o tai yra labai prasminga planuojant ankstyvasias savireguliacijos sunkumų prevencijos ir intervencijos priemones), trūksta tyrimų, panašūs ar skirtingi veiksniai prognozuoja „šaltos“ ir „karštos“ savireguliacijos raidą. Šiame darbe siekiama patikrinti, ar dviejų faktorių modelis („karštos“ ir „šaltos“ savireguliacijos dimensijos) tinka savireguliacijos struktūrai apibūdinti. Taip pat išskirtini specifiniai veiksniai, prognozuojantys šias dvi savireguliacijos dimensijas – „karštą“ ir „šaltą“ savireguliaciją.

Remiantis *transakcine raidos teorija* (Sameroff & Fiese, 2000), raidą labiausiai veikia ne koks nors vienas aplinkos rizikos veiksnys, o skirtingų aplinkos rizikos veiksnių akumuliacija. Šiuolaikiniuose kumuliacinės rizikos reikšmės vaiko savireguliacijos raidai tyrimuose (pvz., Lengua, 2002; Lengua, Honorado, & Bush, 2007; Lengua et al., 2013) dažniausiai yra atsižvelgiama tik į sociodemografinę ar psichosocialinę kumuliacinę riziką, o netiriama biologinė neonatalinė rizika. Tad vienas iš šio tyrimo uždavinių yra patikrinti, ar iš tikrųjų kumuliacinė rizika yra labiau susijusi su savireguliacija ankstyvojoje vaikystėje nei kurie nors vieni specifiniai rizikos veiksniai.

Dar vienas šio tyrimo naujumas – mėginimas pritaikyti *į asmenį orientuotą požiūrį* (angl. *person-oriented approach*) bandant suprasti, kaip su vaiko savireguliacija susiję rizikos veiksniai skirtingu ekologiniu lygiu. Pritaikant latentinių klasių analizę, mėginama išskirti vaikų grupes, arba latentines klases, kurios pasižymi panašiomis kumuliacinės rizikos savybėmis.

Viena iš teorijų, kuria grindžiamas tyrimo teorinis modelis, yra transakcinė raidos teorija. Kita teorija, kuria remiamasi, yra ekologinė teorija. *Ekologinė teorija* teigia, kad individą laikui bėgant veikia daugialypiai konteksto lygiai (Bronfenbrenner, 1986). Raidą labiausiai veikia artimesni veiksniai, kurių atsiranda asmens tiesioginiame kontekste ir kurie medijuoja atokesnių veiksmų poveikį individui (Bronfenbrenner & Ceci, 1994). Mūsų teorinis modelis konstruojamas remiantis prielaida, kad savireguliaciją geriausiai paaiškina artimos aplinkos veiksniai (pvz., motinystės praktika), kurie medijuoja atokių veiksmų (pvz., šeimos sociodemografinės aplinkos) ir savireguliacijos ryšį.

Taigi, atsižvelgdami į šio disertacinio darbo tikslą – atskleisti savireguliaciją ankstyvojoje vaikystėje prognozuojančius biologinius ir psichosocialinius veiksmus, išskirtos dvi veiksmų grupės: ***biologiniai ir šeimos aplinkos veiksniai***. Šiame darbe atskleidžiama šių veiksmų reikšmė vaikų savireguliacijai, kuri buvo įvertinta psichologinio testavimo metu ir pagal motinos pateiktus duomenis.

2. Disertacinio darbo tikslas, uždaviniai ir ginamieji teiginiai

Disertacinio darbo tyrimo tikslas – įvertinti pagrindinius vaikų savireguliacijos biologinius ir psichosocialinius (šeimos aplinkos) veiksmus, kurie iš jų geriausiai paaiškina ketverių metų vaikų savireguliacijos gebėjimus.

Disertacinio darbo uždaviniai:

7. Patikrinti, ar ketverių metų vaikų savireguliacijos struktūrai nusakyti tinka „karštos“ ir „šaltos“ savireguliacijos modelis.
8. Taikant į asmenį orientuotą požiūrį, išskirti vaikų profilius pagal jų „karštos“ ir „šaltos“ savireguliacijos raišką ir atlikti lyginamąją veiksmų, susijusių su šiais profiliais, analizę.
9. Įvertinti, kurie biologiniai veiksniai yra reikšmingi skirtingiems ketverių metų vaikų savireguliacijos gebėjimams.
10. Įvertinti, kurie šeimos aplinkos veiksniai yra reikšmingi skirtingiems ketverių metų vaikų savireguliacijos gebėjimams.
11. Įvertinti, kurie biologiniai ir šeimos aplinkos veiksniai paaiškina „karštą“ savireguliaciją ir kurie – „šaltą“ savireguliaciją.

12. Taikant į asmenį orientuotą požiūrį, išskirti vaikų profilius pagal jų kumuliacinę riziką skirtingu ekologiniu lygiu ir palyginti juos pagal skirtingus ketverių metų vaikų savireguliacijos gebėjimus.

Ginamieji teiginiai:

5. Ketverių metų vaikų savireguliacijos struktūrai apibūdinti tinka dviejų dimensijų modelis: „karštos“ savireguliacijos, apimančios malonumo atidėjimo gebėjimus, ir „šaltos“ savireguliacijos, apimančios motorinės kontrolės, dėmesingumo, kognityvios kontrolės ir planavimo gebėjimus. Vaikai skiriasi pagal „karštos“ ir „šaltos“ savireguliacijos raiškos lygį.
6. „Karšta savireguliacija“ yra susijusi su vaiko lytimi ir motinos emocine savijauta, o „šalta“ savireguliacija – su vaiko samprotavimo gebėjimais, vaiko amžiumi, tėvų išsilavinimu ir motinystės praktika.
7. Tiesiogiai savireguliaciją paaškina vaiko temperamento reaktyvumas ir motinystės praktika, o kūdikio neonatalinės sveikatos ir šeimos emocinės ir sociodemografinės aplinkos poveikis yra netiesioginis.
8. Kumuliacinė rizika geriau paaškina vaiko savireguliacijos gebėjimus nei atskiri veiksniai. Geresni savireguliacijos gebėjimai susiję su mažesne sociodemografinė, neonataline, motinos emocinės savijautos ir motinystės kumuliacine rizika. Vaikų grupės, išskirtos pagal kumuliacinę riziką skirtingu ekologiniu lygiu, skiriasi pagal savireguliacijos gebėjimus.

2. METODIKA

2.1. Tyrimo dalyviai

Tyrimo dalyviai yra 142 keturių metų amžiaus vaikai (71 berniukas ir 71 mergaitė), kurie gimė 2009 m. gegužės-rugsėjo Kauno medicinos universiteto (dabar Lietuvos sveikatos mokslų universiteto) klinikose ir dalyvauja tęstinėje ankstyvosios savireguliacijos studijoje. 65,5 proc. tyrime dalyvaujančių vaikų motinų turi aukštąjį universitetinį išsilavinimą, 92,3 proc. yra ištekėjusios.

2.2. Tyrimo eiga

Empirinė medžiaga buvo renkama 8 tyrimo etapais: antrą-trečią dieną po gimimo, praėjus 3 mėn., 6 mėn., 12 mėn., 18 mėn., 2 metams, 3 metams ir 4 metams po gimimo (2 lentelė). Pirmame tyrimo etape (antrą – trečią dieną po gimdymo) LSMU klinikose pagimdžiusioms moterims buvo pateiktas klausimynų paketas. Kituose tyrimo etapuose, išskyrus paskutinįjį, klausimynai moterims buvo siunčiami paprastu arba elektroniniu paštu (pageidautiną būdą nurodydavo tyrime dalyvaujančio vaiko motina). Į paskutinį tyrimo etapą, kuris buvo vykdomas vaikams sulaukus 4 metų, tėvai buvo kviečiami palydėti vaikus savireguliacijos ir pažintinių gebėjimų testavimui.

Tiriamųjų skaičius aštuoniuose tyrimo etapuose varijavo nuo 109 iki 142. Visuose aštuoniuose tyrimo etapuose dalyvavo 37,6 proc. vaikų. Šie vaikai nuo likusios imties skiriasi tik pagal motinos išsilavinimą ($\chi^2 = 7,47$, $p = 0,024$). Dauguma (80,8 proc.) motinų, dalyvavusių visuose tyrimo etapuose, turėjo aukštą universitetinį išsilavinimą.

2.3. Kintamųjų įvertinimo būdai

Biologinių veiksnių įvertinimas

Informacija apie *gimdymo būdą ir vaikų neonatalinį funkcionavimą*, įvertintą Apgar balais 1 min. ir 5 min. po gimimo, buvo surinkta gimdymo metu.

Kūdikio probleminis elgesys 3 ir 6 mėn. amžiuje buvo vertintas *Motinos nuomonės apie kūdikio probleminį elgesį skale* (Bornstein et al., 2006). Naudotos skalės lietuviško varianto vidinio suderinamumo koeficientas Cronbach'o alpha yra 0,64 ir 0,60 atitinkamai.

Vaiko temperamento bruožai – neigiamas emocionalumas ir ekstraversija, vaikui esant trejų metų, buvo vertinti naudojant *Vaiko elgesio klausimyno trumpąją formą* (*Children's Behavior Questionnaire Short Form*, Rothbart, Ahadi & Hershey, 1994; Rothbart, Ahadi, Hershey & Fisher, 2001). Neigiamo emocionalumo subskalės Cronbach'o alpha yra 0,80 ir Ekstraversijos subskalės Cronbach'o alpha yra 0,87.

Vaiko samprotavimo gebėjimai, vaikui esant ketverių metų, buvo įvertinti naudojant *Raveno progresuojančias spalvotas matricas* (*Coloured Progressive Matrices*; Raven, 1947; Gintilienė ir Butkienė, 2005). D. Butkienė ir G. Gintilienė (2011) nurodo,

kad CPM patikimumas, vertintas dalijimo pusiau metodu, keturmečių grupėje yra nedidelis, tačiau pakankamas ($r = 0,70$).

Šeimos aplinkos veiksnių įvertinimas

Nėštumo planavimas vertintas moterų prašant atsakyti, ar jos planavo nėštumą. Moterų taip pat buvo klausiama apie jų emocinę reakciją į nėštumą (galimi atsakymų variantai: 1 – nudžiugau, 2 – apėmė prieštarīgi jausmai, 3 – nuliūdau).

Neigiamų emocijų patyrimas nėštumo metu, 3 mėn. ir 2 metai po gimdymo. Moterų buvo prašoma 5 balų skale (nuo 1 – beveik kiekvieną dieną iki 5 – retai arba niekada) įvertinti, kaip dažnai per vertinamą laikotarpį jos jautė: 1) liūdesį, prislėgtumą; 2) irzlumą, blogą nuotaiką; 3) nervinę įtampą, susirūpinimą. Skaičiuotas suminis neigiamų emocijų patyrimo įvertis. Šios trijų teiginių skalės vidinis suderinamumas yra labai geras: Cronbach'o alpha atitinkamai: 0,84, 0,80 ir 0,91 atitinkamai.

Motinos patiriami sunkumai suprasti 3 ir 6 mėn. kūdikio verkimo priežastį. Motinos savo patiriamus sunkumus suprasti kūdikio verkimo priežastį įvertino 4 balų skale, kur 1 reiškia, kad joms buvo labai sunku suprasti kūdikio verkimo priežastį, 2 – šiek tiek sunku, 3 – gana lengva, o 4 – labai lengva.

Motinos santykiai su vyru / partneriu iki pastojimo, nėštumo metu, 3 mėn., 12 mėn., 18 mėn., 2 metai, 3 metai po gimdymo motinos buvo įvertinti 5 balų skaleje, kur 1 reiškia – labai gerus santykius, o 5 – labai prastus santykius.

Motinos depresiškumas antrą – trečią dieną po vaiko gimimo, vaikui esant 3 mėn., 6 mėn. ir 3 metų amžiaus buvo įvertintas naudojant į lietuvių kalbą išverstą Edinburgo pogimdyminės depresijos skalę (Edinburgh Postnatal Depression Scale, EPDS; Cox, Holden & Sagovsky, 1987; Lapkienė et al., 2004). Tyrimo duomenimis, Cronbach'o alpha šiai skalei skirtingais tyrimo pjūviais varijavo nuo 0,81 iki 0,89.

Motinos nuostatos į 3 mėnesių kūdikio auginimą buvo vertintos pagal *Požiūrio į kūdikių auginimą skalę* (Zeifman, 2003). Tiriamiesiems pateikiami 8 teiginiai ir pašoma įvertinti, kiek teiginiai atitinka jų požiūrį skaleje nuo 1 (labai nepritariu) iki 8 (labai pritariu). Didesnis šios skalės įvertis rodo labiau į kūdikio poreikius orientuotas motinos nuostatas. Šios skalės Cronbach'o alpha yra 0,74.

Motinos saviveiksmingumo jausmas, vaikui esant 18 mėnesių amžiaus, buvo vertintas *Motinos saviveiksmingumo skale* (Van Ijzendoorn, Bakermans-Kranenburg &

Juffer, 1999; Kalinauskienė, 2010). Mūsų tyrime šios skalės vidinis suderinamumas buvo labai geras (Cronbach'o alpha yra 0,86)

Motinos stresinių įvykių, nelaimingų atsitikimų, sukrėtimų patyrimas nėštumo metu, po 3 mėn., 6 mėn., 12 mėn., 18 mėn., 2 ir 3 metų po gimdymo buvo vertintas moterų prašant atsakyti, ar per pastaruosius mėnesius (arba metus, priklausomai nuo tyrimo etapo) jos patyrė stresų, nelaimingų atsitikimų, sukrėtimų (1 – patyrė, 0 – nepatyrė).

Motinos taikomos strategijos vaiko neigiamų emocijų atžvilgiu, vaikui esant 3 metų amžiaus, buvo vertintos naudojant *Tėvų įveikos strategijų klausimyną* (*Coping with Children's Negative Emotions Scale; CCNES*, Fabes, Eisenberg, & Bernzweig, 1990). Šis instrumentas skirtas vertinti, kokias įveikos strategijas naudoja tėvai, reaguodami į vaiko neigiamas emocijas. Remiantis kitais tyrimais skaičiuojami dviejų skalių įverčiai: Paremiančios motinos strategijos (mėginimas spręsti problemą, mėginimas keisti emocijas, emocijų raiškos skatinimas) ir Neparemiančios motinos strategijos (susikrimtimas, situacijos sumenkinimas ir baudimas). Paremiančių motinos strategijų skalės Cronbach'o alpha yra 0,87, o Neparemiančių motinos strategijų skalės – 0,88.

Vaikų savireguliacijos įvertinimas

Motinos stebėjimu paremti duomenys

Vaiko valinga kontrolė jam esant 3 metų amžiaus buvo įvertinta naudojant *Vaiko elgesio klausimyno trumpąją formą* (*Children's Behavior Questionnaire Short Form*, Rothbart et al., 1994; Rothbart et al., 2001). Valingos kontrolės subskalės Cronbach'o alpha yra 0,70.

Vaiko savireguliacija jam esant ketverių metų amžiaus buvo įvertinta Savireguliacijos ir veiklos organizavimo subskale iš Lietuviškos adaptatyvaus elgesio skalės (Černiauskaitė, 2002). Savireguliacijos ir veiklos organizavimo skalės patikimumas, vertintas pagal vidinį suderinamumą, yra didelis (Cronbach'o alpha - 0,86).

Vaiko psichologinio testavimo duomenys

Vaiko elgesio, emocijų ir dėmesio reguliacijai psichologinio testavimo metu vertinti naudota *Vaiko elgesio testavimo metu įvertinimo skalė* (PSRA Assessor Report Form; Smith-Donalt, Raver, Hayes, & Richardson, 2007). Tai yra 28 teiginių skalė,

skirta vertinti vaiko emocijas, dėmesį ir impulsyvumą viso testavimo metu. Dėmesio ir impulsų kontrolės skalės patikimumas, vertintas pagal vidinį suderinamumą, yra didelis (Cronbach'o α - 0,91). Sutarimas tarp vertintojų atsitiktinai atrenkant 11,97 proc. atvejų buvo skaičiuotas naudojant intraklasių koreliaciją (ICC). Gauti rezultatai rodo, kad sutarimas tarp skirtingų vertintojų yra labai geras: $ICC = 0,87$.

Skanėsto atidėjimas (Kochanska, Murray, Jacques, Koenig & Vandegest, 1996). Jos paskirtis – įvertinti vaiko malonumo atidėjimo gebėjimą, kiek vaikas gali išlaukti skanėsto.

Dovanos įvyniojimas (Kochanska et al., 1996). Užduoties paskirtis – įvertinti vaiko malonumo atidėjimą, kiek vaikas gali išlaukti dovanos taip, kaip jam liepia tyrėjas.

Pasivaikščiojimas takeliu (Kochanska et al., 1996). Ši užduotis skirta vaiko stambiosios motorikos kontrolei vertinti. Tyrėjas pasiūlo vaikui pasivaikščioti siauru takeliu (takelio ilgis – 2 m, plotis – 15 cm). Vaiko paprašoma iš pradžių pereiti takelį normaliu greičiu, o vėliau du kartus tiek greitai, kiek jis gali.

Apskritimai (Kochanska et al., 1996). Ši užduotis skirta vaiko smulkiosios motorikos kontrolei vertinti. Vaiko yra paprašoma nupiešti apskritimą tarp dviejų apskritimų (vienas iš jų didesnis, kitas mažesnis) tris kartus: pirma kartą – normaliu greičiu, antrą kartą – taip greitai, kaip tik jis gali, trečią kartą – taip lėtai, kaip tik jis gali.

Galva-kojos (McCabe, Rebello-Britto, Hernandez & Brooks-Gunn, 2004). Užduotis skirta vaiko kognityviai kontrolei vertinti. Tyrėjas pasiūlo vaikui pažaisti tokį žaidimą – kai tyrėjas pasako žodį „galva“, vaikas turi paliesti savo kojas, o kai pasako „kojos“, paliesti savo galvą.

Sunkvežimio pakrovimas (Fagot & Gauvain, 1997; Carlson, Moses & Claxton, 2004). Ši užduotis yra skirta vaiko planavimo gebėjimams įvertinti. Jos metu vaikas turi išvežioti kvietimus į skirtingų spalvų namelius.

Dėmesingumas atliekant CPM B dalį. Vaiko gebėjimas sukaupti ir išlaikyti dėmesį buvo vertinamas jam atliekant paskutinę (B) CPM dalį.

Sutarimas tarp vertintojų atsitiktinai atrenkant 21,13 proc. atvejų buvo skaičiuotas naudojant intraklasių koreliaciją (ICC) intervaliniams kintamiesiems ir Cohen'o kapa kategoriniams kintamiesiems. Šiame tyrime ICC svyravo nuo 0,74 iki 0,95. Cohen'o kapa žvilgčiojimo kodui buvo lygi 0,80.

Kumuliacinė rizika

Šiame tyrime analizuota kumuliacinė rizika keturiose srityse: demografinė rizika, kūdikio neonatalinės sveikatos rizika, motinos emocinės savijautos rizika ir motinystės rizika.

3. PAGRINDINIAI REZULTATAI IR IŠVADOS

1. Nustatyta, kad dviejų faktorių – „karštos“ savireguliacijos, kuri apima malonumo atidėjimo gebėjimus, ir „šaltos“ savireguliacijos, kuri apima motorinės kontrolės, kognityvios kontrolės, dėmesingumo ir planavimo gebėjimus, modelis tinka keturmečių vaikų savireguliacijos struktūrai apibūdinti.
2. Pagal „karštą“ ir „šaltą“ savireguliaciją išskirtos dvi vaikų grupės: 1) vaikai, kurių didelė „karšta“ ir vidutinė „šalta“ savireguliacija ir 2) vaikai, kuriems būdinga mažesnė nei vidutinė „karšta“ ir „šalta“ savireguliacija. Vaikai, kurių didelė „karšta“ ir vidutinė „šalta“ savireguliacija, pasižymi didesniais savireguliacijos, motinos vertinimu, įverčiais, aukštesniu motinos išsilavinimu ir didesniais motinos depresiškumo vertinimais antrą – trečią dieną po vaiko gimimo.
3. Nustatyta, kad sociodemografiniai veiksniai yra susiję su keturmečių vaikų savireguliacijos gebėjimais:
 - 3.1. Su aukštesniu motinos išsilavinimu susiję geresni vaiko malonumo atidėjimo ir planavimo gebėjimai, taip pat dėmesio ir impulsų kontrolė testavimo metu.
 - 3.2. Su aukštesniu motinos vyro / partnerio išsilavinimu susijęs didesnis vaiko dėmesingumas ir planavimo gebėjimai.
4. Atskleista, kad biologiniai veiksniai yra susiję su keturmečių vaikų savireguliacijos gebėjimais:
 - 4.1. Mergaičių malonumo atidėjimo gebėjimai yra geresni nei berniukų. Motinų vertinimu, mergaičių valinga kontrolė taip pat yra didesnė nei berniukų.
 - 4.2. Vyresnis vaikų amžius teigiamai susijęs su kognityvia kontrole, smulkiosios motorikos kontrole, planavimo gebėjimais bei impulsų ir dėmesio kontrole.

- 4.3. Geresni vaikų samprotavimo gebėjimai yra susiję su geresniais jų smulkiosios motorikos kontrolės ir planavimo gebėjimais, dėmesingumu bei dėmesio ir impulsų kontrole.
- 4.4. Atlikus skubų cezario pjūvį gimę vaikai pasižymi didžiausiais malonumo atidėjimo ir planavimo gebėjimais.
5. Nustatyta, kad šeimos aplinkos veiksniai yra susiję su keturmečių vaikų savireguliacijos gebėjimais:
 - 5.1. Mažesnis motinos stresiškumo patyrimas antraisiais ir trečiaisiais vaiko gyvenimo metais susijęs su geresniais malonumo atidėjimo gebėjimais.
 - 5.2. Nėštumo planavimas ir motinos teigiama reakcija į nėštumą yra susijusi su geresniais kognityvios kontrolės ir planavimo gebėjimais.
 - 5.3. Motinos geriau įvertinti santykiai su vyru ar partneriu antraisiais ir trečiaisiais vaiko gyvenimo metais susiję su geresniais keturmečių planavimo gebėjimais.
 - 5.4. Motinos neparemiančios strategijos vaikų neigiamų emocijų atžvilgiu yra susijusios su didesniais vaikų malonumo atidėjimo, planavimo gebėjimais bei dėmesio ir impulsų kontrole, bet tik vaikų, kuriems būdingas didesnis neigiamas emocionalumas.
6. Didesnė „karšta“ savireguliacija yra susijusi su tokiais veiksniais: mergaitės lytis, gimimas po skubaus cezario pjūvio ir gera motinos emocinė būsena antraisiais ir trečiaisiais vaiko gyvenimo metais. „Karštą“ savireguliaciją prognozuoja gimimo būdas.
7. Didesnė „šalta“ savireguliacija yra susijusi su vyresniu vaiko amžiumi, aukštesniu tėvų išsilavinimu, geresniais vaiko samprotavimo gebėjimais, planuotu nėštumu, motinos geriau įvertintais santykiais su sutuoktiniu antraisiais ir trečiaisiais vaiko gyvenimo metais. „Šaltą“ savireguliaciją prognozuoja vaikų amžius.
8. Motinos įvertintą vaikų savireguliaciją tiesiogiai prognozuoja motinos paremiančios strategijos ir motinos saviveiksmingumo jausmas, o motinos ankstyvasis depresiškumas turi netiesioginę reikšmę ir veikia vaiko savireguliaciją per motinos saviveiksmingumo jausmą. Vaiko savireguliaciją per motinos

paremiančias strategijas veikia ir santykių su vyru / partneriu įvertinimas, kai vaikas 2 metų amžiaus.

9. Didelės motinystės rizikos vaikai pasižymi mažesne savireguliacija pagal motinos vertinimus, nei vaikai, kuriems būdinga maža rizika visais ekologiniais lygiais ir kuriems būdinga didelė motinos emocinės savijautos rizika.

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TRUMPA INFORMACIJA APIE DOKTORANTĘ

Rima Breidokienė studijavo psichologiją Vilniaus universitete. 2004 m. įgijo psichologijos bakalauro, o 2006 m. – klinikinės psichologijos magistro laipsnį. 2007-2014 metais buvo Vilniaus universiteto Bendrosios psichologijos katedros doktorantė.

Rima Breidokienė nuo 2007 metų dirba medicinos psichologe Vilniaus universiteto Vaikų ligoninės filiale Vaiko raidos centras. Nuo 2012 metų dirba jaunesniąja mokslo darbuotoja Vilniaus universiteto Psichologinių inovacijų ir eksperimentinių tyrimų centre (PTMC) projekte „Ankstyvoji savireguliacijos įgūdžių raida“ (projekto vadovė doc. dr. Roma Jusienė). 2004-2013 metais dirbo Vaikų laikinosios globos namuose „Atsigręžk į vaikus“ psichologe ir direktoriaus pavaduotoja metodinei ir projektinei veiklai. Dar studijų laikais dirbo konsultante savanore ir supervizore Vilniaus Vaikų linijoje. Yra baigusi PTMC organizuojamas Vaikų ir paauglių psichodinaminės psichoterapijos podiplomines studijas (bazinį lygį).

Doktorantūros studijų metu Rima Breidokienė dalyvavo kelete mokslininkų grupės projektu, parengė keletą mokslinių straipsnių, pristatė projektų ir disertacijos tyrimo rezultatus tarptautinėse bei Lietuvos mokslinėse konferencijose, mokslo populiarinimo leidiniuose.

Domėjimosi sritis: raidos psichologija ir psichopatologija.

ABOUT DOCTORAL STUDENT

Rima Breidokienė has studied psychology at Vilnius university. She was awarded a Bachelor's degree in Psychology in 2004 and a Master's degree in Clinical psychology in 2006 year. From 2007 to 2014 years she was a doctoral student at Vilnius university, Department of General Psychology.

Since 2007 year Rima Breidokienė has been working as a medicine psychologist in the department of Vilnius university Children's hospital – Child Development Center. Since 2012 year she has been working as a junior scientific worker in the project of the Psychological innovations and Research Training Center (PTMC) „Early development of self-regulatory skills“ (project manager assoc. prof. dr. Roma Jusienė). From 2004 to 2013 year she worked at children's home of temporary care „Atsigręžk į vaikus“ as a psychology and deputy director for methodological and project activity. In the study time

she was working a volunteer counsellor and supervisor at Vilnius Child line. She has also graduated the postgraduate studies of Children's and adolescents' psychodynamic therapy (the basic level), organized by PTMC.

During her doctoral studies Rima Breidokienė participated in the several research group projects, has prepared several scientific publications, has presented the findings of the project and doctoral research at both international and local scientific conferences, has published the findings in the popular science magazine.

Research interests: developmental psychology and psychopathology.

Mokslinės publikacijos disertacijos tema:

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