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## Child Temperament and Gender Differences<sup>1</sup>

Luciana Cosentino-Rocha  
Maria Beatriz Martins Linhares<sup>2</sup>  
*Universidade de São Paulo, Ribeirão Preto-SP, Brasil*

**Abstract:** The aim of this study was to analyze studies about the effect of temperament and gender on child development, from birth to school age. A systematic search was performed through PubMed, PsycInfo, Web of Science, LILACS and SciELO. The keywords temperament and gender or sex differences were used to identify empirical studies published between 2004 and April/ 2009. The results showed that studies about child sample with typical development, boys outperformed girls in the dimensions of Negative Emotionality, Impulsivity, Activity and Approaching Behavior, whereas girls outperformed boys in the dimensions of Fear, Cooperation and Positive Mood. Effortful Control was studied in children at biological and psychosocial risks where the girls outperformed boys. In conclusion, there were differences in temperament traits on developmental pathway of children from birth to school-age associated with gender variable.

**Keywords:** temperament, gender differences, childhood

## Temperamento de Crianças e Diferenças de Gênero

**Resumo:** O objetivo do presente estudo foi analisar estudos sobre o efeito do temperamento e gênero no desenvolvimento, do nascimento até a idade escolar. Uma revisão sistemática foi realizada nas bases PubMed, PsycInfo, Web of Science, LILACS and SciELO. As palavras-chave temperament e gender ou sex differences foram usadas para identificar estudos empíricos publicados entre 2004 e Abril/2009. Os resultados mostraram que nos estudos sobre amostras de crianças com desenvolvimento típico, meninos apresentaram maiores escores do que as meninas nas dimensões Emocionalidade Negativa, Impulsividade, Atividade e Comportamento de Aproximação, enquanto as meninas tinham maiores escores que os meninos nas dimensões Medo, Cooperação e Humor Positivo. O Controle com Esforço foi estudado em crianças com riscos biológicos e psicossociais, nos quais as meninas mostraram maiores escores do que os meninos. Concluindo, houve diferenças nos traços de temperamento ao longo do desenvolvimento de crianças do nascimento até idade escolar associadas com a variável gênero.

**Palavras-chave:** temperamento, gênero, infância

## Temperamento de Niños y Diferencias de Género

**Resumen:** El objetivo dese estudio fue analizar el efecto del temperamento y género en el desarrollo, del nacimiento hasta la edad escolar. Fue realizada una revisión sistemática en las bases PubMed, PsycInfo, Web of Science, LILACS y SciELO. Las palabras-clave *temperament* y *gender* o *sex differences* fueron utilizadas para identificar estudios empíricos publicados entre el 2004 y Abril/2009. Los resultados mostraron que, en los estudios sobre muestras de niños con desarrollo típico, los chicos tenían mayores escores que las chicas en las dimensiones Emocionalidad Negativa, Impulsividad, Actividad y Comportamiento de Aproximación, mientras las chicas tenían mayores escores que los chicos en las dimensiones Miedo, Cooperación y Humor Positivo. El control con esfuerzo fue estudiado en niños con riesgos biológicos y psicossociales, en el que las chicas tenían mayores escores que los chicos. La conclusión es que hubo diferencias en los trazos de temperamento a lo largo del desarrollo de niños del nacimiento hasta la edad escolar, asociadas a la variable de género.

**Palabras-clave:** temperamento, diferencias de género, infancia

Temperament refers to individual differences, relatively stable across ages, including biological and psychological factors, forming the basis of later personality (Else-Quest, Hyde, Goldsmith, & Van Hulle, 2006). Independently of temperament approaches, there is an agreement that expression thereof is influenced by experience and contextual factors (Zentner & Bates, 2008).

An integrative perspective on child temperament concepts, which is possible within the boundaries of definition criteria and fundamental temperament concepts emerging in childhood, was proposed by Zentner and Bates (2008). According to this review, the features of child temperament studies include: a) individual differences in normal behaviors pertaining to the domains of affect, activity, attention, and sensory sensitivity; b) typically expressed in formal characteristics such as response intensities, latencies, durations, thresholds, and recovery times; c) appearance in the first few years of life (partial appearance in infancy, full expression by preschool age; d) counterpart exists in primates as well certain social mammals (e.g., *canis familiaris*); e) closely, if complexly

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<sup>2</sup> Correspondence address:

Maria Beatriz Martins Linhares. Faculdade de Medicina de Ribeirão Preto. Universidade de São Paulo. Av. Tenente Catão Roxo, 2650. Prédio da Saúde Mental, sala 53. Monte Alegre. CEP 14.049-900. Ribeirão Preto-SP, Brazil. E-mail: linhares@fmrp.usp.br

linked to biological mechanisms (e.g., neurochemical, neuroanatomical, genetic); f) relatively enduring and predictive of conceptually coherent outcomes (e.g., early inhibition predicting internalizing, early difficulty predicting externalizing disorders).

Temperament may be studied according to several approaches, such as the following: Behavioral Style Approach, Criterial Approach, Psychobiological Approach and Biotypological Approach.

### **Behavioral Style Approach**

The New York Longitudinal Study, developed by Thomas and Chess (1977, 1980) and colleagues (Thomas, Chess, Birch, Hertzog, & Korn, 1963), was a breakthrough in temperamental studies, changing the emphasis of the prevalent theories in environmental influence on psychological development to child's individual differences. This approach describes nine dimensions of temperament, the concept of which reflects the stylistic component of behavior, the how of the behavior, differently from the motivation of the behavior (why) and the behavioral abilities (what) (Goldsmith et al., 1987). Other researchers developed validated measurement scales using parent reports, according to Thomas and Chess approach, including the Infant Temperament Questionnaire (Carey, 1970), the Revised Infant Temperament Questionnaire (Carey & McDevitt, 1978), the Behavioral Style Questionnaire (McDevitt & Carey, 1978), the Infant Characteristics Questionnaire (Bates, Freeland, & Lounsbury, 1979), and the Toddler Temperament Scale (Fullard, McDevitt, & Carey, 1984).

### **Criterial Approach**

The *Criterial Approach* developed by Buss and Plomin, describes temperament as a set of inherited personality traits that appear early in life. Thus, in order to define temperament traits, five criteria must be observed (Buss & Plomin, 1975, 1984). The traits are heritable, relatively stable during childhood, evolutionarily adaptive, present in our phylogenetic relatives, and show developmental continuity. The focus of this approach is in traits that have residuals for later personality. There are four dimensions in the Criterial Approach, being Emotionality, Activity, Sociability, and Impulsivity. This approach uses caregivers' reports about the child's behavior for assessing temperament.

### **Psychobiological Approach**

The *Psychobiological Approach*, proposed by Rothbart, postulates that temperament is constitutionally based on individual differences in reactivity and self-regulation (Rothbart & Bates, 2006; Rothbart &

Derryberry, 1981). Constitutional is defined as the biological bases of temperament, influenced over time by heredity, maturation and experience. Reactivity delineates responsiveness to change in the external and internal environment (the onset, intensity and duration of emotional, motor and attentional reactions). Self-regulation refers to the processes that modulate reactivity. The measurements used in the Psychobiological Approach involve questionnaires and behavioral observations, even though this approach is psychobiological in design. The Laboratory Temperament Assessment Battery (Labtab) from Goldsmith, Reilly, Lemery, Longley and Prescott (1995) is considered an observational measure of temperament in Rothbart's approach. LabTAB has structured tasks that involve both non-social (Risk Room) and social (Stranger Approach) stimuli (Talge, Donzella, & Gunnar, 2008). Additionally, tasks from Kochanska, Murray, Jacques, Koenig and Vandegeest (1996) may be used to assess individual differences in Effortful Control, based on the conceptualization that Effortful Control is the ability to suppress a dominant response and initiate a subdominant response according to varying task demands (Rothbart, 1989).

### **Biotypological Approach**

Developed by Kagan and colleagues, the *Biotypological Approach* to temperament, is an inductive approach, based on behavioral observation, to establish broad concepts of temperament (Kagan & Fox, 2006). This approach studied behavioral inhibition to unfamiliarity and its counterpart, an uninhibited style, with an emphasis on the longitudinal study of behavioral and physiological manifestations from early infancy onward (Zentner & Bates, 2008). In the Biotypological Approach, the temperament is viewed as a standard sequence of behaviors that relate to a pattern of physiological reactions in an individual's innate response to a specific stimulus. It focuses on the study of temperament by measuring observational categories of types of temperament. The temperament dimensions are studied according to two extremes. The categories studied are inhibited and uninhibited temperament, positive and negative affect, among others (Kagan, Reznick, & Snidman 1988; Klein & Linhares, 2010).

### **Gender Differences**

There are differences in the meaning between the terms "sex" and "gender". The most common conceptualization is the use of the term "sex" for the biological aspects (hormones, chromosomes, genitals) of being male or female, and "gender" for the social or cultural aspects (Blakemore, Berenbaum, & Liben, 2009). Regarding the developmental process, children develop ideas on gender

identification from about 1 ½ to 3 years of age (Santrock, 2007), some findings imply that many children understand gender labels by their second birthday and even before children can walk or talk, they have in place perceptual categories that distinguish “male” from “female” (Ruble, Martin, & Berenbaum, 2006). Furthermore, Zahn-Waxler, Shirtcliff and Marceau (2008), in their review study on gender and psychopathology in childhood and adolescence, referred that risk-by-gender interactions often emerge in development, suggesting that gender plays a role in the different mental health outcomes for boys and girls.

The study of gender differences in temperament, in conformity with Else-Quest et al. (2006), is the most fundamental question in gender differences research in the areas of personality and social behavior. In this recent meta-analysis, the authors assert that temperament theories have covered the issue of gender differences in temperament, yet inconclusive findings were shown. The meta-analysis of Else-Quest et al. has shown that in accord with temperament dimension on three frameworks, Buss and Plomin (1975), Rothbart (1981) and Thomas and Chess (1977, 1980), girls outperformed boys in Effortful Control factor, while boys outperformed girls in Activity and High Intensity Pleasure dimensions, from Surgency factor.

Although some studies addressed this issue in the last decade, more evidence is needed, focusing a broad range of approaches in the interaction between temperament and gender differences at childhood. The aim of the present study was to review the literature published, between the years of 2004 and 2009 (April), concerning empirical studies that analyze the relationship involving temperament and gender in child development, from birth to school age, using several theoretical and conceptual approaches in temperament assessment.

## Method

A systematic search was performed using the PubMed, PsycInfo, Web of Science, LILACS and SciELO databases. In order to identify studies that demonstrated the relationship of temperament and gender variables, combinations of the following keywords were used: “temperament and gender differences” and “temperament and sex differences”. The search revealed 134 references, after examining the abstracts. The following inclusion criteria were established: empirical articles published between the years of 2004 to April 2009, in English, Portuguese, Spanish and Italian; studies with children up to school age; where the purpose of which was to analyze the relationship between temperament and gender/sex as the main goal of the article or among the data analysis. The articles found in LILACS and SciELO did not meet the inclusion criteria. A total of 16 articles were reviewed.

## Results

### Approaches to Temperament

Considering the theoretical approaches used among the studies, the approach based on Rothbart was the most employed (in 50% of the articles), as a singular approach (Gleason, Gower, Hohmann, & Gleason, 2005; Kerestes, 2005; Pérez-Edgar, Schmidt, Henderson, Schulkin, & Fox, 2008; Pesonen, Räikkönen, Strandberg, & Järvenpää, 2006; Talge et al., 2008) or associated with another approaches (Fearon & Belsky, 2004; Olson, Sameroff, Kerr, Lopez, & Wellman, 2005) or by employing other instruments based on Rothbart’s assessments (Lahey et al., 2008). Next, Buss and Plomin’s approach to temperament was used in 31% of the studies, as a single approach (Porter et al., 2005; Theall-Honey & Schmidt, 2006), associated with another approach (Li-Grining, 2007), or through using instruments based on the assessment of Buss and Plomin (Heinonen, Räikkönen, & Keltikangas-Järvinen, 2005; Keltikangas-Järvinen, Pulkki-Råback, Puttonen, Viikari, & Raitakari, 2006). Finally, other approaches were employed less frequently, such as: Thomas and Chess approach, represented by Carey and McDevitt (Kivijärvi, Räihä, Kaljonen, Tamminen & Piha, 2005) and Bates (Kiang, Moreno, & Robinson, 2004) instruments (12%) and one study with Kagan’s approach (Rimm-Kaufman & Kagan, 2005).

Rothbart’s approach was employed in conjunction with the observational tasks of Kochanska (Olson et al., 2005), with Buss and Plomin’s approach (Li-Grining, 2007), and with the Thomas and Chess approach, through a McDevitt and Carey’s instrument (Fearon & Belsky, 2004).

### Temperament Assessment

Temperament assessment through mother’s report was the most used in the studies, accounting for 44% of the studies (Fearon & Belsky, 2004; Heinonen et al., 2005; Keltikangas-Järvinen et al., 2006; Kiang et al., 2004; Kivijärvi et al., 2005; Lahey et al., 2008; Pérez-Edgar et al., 2008), followed by 25% of studies that used reports from both parents (Kerestes, 2005; Pesonen et al., 2006; Porter et al., 2005; Theall-Honey & Schmidt, 2006), and 19% of the articles that used both parents’ reports and systematic observation (Li-Grining, 2007; Olson et al., 2005; Talge et al., 2008). Finally there was just one study in each of the following categories: teacher’s report (Gleason et al., 2005), and systematic observation only (Rimm-Kaufman & Kagan, 2005). In sum, the reports, either maternal and both parents, are the most employed temperament assessment.

## Age of the Samples

In regard to age of the study samples in temperament assessment, 38% of the studies focused on the first year of post-natal age (Kerestes, 2005; Kiang et al., 2004; Kivijärvi et al., 2005; Lahey et al., 2008; Pesonen et al., 2006; Pérez-Edgar et al., 2008), followed by the first year associated with another age group (Fearon & Belsky, 2004; Rimm-Kaufman & Kagan, 2005). Fifty percent of the studies focused on the age group of 2 to 6 years (Gleason et al., 2005; Heinonen et al., 2005; Keltikangas-Järvinen et al., 2006; Li-Grining, 2007; Olson et al., 2005; Porter et al., 2005; Talge et al., 2008; Theall-Honey & Schmidt, 2006).

## Countries of the Studies

The studies were developed mainly in the USA (57%) (Fearon & Belsky, 2004; Gleason et al., 2005; Kiang et al., 2004; Lahey et al., 2008; Li-Grining, 2007; Pérez-Edgar et al., 2008; Talge et al., 2008; Olson et al., 2005; Rimm-Kaufman & Kagan, 2005). The second country was Finland with 25% of the studies (Heinonen et al., 2005; Keltikangas-Järvinen et al., 2006; Kivijärvi et al., 2005; Pesonen et al., 2006). Canada (Theall-Honey & Schmidt, 2006), Croatia (Kerestes, 2005) and China (Porter et al., 2005) were represented in 6% of the articles, respectively.

## Main Findings of the Studies

### Temperament and gender differences on developmentally typical child samples

**Negative affectivity factor.** All six studies that addressed the Negative Affectivity factor and its dimensions (Fear, Fussiness, Distress to Limitations and Distress to Novelty, Soothability and Negative Emotionality) found positive results on temperament and gender differences. Otherwise, two of these studies also found no significant results for gender differences, specifically on Fussiness and Negative Emotionality dimensions of temperament.

Regarding the differences among boys and girls the dimension of Fear was studied among USA infants between birth and 11 months of post-natal age with an instrument based on Rothbart's approach (Lahey et al., 2008); males was rated as less fearful than female infants.

A study created a cumulative index named Fearful Temperament, comprised of four measures of fearful temperament, two observational measures based on Goldsmith's Laboratory Temperament Assessment Battery (Goldsmith et al., 1995) and two parent report scales (Fear and Shyness) from Rothbart's Approach (Talge et al., 2008). In USA children, assessed between 3 years and 2 months to 5 years, the girls scored higher than boys on the cumulative index for Fearful

Temperament, which reflected significant differences in CBQ Fear (Parent's report), and Stranger Approach Fear (observational data). The girls showed higher levels of fear than the boys in both assessments.

A longitudinal regression model showed a significant sex-by-fussiness interaction, indicating a stronger positive predictive association between fussiness (assessed between 0 to 11 months) and future behavioral problems in boys (assessed between 4 to 13 years) (Lahey et al., 2008). There were no significant sex differences in infant fussiness between 0 to 11 months of age.

Pérez-Edgar et al. (2008) studied USA children using Rothbart's Infant Behavior Questionnaire, and created the composite measure Negative Affect by summing the children's scores on two scales, Distress to Limitations and Distress to Novelty. When predicting Withdrawal behavior at age four, the interaction between Negative Affect and gender accounted for 3.8% of the variance; boys showed a significant positive relation. In boys high in early negative affectivity, the home cortisol levels positively correlated with Withdrawal at age four. High basal cortisol levels were strongly associated with Withdrawal in male participants. However, the relationship was significant only in boys who exhibited high levels of negative temperament in infancy (Pérez-Edgar et al., 2008).

In the temperament dimension of Soothability, Gleason et al. (2005) aimed to examine the role of friendship and temperament in early childhood, evaluating USA children from three years and six months to five years and eight months of age through teacher reports on Rothbart's Child Behavior Questionnaire. The findings showed that the more soothable a girl was, the higher the proportion of nominations in her class she received, which represents the proportion that the girl was seen as a friend by the classmates. In addition, failing to be high on temperamental characteristics such as Soothability and Impulsivity and low on Activity Level may compromise preschool aged girls' attractiveness to other children.

According to Buss and Plomin's Approach to temperament, the dimension of Negative Emotionality was assessed longitudinally in Finnish children around three to nine years of age in order to investigate whether childhood temperament was able to predict carotid artery intima media thickness (IMT) and/or its risk factors in adulthood, 21 years later, through the medical risk variables of LDL cholesterol (low-density lipoprotein) (Heinonen et al., 2005). The results showed that boys had higher levels of Negative Emotionality and lower levels of LDL cholesterol than the girls. Heinonen et al. (2005) examined the impact of childhood perceived temperament and the mother's child-rearing attitudes on dispositional optimism-pessimism in adulthood, using the same instrument in Finland. They found that mothers rated their sons as more Negatively

Emotional than their daughters at 6 to 9 years, but in children aged three to six years old, mother's assessment revealed no significant gender differences in the dimension of Negative Emotionality.

**Surgency factor.** Among the results of Surgency factor and its dimensions (Activity, Impulsivity, Cooperation, Approaching, Positive Mood, and Shyness/Inhibition) in six studies, all found positive results on the relationship between temperament and gender differences, and two of these studies also found negative results for temperament and gender relationship on Activity, Cooperation and Shyness dimensions.

The Activity dimension was the most studied dimension in Surgency Factor, including four studies. Kivijärvi et al. (2005) studied Finnish children at 6 months and 12 months using the Thomas and Chess approach, and found that Positive Mood and Approaching Behavior, together, in 6-month-old boys, might result in high Activity and Approaching Behavior at 12 months of age. They also found that girls were less active than boys at 12 months of age.

Between group comparisons of USA boys and girls aged from three years and six months to five years and eight months, studies using Rothbart's Approach showed that teachers rated boys higher than girls in Activity (Gleason et al., 2005). On the other hand, the study by Lahey et al. (2008) showed no gender differences in *Activity* in USA younger children from birth to 11 months, rated by mothers in Rothbart's Approach. Also, Heinonen et al. (2005) found no gender differences in *Activity* using Buss and Plomin's Approach, rated by mothers, in Finnish children aged 3 to 9 years. Gleason et al. (2005) showed that, similar to the Activity Level dimension, gender differences on the temperament characteristics were found for the Impulsivity dimension. Teachers rated boys' levels higher than girls' in a between group comparison of USA children in the first year of post-natal age, using the Rothbart's Approach.

The dimension of Cooperation was assessed with an instrument based on the Buss and Plomin Approach in Finnish children aged 3 to 9 years, which demonstrated that mothers perceived their sons as significantly less cooperative at 3 to 6 years (Heinonen et al., 2005). However, no gender differences were found in children 6 to 9 years old.

The Thomas and Chess Approach showed, in Finnish children at 6 months and at 12 months of age, that boys displayed more Approaching Behavior than girls, as rated by mothers. In addition, boys had more Positive Mood than girls at six months of age (Kivijärvi et al., 2005).

Theall-Honey and Schmidt (2006) studied how temperamentally Shy children process emotion differently than non-shy children, in a Canadian sample aged around 4.5 years, applying regional brain electrical activity (EEG) as a measures of emotional processing. The children were

divided into two groups of shy and non-shy according to results from the Colorado Childhood Temperament Inventory (CCTI) rated by their parents. Shy females displayed greater relative right mid-frontal activation across all affective videoclips than their male counterparts, who exhibited consistently greater relative left mid-frontal activation. Shy females also exhibited significantly greater relative right midfrontal EEG activity than shy males during both, sad and happy conditions. In contrast, non-shy females exhibited greater relative left mid-frontal activity than the non-shy males, who displayed more symmetrical mid-frontal activity across all of the affective conditions. Despite the positive results for gender differences, an analysis of variance with group (shy, non-shy) and gender (male, female) on the maternal CCTI shyness ratings has shown that the main effect for gender and the group by gender interaction were not significant.

A systematic observation of temperament found that Inhibited girls and Uninhibited boys talked more in school setting compared to the other two groups of inhibited boys and uninhibited girls, in American children 4-6 years of age (Rimm-Kaufman & Kagan, 2005).

### **Temperament and gender differences in children at biological and/or psychosocial risks**

**Preterm birth.** The comparison between premature Croatian infants and Croatian full-term infants in Rothbart's temperament dimensions showed that boys were rated by their mothers as more prone to Frustration (Negative Affectivity factor) than girls at 6 and 12 months (Kerestes, 2005). Furthermore, in the Fear dimension of the same factor, boys at 6 months showed more fear than boys at 12 months, whereas 6 months old girls manifested less fear than older ones; there is an interaction between the age and sex over temperament outcome. In addition, in the Duration of Orienting/Attentional Persistence (Effortful Control factor), premature Croatian boys at 6 months of age and girls at 12 months of age, respectively, were rated as having shorter periods of orienting than their full-term counterparts.

**Low birth weight and low-income preschoolers.** Li-Grining (2007) assessed Effortful Control in low birth weight and low-income preschoolers, through Kochanska's tasks of Delayed Gratification (demanding children to inhibit impulsive behavior and shift attention away from tempting objects) and Executive Control (requiring children to control behavior and to focus attention, demanding more of children's working memory). Only Delayed Gratification scores were higher for girls than for boys, in a representative sample of low-income, predominantly African-American and Latino children, USA residents from 3 to 4.5 years. Low birth weight was a predictor of Delayed Gratification in boys but not in girls.

**Small for gestational age.** The relation between temperament and gender in children born small for gestational age was studied by Pesonen et al. (2006). The sample consisted of Finnish infants at the mean age of 6.3 months, rated by both parents on Rothbart's Approach. The dimensions assessed were Activity level, Smiling and Laughter, Fear, Distress to Limitations, Soothability, and Duration of Orienting, besides two clusters were created from an item-weighted sum as the following: Negative Reactivity cluster (including Fear and Distress to Limitation dimensions), and Positive Reactivity cluster (including Smiling and Laughter, and Activity dimensions). The gender did not interact with infant temperament assessed by parental reports.

**Low-income preschoolers.** The study of Kiang et al. (2004) examined the impact of maternal preconceptions (negative, maladaptive attitudes about parenting and children, prenatally assessed) on later child temperament and maternal sensitivity and to predict children's empathy from the three cited sources. This longitudinal study assessed USA infants at 6 months old for difficult temperament using the Thomas and Chess Approach, at 12 to 15 months for maternal sensitivity, and at 21 to 24 months to evaluate empathy (prosocial behavior and indifference toward mother). The maternal preconceptions were significantly correlated with difficult temperament and children's prosocial responses toward mother, but only for boys. Also for boys, difficult temperament was significantly related to indifference toward the mother; however, this relation was not significant for girls. Group modeling analyses were made to assess potential gender group differences for each empathy outcome, revealing that boys and girls did not exhibit significantly different pathways. Therefore no significant gender differences were found with respect to maternal preconceptions, difficult temperament, or maternal sensitivity.

**Cumulative social-contextual adversity.** Fearon and Belsky (2004) combined both, the Rothbart and the McDevitt and Carey approaches, in the measure of attention and children's early temperamental difficulty, respectively. They created an Attention-Related Behavior Problems factor, composed by Effortful Control dimension of Attention Focusing and Inhibition-Control, and the Attention Problems Scale of the Child Behavior Checklist (Achenbach, 1991). The American boys with high cumulative contextual risk presented high attention-related behavior problems at 4.5 years. Contextual risk refers to low birth weight, psychosocial risk, socio-demographic risk, residential risk and mother-child interaction.

**Behavior problems.** The study by Olson et al. (2005) assessed American children with externalizing problems between 32 and 45 months of age in order to examine the role of Effortful Control on externalizing problems. They

used observational data and parent reports for temperament assessment based on the Rothbart Approach. Girls showed higher levels of Effortful Control than boys. Furthermore Effortful Control made a highly significant contribution to the variance in mothers', fathers', and teachers' ratings of child externalizing problems. Child gender did not make a significant contribution to the variance in any dependent measure, and no significant interactions were obtained. Also in this study, no gender differences were found in reference to the Anger /Frustration Scale.

### **Temperament and gender differences in cross-cultural studies**

The study assessed children temperament across different cultures, comparing USA sample with a sample from China. Porter et al. (2005) studied cross-culture differences in temperament (Buss and Plomin Approach) in children between four to six years. USA boys were rated as less active than boys in China and USA girls were rated as more emotional than Chinese girls, by their fathers. No differences between cultures were found for girls' *Activity* or boys' *Emotionality*. In addition, USA girls were rated as less sociable by their mothers and fathers than girls in China, but no cultural differences were found for Sociability in boys of both countries. This study is aimed to examine comparable dimensions and links between child temperament and parenting styles with samples from Beijing, China and the USA, since the authoritative parenting style and authoritarian parenting style were related to children's temperament, as well as gender. Authoritative parenting was measured in terms of the latent constructs of connection, reasoning-oriented regulation, and autonomy granting, and the authoritarian parenting was measured in terms of the latent constructs of physical coercion, verbal hostility and non reasoning/punitive parent's behavior. Concerning gender differences in cross-cultural studies of temperament, the authoritative parenting was negatively correlated with boys' *Emotionality* in the USA sample for both mothers and fathers, but in the Chinese sample only mothers' authoritative parenting was related with *Emotionality* in boys.

Similar to authoritarian parenting, a culture-specific pattern of findings also emerged between authoritative parenting in China and child *Activity*; however, in this instance, links were specific for girls, but not to boys. Moreover, only USA fathers' authoritative parenting was found to be linked to their boys' dimension of *Sociability*. No additional significant linkages were found between authoritative parenting and children's *Sociability*.

### **Discussion**

The results of the present review found that the Psychobiological approach proposed by Rothbart is very

frequently used as a conceptual model to study child temperament; both for developmentally typical samples of children and for children with biological or psychosocial risks. Rothbart's approach has a well established theory and instruments that permit a broad view of child temperament, reasons that support the preference for this model.

Congruent with a meta-analytic study about gender differences by Else-Quest et al. (2006), the present review displayed some "moderating factors" in the relationship between temperament and gender, such as source of temperament assessment, typical or at-risk child samples, socioeconomic and cultural context, and the age of the child. Each moderating factor can either increase or decrease the gender differences in temperament.

The present review showed a largest preference for caregivers' report on temperament assessment, which has methodological advantages. These questionnaires can evaluate a variety of temperament factors and dimensions, in contrasts to observational methods, which are focused on a single dimension each time. The parents used as an informant in most of temperament assessment of these reviews' studies, see the child in many different contexts over a long period of time, including during infrequent behaviors, providing more accuracy to the measurement of temperament (Rothbart & Bates, 2006). A caregiver's report is considered inexpensive to develop and easy to administer and analyze (Bates, 1989). They also have concurrent validity with some observational methods (Talge et al., 2008).

The studies that have examined temperament and gender differences on the development of typical samples of children, focused on Surgency and Negative Affectivity factors, while Effortful Control factor was evaluated only on samples of children at biological and/or psychosocial risks. Twelve studies appraised eleven dimensions of temperament on typical child samples, divided almost equally between both factors.

The studies on typical child samples covered age ranges from birth to nine years old, finding many gender differences on temperament outcomes. In these studies, boys outperformed girls in the dimensions of Negative Emotionality and Impulsivity from Negative Affectivity factor, and Activity and Approaching Behavior from Surgency Factor. Meanwhile, girls outperformed boys in the dimension of Fear from Negative Affectivity and in the dimensions of Cooperation and Positive Mood from Surgency factor.

The dimension of Activity was appraised in four typical child sample studies (Gleason et al., 2005; Heinonen et al., 2005; Kivijärvi et al., 2005; Lahey et al., 2008) and one cross-cultural study (Porter et al., 2005), with a wide age range (from birth to 9 years old). Four studies showed boys higher in Activity than girls. These

results are consistent with similar findings in the literature, as the meta-analysis of Else-Quest et al. (2006), in children aging three months to 13 years, and as the meta-analysis focused in gender differences in motor Activity Level, in the first 12 months of postnatal age (Campbell & Eaton, 1999). Otherwise, these findings contrast with results from two studies. The study by Lahey et al. (2008) showed no gender differences in Activity Level in USA infants in the first year of postnatal age; and the study by Pesonen et al. (2006) demonstrated no gender differences in Activity dimension in a sample at risk for low birth weight in the first month of postnatal age.

Studies focusing Effortful Control factor analyzed samples of children since preschool age, where this factor has its first largest development (Kochanska, Murray, & Harlan, 2000). Moreover, this factor was the most studied in children at biological (preterm birth, low birth weight and low-income preschoolers) and psychosocial risk (low-income preschoolers, cumulative social-contextual adversity, behavior problems), which shows a concern on the self-regulation functions of vulnerable children and those consequences for development (Fearon and Belsky, 2004; Li-Grining, 2007; Olson et al., 2005). The Effortful Control involves a regulation process for Negative Affectivity and prevention for later behavior problems, regarding that the self-regulation influences child adaptation (Calkins, 2009).

Regarding the studies with children at biological and psychosocial risk, the girls outperformed boys in the dimensions of Effortful Control factor. These findings are coherent with the Else-Quest et al. (2006) meta-analysis, in which the Effortful control factor and its dimensions (e.g., inhibitory control) showed a large difference in favor of girls. In addition, the study by Nygaard, Smith and Torgersen (2002) found that among a premature sample, girls were higher than boys in the dimension of Attentional Focusing (Effortful Control factor).

Some studies showed gender differences in temperament among the samples subject to biological risks, such as preterm birth (Kerestes, 2005) and low birth-weight (Li-Grining, 2007). On the other hand, inconsistencies are found in the studies with at-risk children. A study in a "small for gestational age" sample with infants around 6 months of post-natal age (Rothbart's Approach), showed no gender differences in any temperament dimension (Pesonen et al., 2006). Future studies should be addressed to investigate the role of gender in temperament of at-risk samples.

Considering that the present review found only one cross-cultural temperament study in children, and that aspects of children's age and culture may act as moderating factors on temperament and gender development (Else-Quest et al., 2006), this particular relationship between temperament and gender in children is poorly investigated



in cross-cultural studies in children before school years. More studies about temperament in younger samples should be done. The present review also reveals that the majority of the studies are in European and North America countries, showing the gap in the literature on temperament and gender amongst other countries of the world, especially in developing countries. Based on the current findings, future investigations are needed to know the influence of gender differences on temperament in child samples at biological and psychosocial risk, and in cross-cultural studies, especially in early ages of the child development.

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*Luciana Cosentino-Rocha* is M.Sc. student of the Post-Graduate Program of Mental Health, Faculdade de Medicina de Ribeirão Preto, Universidade de São Paulo.

*Maria Beatriz Martins Linhares* is Associate Professor at Departamento de Neurociências e Ciências do Comportamento, Faculdade de Medicina de Ribeirão Preto, Universidade de São Paulo.

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