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THE TEMPERAMENTAL TRAIT OF BEHAVIORAL INHIBITION:

Characteristics, Assessment, and Psychopathological Risk in Preschool Age

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Part I.

TEMPERAMENT AND BEHAVIORAL INHIBITION

CHAPTER 1.

TEMPERAMENT AND BEHAVIORAL INHIBITION

1.1 Theoretical background on child's temperament

The notion of temperament has been taken into account for a long time. Indeed, Galen, a Roman physician in the second century (129-199 A.C.), suggested that much of the variation in human behavior could be explained by an individual's temperament. He described four different types of individuals that can be considered as the first attempt to conceptualize temperament profiles: melancholic, sanguine, choleric, phlegmatic. The melancholic individuals were described as cool and dry due to an excess of black bile, while sanguine individuals were warm and moist because of an excess of blood. The choleric individuals were described as warm and dry due to an excess of yellow bile, and the phlegmatic individuals were cool and moist because of an excess of phlegm (Kagan, 1994). Although Galen recognized these four humors as inherit, he also wrote about the susceptibility of these temperaments to external events (Fox, 2004).

One of the first psychological conceptualization of temperament in XX century derives from Buss and Plomin's theories (1975, 1984), which started defining temperament based on previous work by Diamond (1957). He argued that in order to identify the essential foundations of individuality it is necessary to look at the animal world. Specifically, Diamond found four temperament dimensions that are shared by primates: fearfulness, aggressiveness, affiliativeness, impulsiveness (Zentner & Bates, 2008). Buss and Plomin (1975) endorsed and expanded Diamond's phylogenetic approach to temperament, defining this latter as the inherit and biological part of personality. Moreover, the authors recognized four temperament dimensions:

- Emotionality: the predisposition to get easily upset and distressed;
- Activity: the "total energy output" (Buss & Plomin, 1975, pp. 32-33), which refers to the total amount of motor activity displayed by the child;
- Sociability: the tendency to prefer the presence of others rather than being alone. Importantly, the opposite of this tendency is not shyness because shy people may desire the presence of others but they avoid it;
- Impulsivity: the tendency to display behaviors characterized by little or no forethought, without considering the consequences. Initially included but later dropped

from Buss & Plomin's model due to methodological and conceptual matters (see Zentner & Bates, 2008).

Approximately in the same period, Thomas and Chess (1970, 1977) detected a small number of dimensions as basically composing temperament predispositions in infancy and childhood. In their *New York Longitudinal Study*, Thomas & Chess (1970) defined temperament as an early and differentiated style of response to environment, focusing on the interaction between the infant/child and the environment. Although the relevance given to the genetic bases in considering temperament, the authors emphasized on infants' first experiences with their life context (Attili, 1993). Specifically, they conceptualized the idea of *"Goodness of fit"* as the degree to which temperament is compatible with the demands and expectations of the social environment. When there is compatibility, the child will normally and healthy develop, while when the expectations of the social environment are too high for him, a risk for child negative outcomes may be found (Attili, 1993).

Based on the *New York Longitudinal Study*, Thomas and Chess reported nine temperament categories (Table 1):

1) Activity level: how the child is generally active during play and feeding;
2) Rhythmicity: the predictability of biological functions like appetite and sleep;
3) Distractibility: the degree of concentration and attention displayed by the child when s/he is not particularly interested in an activity;
4) Approach/withdrawal: refers to the child's characteristic response to a new situation or stranger;
5) Adaptability: related to how easily the child adapts to transitions and changes, like switching to new activities;
6) Attention spam and persistence: the length of time the child continues in activities in the face of obstacles;
7) Intensity of reaction: the energy level of a response whether positive or negative;
8) Threshold of responsiveness: related to how sensitive is the child to the physical stimuli. It is the amount of stimulation (sounds, tastes, touch...) needed to produce a response in the child;
9) Quality of mood: the tendency to react the world primarily in a positive or negative way.

These categories were found by authors interviewing mothers about their child's behavioral responses to environment from the first months of age to adulthood. Based on these nine dimensions, Chess and Thomas (1999) reported three major temperament types:

- *Easy babies*. They represent the 40% of infants, and they characterized by the capacity to adjust easily to new situations, quickly establish routines, generally cheerful and easy to calm.

- *Difficult babies*. They represent the 10% of infants, and they look to be slow in adjusting to new experiences, they likely react negatively and intensely to stimuli;

- *Slow-to-warm-up babies*. They represent the 15% of infants, and they are described as somewhat difficult at first but become easier over time.

Table 1. Thomas and Chess's temperament dimensions across different ages

Temperamental Quality	Rating	2 months	2 years	5 years	10 years
Activity level	High	Moves often in sleep. Wriggles when diaper is changed.	Climbs furniture. Explores. Gets in and out of bed while being put to sleep.	Leaves table often during meals. Always runs.	Plays ball and engages in other sports. Cannot sit still long enough to do homework.
	Low	Does not moved when being dressed or during sleep.	Enjoys quiet play with puzzles. Can listen to records for hours.	Takes a long time to dress. Sits quietly on long automobile rides.	Likes chess and reading. Eats very slowly.
Rhythmicity	Regular	Has been on four-hour feeding schedule since birth. Regular bowel movement.	Eats a big lunch every day. Always has snack before bedtime.	Falls asleep when put to bed. Bowel movement regular.	Eats only at mealtimes. Sleeps the same amount of time each night.
	Irregular	Awakes at a different time each morning. Size of feeding varies.	Nap time changes from day to day. Toilet training is difficult because bowel movement is unpredictable.	Food intake varies; so does time of bowel movement.	Food intake varies. Falls asleep at a different time each night.
Distractibility	Distractible	Will stop crying for food if rocked. Stops fussing if given pacifier when diaper is being changed.	Will stop tantrum if another activity is suggested.	Can be coaxed out of forbidden activity by being led into something else.	Needs absolute silence for homework. Has a hard time choosing a shirt in a store because they all appeal to him.
	Not distractible	Will not stop crying when diaper is changed. Fusses after eating, even if rocked.	Screams if refused some desired object. Ignores mother's calling.	Seems not to hear if involved in favorite activities. Cries for a long time when hurt.	Can read a book while the television is at high volume. Does chores on schedule.
Approach/Withdrawal	Positive	Smiles and licks washcloths. Has always liked bottle.	Slept well the first time he stayed overnight at grandparents' house.	Entering school building unhesitatingly. Tries new food.	Went to camp happily. Loved to ski the first time.

	Negative	Rejected cereals the first time. Cries when strangers appear.	Avoids strange children in the playground. Whimpers first time at beach. Will not go into water.	Hid behind mother when entering school.	Severely homesick at camp during first days. Does not like new activities.
Adaptability	Adaptable	Was passive during first bath; now enjoys bathing. Smiles at nurse.	Obeys quickly. Stayed contentedly with grandparents for a week.	Hesitated to go to nursery school at first; now goes eagerly; slept well on camping trip.	Likes camp, although homesick during first days. Learns enthusiastically.
	Not adaptable	Still startled by sudden, sharp noise. Resists diapering.	Cries and screams each time hair is cut. Disobeys persistently.	Has to be hand led into classroom each day. Bounces on bed in spite of spankings.	Does not adjust well to new school or new teacher. Comes home late for dinner even when punished.
Attention span and persistence	Long	If soiled, continues to cry until changed. Repeatedly rejects water if he wants milk.	Works on a puzzle until it is finished. Watches when shown how to do something.	Practiced riding a two-wheeled bicycle for hours until mastered it. Spent over an hour reading a book.	Reads for two hours before sleeping. Does homework carefully.
	Short	Cries when awakened but stops almost immediately. Objects only mildly if cereal precedes bottle.	Gives up easily if a toy is hard to use. Asks for help immediately if undressing becomes difficult.	Still cannot tie his shoes because he gives up when he is not successful. Fidgets when parents read to him.	Gets up frequently from homework for a snack. Never finishes a book.
Intensity of reaction	Intense	Cries when diapers are wet. Rejects food vigorously when satisfied.	Yells if he feels excitement or delight. Cries loudly if a toy is taken away.	Rushes to greet father. Gets hiccups from laughing hard.	Tears up an entire page of homework is one mistake is made. Slams door of room when teased by younger brother.
	Mild	Does not cry when diapers are wet. Whimpers instead of crying when hungry.	When another child hit her, she looked surprised, did not hit back.	Drops eyes and remains silent when given a firm parental "No." Does not laugh much.	When a mistake is made in a model airplane, corrects it quietly. Does not comment when reprimanded.
Threshold of	Low	Stops	Runs to door	Always notices	Rejects fatty

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responsiveness		sucking on bottle when approached.	when father comes home. Must always be tucked tightly into bed.	when mother puts new dress on for first time. Refuses milk if it is not ice-cold.	foods. Adjusts shower until water is exactly the right temperature.
	High	Is not startled by loud noises. Takes bottle and breast equally well.	Can be left with anyone. Falls asleep easily on either back or stomach.	Does not hear loud, sudden noises when reading. Does not object to injections.	Never complains when sick. Eats all food.
Quality of mood	Positive	Smacks lips when first tasting new food. Smiles at parents.	Plays with sisters; laughs and giggles. Smiles when he succeeds in putting shoes on.	Laughs loudly while watching television cartoons. Smiles at everyone.	Enjoys new accomplishments. Laughs aloud when reading a funny passage.
	Negative	Fusses after nursing. Cries when carriage is rocked.	Cries and squirms when given haircut. Cries when mother leaves.	Objects to putting boots on. Cries when frustrated.	Cries when he cannot solve a homework problem. Very "weepy" if he does not get enough sleep.

Adapted from Thomas, Chess, and Birch (1970)

Thomas and Chess' categories referred to behavioral styles rather than genetic profiles or emotional characteristics. According to this perspective, also Rothbart and colleagues (1981) found five dimensions, which can be detected in infancy as early temperament traits: positive affect, two kinds of negative affect (fear/anxiety and anger/irritability), activity level and rhythmicity. These authors classified these dimensions as parts of three broader categories that they called Surgency/extraversion, Neuroticism/negative affect, and Affiliation/orienting (i.e., in general, the capacity to soothe). During the toddlerhood and from early to middle childhood, according to Rothbart and colleagues (1981) this last dimension is anchored by attentional control and they called it as "effortful control".

In later studies (Rothbart et al., 2006), the authors switch the accent from the behavior to more "intrapersonal" dimensions. Specifically, they define temperament as "constitutionally based individual differences in *reactivity* and *self-regulation*, in the domains of affect, activity, and attention" (Rothbart & Bates, 2006). Reactivity and self-regulation are terms initially used by Rothbart & Derryberry (1981) to refer to temperament domains. Specifically, Reactivity refers to a broad class of reactions to change in the internal and external environment (e.g., fear, motor activity, orienting, negative affect, cardiac reactivity…). It is measured in terms of latency, duration and intensity of affective, motor and orienting reactions. Self-regulation is linked to attention and serves to modulate reactivity and organize change (Rothbart & Derryberry, 1981). In Rothbart & Bates' definition of temperament, affect and emotion regulation represent a relevant matter. By *emotion regulation*, the authors mean the modulation of a given emotional reaction, including its inhibition or activation. It includes attentional strategies. Thus, it is possible describing temperament as a dynamic balance among emotional tendencies, and between emotions and attention.

Although over time temperament theorists differ with regard to issues such as the heritability of temperament, its stability over time or its relation to biological factors (Lindhout et al., 2008), some key criteria have been recognized to define temperament (Table 2) (Zentner & Bates, 2008). Currently, there is a general consensus that temperament consists of a variation in relatively stable emotional and behavioral responses that emerge early in life (Kagan, Snidman, Arcus, 1995), are based, in part, on genetic mechanisms, and may be modulated by environmental factors (Thomas & Chess, 1977). Historically, temperament and personality have been conceived as quite similar domains (Rutter et al., 1987). Indeed, traits described as temperament and those described as personality share some common characteristics: 1) they appear early in life; 2) have similar heritability; 3) have similar cross-time and cross-situation continuity; 4) are associated with emotional and motivational components of behavior (Nigg, 2006).

Although these shared aspects, temperament has been mainly considered as a constitutionally-based behavioral style in very young children (Goldsmith et al., 1987), while personality as a more complex set of psychosocially-based behavioral preferences in adults (Mayer, 2005). More specifically, it has been argued that temperament is an *early precursor* of personality, while this latter refers to a broader bunch of characteristics, such as coping styles, defensive styles, motives, self-views, life stories, and identities (McAdams & Pals, 2006).

Table 2. Key criteria to define child temperament

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1. Individual differences in normal behavior pertaining to the domains of affect, activity, attention, and sensory sensitivity

2. Typically expressed in formal characteristics such as response intensities, latencies, durations, thresholds, and recovery times

3. Appearance in the first few years of life (partial appearance in infancy, full expression by preschool age)

4. Counterpart exists in primates as well certain social mammals (e.g., *Canis familiaris*)

5. Closely, if complexly linked to biological mechanisms (e.g., neurochimical, neuroanatomical, genetic)

6. Relatively enduring and predictive of conceptually coherent personality types

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Adapted from Zentner & Bates (2008)

1.2 Main temperament dimensions

In this paragraph we describe basic temperament dimensions that fulfill most of the previous key criteria reported above (Table 2), are recognized by most current research, and have been studied extensively (Caspi & Shiner, 2006; Zentner & Bates, 2008). It should be noted that temperament criteria for each dimension may differ from case to case, for example they are less evident for sensory sensitivity. Also, it should be noted that concepts like positive emotionality or activity level have been best considered as broader "families of temperament" rather then specific traits (Zentern & Bates, 2008).

Activity Level. This temperament dimension represents the level of gross motor activity including rate and extent of locomotion (Putnam & Rothbart, 2006). It has been argued that children who are more active tend to explore more, and are more actively processing incoming stimulation (Chervaz & Martinez, 1984), so that Activity Level seems to be a fundamental component of exploration (Berlyne, 1960).

According to Rothbart & Bates (2006), Activity Level may be a derivate of positive emotionality or, in a broader perspective, an expression of the general activation system. However, because of Activity Level is present both in positive and in negative emotionality, as well as in neutral behavior, it has been argued that, actually, the two dimensions are separate. Also, neural circuits implicated in positive affect are separate from those regarding Activity Level (Zentner & Bates, 2008).

Activity Level is relatively stable across early and middle childhood (Buss, Block & Bloc, 1980), even in parents' perceptions (Guerin et al., 2003), although other studies reported mixed results (Lemery et al., 1999, 2002).

Positive Emotionality. This dimension is characterized by several subcomponents, such as positive anticipation (e.g., child's tendency to positively reacts towards expected events, such a school trip), smiling and laughter, and, according to some authors (Rothbart & Bates, 2006), activity level. Specifically, in infancy Positive Emotionality is expressed by the total amount of smiling, laughing, and non-fussy motor acts (e.g., clapping hands) (Kochanska et al., 1998). Across early and middle childhood, this dimension is mainly represented by smiling and laughing, as well as positive anticipation behaviors (Putnam, Gartstein & Rothbart, 2006). It should be noted that Positive Emotionality is not the inverse of Negative Emotionality, but these two dimensions are quite independent and differentiated (Zentner & Bates, 2008).

The neurobiological underpinnings of Positive Emotionality are not fully understood but it has been shown how it is linked to a number of neural circuits, such as midbrain dopamine systems projecting from the substantia nigra and the ventral tegmental area (Posner & Rothbart, 2007).

Negative Emotionality. As Positive Emotionality, also Negative Emotionality is composed of several subcomponents, such as irritability, frustration, and sadness. It involves the experience of negative emotions and poor self-concept (Watson & Clark, 1984) and there is a general consensus that early temperament Negative Emotionality predicts later Neuroticism dimension of personality.

Researchers generally have found a good stability of Negative Emotionality levels across development. However, some studies have reported increases in the means of intensity and frequency of negative affect in adolescence and later-adolescence (Larson & Richards, 1994; Laursen & Collins, 1994).

Attention/persistence. This dimension has been conceptualized by Rothbart & Bates (2006) as a specific temperament quality called *Effortful Control*. This latter represents the regulatory component of temperament, and more specifically:

> "…the efficiency of executive attention, including the ability to inhibit a dominant response and/or to activate a subdominant response, to plan and to detect errors" (Rothbart & Bates, 2006, p. 129)

Effortful Control includes the ability to deploy attention willfully (usually called *Attentional Focusing* or *Attentional Shifting*) and the ability to inhibit and to activate behavior willfully (usually called *Inhibitory Control* and *Activational Control*, respectively) (Rothbart et al., 2003; White et al., 2011; Hendersen et al., 2014), and it represents an "impulse control system", emerging in toddlerhood and developing in preschool age (Rhoades et al., 2009). In particular, Lauch, Becker, & Schmidt (2006) found that infants' attention problems at 3 months of age were related to novelty seeking in adolescence, while Kochanska, Murray, & Harlan (2000) reported that focused attention at 9 months predicted Effortful Control in toddlerhood. In turn, preschool Effortful Control has been shown to predict cognitive and self-regulatory capacities in adolescence (Shoda, Mischel, & Peake, 1990).

Perceptual Sensitivity. Although this dimension is less established by research (Zentner & Bates, 2008), infants and children vary greatly in their responses to sensory stimuli, with some children avoiding certain kinds of sensory experience, while others being "sensation seekers".

In general, Perceptual Sensitivity may be defined both as the tendency to show sensitivity to aversive stimuli (e.g., loud noises) (Kochanska et al., 1998), and the ability to react to sensory stimuli of low stimulative value (Goldsmith, 1996).

Behavioral Inhibition to Unfamiliar (BI). This temperament predisposition, emerging in the second year of life, has been greatly studying in the last thirty years, especially by Kagan and colleagues (Kagan, Reznick, & Snidman, 1987). In literature, this predisposition is also called using the more general term "*fearfulness*", above all for what concerns studies on infancy and early childhood. Although many studies have investigated this construct, several issues are still unsolved and next chapters will focus both on consensus in literature about characteristics of BI and its associated outcomes and on still questioned issues.

The following paragraph will extensively describe the characteristics of Behavioral Inhibition and the first studies on it.

1.3 The temperament trait of Behavioral Inhibition: Characteristics of the construct

Research on BI originated in a study on Caucasian adults born between 1929 and 1939. This study, which took place in the Antioch College in Yellow Springs (Ohio), aimed to explore the individual differences from infancy to adulthood. It was conducted by two psychologists of Harvard University, Howard Moss and Jerome Kagan (Kagan & Snidman, 2004), who interviewed and tested the young adults in order to collect information about behaviors that survived across development.

The most important discovery was that children who usually avoided unfamiliar objects, people or situations became adults showing similar patterns of introverted and cautious behaviors. Differently, sociable children became competitive and extrovert adults. Also, the sympathetic tone in the cardiovascular system showed differences between these two groups, with high and minimally variable heart rates for shy and timid adults (Kagan & Snidman, 2004).

In a later study in 1979, Cynthia Garcia-Coll filmed 117 twenty-one-months-old children when confronting with new and unfamiliar stimuli (Garcia-Coll et al., 1984). Avoidant behavior, crying, reticence were selected as typical reactions of inhibition to unfamiliarity. Part of this initial sample was then observed at age 4. Children who were initially classified as "inhibited" had higher

heart rates, glanced frequently at the examiner and usually were described as "shy" by mothers, while the "uninhibited" children showed the opposite behaviors (Kagan & Snidman, 2004).

After these two initial studies, Kagan, Reznick, & Snidman (1987) worked on further research regarding what they called "*Behavioral Inhibition to Unfamiliar*". Kagan, Reznick and Snidman (1986) defined Behavioral Inhibition as

> "the tendency to display or not display an initial period of inhibition of speech and play, associated with a retreat to a target of attachment, when the child encounters an unfamiliar or challenging event" (p.54)

Thus, BI refers to "the child's early initial behavioral reactions to unfamiliar people, objects, and contexts, or challenging situations" (Kagan, Reznick, & Snidman, 1985, p.53), which can be observed as early as 14 months of age and characterizes 10 to 15% of Caucasian population (Kagan, Reznick, & Snidman, 1988).

As each temperament trait, Behavioral Inhibition can be also described in terms of *neurophysiological correlates* (Kagan, Reznick, & Snidman, 1987; Kagan & Snidman, 1991; Scarpa et al., 1997; Chronis-Tuscano et al., 2009; Tarullo, Mliner, & Gunnar, 2011). Indeed, it has been shown that BI children, compared to non-BI peers, show a higher heart rate, increased skeletal muscle tension and pupillary dilatation, higher cortisol levels and more vigilant attention styles. These psychophysiological characteristics seem to reflect an innate lower threshold to limbic excitability and sympathetic activation (Hirshfeld-Becker et al., 2003).

However, Kagan and colleagues (1994) suggested that the physiological correlates are specifically evident for children with an extreme BI profile. For this reason, the authors pointed out that the identification of BI needs to focus on child's *behavioral* and *affective* profile (Kagan et al., 1994; Bishop, Spence, & McDonald, 2003). Specific *behavioral features* of BI in early childhood include latency of approach to new social and non-social stimuli, proximity to the caregiver, avoidance, wariness, disorganization, crying, stopping playing when confronting with unfamiliar situations (Fox et al., 2005). *Emotional features* in early childhood include anxiety, fear, unease in changing or novel situations with unfamiliar people or objects (Hirshfeld-Becker et al., 2008).

Some of these behavioral and emotional characteristics may be shared by both BI and Shyness, although these two constructs are distinct. As argued by Volbrecht & Goldsmith (2010), Shyness represents wariness in *socio-evaluative* settings. The accent regards the social and evaluative aspects, while Behavioral Inhibition mainly refers to a general fear for novelty, independently of evaluative situations. Kagan (1992) argued that:

"[…] the temperamentally inhibited children must be differentiated from the shy child who was not born with any temperamental bias favoring limbic reactivity to unfamiliarity, but happened to experience an environment that promoted the acquisition of timidity and restraint. This latter child may resemble the temperamentally timid youngster behaviorally, but can be differentiated from him or her by evaluating early history and physiology. It is assumed […] that the differences between these two classes of children have important implications for the choice of therapeutic interventions as well as the probability of therapeutic success." (Kagan, 1992, p. 55)

Kagan pointed out that an inhibited child may be described by parents and teachers as shy because they focus on that child's interactions in social contexts rather than examining whether the child has a more general tendency to fearfully react to novel situations and stimuli (Kagan & Snidman, 2004). Therefore, several inhibited children may be apparently considered just as shy children, and *vice versa*.

Some studies in literature did not consider this distinction, adopting measures for the assessment of Shyness in place of measures for the assessment of Behavioral Inhibition. Similarly, other studies evaluated just child's responses to social stimuli, neglecting the assessment of child's reactions to non-social stimuli (See Chapter 3, p. 31).

The relevance to consider both these components has been argued by Kagan, Snidman, & Arcus (1998) who traditionally have described BI as a *unitary* construct, characterized by wariness and reticence towards *both social and non-social* stimuli. However, some authors (Dyson et al., 2011; Kertes et al., 2009; Kochanska, 1991) have argued that BI is a complex *multidimensional* construct that may occur in different forms, social (unfamiliar adults, peers) *or* non-social (new objects, food, physical activity with risk of injury and uncertainty), with a certain degree of independence one from each other. For instance, a child may show high levels of BI when confronting with a stranger, but never when exposed to new toys, new objects or unfamiliar situations. Stevenson-Hinde & Glover (1996) reported that a small number of children had to be classified in the "extremely shy" group based on observations at home but they fell into the "not shy at all" group when observed in the laboratory. Rubin et al. (1997) argued that a "system of social Behavioral Inhibition" might exist independently of a "system of non-social Behavioral Inhibition". The authors underlined that BI in early childhood can take different forms and each inhibited behavior can reflect the activity of a different behavior system. Thus, a toddler with high levels of inhibition can display consistent inhibited behavior both in social and non-social contexts.

However, a toddler may also be extremely shy with an adult stranger but not necessarily inhibited in a non-social context (van Brakel, 2007).

Dyson et al. (2011) agree with this position. Specifically, the authors have examined the distinction between social and non-social aspects of BI in a sample of preschoolers, finding that the two aspects were not significantly correlated. Also, the authors reported that social and non-social BI exhibited distinct associations with patterns of anxiety symptoms, pointing out the importance to keep into account the different forms of BI in order to better understand the child's developmental trajectories (Dyson et al., 2011).

Also Kochanska et al. (1991) and Kertes et al. (2009) argued that social and non-social BI might differ in predicting distinct physiological responses; specifically, Kertes and colleagues (2009) found social and non-social components of BI as associated with distinct cortisol responses in a sample of preschool aged children.

The relation between social and non-social components of BI is still an open-debate in literature. It is possible that both the unitary and the multidimensional perspectives are adequate according to child's age. Indeed, Kagan, Snidman, & Arcus (1998) highlighted that a young child classified as inhibited might, with experience, diminish the initial reticence with strangers but retain an avoidant style to new objects and unfamiliar places. Thus, "a child can display an avoidant style in any of a number of contexts, but not necessarily all of them" (Kagan, Snidman, & Arcus, 1998, p. 1483).

Cultural factors may strongly contribute to the expression of BI too. Geng et al. (2011), examining parental perception of BI, analyzed social and non-social associations within gender groups in preschool aged children and reported that social and non-social BI were significantly correlated (r=0.31, p<0.05) for boys, while not for girls. The authors explained this gender difference arguing that parents may perceive both boys' social and non-social BI as not "masculine". Thus, it is more likely for boys to receive similar ratings in both social and non-social Behavioral Inhibition from their parents than girls, as suggested by previous studies (Rooth & Rubin, 2010; Stevenson-Hinde & Glover, 1996). Cultural factors, such as gender in parental perception of inhibition, should be better explored in research on BI. Generally, further studies are needed in this direction in order to highlight and better describe the associations between social and non-social aspects of BI.

1.3.1   Gender Differences in Behavioral Inhibition trait

To our knowledge, until now only a few studies have investigated gender differences in the intensity of BI trait in toddlerhood and preschool age. Some of them did not show any significant difference between males and females (Mullen, Snidman, & Kagan, 1993; Stevenson-Hinde & Shouldice, 1995; Martin et al., 1997; Bishop, Spence, & McDonald, 2003), while others (Dyson et al., 2011; Gagne, Miller, & Goldsmith, 2013; Johnson et al., 2016) revealed that girls are more inhibited than boys, both considering parent-reports and observational measures. Similarly to this second bunch of studies, two meta-analyses indicated a small gender difference in fearfulness for girls early in life (Else-Quest et al., 2006; Chaplin & Aldao, 2013). The debate in literature about the existence of gender differences in BI is still open, above all considering these mixed results (Table 3).

Authors supporting the existence of gender differences have argued that both innate and cultural aspects may be somehow related to them (Chaplin, 2015). Biological theorists have suggested that males and females show innate differences in temperament that are related to biological factors, existing either prenatally and/or birth (e.g., sex hormones in utero, which lead to body and brain differences between males and females) or that occur at a later point in development (Chaplin, 2015). Specifically, it has been shown higher levels of activity and arousal for boys compared to girls in infancy, suggesting that boys are less likely to inhibit or down-regulate negative emotions (e.g., fear) and more likely to express them in infancy (Brody, 1999; Weinberg et al., 1999).

Some authors (Else-Quest et al., 2006; Martin et al., 1997) have suggested that differences are less evident in infancy and start to appear in toddlerhood and, above all, in school age, due to gender roles and stereotypes (Rubin et al., 2001). Indeed, it has been shown that in Western cultures, parents respond to boys in ways that dampen their emotional expressiveness and encourage boys to limit their emotions as a means of down-regulating their high arousal (Chaplin, 2015). Specifically, parents are likely to respond to their daughters by talking to them about emotions, encouraging emotion expression, and using more emotion words (i.e., happiness-related words and sadness-related words) (Adams et al., 1995; Fivush, 2000). Coherently with these findings, Buck (1977) reported that boys' observed emotion expressions diminished with age from 4 to 6 years while girls' did not.

Taken together, these findings suggest that cultural factors may have an important role in different responses to Behavioral Inhibition for boys and girls (Doey et al., 2014). For instance, they can have different consequences from the protective parenting, with boys experiencing negative

outcomes and girls positive ones (McShane & Hastings, 2009). Similarly, it has been shown that a parenting style characterized by a lack of encouragement of independence may promote social fear for reticent and inhibited boys (Coplan et al., 2004). A recent review (Doey et al., 2014) have suggested that anxious and fearful behaviors in girls are more likely to be rewarded and accepted by parents compared to the same behaviors in boys. Maybe due to these cultural factors, in a study investigating maternal accuracy, Kiel & Buss (2006) found that maternal reports more accurately predicted fear *versus* anger in girls than in boys. Similarly, other authors (Fivush et al., 2000) reported that mothers more accurately predicted distress to novelty (i.e., BI) for girls than for boys.

Considering the contribution of both innate and cultural aspects to gender differences in the intensity of BI trait, Gagne, Miller, & Goldsmith (2013) have argued that an important period for understanding these differences occurs between toddlerhood and preschool age, when cultural factors are supposed to influence boys and girls' behaviors in a limited manner. However, as reported above, only a few studies until now have examined this issue and further researches are strictly recommended.

Table 3. Main studies on gender differences in the intensity of BI in early childhood

Study	Child's age	Findings
Mullen, Snidman, & Kagan (1993)	14 months	No gender differences
Stevenson-Hinde & Shouldice (1995)	4 years	No gender differences
Martin et al. (1997)	5 years	No gender differences
Bishop, Spence, & McDonald (2003)	3-5 years	No gender differences
Dyson et al. (2011)	3-4 years	Females were more inhibited than males
Gagne, Miller, & Goldsmith (2013)	3 years	Females were more inhibited than males
Johnson et al. (2016)	3 years	Females were more inhibited than males

CHAPTER 2.

TRAJECTORIES OF BEHAVIORAL INHIBITION OVER TIME

2.1 Prenatal environment and precursors of Behavioral Inhibition

The Goodness of Fit Model by Thomas and Chess (1977) previously shown (See "*1.1 Theoretical Background on child's temperament*", p. 7) highlights the close relation between environment and temperament. Recent studies (Huizink et al., 2003; Werner et al., 2007; Glover et al., 2010; O'Donnell, O'Connor, & Glover, 2009; Conradt et al., 2015) have put in light the influence of prenatal environment on temperament predispositions, reporting that maternal prenatal stress and anxiety have an impact on the fetus' neurobehavioral development (Weinstock et al., 2005; Poggi Davis et al., 2007; Bergman et al., 2007), influencing infant temperament and adverse child developmental outcomes (Van den Bergh, 2005; Conradt et al., 2015). Specifically, high maternal prenatal stress has been found as related to poorer attention regulation at 8 months (Huizink et al., 2003), lower mental and motor development at 8 months (Buitelaar et al., 2003) and externalizing behavior at age 2 (Gutteling et al., 2005), while high maternal pregnancy-specific anxiety (PSA) has been associated with the development of anxiety problems during the preadolescent age (Davis & Sandman, 2012).

Moreover, the current evidence suggests that maternal prenatal stress and anxiety have an impact on infant individual differences in negative affect, irritability and rhythmicity, which have been identified as early precursors of later Behavioral Inhibition in toddlerhood (Moelher et al., 2008). Specifically, some studies have reported maternal stress, symptoms of depression, and anxiety as predicting negative affect (e.g., fear, sadness, and distress/frustration) in infants (de Weerth et al., 2005; Pesonen et al., 2005; Davis et al., 2007; Henrichs et al., 2009; Rouse & Goodman, 2014) and toddlers (Blair et al., 2011; Agrati et al., 2015), and more irritability and low rhythmicity in infants (Austin et al., 2005; Della Vedova, 2014). Recently, Nolvi and colleagues (2016) compared infants of mothers with high stress during pregnancy and infants mothers with low stress in the emotional reactivity shown at 6 months of age. The authors reported that infants of mothers with high stress during pregnancy showed higher both positive and negative emotional reactivity compared to infants of mothers with low stress during pregnancy. In addition, pregnancy-specific anxiety (PSA) significantly predicted infant negative affect and fearfulness.

How prenatal exposure to maternal stress and anxiety may be related to individual differences in offspring's temperament and behavior is still unclear. Glover (2014) underlined that prenatal anxiety or depression may contribute 10-15% of the attributable load for emotional and behavioral characteristics in infancy and childhood, although little is understood regarding underlying biological mechanisms. For what concerns infant negative affect and later BI, one mechanism that has been hypothesized is related to the increased exposure of the fetus to cortisol. Cortisol is a glucocorticoid and the end product from a cascade of hormones secreted by the hypothalamic-pituitary-adrenal (HPA) axis (Gunnar & Quevedo, 2007). Although cortisol is essential for the fetus development, it has been associated with infant and child's response to stress and it has been identified as a risk for anxiety spectrum problems (Davis et al., 2012). Other studies have also reported high cortisol reactivity as associated with infant negative affect and toddler Behavioral Inhibition (Davis et al., 2012; Kiel & Buss, 2013).

Thus, a fetal overexposure to cortisol can have long-term implications for individual's health from childhood to adulthood, predisposing the individual to mental illness (Harris et al., 2011). Fetal overexposure to cortisol could occur through increases in maternal cortisol levels associated to stress and anxiety. Maternal cortisol then crosses the placenta into the fetal environment (Davis et al., 2012). Also, the fetus could be overexposed to glucocorticoid through changes in placental functions, especially the enzyme 11B-HSD2, the barrier enzyme, which converts cortisol to the inactive cortisone. If there is less of this barrier enzyme, then the fetus will be overexposed to maternal cortisol (Conradt et al., 2015).

Other biological mechanisms may have a role in linking maternal stress and anxiety to infant negative affect and later BI. Currently, a few but growing number of studies focus on epigenetic levels. Epigenetics is generally defined as "inheritance of information based on gene expression control rather than on gene sequence" (Berger et al., 2009 *in* Conradt et al., 2015). Currently, some epigenetic studies have considered DNA methylation as an epigenetic mechanism related to developmental outcomes in offspring, usually adopting animal models (Conradt et al., 2015). DNA methylation is a process by which methyl groups are added to DNA, acting for a transformation of the DNA functions. When located in a gene promoter, DNA methylation acts to repress gene transcription. In rhesus macaque, Alisch and colleagues (2014) reported that greater DNA methylation of BCL11A and JAG1, genes implicated in neurogenesis, were related to higher levels of anxious temperament. Similarly, in human models, DNA methylation of NR3C1 has been associated with greater cortisol reactivity in 3-months-old infants exposed to maternal prenatal depression (Oberlander et al., 2008). Methylation of NR3C1 has also been associated with increased internalizing behaviors among preschoolers exposed to early adversity (Parade et al., 2016).

Similarly, Ostlund et al. (2016) reported, only for *female* infants, both a trend-level association (p=0.057) between prenatal stress and increased methylation of NR3C1 exon 1F, and an increased methylation significantly associated with greater infant negative affect, and specifically fear.

Taken together, all these results suggest that prenatal environment may be associated with emerging behaviors in infants, evidencing continuity between prenatal factors and infant specific characteristics, and between these latters and child's Behavioral Inhibition.

2.2 High Reactivity as an infant precursor of BI

As underlined above, specific infant characteristics, such as negative affect and irritability, have been identified as precursors of Behavioral Inhibition.

One of the first studies on these early aspects of BI was the research by LaGasse and colleagues (1989, *in* Kagan & Snidman, 1991). The authors reported that infants who displayed an increased sucking rate when the water they were ingesting in a nipple suddenly changed to a sucrose solution, became more inhibited at 2 years of age compared to newborns that displayed a minimal increase. LaGasse and colleagues (1989) argued that the differences between the two groups might be linked to differences in the excitability of nuclei in the amygdala that project to the motor centers associated to the sucking rate.

Other studies (Kagan, Reznick, & Snidman, 1988; van den Boom, 1989) found that infants with increased cardiac sympathetic tone, as well as infants who fret or cry when exposing to new or unfamiliar stimuli, were more likely to become fearful compared to less irritable infants.

Following studies, and specifically those by Kagan, Snidman, & Arcus (1998), identified, in four-months-old infants, a specific pattern of *behavioral indicators* of later BI, which has been called *High Reactivity* (or, more generally, "*difficult temperament*"). *High Reactivity* is generally defined as a very early temperament predisposition that is assumed being characterized by a low threshold of activation in the amygdala to sensory stimulation. Infants move their limbs and fret or cry when their low threshold has been passed; this is related to the functioning of amygdale, which is a small almond-shaped organ in the limbic circuit that is supposed being involved in the response of new and unfamiliar stimuli, as well as in the fear responses (Kagan & Snidman, 2004). Amygdala represents the only brain structure able to detect the change in both the outside environment and the body, and can inform the body to freeze or fight. Thus, infants born with a neurochemistry that rendered the amygdala unusually excitable would display vigorous motor activity and crying when confronting with novelty (Kagan & Snidman, 2004; Conradt et al., 2015).

These infants have been called "high reactive" by Kagan, Snidman, & Arcus (1998), as they displayed vigorous motor activity and distress vocalizations to visual (i.e., brightly colored toys), auditory (i.e., tape recording of voices speaking brief sentences) and olfactory stimulations (i.e., cotton swabs dipped in dilute butyl alcohol applied to the nose), and represented the 20% of healthy, European American infants in the initial samples of Kagan's studies.

Differently from high reactive infants, infants who were born with a neurochemistry associated to a high threshold of reactivity in the amygdala showed minimal motor activity and distress in response to the same unfamiliar stimuli (Kagan & Snidman, 2004; Calkins et al., 1996). These infants were called "low reactive" babies by Kagan, Snidman, & Arcus (1998), and they constitute about 40% of European American infants in Kagan's samples.

High and low reactive infants, who have been previously considered by Chess and Thomas (1999) as *Difficult babies* and *Easy babies* (See "*1.1. Theoretical background on child's temperament*", p. 7), belong to two distinct categories, rather than creating a continuum of reactivity. Evidences of this distinction are based on the fact that infants who show vigorous motor activity and infrequent crying or infants who show frequent crying and low motor activity develop temperament and behavioral profiles that are different from high and low reactive infants (Kagan, Snidman, & Arcus, 1998). Moreover, a continuity of high and low reactive predispositions has been reported by some studies (Kagan & Snidman, 1991; Kagan, 1994; Kagan & Snidman, 2004), especially by the recent research of Fox and colleagues (2015) where three different laboratories, using different coding methods and paradigms for assessing infant and toddler temperament, found that high reactivity at 4 months predicted BI at 14, 21, 24 months of age in three distinct samples.

The continuity of *infant high reactivity- child Behavioral Inhibition* has been found as an important risk factor for child impaired outcomes (Chronis-Tuscano et al., 2009) (See Chapter 3, p. 31), reason why studying the longitudinal trajectories of Behavioral Inhibition, from early aspects to later behavioral manifestations, is particularly recommended.

2.3 Continuity and discontinuity of Behavioral Inhibition across child's development

The main finding from the considerable number of longitudinal studies on Behavioral Inhibition is that the expression of this trait, although elicited in different contexts, shows a moderate degree of continuity from early childhood to adolescence and adulthood (Fox et al., 2005).

Kagan (1988, 1999) found that the 75% of children who were classified as inhibited toddlers still displayed the same behavior six years later when confronting with new situations or people.

Several subsequent studies confirmed this result, finding *moderate to considerable* stability of BI, with 30-70% of continuity from toddlerhood to middle childhood (Biederman et al., 1993; Scarpa et al., 1995; Asendorpf, van Aken, 1994; Kerr et al., 1994; Prior et al., 2000; Broeren et al., 2013). Besides, it has been found that children with *high levels* of BI maintained their inhibited profile from toddlerhood to middle childhood (Asendorpf, 1990, 1994; Kerr et al., 1994; Hirshfeld-Becker et al., 2004, 2008) and from childhood to early adulthood (Gest, 1997).

However, it should be noted that a certain degree of discontinuity exists. Some studies have, in fact, reported that almost a third of high reactive infants and inhibited toddlers were less inhibited in childhood (Calkins et al., 1996; Fox et al., 2001; Pfeifer et al., 2002). Possible explanations may be due to methodological issues. Indeed, some longitudinal studies measured BI with appropriate observational protocols (e.g., *Behavioral Inhibition Paradigm, Laboratory Assessment Battery*) at the first assessment but used different scales (e.g., questionnaires for shyness or scales of social withdrawal) in the other evaluations, making difficult the comparison of results (See Chapter 3, p. 31).

A further reason why inhibited children not always maintain their inhibited profile may be linked to specific child and environmental factors. Thus, child factors, such as gender (Kagan, Snidman, & Arcus, 1998) and temperament predispositions (e.g., positive emotionality: Johnson et al., 2016), and environmental factors, such as parenting style (Park et al., 1997; Rubin et al., 2002; Fox et al., 2005; Degnan et al., 2008), parental/nonparental care (Fox et al., 2001), maternal behavior (Park et al., 1997; Rubin et al., 2002) have been investigated in relation to the continuity or discontinuity of BI over time.

Among child factors, some studies have focused on gender and temperament. For what concerns gender, Henderson, Fox & Rubin (2001) reported that infant high reactivity was significantly correlated with 4-years wariness only for girls but not for boys. Similarly, Kagan (1998b) reported that females were more fearful across development than males, showing more stable BI over time, and Essex and colleagues (2010) reported female gender as a significant predictor of BI in preschool to school age children. Other studies by Kagan, Snidman, & Arcus (1998) and other authors (Zhengyan et al., 2003) revealed a continuity of BI for females across early childhood but not later in life. On the contrary, other studies found males as more constantly inhibited across the first two years of life, although no gender differences were reported at 4 months of age (Fox et al., 2015), and from early to middle childhood (Fagan, 1990; Crockenberg & Smith, 1982). Finally, some studies reported no significant gender differences on a longitudinal sample in early childhood (Davidson & Rickman, 1999) and from early to middle childhood (Asendoprf, 1991). Table 4 shows main studies investigating gender in relation to the continuity of BI over time.

For what concerns temperament, Rothbart & Bates (2006) pointed out the lack of studies investigating interactions between multiple temperament traits. Indeed, considering that temperament traits do not exist in isolation within an individual, the authors highlight the importance of examining how traits work together to shape the child's development. Thus, Rothbart & Bates (2006) have suggested that Behavioral Inhibition may show different trajectories over time based on other temperament traits present within the child. However, to our knowledge, to date only one study (Johnson et al., 2016) has investigated the contribution of temperament to longitudinal trajectories of BI over time. Specifically, the authors have taken into account positive emotionality in a longitudinal sample of preschoolers from age 3 to 6, reporting that lower levels of child positive emotionality at baseline predicted stronger associations between laboratory measures of BI at age 3 and 6. Increased understanding of interactions between temperament traits, particularly for what concerns BI, could provide a deeper understanding of factors that contribute to child's development, specifically in terms of risk and resilience processes (See Chapter 4, p. 42). Thus, further empirical studies are recommended in this direction.

Among environmental factors, several studies have examined parenting style, reporting mixed results. Thus, some studies highlighted that intrusive parenting is related to toddler inhibition (Rubin et al., 2002, 2001, 1997), and maternal acceptance, sensitivity and warmth are associated with less inhibited and more adaptive behaviors (Park et al., 1997; Wood et al., 2003). According to these findings, Fox and colleagues (2005) argued that a more sensitive maternal style might reduce BI by diminishing negative affect and increasing self-esteem in inhibited children. Differently, other authors (Kagan, 1994; Park et al., 1997) argued that a sensitive and warm style might promote the continuity of BI over time, suggesting the message that extreme fearfulness is a stable characteristic of the individual, difficult to change. Indeed, Rubin et al. (2002) reported that children with overly warm and solicitous parents tended to maintain their inhibited behavior across childhood. Some studies also reported high intrusiveness as associated to stable BI, while others found associations with lower intrusiveness (Park et al., 1997; Rubin et al., 1997; van Brakel et al., 2006).

As previously underlined, also parental/nonparental care may have an impact on the continuity of BI over time. Across development, different forms of child care can influence the resilience process of inhibited children. Indeed, children with BI who are exposed to peer interactions early can easily develop social strategies and become less inhibited over time (Degnan et al., 2007). Thus, some studies (Arcus & McCartney, 1989; Fox et al., 2001) reported that high reactive infants were less likely to become inhibited toddlers when they were placed in a nonparental child care environment compared to high reactive infants growing up in a parental care context.

Although research on the continuity of BI has been widely developed in last decades, several child and environmental factors have not been explored enough, and further research should be oriented in this direction.

Table 4. Main studies investigating gender as related to the continuity of BI over time

	STUDIES REPORTING		
	No gender differences	**Females as constantly more inhibited than males**	**Males as constantly more inhibited than females**
Across early childhood[1]	Davidson & Rickman, 1999	Kagan, Snidman, & Arcus, 1998; Zhengyan et al., 2003	Henderson, Fox, & Rubin, 2001; Fox et al., 2015
From early to middle[2] childhood	Asendorpf, 1991	Essex et al., 2010	Crockenberg & Smith, 1982; Fagan, 1990

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[1] According to the National Association for the Education of Young Children (NAYEC), early childhood spans human life from birth to age eight.

[2] According to the National Association for the Education of Young Children (NAYEC), middle childhood begins at around age 7-8, approximating primary school age.

CHAPTER 3.

ASSESSMENT OF BEHAVIORAL INHIBITION IN EARLY CHILDHOOD

3.1 Assessment of Behavioral Inhibition in Early Childhood and available measures in literature: An overview

As previously underlined (See "*1.3 The temperament trait of Behavioral Inhibition: Characteristics of the construct*", p. 18), Behavioral Inhibition is a complex construct, characterized by emotional and behavioral manifestations in social and non-social contexts. Besides, the expression of Behavioral Inhibition may differ according to the child's age (Hirshfeld-Becker et al., 2008). In toddlerhood, inhibited children show reluctance to approach, or withdrawal towards new objects and decreased vocalizations and smiling with unfamiliar people, fret or crying in unfamiliar situations and closed proximity to their mothers (Garcia-Coll et al., 1984). Inhibited preschoolers are quiet with strangers, and have long latencies to play with new peers (Rubin et al., 2002) or to speak to new adults (Kagan, Reznick, & Snidman, 1987). By the primary school, the child's inhibited behavior is mainly notable in the group contexts, with children remaining in the periphery in social situations (Kagan, Reznick, & Snidman, 1988). In later childhood, adolescence and adulthood, inhibited individuals, compared to non-inhibited ones, are more cautious and restrained when conserving with strangers; less extraverted, with less active social lives, they usually do not like to assume leadership roles or being in the center of the attention (Caspi et al., 2003).

In the light of these evidences, the assessment of BI should be differentiated according to the child's age. Indeed, specific behaviors may be assessed at specific ages but not later or earlier in life. Also, considering that BI has been associated with later impaired outcomes for child's development (See Chapter 4, p. 42), an early detection of the BI trait, specifically focused on child's age, is particularly relevant. Therefore, an accurate process of selection of methods for the assessment of BI, above all early in life, should represent an important step for the implementation of studies.

However, researches on Behavioral Inhibition in childhood have used heterogeneous methods to assess the same construct, and sometimes those measures have been adapted from other more general measures of child's temperament or created *ad hoc* for a certain study, without previous

validation or accurate pilot study. This fact may have lead to possible biases in the research. Specifically, as argued by Degnan & Fox (2007), the use of different assessment methodologies in literature may represent one possible explanation for mixed findings on the continuity of BI over time or other still questioned issues.

In both first and later studies, Kagan and colleagues have used observational protocols for the assessment of BI, arguing that they are more reliable compared to parent reports (Garcia-Coll et al., 1984). Several studies in literature have adopted the same protocols or similar procedures, whereas other researches have used caregivers' questionnaires, especially maternal reports. Next paragraphs will show observational protocols and caregivers' measures of BI that are available in literature and can be used early in life (i.e., toddlerhood and preschool age). Besides, a specific section (*3.4*) will focus on strengths and limitations of both types of methods.

3.2 Observational measures for the assessment of BI

Observational protocols for early assessment of BI have been found as reliable and appropriate measures (Hirshfeld-Becker et al., 2008; Kagan & Snidman, 2004). The majority of them include specific *laboratory* procedures. According to Hirshfeld-Becker and colleagues (2008), a laboratory that a child has never before seen may contribute to an adequate setting of assessment due to the fact that it represents an unfamiliar place.

Observational protocols for the assessment of BI usually involve one or more of the following features: 1) a "risk room" episode, in which the child is presented several new or unfamiliar toys (e.g., a tunnel, a balance beam, a mask) and s/he is asked to play with each object; 2) an interaction between the child and an adult stranger (including games and "stressful" cognitive tasks); 3) an interaction with strangers in unusual dress (e.g., clown) or with unusual toys (robot with lights and voices); 4) interactions with unfamiliar peers (usually for children aged 3-4 or older). Table 5 shows main observational protocols for assessing BI in toddlerhood and preschool age.

The first and most famous protocol for assessing BI is the *Behavioral Inhibition Paradigm* that has been created by Kagan's research group (Garcia-Coll et al., 1984; Kagan, Reznick, & Snidman, 1987).

The first one represents the original paradigm used by Kagan and colleagues in their first studies on inhibited temperament. For what concerns the *toddlerhood*, the Behavioral Inhibition Paradigm consists of 5 episodes in the following order (Garcia-Coll et al., 1984):

- Free play. A set of toys, including realistic representations of people, utensils, food, animals, is arranged on a floor in the lab; the mother is instructed not to encourage the child to play and to interact only if the child starts the interaction with her. The duration of this episode is 5 minutes;

- Presentation of toys. After 5 minutes of free play, the experimenter shows 3 toys to the child: 1) a doll talking on a toy telephone, 2) a doll cooking toy food and serving dinner to two other dolls, 3) three animals walking together through a rain storm simulated by hand motions. The session lasts five minutes of free play. Then, the experimenter leaves the room;

- Unfamiliar Adult. An unfamiliar woman enters the lab room, sits on a chair, and does not initiate any interaction with the child or the parent for 30 seconds. The woman then calls the child by name and asks the child to come to the floor and play with some toys. Then, the woman leaves the room;

- Unfamiliar objects. The experimenter returns and shows an unfamiliar toy to the child. Specifically, the toy consists in a robot 60 cm tall and 15 cm wide and characterized by Christmas-three lights on its head. The toddler is encouraged to explore the robot by the experimenter, and after the child touches the toy, the experimenter explains to the child how to turn the lights on and off. Then, the experimenter presses a pedal that operates a tape recorder with a male voice speaking to the child through the mouth of the robot for 20 seconds. After that, the experimenter encourages the child to explore the robot;

- Separation from the mother. The experimenter signals the mother to leave the room. The mother returns after 3 minutes or immediately after the child starts crying.

The entire procedure is videotaped and specific behavioral variables are coded, such as the number of approaches and spontaneous interactions with the unfamiliar adult, latency to play, duration of exploration of the toys and the robot, clinging to the mother, crying and fretting, etc.

Further episodes adopted by Kagan's group for assessing BI, specifically in *preschool age* (for children older than 32-months), are:

- Home Visit. The experimenter and one unfamiliar stranger visit the child's home when no siblings were present. The experimenter places a set of toys on the floor and sits with the mother on a nearby couch. The mother is instructed not to interact to the

child. The stranger sits in a corner of the room and describes the child's behavior into a tape recorder for 30 minutes of play.

- Peer Play. Pairs of inhibited and uninhibited children with their mothers visit the lab. The two mothers and the two children are introduced one to each other and they enter a playroom. Mothers are instructed to sit and talk to each other if they want, but not to start an interaction with the children. Several age-appropriate toys are on the floor of the room and children can play with them. The session lasts 30 minutes.

As the previous episodes, also in this case the sequence is videotaped and specific behavioral variables were codified. For instance, regarding the Home Visit episode, some behavioral variables are: latency to first manipulation of toys, latency to first speech, latency to first interact to the observer, total time clinging to the mother, etc. Regarding the Peer Play episode, some behavioral variables are: latency to first manipulation of the toys, number of different toys played with, number of approaches to other child, amount of time clinging to the mother, etc.

The procedure adopted by Rubin and colleagues (1997) is very similar to the Behavioral Inhibition Paradigm and includes the following episodes: unfamiliar toys, adult stranger, separation from mother, peer play (in this case, each child is paired with a peer showing an average score of BI, such that pairings are composed of wary-average, average-average, not wary-average children). However, this procedure includes an additional episode with a female stranger dressed as a clown who enters the room and talks to the child. The amount of time each child spent in physical contact with the mother, the child's latency to approach the stranger, the child's latency to approach each toys, the frequencies of anxious and aggressive behaviors during the peer play, are some of the specific behavioral variables that are codify for this procedure.

A further observational procedure, which is widely used in literature on BI, is the *Laboratory Temperament Assessment Battery* (LAB-TAB: Goldsmith et al., 1995, 1999). The Lab-Tab represents a general temperament battery with several versions according to the child's age (*Pre-locomotor Version*; *Locomotor Version*; *Preschool Version*). The Lab-Tab is composed of approximately 30 episodes (depending on the specific version) for assessing several child temperament dimensions. Specifically, each episode lasts 3-5 minutes and simulates everyday situations in which one can reliably observe individual differences in the expression of emotion, approach/withdrawn, activity levels, and regulatory aspects of behavior. In all the three mentioned versions, specific episodes are dedicated to the assessment of BI trait and the coding variables for each episode come from Kagan's original variables. For a detailed description of the Preschool version see Study I, p. 58.

Another observational procedure for assessing child's BI in early childhood is the *Multi Method Assessment of Social Inhibition* by Asendorpf (1990). The author mainly focused on *social inhibition*, and adopted a procedure characterized by:

- <u>Adult stranger</u>: The mother and the child are in the lab room previously arranged with several toys. When the child is playing with toys, a female stranger enters the room with a bag containing other toys and starts pulling toys out the bag. If the child does not start the interaction with the stranger within 3 minutes, the stranger starts talking the child about toys;
- <u>Peer play</u>: Free play between the child and an unfamiliar peer (attending the same school) for 15 minutes (2-aged children) or 10 minutes (4-aged children) in a room of children's school previously arranged by several toys;
- <u>Group class interaction.</u> Free play during a normal school session. Each child is observed for 10 minutes in 5 days.

The episodes are videotaped and specific behavioral variables, similar to those previously mentioned for Kagan's paradigm, are coded from video files. Although Asendorpf's procedure (1990) is composed of several episodes and allows an accurate assessment of child's behaviors in multiple contexts, it should be considered that it is only referred to *social* stimuli.

Most of the studies in literature examining the BI construct through observational measures have adopted the procedures mentioned above or a modified version of those. Although highly standardized within studies, these observational assessment procedures are not standardized between laboratories, except for the Laboratory Temperament Assessment Battery. In addition, it should be noted that all the observational procedures presented above have been created on American population, except for one (Asendorpf, 1990) on German population (Table 5).

Considering that culture can have an impact on behavioral manifestations of BI (Chen et al., 1998), further studies examining the reliability of these procedures on different cultures are needed.

Table 5. Main observational measures for the assessment of BI in early childhood

MEASURE	AUTHORS (YEAR)	CHILD'S AGE	COMPONENTS OF BI	VALIDATED ON
Behavioral Inhibition Paradigm	Garcia-Coll et al. (1984)	Different versions according to child's age: 14, 21, 31 months of age, 4 yrs, 5-6 yrs	Social and non-social components of BI	U.S. population
Multi Method Assessment of Social Inhibition	Asendorpf, (1990)	2-4 yrs	Social component of BI	German population
Peer Social Inhibition Paradigm	Rubin et al. (1997)	2-3 yrs	Social component of BI	U.S. population
Laboratory Temperament Assessment Battery (LAB-TAB)	Goldsmith et al. (1999)	Different versions according to child's age: 1-2 yrs, 3-5 yrs	Social and non-social components of BI	U.S. population

3.3 Parent and teacher reports for the assessment of BI

Another available method for the early assessment of BI is represented by caregiver questionnaires. Only a few number of parent and teacher reports have been created and validated *ad hoc* for the assessment of Behavioral Inhibition (Table 6). Specifically, for what concerns preschool age, to our knowledge only three questionnaires are available: the *Behavioral Inhibition Questionnaire (BIQ)* by Bishop, Spence, & McDonald (2003), the *Preschool Behavioural Inhibition Scale (P-BIS)* by Ballespì and colleagues (2003), and the *Behavioural Inhibition Scale for children aged 3-6 (BIS)* by Ballespì and colleagues (2012a).

The Behavioral Inhibition Questionnaire (BIQ) is a good example of multidimensional assessment of BI, since it refers to six dimensions related to both social and non-social situations. Specifically, these dimensions refer to child's reaction to: 1) adult strangers, 2) unfamiliar peer, 3) separation from caregiver/preschool situations, 4) performance situations, 5) physical challenges, and 6) unfamiliar situations. The BIQ is composed of 30 items for parents and 28 items for teachers, and a total score of 210: the higher the score, the more inhibited is the child according to caregiver perception. The questionnaire has been validated on Australian (Bishop, Spence, & McDonald, 2003), Dutch (Broeren & Muris, 2010) and American (Kim et al., 2011) populations, showing good psychometric properties. The Dutch version has been validated also for children aged 8-15, demonstrating satisfactory reliability (Broeren & Muris, 2010). For a more detailed description of the instrument see Study II (p. 67).

The Preschool Behavioural Inhibition Scale (P-BIS) is a brief tool of easy application only for teachers. The scale has been created and validated on Spanish population and is composed of 14 items based on a 4-point Likert scale (*never, sometimes, often, always*). The scale is characterized by two main parts: one asking for child's reaction to unfamiliar people, and one asking for child's behavior within the group class. The P-BIS is mainly oriented to evaluate social aspects of Behavioral Inhibition in preschoolers, and has been developed based on previous questionnaires, both international questionnaires for assessing child's temperament and a Spanish father report for assessing BI in preschoolers (*Escala de Inhibicion Conductual para Preescolares –version Padres:* Ballespì, Jané, & Domenech-Llaberia, 1999). It has been shown a good internal consistency and a good convergent and discriminant validity for the P-BIS scale.

The Behavioural Inhibition Scale for children aged 3-6 (BIS), developed by the same research group who has been created the P-BIS, is a scale characterized by a unique version for both parents and teachers. It is composed of 37 items to which the adult responds based on a child's current behavior using five response categories (*almost never, rarely, sometimes, often, almost always*).

The BIS requires that parents describe child's inhibited behaviors in social contexts but not in non-social ones. Considering that social aspects are predominant, a possible bias for this scale refers to an overlap between social components of BI and Shyness. However, the BIS has shown a good internal consistency, high test-retest reliability, and a good convergent validity in the original validation study on the Spanish population (Ballespì et al., 2012a).

Although the parent/teacher reports described above are brief- and easy-tools with good psychometric properties, only a few validations have been conducted, so that their use is still limited. Moreover, their use is strictly related to a limited time-range, that is the preschool age. To our knowledge, no questionnaires have been developed for children aged 2-7 years. Finally, although the existence of these scales, many studies in literature have used generic temperament questionnaires, such as the *Colorado Children's Temperament Inventory* by Rowe & Plomin (1977) and the *Child Behavior Questionnaire* by Rothbart and colleagues (2001), with possible biases as a result.

Further studies need to be conducted in order to examine the validity of the scales presented above on several populations in order to promote a more accurate use of parent/teacher reports specifically oriented to the assessment of Behavioral Inhibition.

Table 6. Main parent/teacher reports for the assessment of BI in early childhood

MEASURE	AUTHORS (YEAR)	INFORMANTS	CHILD'S AGE	COMPONENTS OF BI	VALIDATED ON
Behavioral Inhibition Questionnaire (BIQ)	Bishop, Spence, & McDonald (2003)	Parents (30 items) Teachers (28 items)	3-5 yrs	Social and non-social components of BI	Australian, U.S., Dutch populations
Preschool Behavioral Inhibition Scale (P-BIS)	Ballespì et al. (2003)	Teachers (14 items)	3-6 yrs	Social component of BI	Spanish population
Behavioral Inhibition Scale for children aged 3-6 (BIS)	Ballespì et al. (2012a)	Unique version for both parents and teachers (37 items)	3-6 yrs	Social component of BI	Spanish population

3.4 Strengths and limitations of observational measures and parent/teacher reports

Strengths and limitations can be underlined for both observational and report methods.

For what concerns the former, the observational protocols are usually considered as reliable and unbiased measures for the assessment of BI (Goldsmith et al., 1999; Smith et al., 2012). However, it has been argued that observational methods only capture a snapshot of behavior in a specific context and moment, so that they may reflect state, rather than trait, behaviors (Wachs, 1992, reported by Smith et al., 2012). Thus, according to Kendler & Baker (2007), observational methods may be susceptible to random error due to short segments of observational data collected. Moreover, these methods are cost- and time- expensive.

Differently, parent and teacher reports are cost- and time- efficient, and gather information from broader perspectives of behavior across situations. Also, parents and teachers are in a privileged position to observe child's behavior and report when something is unusual (Ballespì et al., 2012b).

However, caregiver reports, and more often parent reports, have been criticized because of possible source of biases. Among them, it is possible to recognize rater biases, parental characteristics, and cultural aspects (Smith et al., 2012).

Rater biases are usually defined as the tendency to a rater to consistently overestimate or underestimate scores (Neale & Cardon, 1992). Rater biases may be due to specific parent's characteristics (Kitamura et al., 2015), such as anxiety symptoms or personality trait, as well as child's characteristics, such as gender (Gill & Link, 2000). For example, Kitamura and colleagues (2015) reported that child's emotionality tended to be overestimated during preschool age if the father was characterized by both anxiety symptoms and novelty-seeking personality trait. Also, child was described as impulsive if maternal personality was characterized by self-transcendence (Kitamura et al., 2015). Similarly, Gill & Link (2000) have shown that child's gender (male) and maternal high levels of stress can affect maternal reports, as other studies (Donovan et al., 1998; Schuetze & Zeskind, 2001) have reported similar results for both maternal and paternal depressive symptoms.

For what concerns the latter aspect, parents who report depressive symptoms are more likely to rate their child as characterized by a difficult temperament, compared to parents without depressive symptoms (Donovan et al., 1998; Schuetze & Zeskind, 2001; Atella et al., 2003; Dave et al., 2005). Indeed, it has been argued that the formers have difficulties in interpreting their baby's cries (Donovan et al., 1998). Parents with depressive symptoms may be preoccupied with their own feelings, failing to interpret their baby's behavior correctly, or may feel more depressed when

exposed to infant's cries (Parade & Leerkes, 2008). In another study (Bayly & Gartstein, 2013), it has been reported that maternal stress due to marital relationship and mother-child attachment predicted maternal ratings, after accounting for the contribution of fathers' temperament ratings. All these evidences highlight that parent reports may be biased by specific parent or child/parent factors.

Moreover, another limitation of parent reports is represented by cultural aspects. For example, considering that extreme shyness and inhibition are less common and less appreciated than sociability in Western cultures, adults tend to exaggerate the significance of these traits, and some view it as undesirable (Kagan & Snidman, 2004). Specifically, Kagan & Snidman (2004) reported that:

> "The automatic attention paid to infrequent events is one reason why questionnaire measures of temperament are less valid than extensive behavioral observations. Parents of a shy child will attribute less shyness to that child if he possesses another even less common trait – for example extreme aggression or impulsivity. By contrast, parents of a child for whom shyness is the only salient quality are tempted to exaggerate the seriousness of this trait." (p. 25)

Another source of biases is represented by the fact that, although specific scales have been created for the detection of BI, some studies have used non-specific questionnaires, such as generic parent reports for the evaluation of temperament or shyness-oriented scales, increasing the risk of false positives. Similarly, some studies using observational paradigms for the assessment of BI have adopted social-oriented batteries, which usually consist of interactions between a child and peers. Although the latter is a good method to detect inhibited behaviors, using only social-oriented batteries may limit the capacity of a study to reach its aims.

Finally, a further source of biases derives from the use of parent and teacher reports as an *impartial* measure of Behavioral Inhibition rather than a measure of *adult's perception of child temperament*. However, assessing parents' perceptions is important in a *developmental* perspective. Indeed, parents' perception of child temperament has a direct impact on how the parent interacts and on the quality of parent-child relationship, influencing the child's development and his/her social-adjustment in early childhood (Crockenberg & Acredolo, 1983; Olson et al., 1989; Mangelsdorf et al., 1990; Oberklaid et al., 1993). Also, maternal perception of child temperament interacts with quality of parenting style in the prediction of behavioral problems in early and middle childhood (Rubin et al., 2001; Hane et al., 2006).

In the light of these evidences, some studies have explored caregivers' perceptions of Behavioral Inhibition and, in some cases, have compared parents' and teachers' perceptions, showing from high-moderate to low convergence of ratings (Ballespì et al., 2012a, 2012b; Jané et al., 2006; Bishop, Spence, & McDonald 2003; Achenbach et al., 2002; Larsson et al., 2002; Sourander et al., 1997). Differently, other studies have examined the agreement between observational measures of BI and parent/teacher questionnaires. For instance, Garcia-Coll and colleagues (1984), Reznick and colleagues (1986) and Andersson (1999) reported moderate correlations (from $r = 0.3$ to $r = 0.54$) between laboratory observations of BI and mother and father scales of child's approach/withdrawal in the first two years of life.

More recently, Gagne, Miller, & Goldsmith (2013) found a significant agreement between questionnaires (both maternal and paternal) and laboratory measures for social BI, Inhibitory Control and activity levels in 36-years-old children. Specifically, they showed *low-medium* correlations between parent-reports and laboratory measures ($r = 0.2$-0.3, p<0.05). Although the authors did not find a high degree of concordance between measures, they concluded that parent-reports may represent a reliable method of assessment since no single methodology allows a more or a less biased view of preschool temperament (Gagne, Miller, & Goldsmith, 2013).

The study by Ballespì and colleagues (2012a) revealed *moderate-to-low* correlations between parent reports and observational measures ($r = 0.58$ to 0.2, p<0.05). Moreover, the authors, adopting a discriminant analysis, reported a good capability of the BIS scale scores to identify extreme inhibited children. However, it should be noted that Ballespì and colleagues have taken into account only children with extremely high scores of BI, while, in many cases, studies using questionnaires have considered BI in the whole undifferentiated sample of children. Thus, it is possible that, although parents and teachers may adequately recognize extremely profiles, medium-high levels of Behavioral Inhibition are not completely identified. For this reason, using a *multi-instrument approach* should be recommended.

In the light of all the issues presented above, it could be argued that using simultaneously both observational measures and caregiver questionnaires can strongly improve the accuracy of research on Behavioral Inhibition. Specifically, examining the reliability of parent reports as well as their concordance with observational measures can effectively help researchers to investigate the capability of caregivers to recognize BI, with the consequence of a more accurate assessment and identification of the trait.

CHAPTER 4.

THE PSYCHOPATOLOGICAL RISK ASSOCIATED TO CHILD'S BEHAVIORAL INHIBITION

4.1 Consequences of an inhibited temperament

As noted by Rothbart & Bates (2006), conceptually homologous links exist between temperament dimensions and child's specific later outcomes of adjustment. In some cases, certain behavior problems in later childhood seem to embody specific temperament dimensions of early childhood (Zentner & Bates, 2008). The two main dimensions of maladjustment or psychopathology that have been usually associated to specific temperament traits are internalizing problems (e.g., anxious and depressed behaviors) and externalizing problems (e.g., aggression and rule-breaking problems) (Zentner & Bates, 2008).

Four basic models have been conceptualized in order to explain the relation between temperament and child's impaired outcomes or, more generally, psychopathology (Shiner & Caspi, 2003; Krueger & Tackett, 2005):

- Pathoplastic effect model: Temperament alters the course of disorder once it occurs, for example adaptation to a major depression may be facilitated by better regulatory abilities;
- Scar effect model: Pathological processes alter temperament or have a certain degree of influence on it;
- Resilience model: Certain temperament traits predispose to, while others protect from, specific kinds of psychopathology in some contexts but not in others;
- Spectrum model: Temperament is basically a subclinical manifestation of psychopathology, with shared etiological determinants.

A general consensus in literature regards the Resilience model as characterizing the Behavioral Inhibition trait. Indeed, child's BI has been associated to peer difficulties, anxiety disorders and internalizing problems in preschool age and middle childhood (Biederman et al., 2001; Lemery, Essex e Smider, 2002; Crockenberg e Leerkes, 2006; Kagan et al., 2007; Degnan et al., 2008; Williams et al., 2009; Walker et al., 2013), as well as anxiety disorders in adolescence and adulthood (Hayward et al., 1998; Fox et al., 2001; McDermott et al., 2009; Chronis-Tuscano et al.,

2009), specifically social phobia (Clauss et al., 2012). Besides, it has been shown that higher levels of BI promote higher continuity of the trait over time, which in turn increases the risk of child's impaired outcomes (Hirshfeld-Becker et al., 2002; Chronis-Tuscano et al., 2009) (See "*2.3 Continuity and discontinuity of Behavioral Inhibition across child's development*", p. 27).

However, as previously discussed (See "*2.3 Continuity and discontinuity of Behavioral Inhibition across child's development*", p. 27), the current evidence suggests a certain degree of discontinuity of BI (Degnan & Fox, 2007), with children who were highly inhibited displaying less BI over time, and some inhibited children who never develop peer difficulties and/or internalizing problems in life (Rubin, Coplan, & Bowker, 2009). Degnan & Fox (2007) have indeed conceptualized the idea of a *resilience process* for some inhibited children, arguing that specific factors, such as child and parents' characteristics, may have an impact on the longitudinal trajectories of Behavioral Inhibition. This resilience process recalls the Goodness of Fit Model by Thomas and Chess (1977) (See "*1.1 Theoretical background on child's temperament*") and other theoretical models that consider the interplay among several factors in the etiology of child's impaired outcomes. The Transactional Model of Development by Sameroff (2009) argued that the child's development is the product of the continuous dynamic interactions between the child and the experiences provided by his or her social and family environment.

Coherently with these perspectives, in a review by Murray, Creswell, & Cooper (2009) have argued that the vulnerability to the development of child's anxiety may be reflecting in: 1) genetic basis, 2) temperament predisposition of BI, 3) biased information processing, 4) negative life events (e.g., traumatic events), 5) modelling and information transfer, 6) overcontrolling and overprotective parenting. For "biased information processing", the authors mean both attentional biases in relation to threat (See "*1.2 Main temperament dimensions*", p. 16) and biases in interpretation of ambiguous material as threatening material (Rapee, 2001; Rapee & Spence, 2004). For "modeling and information transfer" the authors mean the child's observation of other's anxiety and communication to the child of information regarding the threatening characteristics of the environment. For instance, this latter concept was emphasized by Pass and colleagues (2012) in a study on maternal social phobia and child's anxiety. In this research, during a Doll Play procedure focusing on the social challenge of starting primary school, results revealed that children of mothers with social phobia were significantly more likely to give anxiously negative responses. The authors noted that maternal communications about starting school were characterized by more negative contents for mothers with social phobia compared to mothers in the control group (Pass et al., 2012).

Therefore, as suggested by Murray, Creswell, & Cooper (2009), the etiology of internalizing problems and anxiety disorders is based on the interplay among several factors. Thus, understanding the "resilience process" (Degnan & Fox, 2007) for inhibited children is possible only looking at a complex model of interacting child and environmental factors. Next paragraphs will describe, more in details, the risk for social difficulties and internalizing/anxiety problems associated to Behavioral Inhibition, as well as consider the specific factors involved in this risk.

4.2 Social relationships for behaviorally inhibited children

Over development, the prolonged expression of Behavioral Inhibition may limit both the quantity and the quality of children's experiences, particularly in novel contexts and/or with unfamiliar others (Henderson et al., 2014).

The start of preschool or kindergarten represents an important developmental step for young children (Hamre & Pianta, 2001). However, for inhibited children this experience may be a particularly daunting challenge (Henderson & Fox, 1998). Indeed, some authors (Garcia-Coll et al., 1984; Asendorpf, 1991; Rubin, 1993; Bohlin, Hagekull, & Andersson, 2005; Kagan et al., 2007; Walker et al., 2013) argued that inhibited children, compared to their non-inhibited peers, develop less social competence and poorer peer relationships during the preschool years. Specifically, inhibited behaviors in toddlerhood have been often considered an antecedent of child's tendency of being reticent and withdrawn with both familiar and unfamiliar peers in preschool and kindergarten (Asendorpf, 1991; Kagan, Reznick, & Snidman, 1988; Fox et al., 2005; Asendorpf et al., 2008; Rubin, Coplan, & Bowker, 2009).

Inhibited and reticent children, compared to their more sociable agemates, produce fewer alternative solutions in peer contexts and are more likely to ask for adult's intervention in response to hypothetical social dilemmas (Rubin et al., 1984). Moreover, some authors (Rubin et al., 1984; Stewart & Rubin, 1995; Walker et al., 2013) observed that a reticent child approaches challenging situations more passively than her/his peers, and s/he is more likely to attempt to require attention from a playmate rather than attempts to obtain an object or elicit active behaviors from her/his playmates. Also, Rubin and colleagues (1984) observed that an inhibited child is less assertive and direct, and the outcomes of her/his requests are more likely to fail.

Although inhibited children seem to be motivated to interact with others, the anxiety and fear associated with novelty often lead these children to display social wariness (Crozier, 2000). This latter in turn appears to carry with it negative thoughts and feeling about the self (Rubin, 1993) and it may lead to the *social isolation* from the classmates (Rubin, Coplan, & Bowker, 2009). Perhaps as a result,

even in early childhood, inhibited children, compared to their more sociable peers, report feeling less positively about themselves and are more lonely (Coplan et al., 2008; Coplan et al., 2007; Henderson et al., 2004). Moreover, in some cases, peers respond to reticent and inhibited behaviors with *exclusion, rejection*, and victimization (Chen et al., 2000; Gazelle & Ladd, 2003; Perren & Alsaker, 2006).

However, as discussed above (See "*4.1 Consequences of an inhibited temperament*", p. 42), while some inhibited children show difficulties in peer social contexts, other inhibited children do not show them (Degnan & Fox, 2007). Thus, Gazelle (2008) reported that inhibited children displaying attention-seeking and/or aggressive behavior were at greater risk for peer exclusion, rejection and victimization compared to inhibited children who did not show these characteristics.

Differently, in a recent study by Degnan and colleagues (2014), longitudinal trajectories of social reticence for inhibited children were examined in a sample of children aged 2 and 3. The results revealed that Behavioral Inhibition was related to onlooking and unoccupied behavior in the presence of unfamiliar peers at each age. The authors called "*social reticence*" this behavior and reported that high-stable trajectory of social reticence was associated with greater Behavioral Inhibition and higher levels of internalizing disorders compared to the low-increasing and high-decreasing trajectories, confirming different developmental outcomes for inhibited children.

Finally, it has been argued that the ability to competently regulate emotions predicts high social competence with peers (Diener & Kim, 2004). Indeed, the study by Panela and colleagues (2015) reported that emotional regulation strategies at age 5 were mediators of the relation between toddlers' Behavioral Inhibition and social competence at age 7 but only for highly inhibited children.

Although several studies have investigated social difficulties for inhibited children, most of them have adopted parents' reports or laboratory measures (Buss et al., 2013) but did not examine *peer relationships* of inhibited children *within the classroom*, except two studies (Gazzelle & Faldowski, 2014; Tarullo, Mliner, & Gunnar 2011) reporting that inhibited preschoolers were less socially integrated in positive peer play and were at greater risk for peer exclusion. Therefore, further investigations are recommended in this direction, in order to investigate the risk for social difficulties within the peer group.

4.3 Behavioral Inhibition and the risk for anxiety disorders and internalizing problems

Many characteristics of Behavioral Inhibition, such as reluctance in approaching new social events, negative affect, and vigilance are used to describe certain anxiety disorders (American Psychological Association, 2007; Degnan & Fox, 2007). For these reasons, a great number of

studies started to examine the relation between Behavioral Inhibition and anxiety disorders. Some authors have even argued that BI and anxiety are different expressions of the same construct, as considered by the Spectrum Model (Shiner & Caspi, 2003; Krueger & Tackett, 2005) (See "*4.1 Consequences of an inhibited temperament*", p. 42). However, there is a considerable consensus in literature that Behavioral Inhibition is a *risk factor* for later anxiety disorders rather than a subclinical manifestation of them (Bosquet & Egeland, 2006).

One of the first attempts to study associations between Behavioral Inhibition and anxiety disorders was the research by Biederman and colleagues (1990) that revealed an increased risk for more than one anxiety disorder for inhibited children (22.2% of inhibited children *vs* 0% of uninhibited children) as well as an increased risk for phobic disorders (31.8% of inhibited children *vs* 5.3% of uninhibited children). A follow-up study by the same authors (Biederman et al., 1993) re-examined children from age 4 to 11, reporting that inhibited children had higher rates of anxiety disorders compared with children without BI. Moreover, consistently with the previous study, inhibited children had higher rates of multiple anxiety disorders compared to uninhibited children.

A later study by Hirshfeld and colleagues (1992) followed children (previously classified as inhibited and uninhibited at 14 months) from 21 months to 7.5 years of age, reporting that stable inhibited children had higher rates of anxiety disorders compared to those who were not continuatively inhibited. Eight on 12 stable inhibited children showed one or more anxiety disorders compared with only one of the 10 unstable inhibited children.

Although other studies have documented associations between BI and generalized anxiety on samples of children, adolescents, and adults (van Ameringen et al., 1998; Muris et al., 1999, 2001, 2003), a higher number of studies have put in light the *specificity of BI for social phobia* (Mich & Telch, 1998; Wittchen et al., 1999; Gladstone et al., 2005; Gladstone & Park, 2006; Coplan et al., 2006; van Brakel et al., 2006). For instance, Schwartz and colleagues (1999) found that inhibited toddlers were more likely to suffer from social phobia at 13 years compared to uninhibited children (61% of inhibited children *vs* 27% of uninhibited children). When the authors raised the threshold to include impairment in functioning, 44% of inhibited females were impaired by social phobia versus only 6% of uninhibited females. No significant results were obtained for males, suggesting female gender as more likely involved in internalizing trajectories, as confirmed in later studies on anxiety problems (Carter et al., 2003; Bongers et al., 2003; Leve et al., 2005; Dell'Osso et al., 2015).

In addition, Hayward and colleagues (1998) reported that BI was predictor of social phobia during a 4-years follow-up in high school, with 22.3% of inhibited adolescents showing symptoms, a risk four times greater than for non-inhibited adolescents.

Similarly, Hirshfeld-Becker and colleagues (2007) revealed that BI significantly predicted the onset of social phobia in 6-years-old children unaffected at baseline (22% of inhibited children *vs* 8% of non-inhibited children). Specifically, BI measured at age 4 or 6 was significantly more predictive of social phobia compared to BI measured at 21 months. The authors reported no other anxiety disorders as associated to toddler's BI, suggesting that BI is a specific risk factor for social phobia (Hirshfeld-Becker et al., 2007).

A recent study by Rapee (2014) confirmed this trend, reporting that social phobia at age 15 years was predicted by both BI and maternal anxiousness at age 4, while other anxiety disorders were predicted by only maternal anxiousness. Also, 37% of inhibited preschool children, compared to 15% of uninhibited peers, displayed social phobia at age 15.

In order to quantify the association between BI and the risk for developing social phobia in children, Clauss and colleagues (2012) conducted a meta-analysis taking into account studies that assessed BI from early to middle childhood, and social phobia from middle childhood to adolescence. The authors reported that 43% of children classified as inhibited showed symptoms of social phobia in adolescence compared to 12% of non-inhibited children, proposing that BI is one of the largest single risk factors for developing social phobia.

Although the majority of studies on BI as a risk factor for developing later psychopathology have focused on anxiety disorders, some studies have also examined internalizing problems, above all for what concerns early childhood. For instance, a study by Rubin and colleagues (1995) documented more internalizing problems for inhibited preschoolers during free play with unfamiliar peers. In addition, the 19-year longitudinal study by Asendorpf, Denissen, & van Aken (2008) showed higher rates of internalizing problems for extremely inhibited children.

Finally, Buss, Davis, & Kiel (2011) reported a higher risk for internalizing problems for inhibited children from 2 to 3 years of age, and Williams and colleagues (2009) revealed the same effect of BI on internalizing problems at age 4.

All the evidences provided highlight that BI is a considerable risk factor for child's internalizing outcomes early in life, and later anxiety disorders. However, only recently a growing interest on trajectories of BI have been occurred in literature and furthers studies are needed in this direction.

4.4 The psychopathological risk for inhibited children: Endogenous and exogenous factors

As previously highlighted (See "*4.1 Consequences of an inhibited temperament*", p. 42), some inhibited children do not develop later impaired outcomes. For instance, for what concerns the

specific risk for social phobia, Schwartz and colleagues (1999) reported that the 39% of inhibited toddlers did not show any symptom in adolescence. Another study reported that 83% of inhibited preschoolers did not develop social phobia some years later, although this percentage was lower compared to that within the non-inhibited subgroup (Biederman et al., 2001). Results from Gladstone and colleagues' study (2005) revealed that the 58% of inhibited children did not show any symptom of social phobia in adulthood.

In the light of these evidences, some studies have examined specific *endogenous* (i.e., child's specific characteristics) and *exogenous* (i.e., family environment, parents' characteristics) factors that may impact the developmental trajectories for inhibited children (Degnan & Fox, 2007). Table 7 shows these studies.

Endogenous factors. Endogenous factors refer to child's internal resources and characteristics, such as specific temperament traits, that may be involved in her/his emotional regulation. Among them, some studies have focused on Attention Shifting (or "Attentional Focusing") and Inhibitory Control. For a description of these two constructs, see "*1.2 Main temperament dimensions*" (p. 16).

It has been shown that Attention Shifting allows decreasing child's levels of negative affect or fear by facilitating the disengagement of attention from negative thoughts or threatening stimuli and focusing attention on more positive stimuli (Lonigan & Vasey, 2009). On the other hand, Inhibitory Control helps a child to modulate the expression of an inappropriate behavior, aiding in adaptive social and emotional development (Kieras et al., 2005). Both Attention Shifting and Inhibitory Control have been considered as protective factors for child's development. However, how these two components of Effortful Control contribute to adaptive regulation may differ according to the child's style of temperament (Eisenberg et al., 2005; White et al., 2009). Thus, some studies have examined Attention Shifting and Inhibitory Control as factors involved in developmental trajectories for inhibited children.

For what concerns the former, some authors (Eisenberg, Champion e Ma, 2004; Henderson, Pine e Fox, 2015; White et al., 2011) reported that high levels of Attention Shifting diminished the probability to develop internalizing outcomes for inhibited children. Besides, Eisenberg and colleagues (1998) highlighted that children perceived by parents as characterized by high negative affect and low Attention Shifting were more inhibited two years later compared to children with high Attention Shifting. Perez-Edgar and colleagues (2010) reported that inhibited children were more focused on threatening stimuli compared to non-inhibited peers, so that the ability to adequately shift their attention to more positive stimuli seems particularly relevant for their

development. Finally, White and colleagues (2011) revealed that high Attention Shifting reduced anxiety symptoms in children with high BI.

For what concerns Inhibitory Control, to our knowledge only two studies have examined its role in the relation between BI and internalizing/anxiety outcomes. Specifically, both the studies (Thorell et al., 2004; White et al., 2011) showed that inhibited preschoolers having high Inhibitory Control showed higher levels of anxiety compared to their inhibited peers with low Inhibitory Control.

Exogenous factors. Animal and human studies have highlighted the importance of contextual factors on the plasticity of developmental outcomes (Hane & Fox, 2007). Exogenous factors refer to the characteristics of the family environment, and specifically parents' characteristics, such as parental psychopathology and parenting style.

For what concerns the former, a strong relation between parental anxiety and BI has been highlighted by several family studies, which have shown that offspring of adults with anxiety disorders display an inhibited temperament (Hirshfeld et al., 1992; Battaglia et al., 1997; Rosenbaum et al., 2000; Biederman et al., 2001). Among these studies, the research by Rosenbaum and colleagues (1992) reported that the rate of parental anxiety disorders was significantly higher when children showed both BI and anxiety compared to parents of children with BI only or parents of children without BI or anxiety. Based on these results, the authors suggested that greater anxiety loading in parents increased the risk for anxiety disorders in inhibited children.

Following studies have confirmed this hypothesis, showing that parental psychopathology, and specifically anxiety disorders, may increase levels of anxiety in inhibited children in preschool and school age (Biederman et al., 2001; Shamir-Essakov et al., 2005).

 As previously underlined (See "*4.1 Consequences of an inhibited temperament*", p. 42) the development of child anxiety derives from an interplay among several factors. Thus, the intergenerational transmission of anxiety from parents to children may be possible through specific behaviors and communications characterizing the everyday parent-child interactions, parenting style, and specific child's factors. Confirming this perspective, Hirshfeld and colleagues (1997) showed that mothers with panic disorders expressed significantly more criticism towards inhibited children (55%) compared to uninhibited children (18.2%). This tendency of criticism was not found in non-anxious mothers. The authors argued that maternal anxiety and a difficult behavior in the child (e.g., BI) may contribute to a strained mother-child relationship and may exacerbate symptoms for both mother and child (Hirsheld et al., 1997).

Also parenting style may be involved into these dynamics. Some parenting behaviors, such as overprotection, may be elicited by child characteristics, especially in the context of parental anxiety,

and this mechanism may serve to maintain child anxiety (Murray, Creswell, Cooper, 2009). Over-controlled and overprotective and solicitous parenting behaviors have been often associated with child's Behavioral Inhibition in preschool age (Edwards, Rapee e Kennedy, 2010; Rubin et al., 1997; Rubin, Burgess e Hastings, 2002), while maternal responsiveness and sensitivity have been found as related to less inhibited and more social adaptive behaviors (Hane et al., 2008; Wood, McLeod e Sigman, 2003). Similarly, maternal intrusiveness has been associated with child's BI (Kiel, Premo, & Buss, 2016) and it has been reported as significantly associated with anxiety problems for inhibited children in middle childhood (Chorpita, Brown e Barlow, 1998; Hudson e Rapee, 2001). However, some authors have suggested that even a parenting style characterized by responsiveness and sensitivity may maintain and reinforce child's inhibited behaviors, suggesting that extreme fearfulness is not something that one can change (Kagan, 1994; Park et al., 1997). A study by Kiel, Premo, and Buss (2016) showed that both maternal intrusiveness and maternal sensitivity predicted significantly high levels of anxiety in inhibited children one year later, while this effect was not significant when mothers had low levels of intrusiveness or sensitivity.

Although several studies in literature have investigated parenting styles associated to child's BI, a very few studies have examined *how* parent's behaviors and beliefs may have an impact on the relation between BI and child's impaired outcomes, such as internalizing problems or anxiety disorders. Among these researches, a study by Williams and colleagues (2009) showed that permissive parenting was a moderator of the relation between child's BI at age 2 and internalizing problems at age 4. Thus, highly inhibited children showed higher difficulties when their parents adopted a permissive parenting. Another study (Affrunti, Geronimi, & Woodruff-Borden, 2014) have found low maternal sensitivity as a moderator of peer victimization and anxiety problems in preschool age but no significant effects were reported by this study for what concerns the relation between BI and anxiety problems.

Although recently several studies have started to investigate factors that may contribute to later impaired outcomes or, *vice versa*, to the resilience process for inhibited children, most of them have examined these factors separately, without considering the *interplay* among them as suggested by theoretical models cited above (See "*4.1 Consequences of an inhibited temperament*", p. 42).

Future studies need to explore possible resilience processes that these endogenous and exogenous factors may be involved in. For instance, investigations need to determine which parent's behavior and which child's factor, in which context, may help children overcome their fears.

Table 7. Main studies on BI, internalizing/anxiety outcomes and endogenous/exogenous factors

	Study	*Investigated factors*	*Sample size (N)*	*Child's age*	*Findings*
Endogenous Factors					
	Thorell et al., 2004	Inhibitory Control	151	5-8 yrs	High levels of BI and high levels of Inhibitory Control predicted high levels of social phobia.
	White et al., 2011	Attention Shifting Inhibitory Control	291	2-4 yrs	High levels of Attention Shifting decreased the risk for anxiety problems in children with high levels of BI.
Exogenous Factors					
	Biederman et al., 2001	Parents' psychopathology	179	2-6 yrs	Symptoms of social phobia were significantly higher for inhibited children compared to non-inhibited peers when parents had panic disorder or major depression.
	Shamir-Essakow et al., 2005	Maternal anxiety	104	3-4 yrs	Inhibited children having insecure attachment and anxious mothers showed clinical levels of anxiety.
	Williams et al., 2009	Maternal style	133	4-15 yrs	Internalizing difficulties at age 4 were higher for inhibited children whose mothers showed permissive parenting style.
	Affrunti et al., 2014	Peer victimization, maternal style	124	7-12 yrs	Peer victimization mediated the relation between BI and anxiety problems. Maternal nurturing parenting style moderated the relation between peer victimization and anxiety problems.
	Lewis-Morrarty et al., 2015	Maternal style	165	Early childhood-adolescence	Maternal overcontrol (measured at age 7) moderated the relation between early BI (14-24 months) and anxiety symptoms in adolescence (14-17 yrs).

Part II.

THE RESEARCH

STUDY I.

Background

Exploring BI in different cultures and countries is relevant considering that cultural aspects may influence both the expression of BI and parental attitudes towards inhibited children (Chen et al., 1998; Chen et al., 2009).

Although the considerable interest on BI in childhood in the international literature, it should be underlined that most of the studies have derived from North American and Western European populations. To our knowledge, only the study by Rubin and colleagues (2006) have investigated BI on Italian population, reporting that Italian children were less inhibited compared to Canadian, Chinese, and South Korean children. However, neither these authors nor other researchers have investigated the *construct* of Behavioral Inhibition and its characteristics on Italian population.

Moreover, even regarding the numerous international studies on BI, some issues have never been investigated or are still unsolved, such as the unitary or multidimensional construct (e.g., relations between social and non-social components of BI), gender differences in the intensity of BI trait, and which factors may be involved in the trajectories of Behavioral Inhibition over time.

Regarding this latter, the literature has shown interest in both parental and child factors. For what concerns *parental* factors, while parental anxiety and parenting style were examined, even if not deeply, in literature on the continuity of BI over time, to our knowledge no studies have investigated parents' perception of BI. In addition, most of the studies on BI have taken into account *maternal* factors rather than considering also the *paternal* variables.

For what concerns *child* factors, a very few studies have investigated their role in the consistency of individual differences on BI. As previously mentioned (See Chapter 2), Rothbart & Bates (2006) have argued that Behavioral Inhibition may show different trajectories over time based on other temperament traits present within the child. However, to our knowledge only one study (Johnson et al., 2016) has investigated the role of child temperament on the continuity of BI over time, reporting that child's low positive emotionality predicted stronger associations between the observed BI at age 3 and 6. Differently, two studies (Thorell et al., 2004; White et al., 2011) have focused on the temperament trait of Inhibitory Control as a risk factor for developing anxiety symptoms in inhibited preschoolers. No further researches have investigated other temperament traits in association with BI.

A few studies (Kerr et al., 1994; Kagan, 1998b; Essex et al., 2010) have examined the role of gender as a child factor possibly involved in longitudinal trajectories of BI (See Chapter 2),

suggesting that culturally shared notions of gender-appropriate behavior may influence the stability of inhibition.

Further studies are needed to deeply analyze the contribution of parental and child factors to longitudinal trajectories of BI across child's specific ages.

In the light of these premises, this study aimed to contribute to the lacks of literature exploring the characteristics of BI construct in a group of Italian preschoolers; also, a specific focus on deepening the role of parental and child factors possibly involved in trajectories of BI over time was realized.

Aims and Hypotheses

The specific aims and hypotheses of this study were:

1. To explore the associations (both cross-sectional and longitudinal) between BI expressed in social contexts and BI expressed in non-social ones at T1 (November: beginning of the school year) and T2 (May: end of the school year).
   Based on Kagan's studies on BI as unitary construct (1998a), we expected to find a high degree of positive correlation between social and non-social components of BI both at T1 and T2.

2. To explore gender differences in the intensity of the observed BI at T1, T2, and T3. Due to mixed results in literature for children aged 3-5, no specific hypotheses were developed.

3. To explore the longitudinal course of BI in 4-aged children across two school years. Specifically, we aimed:
   a) To investigate whether BI measured at T1 (November: beginning of the school year) remained stable across T2 (May: end of the school year), and T3 (November). We expected to find a moderate stability over time. We also aimed to test a mediation model in order to examine whether BI at T1 significantly predicted BI at T2 and at T3, and whether BI at T2 significantly predicted BI at T3. We expected to find BI at T2 as a mediator of the relation BI T1-BI T3;

b) To investigate whether levels of BI changed across time point assessments due to specific *parental* factors, such as parental anxiety symptomatology, authoritarian parenting style, and parents' perception of child BI.

Thus, we aimed:

- To investigate whether maternal and paternal anxiety symptomatology at T1 and T2 moderated the relation between BI at T1 and BI at T3. We expected to find that children with high levels of BI at T1, having mothers and fathers with high anxiety symptomatology, had higher levels of BI at T3;

- To investigate whether maternal and paternal authoritarian style at T1 and T2 moderated the relation between BI at T1 and BI at T3. We expected to find that children with high levels of BI at T1, having mothers and fathers with a predominant authoritarian style, showed higher levels of BI at T3;

- To investigate whether maternal and paternal perceptions of BI at T1 and T2 moderated the relation between BI at T1 and BI at T3. We expected to find that children with high levels of BI at T1 and perceived by mothers and fathers as highly inhibited had higher levels of BI at T3.

c) To investigate whether levels of BI changed across time point assessments due to *child* factors, such as gender and Inhibitory Control. Thus, we aimed:

- To investigate whether gender might be associated to changed BI across time point assessments. Due to mixed results in literature regarding gender differences in longitudinal trajectories of BI, no specific hypotheses were developed;

- To investigate whether Inhibitory Control at T1 might be associated to changed BI across time point assessments. Due to the lack of studies on the contribution of Inhibitory Control on the trajectories of BI over time, no specific hypotheses were developed.

Method

The project consisted of a longitudinal case-control study, including a within-between subjects design. Three consecutive moments were considered in order to detect individual differences on Behavioral Inhibition and Inhibitory Control, and to provide specific questionnaires to children's parents.

Participants

Sixty Italian 4 and 5 aged children, their mothers (N=60) and fathers (N=53) were recruited from three kindergartens in Bologna. The inclusion criteria for children were: (a) comprehension and expression of Italian language appropriate to the age; (b) lack of disabilities or cognitive impairments. The inclusion criteria for parents were a good comprehension and expression of the Italian language.

All the children, except for a 4-year-old, their mothers and fathers completed both the assessments (T1, T2) across a school year. Thirty-six 4-aged children, their mothers (N=34) and fathers (N=27) completed the measures at T3 too.

The sample size, minimum required for the achievements of the aims, was estimated on the basis of the *power analysis* (G Power version 3.1.9.2) *(effect size = 0.2, p = 0.05)*: Considering the expected statistical analysis, it was defined a total number of 33 children.

Demographic characteristics of the sample are presented in Results section.

Procedure

The project has been approved by the Ethic Committee of the Department of Psychology, University of Bologna, in January 2014.

Meetings were held at school with parents and teachers, in order to explain the project and collect informed consent forms. For the aims of the study, measures were proposed to parents and children at 3 time point assessments across two school years (1st school year: T1- November, T2 – May; 2nd school year: T3 – November). A further time point assessment (2nd school year: T4 - May) is going to be realized, but analyses regarding T4 will not be included in the present work.

At each time point assessment, mothers and fathers completed questionnaires in order to evaluate parenting style, parental anxiety symptomatology, and parental perception of child's BI.

Assessments of child's BI and Inhibitory Control were realized through a standardized observational measure, which was administered at school at each time point assessment for BI, and

at T1 and T3 for Inhibitory Control. At the beginning of the project, the main experimenter met the children of each school before proposing tasks in order to allow children becoming more familiar with her.

The Heads of the school had provided a space (*unfamiliar to the children*: i.e., the room for teachers' meetings) corresponding to the needs of the observation methodology.

In order to conduct the research, several collaborators were needed, at least two (the main experimenter and a collaborator) for each time. Several collaborators (psychologists) of the experimenter were instructed to behave as "the stranger" in the observational procedure. At each time point assessment, "the stranger" had to be different from the previous one and never seen by the children before the procedure.

Measures

Measures related both to the child and to parents were adopted in order to reach the aims of the present study. They are summarized in Table 8.

Table 8. Child and parent measures included in Study I

MEASURES RELATED TO			AIMED TO
	CHILD	**Laboratory Temperament Assessment Battery Lab-Tab Preschool Version** (Goldsmith et al., 1999)	Assessment of temperament: BI and Inhibitory Control
		Stranger Approach episode	Social BI
		Risk Room episode	Non-Social BI
		Choosing Dinky Toys episode	Inhibitory Control
	MOTHERS AND FATHERS	**Penny State Worry Questionnaire PSWQ** (Meyer et al., 1990)	Assessment of anxiety symptomatology
		Child Rearing Practice Report CRPR (Block, 1981; Dekovic et al., 1991)	Evaluation of Parenting style
		Behavioral Inhibition Questionnaire BIQ (Bishop, Spence, and MacDonald, 2003)	Evaluation of Parents' perception of child BI

Measures administered to the child

Lab-Tab Preschool Version (Goldsmith et al., 1999). The Lab-Tab represents a standardized protocol composed of 33 episodes evaluating temperamental dimensions in children aged 3-6 years old. Following several studies in literature (Bergman et al., 2007; Kertes et al., 2009; Dyson et al., 2011; Dougherty et al., 2013; Kiel & Buss, 2013), 3 specific episodes have been chosen in order to reach the aims of the study, two for assessing BI and one for assessing Inhibitory Control. The episodes were videotaped in order to allow the coding. They were:

- *Stranger Approach* (Figure 1): the child was briefly left alone in a room while the experimenter went to look for some toys. In the experimenter's absence, a stranger entered the room and spoke to the child in a neutral tone while gradually walking closer to the child. At the end of the episode, the experimenter entered the room and introduced the stranger to the child as her friend. The reaction of the child when the stranger approached him/her was coded. This episode was oriented to detect the *social aspects of BI.*

- *Risk Room* (Figure 2): the child was lead into a room with unfamiliar or new toys. Initially s/he was left alone to play (*Phase I*), and after 5 minutes the experimenter entered the room asking the child to engage in play with each toy (*Phase II*). The reaction of the child to each unfamiliar/new object and the engagement with it was coded. This episode was oriented to detect the *non-social aspects of BI* identified by Kagan's group (1984).

- *Choosing Dinky Toys* (Figure 3): The experimenter presented a big container of several dinky toys to the child, asking her/him to choose only two toys s/he would like to play with. Thus, the experimenter emphasized to the child to think hard so s/he picked the ones s/he really liked, without changing her/his mind. The necessary time to the choice was evaluated. This episode was oriented to detect individual differences on Inhibitory Control.

Figure 1. Picture from Lab-Tab Stranger Approach episode

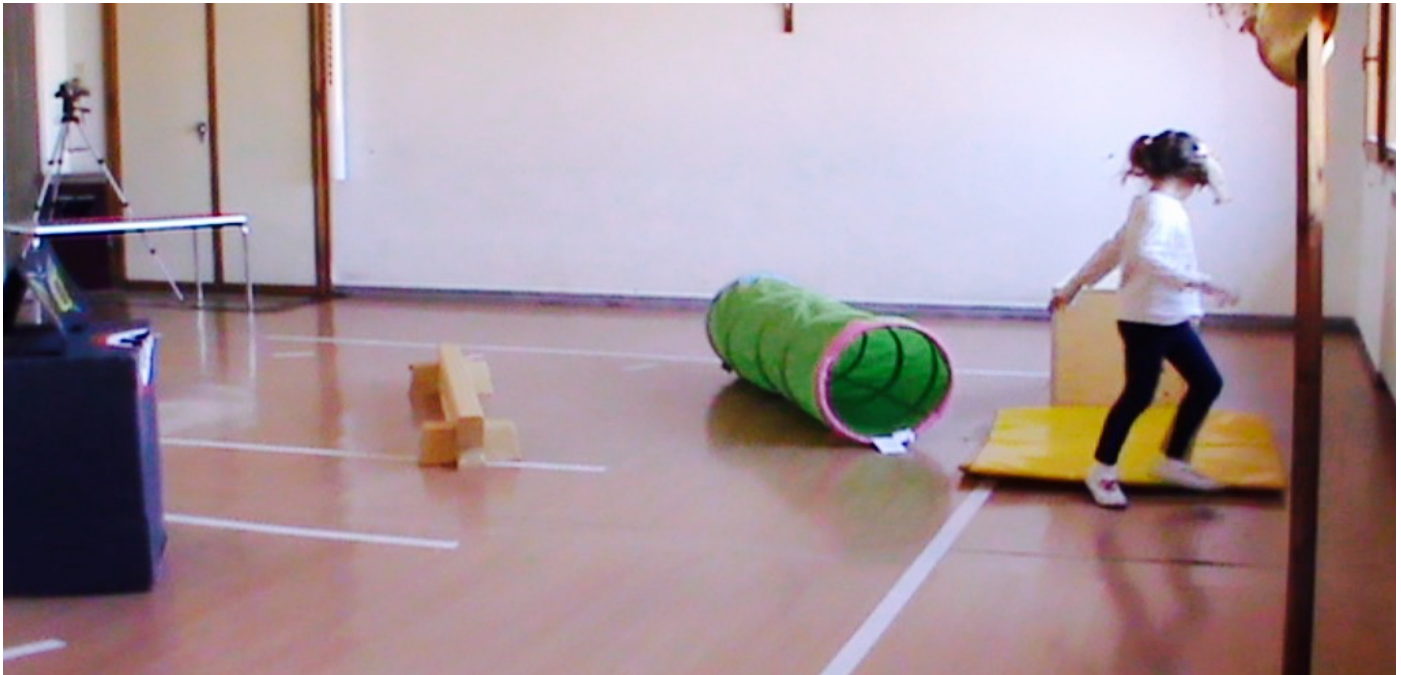**Figure 2.** Picture from Lab-Tab Risk Room episode

Figure 3. Picture from Lab-Tab Choosing Dinky Toys episode

Specific behavioral and emotional variables were coded from video files as defined by the manual. Goldsmith et al.'s (1999) coding system implies specific ratings of emotional and behavioral responses at discrete time intervals (30s epochs). Table 9 summarizes the coding variables considered in this study. They were:

- *Stranger Approach episode.* It includes 10 variables: Latency to first fear response, Intensity of fear expression, Intensity of distress vocalization, Intensity of decrease in activity, Intensity of approach, Intensity of avoidance, Intensity of gaze aversion, Intensity of verbal hesitancy, Nervous fidgeting, Baseline state. These variables were defined as:

   I. *Latency to first fear response.* Interval, in seconds, from the time when the stranger knocks on the door to the first definite fear expression.

   II. *Intensity of fear expression.* Peak intensity of fear or fear blends are noted in each epoch using AFFEX Facial Expression Coding System (Izard, 1982) and rated on a 4-point scale (0 min- 3 max).

   III. *Intensity of distress vocalization.* Peak intensity of distress vocalizations are noted in each epoch and rated on a 4-point scale (0 min- 3 max).

   IV. *Intensity of decrease in activity.* Peak intensity of decreased activity (an apparent or sudden decrease in the activity level of the child, including bodily tensing and *freezing*) is noted in each epoch and rated on a 4-point scale (0 min- 3 max).

   V. *Intensity of approach.* Peak intensity of approach behaviors (behaviors initiated by child to decrease the distance from child to stranger) are noted in each epoch and rated on a 4-point scale (0 min – 3 max).

   VI. *Intensity of avoidance.* Peak intensity of avoidance behaviors (behaviors initiated by the child to maintain or increase the distance from child to stranger) are noted in each epoch and rated on a 4-point scale (0 min – 3 max).

   VII. *Intensity of gaze aversion.* Peak intensity of gaze aversion is noted in each epoch and rated on a 4-point scale (0 min – 3 max).

   VIII. *Intensity of verbal hesitancy.* Peak intensity of verbal hesitancy (including neutral response to questions with no initiation of conversation, or no response to questions) is noted and rated on 3-point scale (0 min – 2 max).

   IX. *Nervous fidgeting.* Defined as movement without a purpose that is induced by presence of stranger. Presence or absence of nervous fidgeting is noted during each epoch and rated as 1= present and 0 = absent.

   X. *Baseline state.* The child's state prior to the beginning of the episode is coded once for each child using a 5-points scale that include states such as alert/calm, fussy, and

crying.

- *Risk Room episode*. It includes overall 17 variables. For the *Phase I* of the episode, when the child was alone in the room, the following variables were codified: Latency to intentionally touch the first object, Latency to intentionally touch the second different object, Latency to intentionally touch the third different object, Latency to intentionally touch the fourth different object, Latency to intentionally touch the fifth different object, Total number of objects touched, Latency to first vocalization, Total amount of time playing with objects, Wary/fearful facial affect, Tentativeness of play, Baseline. These variables were defined as:

  I. *Latency to intentionally touch the first object.*
  II. *Latency to intentionally touch the second different object.*
  III. *Latency to intentionally touch the third different object.*
  IV. *Latency to intentionally touch the fourth different object.*
  V. *Latency to intentionally touch the fifth different object.*
  These five variables consist in the interval, in seconds, from the time when the experimenter says s/he will be back in few minutes to the definite contact with the object. Contact can be an explorative touch. It does not have to involve playing with objects but it must be intentional.
  VI. *Latency to first vocalization*. Interval, in seconds, from the time when the experimenter says s/he will be back in few minutes to the first definite vocalization.
  VII. *Total amount of time playing with objects*. The total amount of time, in seconds, that the child participated in each activity where "participate" is defined as being involved in or playing with the objects.
  VIII. *Wary/fearful facial affect*. Presence of fear or wariness is noted in each epoch using AFFEX Facial Expression Coding System (Izard, 1982) and rated on a 4-point scale (0 min – 3 max).
  IX. *Tentativeness of play*. The peak intensity of the child's touching each object, or participating in each activity (including extreme hesitancy, with child spending time in looking at objects but spending no time in touching or exploring them) is rated on a 4-point scale (0 min – 3 max).
  X. *Baseline state*. The child's state prior to the beginning of the episode is coded once for each child using a 5-points scale that include states such as alert/calm, fussy, and crying.

For the *Phase II* of the episode, the following coding variables were considered: Comply,

Latency of request to initiation of compliance, Tentativeness of play, Reference experimenter, Distress vocalizations, Wary/fearful facial affect, Total number of prompts. These variables were defined as:

    I. *Comply*. The presence of child's complying with experimenter's request to participate to each different activity is noted (1= present, 0= not present).

    II. *Latency to comply*. Interval, in seconds, from the time the experimenter begins to ask child to participate in an activity until child initiates an action that leads to participation in that activity.

    III. *Tentativeness of play*. As reported above.

    IV. *Reference experimenter*. The presence of references the child makes towards experimenter before complying with experimenter's request to participate in each activity is noted (1= present, 0= not present).

    V. *Intensity of distress vocalizations*. As reported above, for Stranger Approach episode.

    VI. *Wary/fearful facial affect*. As reported above.

    VII. *Total number of prompts*. Record number of prompts from experimenter to child.

• *Choosing Dinky Toys episode*. It includes 4 variables: Time to choose, Approximate number of toys examined, Degree of control, Degree of rule violation. These variables were defined as:

    I. *Time to choose*. The time (in seconds) it takes the child to choose a toy.

    II. *Approximate percentage of toys examined*. The approximate percentage of toys the child searches through before s/he finds a toy to keep. The percentage is rated on a 5-points scale (0 min – 4 max).

    III. *Degree of control*. The degree of control the child exhibits while performing task is rated on a 4-point scale (0 impulsive – 3 strategic).

    IV. *Degree of rule violations*. The degree to which the child follows or violates instructions. It was rated on a 3-point scale (0 s/he follows rules – 2 violation of rules).

Table 9. Lab-Tab coding variables

STRANGER APPROACH EPISODE	RISK ROOM EPISODE	CHOOSING DINKY TOYS EPISODE
	PHASE I:	
Latency to the first fear response	Latency to intentionally touch the first object	Time to choose
Intensity of fear expression	Latency to intentionally touch the second different object	Approximate percentage of toys examined
Intensity of distress vocalization	Latency to intentionally touch the third different object	Degree of control
Intensity of decrease in activity	Latency to intentionally touch the fourth different object	Degree of rule violations
Intensity of approach	Latency to intentionally touch the fifth different object	
Intensity of avoidance	Latency to the first vocalization	
Intensity of gaze aversion	Total amount of time playing with objects	
Intensity of verbal hesitancy	Wary/Fearful facial affect	
Nervous fidgeting	Tentativeness of play	
Baseline state	Baseline state	
	PHASE II:	
	Comply	
	Latency to comply	
	Tentativeness of play	
	Reference experimenter	
	Intensity of distress vocalizations	
	Wary/Fearful facial affect	
	Total number of prompts	

Measures administered to mothers and fathers

Penn State Worry Questionnaire PSWQ (Meyer et al., 1990; Italian version: Morani, Pricci, Sanavio, 2009). (See Appendix I). The PSWQ is a self-report questionnaire created for detecting generalized anxiety and worries. It represents a *trait* measure consisting in 16 items, which are not referred to the contents of the worries but to the fact of being worried (i.e., Item 2: "My worries overwhelm me", Item 7: "I am always worried about something"). The person is asked to answer each item on a scale ranging from 1 (*not at all typical of me*) to 5 (*very typical of me*). The total score is represented by the sum of all 16 items. Possible range score is 16-80, with 3 possible acuity ranges in the original version: Low Worry (total score: 16-39), Moderate Worry (total score: 40-59), and High Worry (total score: 60-80). The original validation study referred to 405 students (Meyer et al., 1990); further subsequent studies investigated the psychometric properties of the PSWQ (Molina & Borkovec, 1994) both on non-clinical populations and clinical populations (e.g., patients with Generalized Anxiety Disorder, patients with Obsessive-Compulsive Disorder, patients with Panic Disorder, etc.). The internal consistency ranged between 0.88 and 0.92 for non-clinical populations, and between 0.86 and 0.93 in patients with anxiety disorders (Morani, Pricci, Sanavio, 2009).

The Italian validation of the PSWQ was based on 388 subjects from 18 to 86 years of age (Morani, Pricci, & Sanavio, 2009). The internal consistency resulted to be adequate, with a *Cronbach's alpha* of 0.85; the clinical cut-off values identified on the Italian population were 57 for women and 49 for men.

Child Rearing Practices Report: CRPR (Block, 1981; Dekovic et al., 1991; Italian version: Zappulla, 2008). This self-report evaluates parenting style, parent beliefs, attitudes, and behaviors. The CRPR was derived from empirical observations of mothers interacting with their children in different structured experimental situations. The CRPR, initially created by Block (1981) as a Q-sort, has been validated as a questionnaire by Dekovic and colleagues (1991), reporting a good factor structure, reliability and construct validity. For the aims of this study, the CRPR *questionnaire* was used. It consists of 91 items and it is based on a 6-point scale, which ranges from *1= not at all descriptive of me* to *6= highly descriptive of me.* The CRPR includes 2 main subscales: *Authoritative* and *Authoritarian* parenting styles, first identified by Kochanska, Kuczynski and Radke-Yarrow (1989) and then by Dekovic et al. (1991). The Authoritative pattern was associated with the parent's use of suggestions and positive incentives. The Authoritarian pattern is associated with the parent's use of direct commands, physical enforcements, reprimands, and prohibitive interventions.

In this study the preliminary version of the Italian CRPR questionnaire by Zappulla (2008) was

used, with the agreement of the author.

Behavioral Inhibition Questionnaire (BIQ) (Bishop, Spence, & McDonald, 2003). *(See Appendix II, III).* The BIQ is a brief parent- and teacher- report developed for measuring the perception of BI in children aged 3-5. It consists of 30 items for parent version and 28 items for teacher version, rated on a 7-point scale ranging from *1= hardly ever to 7= most always.* The structure of the BIQ questionnaire allows assessing the perception of children's inhibited temperament in multiple contexts. Specifically, the items span 6 contexts reflecting 3 specific domains: Social Novelty, Situational Novelty and Physical Challenges. Social Novelty refers to *unfamiliar adults, peers and performing in front of others*, Situational Novelty concerns to *unfamiliar situations, preschool or separation*, while Physical Challenges refers to novel *physical activities* with possible risk of injury.

The total score of the questionnaire varies from 30 to 180: higher scores correspond to higher levels of BI.

A good reliability and internal consistency were found by validations in several countries (Bishop, Spence, & McDonald, 2003; Broeren & Muris, 2010; Kim et al., 2011).

The Italian validation has been developed by Agostini, Benassi, Minelli, Mandolesi (*manuscript in preparation*) and it has shown an excellent internal consistency and a significant item-total correlation for Mother (Alpha=0.92; item-total= 0.25-0.76), Father (Alpha=0.90; item-total= 0.19-0.70) and Teacher (Alpha=0.94; item-total= 0.42-0.79) versions.

Data Analyses

Demographic characteristics of the sample. In order to compare children, mothers and fathers from the three kindergartens on demographic variables, Pearson's Chi Square tests were adopted for categorical variables (i.e., child gender, only child status, mother's education, father's education, couple civil status), and Univariate ANOVAs were used for continuous variables (i.e., child's age, mother's age, father's age).

Lab-Tab composite indexes. In order to create Lab-Tab indexes of Behavioral Inhibition and Inhibitory Control, several steps were adopted according to the *Preschool Lab-Tab Preschool Version Manual* (Goldsmith et al., 1999). First, two independent observers subsequently analyzed each Lab-Tab episode (*Stranger Approach, Risk Room, Choosing Dinky Toys*) from video files and numeric variables were obtained. Good inter-rater reliability was achieved, with correlations ranging from 0.69 to 0.88.

Then, the assumptions of normality were tested for the Lab-Tab variables, and not-normal variables were transformed using a *square root transformation* (Goldsmith, 1999). All the variables were then transformed into *z-scores* and a Person Correlation analyses were run in order to detect the correlations among the variables. Those variables that resulted being correlated with at least a coefficient of r= 0.4 were selected in order to calculate the Lab-Tab index for each episode. A *Social BI* (from *Stranger Approach* episode), *Non-Social BI* (from *Risk Room* episode) and *Inhibitory Control* (from *Choosing Dinky Toys* episode) indexes were calculated as the sum of each selected variables from each episode. A *Total BI index* was calculated as the sum of *Social* and *Non-Social BI* indexes. The normal distribution for each Lab-Tab index was tested and found. This procedure was followed to calculate indexes from Lab-Tab episodes at each time point assessments (T1, T2, T3).

For more details about the creation of Lab-Tab indexes, see the Lab-Tab Preschool Version Manual (Goldsmith et al., 1999).

The obtained BI indexes were considered as both continuous variables and categorical variables. Indeed, as underlined by Tarullo and colleagues (2011), using BI indexes as continuous variables allow treating BI as a dimension, with the advantage of having a greater power. At the same time, as previously suggested in literature by Kagan (1998a), temperamental traits need to be considered as categories in research on Psychology since the origin of each trait is a distinct genome profile (Kagan & Snidman, 2004). Therefore, children who are extremely inhibited in response to novelty are *qualitatively distinct* from those with intermediate levels of inhibited and reticent behavior

(Kagan & Snidman, 2004). Considering Behavioral Inhibition indexes as both continuous and categorical variables allows to better understanding this temperamental disposition and its associations with environmental factors.

Lab-Tab composite indexes, as well as questionnaires scores, were tested for assumptions of normality and the following analyses were run in order to reach the aims of the study.

Aim 1: Behavioral Inhibition in social and non-social contexts. In order to achieve the first aim of this study, Partial Correlational analyses (one-tailed) were run between Social and Non-Social BI indexes at T1 and T2 controlling for child's age. This choice was due to the fact that the expression of BI in several contexts may be different depending on the child's age (Hirshfeld-Becker & Biederman, 2002), therefore this may have an effect on associations between social and non-social components.

Aim 2: Gender differences in the intensity of BI trait. For what concerns this aim, a GLM Multivariate ANOVA was run considering Gender as the factor and Total, Social and Non-Social BI indexes at each time point assessments as dependent variables. Effect sizes of mean gender differences were also estimated as Cohen's d, which expresses group gender differences in standard deviation units.

Aim 3: Longitudinal trajectories of BI. In order to examine the continuity of BI over time, both a continuous approach and a categorical approach for data analysis were adopted. Regarding the first one, a Pearson Correlation Analysis among Total BI indexes at T1, T2 and T3 was run. Also, a Mediation Regression Analysis was adopted in order to investigate whether BI at T1 significantly predicted BI at T3, and whether this effect was significantly mediated by BI at T2 (Figure 4).

Figure 4. Mediation model tested for the continuity of BI over time
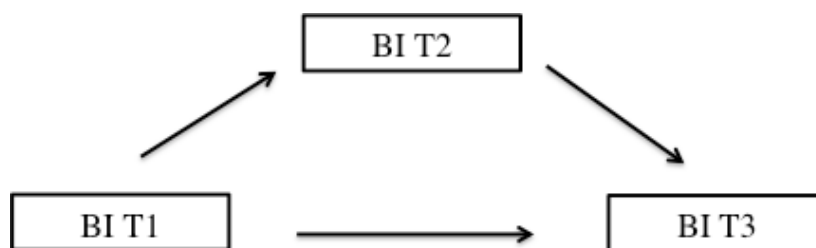
Considering a categorical approach, variables based on 75th percentile of Total BI indexes at T1, T2 and T3 were created. Cross-tabs were used in order to examine whether the number of inhibited children changed from one time point assessment to later ones. Also, a Cochran's Q test was used in order to investigate whether the number of inhibited children significantly changed across the 3 time point assessments (Sheskin, 2004).

In order to investigate whether parental and child factors may influence the trajectories of Behavioral Inhibition over time, two different and separate models were adopted. For what concerns *parental factors*, Moderation Regression Analyses were used due to the fact that PSWQ, CRPR and BIQ scores were considered as continuous variables. Specifically, for what concerns PSWQ scores, we were interested in considering the whole range of scores as representing a parent's general tendency to worry, rather than only considering clinical psychopathological cut-off values. Indeed, as reported in literature (Gruner, Muris & Merckelbach, 1999; Muris et al., 2000), parents' general fears have been associated to a child's tendency to be worried or fearful.

Thus, the following analyses were adopted:

1) To investigate whether the continuity of BI over time was moderated by levels of maternal and paternal anxiety symptoms (Figure 5), Moderation Regression Analyses using PROCESS were run, considering parental PSWQ scores at T1 and T2 as the moderator, BI at T1 as the independent variable and BI at T3 as the outcome.

2) To investigate whether the continuity of BI over time was moderated by maternal and paternal authoritarian style (Figure 6), Moderation Regression Analyses using PROCESS were run, considering authoritarian parenting style at T1 and T2 as the moderator, BI at T1 as the independent variable and BI at T3 as the outcome.

3) To investigate whether the continuity of BI over time was moderated by maternal and paternal perception of BI (Figure 7), Moderation Regression Analyses using PROCESS were run, considering maternal and paternal Total BIQ score at T1 and T2 as the moderator, BI at T1 as the independent variable and BI at T3 as the outcome.

Figure 5. Moderation model for the continuity of BI over time: Maternal/Paternal anxiety symptomatology as moderators
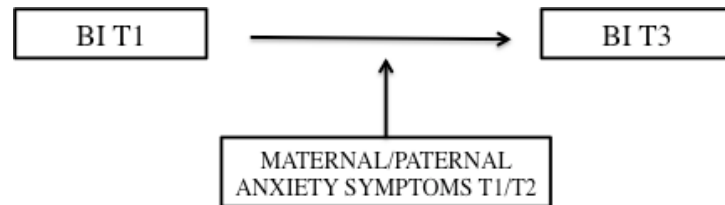
Figure 6. Moderation model for the continuity of BI over time: Maternal/Paternal Authoritarian style as moderators
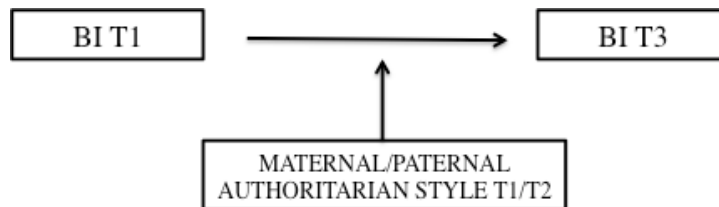
Figure 7. Moderation model for the continuity of BI over time: Maternal/Paternal perception of BI as moderators
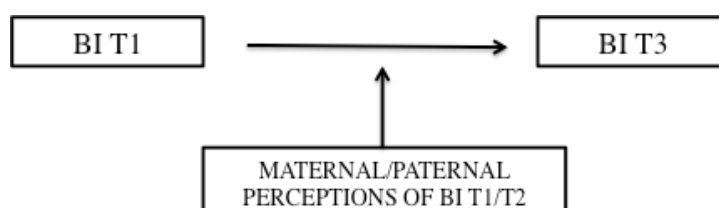
For what concerns *child factors*, GLM Repeated Measures ANOVAs were adopted due to characteristics of the considered variables. Indeed, gender was a categorical variable, and Lab-Tab Inhibitory Control index was used as categorical variable too, due to the fact that literature on Inhibitory Control refers to high and low levels of this temperamental predisposition, often using categorical variables (Pardini, Lochman, Wells, 2004; Anzman & Birch, 2009). Thus, the following analyses were adopted:

1) In order to investigate whether child gender might change levels of BI over time, a GLM Repeated Measures ANOVA was run, with *Time* (time point assessments: T1, T2, T3) as the Within-Subjects variable, and the dichotomous variable *Child Gender* as the Between-Subjects variable;

2) In order to investigate whether child Inhibitory Control might change levels of BI over time, a dichotomous variable based on the *median split method* (Cohen, 1983; DeCoster, Gallucci, Iselin, 2011) was created. Then, a GLM Repeated Measures ANOVA was run, with *Time* (time point assessments: T1, T2, T3) as the Within-Subjects variable, and *Child Inhibitory Control* as the Between-Subjects variable.

Data analyses were conducted using Statistical Package for Social Science (SPSS) Version 21. PROCESS by Andrew Hayes (2013) was adopted in order to run Mediation and Moderation Regression Analyses.

Demographic characteristics of the sample

For what concerns the demographic characteristics of children, on 60 children at T1 and at T2, 24 were males (40%); they ranged in age from 46 to 69 months (M±SD= 55.4 ± 6.2) and 34 (56.7%) of them were only child. On 36 children at T3, 14 were males (42.1%), 18 (50%) were only child.

For what concerns parents, mothers' age ranged from 27 to 50 years (M±SD= 37.9 ± 5.1), while fathers' age ranged from 31 to 53 years (M±SD= 48.8 ± 5.5). Most of parents had a high-school diploma (48.3% of mothers; 45.3% of fathers) and were married (78.8%).

Demographic characteristics of the sample are shown in Table 10.

Children, mothers and fathers from the three kindergartens did not differ on demographic characteristics (p>0.05), except for maternal education, with a significant higher number of bachelor/master's graduates in one school compared to the other two (X^2= 11.7, p= 0.019).

Table 10. Demographic characteristics of children, mothers and fathers

Children (N= 60)	
Italian Nationality (%)	100
Age (months), Mean ± SD	55.4 ± 6.2
Only child (%)	56.7
Mothers (N= 60)	
Italian Nationality (%)	100
Age, Mean ± SD	37.9 ± 5.1
Education (%)	
Middle school certificate	10
High school diploma	48.3
Bachelor's or Master's degree	41.7
Fathers (N= 53)	
Italian Nationality (%)	100
Age, Mean ± SD	40.8 ± 5.5
Education (%)	
Middle school certificate	26.4
High school diploma	45.3
Bachelor's or Master's degree	28.3
Couple Civil Status (%)	
Married	75.8
Cohabiting	6.3
Single parent/divorced	17.9

Aim 1

Behavioral Inhibition in social and non-social contexts

Regarding the first aim of this study, we expected to find Social and Non-Social BI indexes significantly correlated. Partial correlation analyses (controlled by child's age) showed that, both cross-sectionally and longitudinally, BI measured in the social context (*Lab-Tab Stranger Approach*) resulted to be significantly and positively associated with BI measured in non-social one (*Lab-Tab Risk Room*), except for the correlation between Social BI at T1 and Non-Social BI at T2 that was not significant.

Also, Social BI at T1 was significantly and highly correlated with Social BI at T2, and Non-Social BI at T1 with Non-Social BI at T2, suggesting a good stability of these aspects over time.

Table 11 shows Partial Correlations between Social and Non-Social BI indexes.

Table 11. Partial Correlations (one-tailed) between Lab-Tab Social and Non-Social BI indexes

	Social BI T1	Non-social BI T1	Social BI T2	Non-social BI T2
Social BI T1	-			
Non-social BI T1	0.309*	-		
Social BI T2	0.677**	0.234*	-	
Non-social BI T2	0.096	0.564**	0.223*	-

** p<0.01 *p<0.05

Aim 2

Gender differences in the intensity of Behavioral Inhibition

Regarding the second aim of this study, gender differences in the intensity of BI trait were explored. Results revealed males showing a tendency to higher mean values in Social, Non-Social, and Total BI indexes at each time point assessment but these differences were not significant ($p>0.05$). However, Cohen's *d* (Cohen, 1988) was calculated for all the BI indexes, showing a range between 0.27 - 0.47, which indicates a small to medium effect size.

Descriptive statistics and Cohen's *d* are reported in Table 12.

Table 12. Differences between males and females in Lab-Tab BI indexes

	Males (N=24) Mean (SD)	**Females** (N=36) Mean (SD)	**Effect size (*d*)**
Total BI T1	1.24 (6.0)	-0.82 (4.6)	0.39
Social BI T1	0.45 (2.9)	-0.30 (1.9)	0.31
Non-Social BI T1	0.79 (4.1)	-0.51 (3.9)	0.32
Total BI T2	0.88 (4.8)	-0.88 (3.5)	0.43
Social BI T2	0.45 (2.5)	-0.49 (2.3)	0.39
Non-Social BI T2	0.88 (3.7)	-0.59 (2.6)	0.47
Total BI T3	0.72 (4.8)	-0.78 (4.1)	0.34
Social BI T3	0.45 (3.3)	-0.28 (2.8)	0.24
Non-Social BI T3	0.27 (3.1)	-0.49 (2.5)	0.27

Aim 3

Longitudinal trajectories of BI

a) Stability of BI over time

Regarding the third aim, we expected a moderate stability of BI from T1 to T3. Considering BI as a continuous variable, results showed significantly moderate-high correlations among total BI indexes at T1, T2 and T3 (Table 13).

Results from Mediation Regression Analysis showed that BI at T1 significantly predicted BI at T2 (b= 0.47, t= 4.29, p= 0.001), with R^2 explaining 31.55% of the variance in the relationship; BI at T1 significantly predicted BI at T3 (b= 0.46, t= 4.29, p= 0.001), with R^2 explaining 30.12% of the variance in the relationship; finally, when both BI at T1 and BI at T2 were included in the model, BI at T2 (b= 0.45, t= 2.40, p= 0.022) but not BI at T1 (b= 0.24, t= 1.85, p= 0.071) significantly predicted BI at T3, with R^2 explaining 44.37% of the variance in the relationship. Specifically, there was a significant *indirect effect* of BI at T2 on BI at T3 through relation BI T1 (b= 0.21, BCa CI [0.0379, 0.4325]). Results showed also that k^2= 0.254, 95% BCa CI [0.0515, 0.4671], so that the *indirect effect* is about 25.46% of the maximum value that it could have been, which represents a good effect.

Table 13. Pearson Correlations among Total BI indexes at T1, T2, T3

	Total BI T1	Total BI T2	Total BI T3
Total BI T1	-		
Total BI T2	0.611**	-	
Total BI T3	0.549**	0.621**	-

** p<0.01

Frequencies of inhibited and non-inhibited children over time. In order to better investigate our aim, BI was also examined as a categorical variable. Considering the 75th percentile, 13 children (21.6% of the total sample) on 60 were classified as behaviorally inhibited at T1, 13 children (21.6%) on 60 at T2 and 9 children (25%) on 36 at T3 (Table 14).

We also considered the percentages of children remaining inhibited from one time to another. These values drastically decreased; specifically, 3 children (8.3% of the total sample) were continuatively inhibited at T1, T2 and T3, 8 children (13.3%) were inhibited from T1 to T2, and 5 children (13.8%) were inhibited from T2 to T3. Also, one child was classified as inhibited at T1 and T3 but not at T2. Table 15 shows the frequencies of inhibited children in the sample.

Regarding the *discontinuity* of BI over time (Degnan & Fox, 2007), 4 children (6.6%) who were classified as inhibited at T1 were classified as non-inhibited at later time point assessments (T2, T3), while 3 children (5%) who were classified as inhibited at T2 were non-inhibited at both T1 and T3. Finally, 4 children (11.1%) were detected as inhibited only at T3 (Table 15).

Table 14. Frequencies of inhibited children at each time point assessment

Children	N (%)
Total number of inhibited at T1 (on 60)	13 (21.6)
Total number of inhibited at T2 (on 60)	13 (21.6)
Total number of inhibited at T3 (on 36)	9 (25)

Table 15. Frequencies of inhibited children over time

Children	N (%)
Always inhibited (T1, T2, T3)	3 (8.3)
Inhibited at T1-T2	8 (13.3)
Inhibited at T2-T3	5 (13.8)
Inhibited at T1-T3	1 (2.7)
Inhibited at T1 but not later	4 (6.6)
Inhibited at T2 but not at T1 and T3	3 (5)
Inhibited at T3 but not previously	4 (11.1)

Results from the Cochran's Q test revealed that, *from one time to another*, the number of children changing from inhibited to non-inhibited group did not significantly differ from the number of children changing from non-inhibited to inhibited group (Cochran's Q= 0.727, p= 0.695), confirming a good stability of BI trait over time.

b) Parental factors moderating BI over time

Parental anxiety symptomatology. Considering the third aim of this study, we examined both maternal and paternal levels of anxiety symptomatology. Results from Moderation Regression Analyses showed that high levels of maternal anxiety symptomatology at T1 significantly moderated the relation between BI at T1 and at T3 (R^2= 0.34, F= 6.705, p= 0.0013) (Table 16). Specifically, children characterized by high levels of BI at T1 whose mothers had high anxiety symptoms showed higher levels of BI at T3 (Figure 8). Regarding maternal anxiety at T2 and paternal anxiety at both T1 and T2 no significant results were found (p>0.05).

Table 16. Moderation Regression Analysis: Maternal PSWQ score as the moderator

	b	SE B	t	p
BI T1	0.418	0.123	3.39	0.001
BI T1 X Maternal PSWQ	0.027	0.012	2.25	0.031

Outcome: BI T3

Figure 8. Moderating effect of maternal anxiety symptomatology (T1) on levels of BI over time (T1-T3)
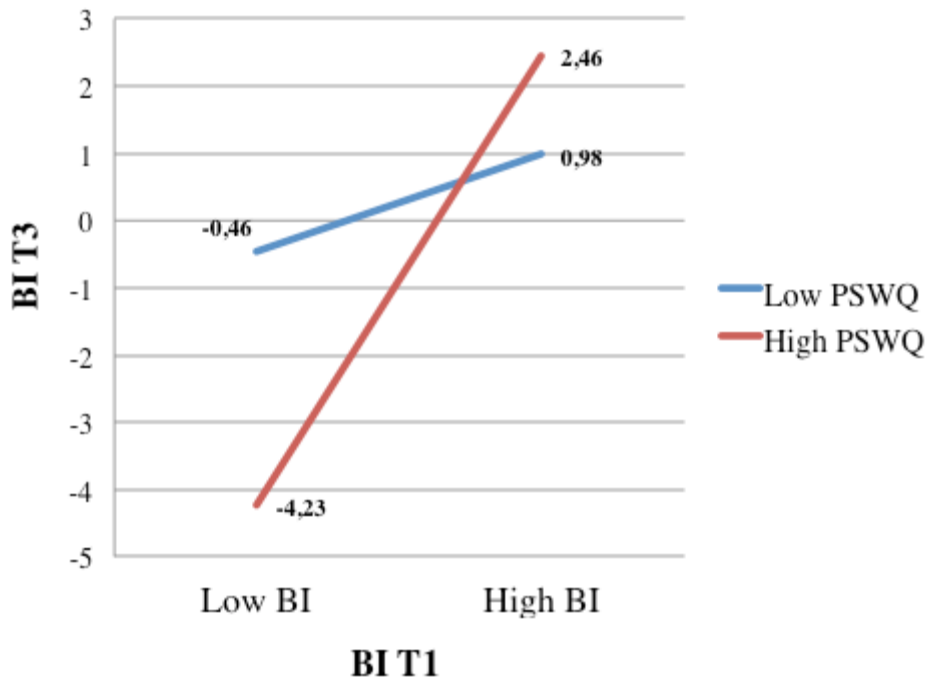
Authoritarian parenting style. Results from Moderation Regression Analyses showed no significant effects for maternal (T1: p= 0.773, T2: p= 0.625) and paternal (T1: p= 0.748, T2: p= 0.207) CRPR authoritarian style as moderators of the relation between BI at T1 and BI at T3.

Parental perception of inhibited temperament. Results from Moderation Regression Analyses showed no significant effects for maternal (T1: p= 0.108, T2: p= 0.719) and paternal (T1: p= 0.639, T2: p= 0.425) BIQ score reports as moderators of the relation between BI at T1 and BI at T3.

c) Child factors associated with BI over time

Child Gender. Results from GLM Repeated Measures ANOVA showed that BI levels did not change across the 3 time point assessments ($F_{(34,1)}$= 0.071, p= 0.931), confirming the idea, previously found, that BI had a good stability over time. No significant within-subjects effects occurred for Time X Gender ($F_{(34,1)}$= 0.079, p=0.924), suggesting that gender did not influence levels of BI over time. Finally, the Test of Between-Subjects Effects revealed no significant gender differences in the overall mean levels of BI over time ($F_{(34,1)}$= 1.435, p= 0.239).

Child Inhibitory Control. As previously mentioned, child Inhibitory Control was investigated as a factor associated with BI across T1, T2, and T3. Results from GLM Repeated Measures ANOVA reported a significant Time X Child Inhibitory Control within-subjects effect from T1 to T3 ($F_{(1,34)}$=5.384, r= 0.37, p=0.026). Specifically, the Within-Subjects Contrasts revealed that, for children with high Inhibitory Control (N=18), BI significantly increased from T1 to T3 (p= 0.025), while no significant effects were found for children with low Inhibitory Control (N=18) (p= 0.536) (Figure 9). Finally, the Test of Between-Subjects Effects was significant ($F(1,34)$=4.839, p=0.035), with children with low Inhibitory Control showing higher overall mean values of BI compared to children with high Inhibitory Control.

Figure 9. GLM Repeated Measures ANOVA: Interaction between Time and Child Inhibitory Control
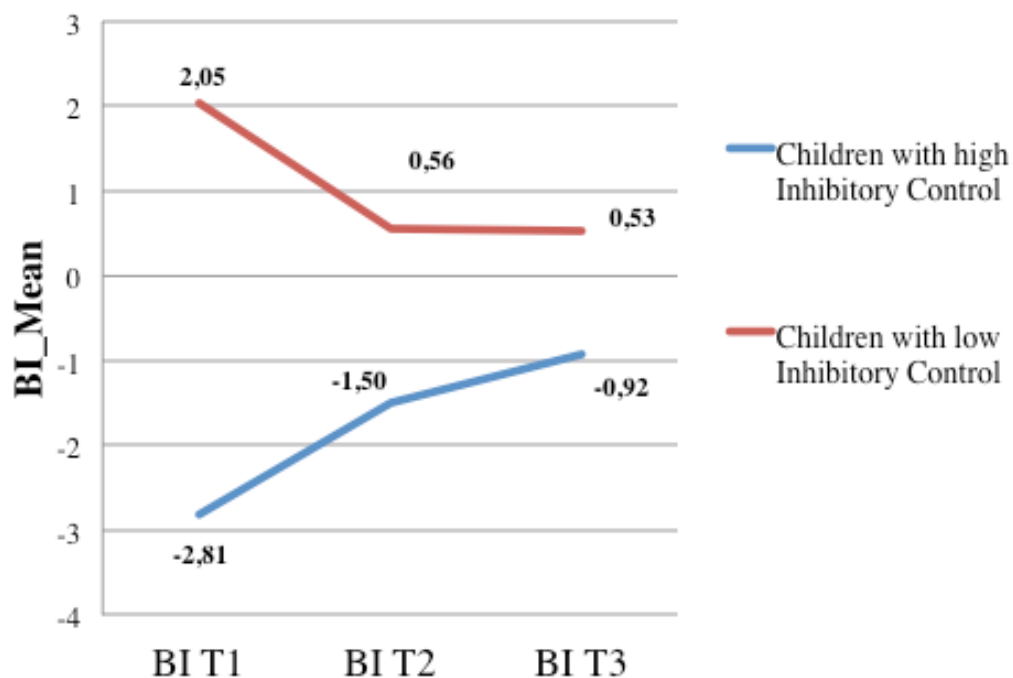
Discussion

This study originated from the awareness that some issues about Behavioral Inhibition are still unsolved in the international literature, such as the unitary or multidimensional construct of BI, factors involved in the continuity of BI over time, and gender differences in the intensity of BI trait. Also, to our knowledge no studies on Italian population have explored the characteristics of BI construct until now. In the light of these premises, this study aimed to contribute to the literature focusing on a sample of Italian preschoolers.

According to the first aim and to our hypothesis, we expected to find a high degree of correlation between social and non-social components of Behavioral Inhibition. The traditional perspective underlined in literature by Kagan (1998b) and others (Asendorpf, 1990, 1991; Broberg, Lamb, & Hwang, 1990; Kerr et al., 1994) regards BI as a *unitary construct* characterized by correlations between social and non-social aspects ranging from 0.24 to 0.64. Our results showed significantly moderate cross-sectional and longitudinal correlations, suggesting that BI is expressed, in our sample of Italian children, as a unitary construct, in line with previous literature. However, we did not find *high* correlations. It is possible that social and non-social components of BI are sensitive to child's age, so that in early childhood inhibited children show reticent behaviors both when confronting with strangers and when approaching new objects, while growing up they may result more inhibited with social novelty compared to non-social one (Hirshfeld-Becker et al., 2008). However, in order to verify this hypothesis further studies would be recommended considering a broader range of child's age.

The second aim of this study was focused on exploring gender differences in the intensity of BI trait, but no significant effects were found, as in few other studies (Stevenson-Hinde et al., 1995; Rubin et al., 2002; Rydell et al., 2009). However, we found that males had higher mean values compared to females, with a partially acceptable effect size (Cohen, 1988; Coe, 2002), although not statistically significant. It is possible that the sample size was too limited to effectively detect differences between males and females. It is also possible that, at the age we investigated, differences in the expression of the inhibited behaviors are not so evident and manifest. Further studies are recommended.

The third aim of this study regarded the continuity of BI over time. Child's inhibited temperament is moderately stable over time, as suggested by correlation and regression analyses in our study. Specifically, the results revealed that BI indexes at each assessment over time were moderately correlated, as other studies on preschool samples reported (Stevenson-Hinde et al., 1995). Also using a mediation regression analysis, we found both a direct effect of BI at T1 on BI at

T3 and an indirect effect mediated by BI at T2. These results confirmed the continuity of BI over time and they are in line with previous literature (Degnan et al., 2007).

Also, exploring the stability using a more categorical and descriptive approach, results are consistent. Specifically, this study revealed around 21-25% of inhibited children at each point time assessment, which represents slightly higher percentages compared to those (10-20%) found in previous studies in literature (Degnan et al., 2007), probably due to the small sample size used in this study. These percentages did not significantly change from one time to another, although some children who were previously classified as inhibited were not considered inhibited later. Overall, only 8.3% of children remained constantly inhibited across T1, T2 and T3. This latter is a small percentage, but from T2 to T3 a certain dropping of subjects from the sample occurred, and this should be considered in interpreting our results. Also, we may consider the influence of different factors (that we did not measure) moderating the expression of BI trait from T1 to T3. Taken together, these findings suggest a moderate stability of BI over time, which does not exclude a certain discontinuity of inhibited profiles. Some studies in literature have reported similar results. Indeed, it has been shown that almost a third of behaviorally inhibited children were less inhibited later in childhood (Reznick et al., 1986; Kagan, Reznick et al., 1988; Kagan, Snidman et al., 1988; Calkins et al., 1996; Fox et al., 2001; Pfeifer et al., 2002). Also, in unselected samples[3], almost 50% of inhibited children displayed discontinuity of BI across childhood and later in life (Kerr et al., 1994; Scarpa et al., 1995; Sanson et al., 1996).

The variability in the levels of stability across these studies suggests that specific factors, inherent to the family environment or to the child, may have an important role on the longitudinal trajectories of Behavioral Inhibition. In our study, we focused on both parental and child factors that may be involved in increasing the intensity of BI over time. For what concerns parental factors, results did not report authoritarian parenting style and parental perception of child's BI as significant moderators of the relation between BI at T1 and at T3. However, maternal anxiety symptoms at T1 resulted to moderate this relation. Indeed, highly inhibited children whose mothers were highly anxious showed higher levels of BI at T3. This finding suggests that children of parents with anxiety disorders are more likely of increasing inhibited behaviors over time, as shown by some studies in literature (Biederman et al., 2001; Hirshfeld et al., 1992). Indeed, as reported by Murray et al. (2009), transmission of parental anxiety may pass through biased information processing, modelling and information transfer. Parental anxious behaviors and parents' tendency

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[3] Unselected samples are undifferentiated samples of children, which were not previously selected based on infant high reactive profiles

of communicating information using negative contents may effectively elicit child's anxiety, above all in children with a temperamental predisposition of becoming anxious, such as inhibited children.

Finally, in this study, child factors, such as gender and Inhibitory Control, were also analyzed in relation to longitudinal trajectories of Behavioral Inhibition over time. No significant effects were found for gender, so that our hypothesis that females were more likely to show increased levels of BI over time has not been confirmed. Further studies are recommended to deepen the role of gender in the consistency and intensity of BI levels over time.

For what concerns Inhibitory Control, to our knowledge no studies have deepened the direct relation between BI and Inhibitory Control, although two researches (Thorell et al., 2004; White et al., 2011) investigated the role of Inhibitory Control in child's developmental outcomes for inhibited children. Results from the present study showed that children with low levels of Inhibitory Control were more inhibited compared to children with high levels of Inhibitory Control. This finding is in line with research on adults (Derryberry & Rothbart, 1988) and children (Gerardi-Caulton, 2000) reporting that lower levels of effortful control (i.e., Inhibitory Control) are related to higher levels of negative affect, which has been recognized as a temperamental quality often associated to Behavioral Inhibition (Zentner & Bates, 2008). Moreover, results from our study revealed that, for children having high Inhibitory Control, levels of Behavioral Inhibition *increased* from T1 to T3. It has been shown by two studies (Thorell et al., 2004; White et al., 2011) that children having high Inhibitory Control were more likely to develop internalizing difficulties, suggesting high Inhibitory Control be a risk for child's development. However, no studies have investigated mechanisms that may be involved in this process. Considering our findings, it is possible that high levels of Inhibitory Control promote higher levels of Behavioral Inhibition over time, which in turn makes more likely the risk for child negative outcomes (Chronis-Tuscano et al., 2009). Further studies are needed to clarify this issue.

It should be noted that, for what concerns the continuity of BI over time as well as parental and child factors involved in BI increasing, we adopted different analyses. Further studies using other kinds of analyses are recommended in order to confirm or contradict our findings.

Some limits of this study should be underlined. First, the sample size we used was limited. Indeed, considering the restricted percentage of inhibited children on general population, using small samples implies detecting few inhibited children, so that only certain kinds of data analyses were possible, with a consequent restriction of the investigation. Similarly, due to the small sample size, Structural Equation Modeling (SEM) could not be used in order to investigate which factors were involved in the longitudinal trajectories of BI and their relations, with the consequence of a more limited investigation.

A further important limit of the present work consists in the time range considered (T1-T3). Although we used 3 time point assessments across two school years, exploring the continuity of BI would benefit more of a wider time range and further studies are recommended.

Finally, another limit regards the observational procedure that we used for the assessment of BI. Indeed, the adaptation of this paradigm to the school environment, realized with the consent by the authors of the Lab-Tab, made it possible to obtain observational indexes from a standardized situation outside the lab. However, while the adaptation to the school setting made the sample recruitment and the data collection simpler, it was obviously less precise than in the laboratory.

Some strengths of this study may be recognized as well. To our knowledge, this is the first study exploring the characteristics of the BI construct on a sample of Italian preschoolers. Also, the effort of this study consists in investigating more than one parental and child factor that might be involved in the trajectories of BI over time, while several studies in literature have just examined the stability of BI.

For what concerns parental factors, most of the studies in literature have considered maternal variables rather than both maternal and paternal factors. Considering that both mother-child relationship and father-child relationship have a considerable impact on child's development (Boldt et al., 2014), examining maternal and paternal characteristics and behaviors in the longitudinal trajectories of BI is relevant.

For what concerns child factors, gender and temperament traits have been little explored in relation to BI over time. Specifically, only one study (Johnson et al., 2016) has focused on other temperament traits in relation to stable BI. As suggested by Rothbart & Bates (2006), Behavioral Inhibition may show different trajectories based on other temperament traits present within the child, and studies examining the interplay between BI and these traits are recommended. Indeed, our findings revealed that high levels of child's Inhibitory Control increased BI levels over time. Further studies should address this question, taking into account Inhibitory Control and other temperament traits in relation to BI.

Considering that a stable inhibited profile has been found as a risk factor for the child wellbeing (Hirshfeld et al., 1992; Chronis-Tuscano et al., 2009), exploring the developmental trajectories of BI is particularly relevant, and future researches are needed to deepen this issue.

STUDY II.

Background

As reported previously (See *Chapter 4*, p. 42), Behavioral Inhibition (BI) represents a risk factor for the child's anxiety problems, so that its early detection is strictly recommended. Parents and teachers are the adults who spend most of the time with children, thus the early detection of the trait could pass through their perceptions. Examining the methods of assessment of Behavioral Inhibition and, specifically, the correspondence between parent/teacher reports and observed measures should represent an important goal of the research on temperament. Indeed, investigating the reliability of caregivers' reports is relevant in terms of a more accurate assessment of child's BI, which in turn may have an impact on early reduction of child's risk of psychopathology.

Aims and Hypotheses

This study focused on different methods of assessment of Behavioral Inhibition in preschool age. Main aims were to examine the concordance between the observational measures of BI and parent and teacher reports of BI and to investigate the caregivers' capability of recognizing inhibited children. Besides, mothers, fathers and teachers' perceptions of BI were compared, and possible gender differences in inhibited behaviors perceived by caregivers were explored.

Two time point assessments were considered for the aims of the study: T1 (November: beginning of the school year) and T2 (May: end of the school year).

The specific aims and hypotheses of the study were:

1. a) To investigate whether the observational measures of BI, considering also social and non-social components of the trait, were associated with maternal, paternal and teachers' perceptions of child's BI. Considering findings in literature showing moderate-to-low associations between observational measures of BI and caregivers' reports, we expected to find similar results;

    b) To examine mothers, fathers and teachers' ability to recognize children identified, based on observational measures, as extremely inhibited and uninhibited/exuberant. Considering that findings from Ballespì and colleagues' study (2012a) (See *Chapter 3*, p. 31) supported a

good capability of parents and teachers to identify both inhibited and uninhibited/exuberant children, we expected to find that parents and teachers recognized most of children who were classified as inhibited and uninhibited/exuberant at the observational assessment procedure;

2. a) To investigate whether mothers, fathers and teachers' perceptions of child's Behavioral Inhibition significantly differed. Due to the explorative nature of this aim, no specific hypotheses were developed. Gender differences in mothers, fathers, and teachers' perceptions of BI were considered too. In the light of some studies reporting females as more inhibited than males in caregivers' perceptions (Coté et al., 2002; Gagne, Miller, & Goldsmith, 2013), we expected to find similar results;

b) To examine specific behaviors detected by mothers, fathers and teachers as mostly characterizing inhibited children, and evaluate possible differences among the three points of view. Due to the explorative nature of this aim, and to the fact that no studies reported similar investigations, no specific hypotheses were developed;

c) To investigate the longitudinal consistency of mother, father, and teacher reports of BI from T1 to T2. Based on previous findings in literature (Bishop, Spence, & McDonald, 2003), we expected to find a good consistency of caregivers' perceptions of BI over time.

Method

The project consisted of a longitudinal case-control study, including a within-between subjects design. In order to detect individual differences on Behavioral Inhibition, two tasks were proposed to children in 2 consecutive moments.

At each moment, specific questionnaires were also provided to children's parents and teachers in order to assess their perception of child BI and temperament.

Participants

The sample of this study consisted of 60 Italian 4 and 5 aged children (24 males, 36 females; mean age $\pm$ SD= 4.2 $\pm$ 0.41), their mothers (N=60), and fathers (N=53) recruited for Study I.

Children's teachers (N=7) were also included as participants of this study. The inclusion criteria for children and parents, as well as demographic characteristics of the sample, were reported in Study I (pp. 56, 73).

All the children, except for a 4-year-old, their mothers and fathers completed both the assessments (T1, T2) across a school year.

The sample size, minimum required for the achievements of the aims, was estimated on the basis of the *power analysis* (G Power version 3.1.9.2) *(effect size = 0.2, p = 0.05)*: Considering the expected statistical analysis, it was defined a total number of 52 children.

Procedure

The project has been approved by the Ethic Committee of the Department of Psychology, University of Bologna, in January 2014.

In order to assess the trait of BI, the same procedure of the Study I was adopted. Besides, a questionnaire for assessing the perception of BI in children was provided to mothers, fathers and teachers both at T1 and T2.

Measures

Measures administered to the child

Lab-Tab Preschool Version (Goldsmith et al., 1999). For the description of Stranger Approach, Risk Room episodes and their coding procedures see Study 1 (p. 58).

Measures administered to mothers, fathers and teachers

Behavioral Inhibition Questionnaire (BIQ) (Bishop, Spence, & McDonald, 2003). *(Appendix II, III).* Both parent and teacher versions of the BIQ were adopted for the aims of this study. For the description of this instrument see Study I (p. 67).

Data Analyses

For the description of analyses concerning continuous (Lab-Tab Social, Non-Social, Total BI indexes) and categorical (inhibited/non-inhibited groups) BI variables see Study I (p. 68).

The normality of the distribution was verified and observed for the variables involved in the data analyses.

Aim 1: Agreement between observational measures of BI and parents and teachers' perceptions of BI.

a) In order to investigate whether the observational measures of BI were associated with mothers, fathers, and teachers' perceptions of BI, Pearson correlation analyses were run involving BIQ scores and Lab-Tab BI indexes.

b) Following Kagan et al. (1987, 1988) trait conceptualization, to examine whether mothers, fathers and teachers' BIQ scores discriminated between inhibited and uninhibited/exuberant cases, two groups at T1 and two groups at T2 were created. Specifically, inhibited group was based on 75th percentile, while uninhibited/exuberant group was based on 25th percentile, respectively reflecting the upper 25% and the lower 25% extremes of the distribution of the values of the Lab-Tab Total BI index. As previously realized by Ballespì and colleagues (2012a), a Discriminant analysis considering parent and teacher BIQ scores at T1 and T2 was adopted in order to determine the function that best discriminated between the two groups and to calculate the percentages of observed cases that were adequately classified by parent and teacher scores.

Aim 2: Differences among mothers, fathers, and teachers' perceptions of BI

a) In order to investigate possible differences among mothers, fathers, and teachers' perceptions of BI, a 3X2 GLM Repeated Measures ANOVA was run, considering mothers, fathers and teachers' BIQ scores at T1 and T2 as within-subject variables. Then, a second 3X2 GLM Measures ANOVA was run including gender as the between-subject factor.

b) In order to examine specific behaviors detected by parents and teachers as mostly characterizing inhibited children, the inhibited group (at T1 and T2) created for Aim 2 was considered. Also, all the children included in the sample who did not belong to the inhibited group were classified as the generic "non-inhibited group" (at T1 and T2). Then, GLM Multivariate ANOVAs were run, considering the inhibited/non-inhibited groups as the factor and BIQ items as dependent variables.

c) In order to examine the longitudinal consistency of parent and teacher reports of BI, a Pearson correlation analysis was run for mothers, fathers and teachers' BIQ questionnaires between scores at T1 and scores at T2. Differences between pairs of correlation coefficients were tested using Fisher's Z (Field, 2013). Moreover, Paired Sample t-tests were run between BIQ scores at T1 and T2 for each informant (mothers, fathers, teachers).

Data analyses were conducted using Statistical Package for Social Science (SPSS) Version 21.

Results

Aim 1

Agreement between the observational measures of BI and parents and teachers' perceptions of
BI

a) Relations between observational measures of BI and parents and teachers' perceptions of
BI

As shown in Table 17, overall our results revealed that teachers' BIQ scores tended to show higher correlations with observational measures of BI compared to mothers and fathers' BIQ scores.

For what concerns parents, at T1 Pearson Correlational analyses showed that maternal and paternal perceptions of BI were not significantly correlated with the observational measure of Total BI, while at T2 only paternal perception of BI showed a significant and moderate association with the observational measure (Table 17). Regarding social and non-social aspects of BI, only social components of BI were significantly correlated with fathers' perception of BI at T2 (Table 17).

Longitudinally, it should be noted that total (observational) BI index at T1 significantly correlated with maternal and paternal perceptions of BI at T2, while the contrary did not occur. Also, considering social and non-social components of BI, Social BI at T1 was significantly associated with both maternal and paternal perceptions of BI at T2.

For what concerns teachers, Pearson Correlational analyses showed that the total (observational) measures of BI were significantly and moderately correlated with teachers' perception of BI both at T1 and at T2 (Table 17). Regarding social and non-social components of BI, both resulted to be cross-sectionally correlated to teachers' perception of BI.

Also longitudinally, the total, social and non-social indexes of BI significantly correlated with teachers' perception of BI, except for BIQ at T1 and Non-Social BI at T2 (p= 0.053).

Table 17. Pearson Correlations between parents and teachers' BIQ and Lab-Tab BI indexes at T1 and T2

	BIQ Mothers T1	BIQ Fathers T1	BIQ Mothers T2	BIQ Fathers T2	BIQ Teachers T1	BIQ Teachers T2
Tot. BI T1	0.042	0.220	0.319*	0.338*	0.436**	0.400**
Tot. BI T2	0.050	0.219	0.181	0.303*	0.310*	0.357**
Social BI T1	0.039	0.236	0.298*	0.328*	0.286*	0.251*
Non-Social BI T1	0.032	0.143	0.237	0.240	0.400**	0.372**
Social BI T2	0.090	0.266	0.216	0.254*	0.309*	0.299*
Non-Social BI T2	0.055	0.183	0.112	0.245	0.251	0.308*

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

b) Observational measures of BI versus mothers, fathers and teachers' perceptions of inhibited and uninhibited/exuberant children

The inhibited group was composed of 13 children on 60 (21.3%) both at T1 and T2. The uninhibited/exuberant group included 13 children on 60 (21.3%) at T1 and 14 children on 60 (23%) at T2. These two groups, including the extreme Total BI values, reflected two groups of *qualitatively distinct temperaments*, as reported by Kagan and colleagues (1991).

When both parents and teachers' scores were simultaneously entered in the analysis at T1, results from Discriminant Analysis revealed just one discriminant function with canonical R^2 = 0.22. This function did not significantly distinguish between (observed) inhibited and uninhibited/exuberant children (p= 0.218). However, teachers' BIQ scores loaded more highly (r= 0.98) than mothers (r= 0.64) and fathers' scores (r= 0.49). As reported in Table 18, teachers and parents correctly identified the 71.4% of the total cases classified in the (observed) uninhibited/exuberant and inhibited groups. Focusing only on the inhibited group, teachers' BIQ scores adequately identified 61.5% (8/13) of the inhibited observed, mothers' BIQ scores identified 53.8% (7/13), and fathers' BIQ scores identified 75% (9/13) (Table 18).

When both parents and teachers' scores were simultaneously entered in the analysis at T2, results from Discriminant Analysis at T2 revealed just one discriminant function with canonical R^2 = 0.49. This function significantly distinguished between (observed) inhibited and uninhibited/exuberant children (p= 0.004). Teachers (r= 0.77) and fathers' BIQ scores (r= 0.66) loaded more highly than mothers' BIQ scores (r= 0.42). As reported in Table 18, teachers and parents correctly identified the 82.6% of the total cases classified in the (observed) uninhibited/exuberant and inhibited groups. Focusing only on the inhibited group, teachers' BIQ scores adequately identified 76.9% (10/13) of the inhibited observed, mothers' BIQ scores identified 53.8% (7/13), and fathers' BIQ scores identified 84.6% (11/13) (Table 18).

Table 18. Discriminant analysis of the BIQ scores between extreme groups of Behavioral Inhibition

T1	Inhibited Mean (SD)	Uninhibited Mean (SD)	Wilks' Lamda	X^2 (df=1)	Correctly classified N (%) Observed inhibited	N (%) Observed uninhibited
Mothers' BIQ scores	101.9 (24.4)	87.2 (19.2)	1	0.009	7 (53.8)	7 (61.5)
Fathers' BIQ scores	96.9 (21.3)	84.5 (27.6)	0.934	1.260	9 (75)	11 (44.4)
Teachers' BIQ scores	116.3 (28.8)	88.6 (24.8)	0.795	5.381*	8 (61.5)	10 (76.9)
Parents and teachers' BIQ scores[a]			0.776	4.437[b]	10 (83.3)	11 (55.6)
T2						
Mothers' BIQ scores	98.4 (23.8)	80.7 (20.2)	0.924	1.863	7 (53.8)	8 (61.5)
Fathers' BIQ scores	99.9 (19.2)	74.3 (22.0)	0.704	7.181**	11 (84.6)	8 (80)
Teachers' BIQ scores	115.5 (30.9)	78.2 (15.7)	0.705	8.572**	10 (76.9)	12 (85.7)
Parents and teachers' BIQ scores[a]			0.508	13.212**[b]	11 (84.6)	8 (80)

[a] Using both parents and teachers' scores at the same time
[b] Df=3
*$p<0.05$ **$p<0.005$

Aim 2

Parents and teachers' perceptions of BI

a) ***Differences among mothers, fathers, and teachers' perceptions of BI***

GLM Repeated Measures ANOVA reported that teachers' BIQ showed significantly higher overall mean values compared to mothers' ($F_{(50,1)}$= 10.575, p= 0.002) and fathers' ($F_{(50,1)}$= 10.779, p= 0.002) BIQ. No significant within-subjects effects occurred for Time (T1, T2) (p= 0.080) and for Time X Rater (p= 0.844) (Figure 10).

A second GLM Repeated Measures ANOVA was run, including gender as the between-subjects factor. No significant within-subjects effects for Rater X Gender (p= 0.785), Time X Gender (p= 0.328), and Rater X Time X Gender (p= 0.475) occurred. In addition, the Test of Between-Subjects Effects revealed no significant gender differences in caregivers' perceptions of BI (p= 0.209).

Descriptive statistics are reported in Table 19.

Table 19. Descriptive statistics of parent and teacher BIQ scores for total sample, males and females

	Mothers			Fathers			Teachers		
	Males	*Females*	*Total sample*	*Males*	*Females*	*Total sample*	*Males*	*Females*	*Total sample*
T1									
Mean (SD)	97.4 (20.4)	89.1 (24.7)	92.8 (23.2)	97.2 (23)	88.9 (26.7)	92.3 (25.7)	111.5 (35.2)	97.6 (26.4)	103.5 (30.2)
T2									
Mean (SD)	99 (23.4)	92.7 (23.6)	94.9 (23)	100.5 (23.4)	90.2 (25.6)	93.5 (25.1)	112.9 (37.3)	104 (27.5)	106.2 (31.4)

Figure 10. GLM Repeated Measures ANOVA: Interaction between Time and Rater
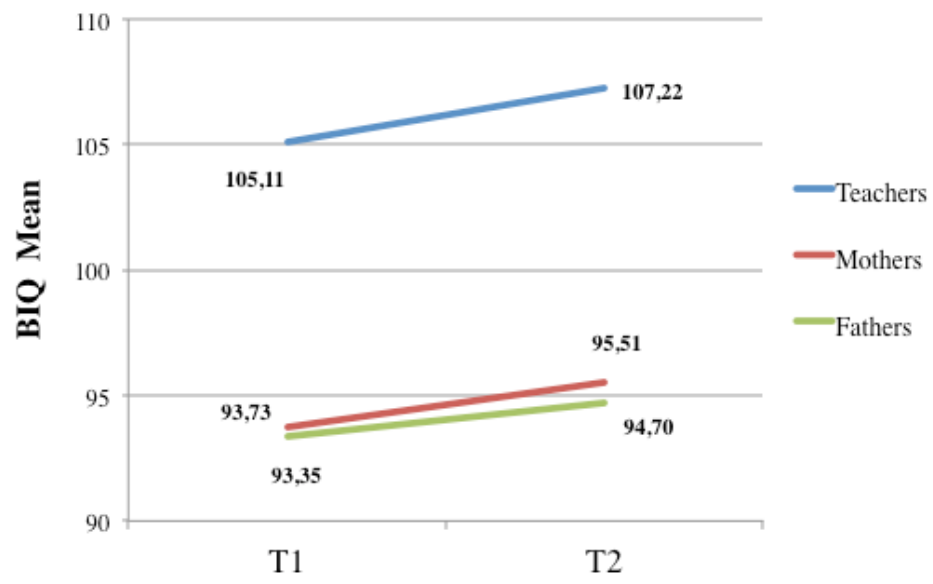
b) Specific behaviors characterizing inhibited children according to mothers, fathers, and teachers' perceptions of BI

The inhibited group created for *Aim 1b* was composed of 13 children on 60 both at T1 and T2. The non-inhibited group at T1 and T2 consisted of the remaining 47 children with lack or low levels of Behavioral Inhibition.

For what concerns T1, GLM Multivariate ANOVAs showed that mothers reported significantly higher mean scores for inhibited children compared to non-inhibited peers for item 8 (p=0.013), item 22 (p= 0.013), item 30 (p= 0.022), and significantly lower mean scores for item 16 (p=0.017), ($F_{(56,1)}$= 2.578, p= 0.048) (Table 20). Fathers did not report any significant differences in BIQ items scores between inhibited and non-inhibited children (p= 0.929) (Table 20). Differently, teachers reported significantly higher mean scores for inhibited children compared to non-inhibited peers for item 1 (p= 0.004), item 4 (p= 0.012), item 25 (p= 0.018), and significantly lower mean scores for inhibited children for item 2 (p= 0.003) and item 21 (p= 0.001) ($F_{(58,2)}$= 3.496, p= 0.008) (Table 20).

As shown in Table 20, most of the items that were recognized by mothers at T1 as specifically characterizing inhibited children belonged to the Social Novelty domain (75%). Differently, most of the items that were considered by teachers as characterizing inhibited children belonged to the Situational Novelty domain (80% according to the original validation study by Bishop, Spence, & McDonald, 2003; 60% according to the Italian validation study).

For what concerns T2, GLM Multivariate ANOVAs showed that mothers attributed significantly higher mean scores to inhibited children compared to non-inhibited peers for item 1 (p= 0.030) and item 14 (p= 0.033) ($F_{(56,1)}$= 6.703, p= 0.002). Fathers reported significantly higher mean values for inhibited children compared to non-inhibited peers only for item 30 (p= 0.040) (F= 3.074, p= 0.055).

Both the two items that were recognized by mothers at T2 as specifically characterizing inhibited children belonged to the Situational Novelty domain, while the only item that was recognized by fathers belonged to the Social Novelty domain.

Teachers did not report any significant differences in BIQ items scores between inhibited and non-inhibited children (p= 0.348).

Table 20. Differences between inhibited and non-inhibited children in parents and teachers' BIQ items

	Item N°	BIQ Item	Factor	Domain	Inhibited children (N=13)	Non-inhibited children (N=47)
					Mean (SD)	Mean (SD)
T1						
Mothers						
	8	The child is shy when first meeting new children	Peer	Social Novelty	4.82 (1.8)	3.71 (1.5)
	16	The child is very talkative to adult strangers	Peer	Social Novelty	3.45 (2.2)	4.49 (1.5)
	22	The child is clingy when we visit the homes of people we don't know well	New Situations	Situational Novelty	4.18 (1.2)	3.17 (1.4)
	30	The child is very quiet with adult strangers	Adult	Social Novelty	3.91 (1.8)	2.98 (1.4)
Teachers						
	1	The child approaches new situations or activities very hesitantly	New Situations	Situational Novelty	4.73 (1.4)	3.37 (2.7)
	2	The child will happily approach a group of unfamiliar children to join in their play	Peer	Social Novelty	1.91 (1.1)	3.51 (1.7)
	4	The child is cautious in activities that involve physical challenge (e.g., climbing, jumping from heights)	Physical Challenges	Situational Novelty	5 (1.7)	3.78 (1.7)
	21	The child happily approaches new situations or activities	New Situations (Performance*)	Situational Novelty (Social Novelty)	3 (1.5)	4.59 (1.5)
	25	The child takes many days to adjust to new situations (e.g., kindergarten, preschool, childcare)	Separation/Preschool (New Situations*)	Situational Novelty	4.91 (2.1)	3.63 (1.9)
T2						
Mothers						
	1	The child approaches new situations or activities very hesitantly	New Situations (Physical/Unfamiliar* [1])	Situational Novelty	4.38 (1.9)	3.32 (1.4)
	14	The child is independent	New Situations	Situational Novelty	5.85 (1.0)	5.15 (0.9)
Fathers						
	30	The child is very quiet with adult strangers	Adult	Social Novelty	4 (1.9)	2.93 (1.5)

* Extracted factor in the Italian validation of BIQ

[1] In the Italian validation of BIQ the Physical Challenges subscale resulted in 2 different factors. One of them consisted in a factor that we have called "Physical/Unfamiliar" and seems to represent both Physical Challenges and Unfamiliar Situations factors.

c) Longitudinal consistency of parents and teachers' perceptions of BI

Results showed high and significant Pearson correlations for mothers' BIQ scores between T1 and T2 (r = 0.653, p= 0.0005), for fathers' BIQ scores between T1 and T2 (r= 0.891, p= 0.0005), and for teachers' BIQ scores between T1 and T2 (r= 0.837, p= 0.0005), suggesting a good consistency of caregivers' perception of Behavioral Inhibition over time (Table 21).

Testing *r* coefficients with Fisher's Z, results revealed that both fathers (Z= 3.28, p= 0.001) and teachers' (Z= 2.27, p= 0.012) coefficients were significantly higher than mothers' coefficient. Differently, fathers' coefficient and teachers' coefficient did not significantly differ (p= 0.134).

Table 21. Consistency of BIQ reports over time: Pearson's Correlations coefficients

	BIQ Mothers T2	*BIQ Fathers T2*	*BIQ Teachers T2*
BIQ Mothers T1	0.653**		
BIQ Fathers T1		0.891**	
BIQ Teachers T1			0.837**

** p=0.0005

Discussion

One of the possible explanations for mixed results in literature on longitudinal trajectories of Behavioral Inhibition in childhood (See Part I "*Temperament and Behavioral Inhibition*") may be the different methodologies of assessment adopted in research.

Although the observational measures of temperament are usually considered as more reliable than parent and teacher reports (Goldsmith et al., 1999; Smith et al., 2012), many studies on BI have used parent reports (above all maternal reports), with the risk of overlap between BI and adult's perceptions of BI. Some studies have investigated the degree of correlations between parents and teachers' reports of BI or have explored caregivers' perceptions of BI (Garcia-Coll et al., 1984; Reznick et al., 1986; Andersson, 1999; Gagne, Miller, & Goldsmith, 2013); however, to our knowledge, until now a very few studies (Ballespì et al., 2012a; Bishop, Spence, & McDonald, 2003) have examined the capability of caregivers' reports to adequately recognize extremely inhibited children. Moreover, while maternal reports have been frequently considered, fathers and teachers' perceptions have been less investigated.

Based on this lack in literature, this study distinguished between caregivers' perceptions of BI and the assessment of BI through an observational paradigm, examined the relation between them, explored caregivers' perceptions of inhibited behaviors and their capacity to accurately recognize inhibited and uninhibited/exuberant preschoolers.

The first aim of the study was to investigate possible associations between the observational measures of BI and caregivers' reports. A few studies in literature have examined this issue, reporting a moderate-to-low agreement between them (Ballespì et al., 2012a, 2012b, 2011; De Los Reyes & Kazdin, 2005). Specifically, for what concerns maternal ratings, some studies revealed Pearson's coefficients around 0.35 and 0.56 (Kerr et al., 1996; Kagan, 1984; Stevenson-Hinde & Shouldice, 1995; Ballespì et al., 2012a). Moreover, in their original validation study of BIQ, Bishop, Spence, & McDonald (2003) found correlations ranging between 0.33 and 0.46. In our study, maternal ratings were not significantly correlated with the observational measures. Differently, for what concerns fathers, we found correlations ranging from 0.25 to 0.30, a finding that is very similar to that (0.25-0.28) reported by the original validation study of BIQ (Bishop, Spence, & McDonald, 2003). It is difficult to understand why fathers showed a certain degree of agreement with the observational measures of BI, while mothers did not. It is possible that the mothers focus on a different set of behaviors in formulating judgments and descriptions about their child's BI. Indeed, some studies in literature (Richters, 1992; De Los Reyes & Kazdin, 2005; Clark et al., 2016) have shown discrepant interpretations of items about child's temperament between mothers and fathers. Moreover, it should be noted that maternal perception of child's temperament

has been more often examined in literature compared to paternal perception, and this lack of studies exploring fathers' perceptions makes difficult to compare and interpret our results.

Regarding the agreement between teacher ratings and observational measures of BI, our results are in line with previous studies, showing significant and cross-sectional correlations ranging from 0.30 to 0.44. Similarly, Asendorpf and van Aken (1994) found significant correlations from 0.23 to 0.38 between reports and laboratory observations, while Ballespì and colleagues (2012a) revealed a significant Pearson coefficient of 0.58. Finally, the original validation of BIQ by Bishop, Spence, & McDonald (2003) reported significant coefficients around 0.25 and 0.34.

Interestingly, in our study the teachers' perception of child's BI was significantly associated with the observational measures both at T1 and at T2, while fathers' perception was cross-sectionally correlated to the observed BI only at T2, specifically for what concerns *social* aspects.

Taken together, our findings suggest that, even though fathers' perception is not far from the observational measure of BI, teachers appear to be more sensitive to detect child's BI features. After having explored teachers' perception of BI, our results reported that they described children with significantly higher levels of BI compared to mothers and fathers. This result is perfectly in line with the findings reported by Kim and colleagues (2011) in their validation study of BIQ on US population. As argued by Ballespì and colleagues (2012b), teachers are more accustomed to observing children's behaviors (e.g., children's reaction to novelty) because of their job and because they have a larger and differentiated group of comparison (i.e., class). For these reasons, their perception of BI seems to be more accurate compared to the parents' one.

This matter seems to be confirmed by our results on child's specific behaviors considered by caregivers as characterizing inhibited temperament. In particular, we found that, although both mothers and teachers recognized BI as characterized by child's reticence and inhibition towards *both social and non-social* stimuli, teachers, compared to mothers, recognized a higher number of contexts where child's BI can be elicited. Indeed, in their point of view, BI seemed to be characterized by: child's reticence towards peers, new situations, situations characterized by physical challenges (i.e., situations with possible risk of injury for the child) or separation from the caregiver. Differently, mothers tended to consider BI as child's reticence towards peers, adult strangers and new situations.

For what concerns fathers, findings showed that they recognized BI as specifically characterized by *social* aspects, above all concerning unfamiliar adults. This is in line with the findings from our first aim, showing fathers' perception associated to observed *social* index of BI.

Taken together, all these findings suggest that the teachers are more sensitive in detecting child's BI features and this is confirmed also by the discriminant analysis. Indeed, we found that

teachers showed a good capacity in recognizing extreme profiles of inhibited children *both at T1 and T2*, while fathers showed a good capacity only at T2, and mothers did not identify extremely inhibited children neither at T1 nor at T2. These results confirm a *consistent* tendency, shown by teachers in our study, of being very sensitive in capturing child's BI features. This represents a very interesting finding in literature on BI. Indeed, a very few studies have examined mother, father, and teacher reports of BI simultaneously in relation to observational measures. More specifically, to our knowledge only Bishop, Spence, & McDonald (2003) and Ballespì et al. (2012a) analyzed both teachers and parents' capacity to recognize extremely inhibited children. Bishop, Spence, & McDonald (2003) reported a good capacity of mothers and teachers to recognize extreme profile of BI, while fathers showed a lower association with observational indicators of their child's behavior. Differently, Ballespì and colleagues (2012a) reported a good capacity shown by both parents and teachers to identify extremely inhibited profiles of children, with teachers recognizing more inhibited children compared to parents. However, these two studies did not consider caregivers' ability to discriminate extreme BI *over time*, as done by our study, and future studies should address this question.

We do not know why fathers show a good capability at T2 but not at T1, and mothers did not display this capacity to identify inhibited profiles. It is possible that one problem presented by parent reports is linked to the evaluation that they require. For instance, in many questionnaires, such as the BIQ, parents are asked to describe their child's behaviors based on *how often* they are shown in specific contexts. We have to underline that parents lack *a term of comparison*, and a possible question they may ask is: "How often…compared to who/what?". Thus, a parent may think that his child "*enjoys being the centre of attention*" (Item 10, BIQ- Parent Version) because he often dances or sings when he is at home. For this reason, the parent may answer to this item with a high score, as "very often"; however, if this child has siblings, it is possible that they more often adopt this behavior, so that the parent may think that, compared to his siblings, this child does not like so much being the centre of attention. As a result, the parent may answer to the item with a low score, as "sometimes" or "not very often". Differently, teachers have the possibility, for their specific point of view, to observe many children at the same time in classroom and in several situations, so they can describe children's behavior based on a comparison group.

In addition, as suggested by Kagan (1998b), although parents, and specifically mothers, have frequently the opportunity to observe their child's behavior in a variety of natural situations, there are many unique influences on maternal descriptions of children that are absent when children were observed through standardized paradigms. Other authors supported this idea. Specifically, Seifer

and colleagues (1994), reporting low correlations between observational measures of infant temperament and parents' reports, argued that:

> "The most important implication of our finding is a cautionary message about the large published literature based on parent reports of their infant's behavioral style. Mothers are a poor source of information about their infant's behavioral style" (pp. 1488-1489).

This strong position, taken by Seifer and colleagues, was supported by Rosicky (1993), who argued that mothers were inaccurate in predicting how their child would behave to unfamiliar events. Some recent studies have examined parental characteristics as associated with parents' perceptions of infant and child temperament. For instance, Kitamura and colleagues (2015) reported that the preschool-aged children in his sample were described by mothers as highly impulsive if these latters were characterized by self-transcendence personality. Similarly, children were rated by fathers with high negative emotionality if these latters were characterized by depressive symptoms and novelty-seeking personality.

In both clinical and developmental perspectives, exploring mother and father's perceptions of child temperament, and examining parental characteristics (e.g., personality, mood) that may influence these perceptions, is particularly relevant. Indeed, how parents perceived their child's temperament could influence both parent-child relationship and child's development. For instance, Pauli-Pott and colleagues (2003) reported that, in many cases, parental perceptions of infant temperament predicted the observed temperament characteristics, such as fearfulness, positive and negative emotionality.

Overall, both the characteristics of parent reports and the parents' specific characteristics (e.g., personality, mood) may have contributed to the informant discrepancies (i.e., parents *versus* teachers' reports) and the methodology discrepancies (i.e., parents' reports *versus* observational measures) that we have found in our results. De Los Reyes & Kazdin (2005) developed a model to explain *informant* discrepancies about child's temperament. Specifically, they proposed that informants may differ based on 3 main characteristics: 1) the causes to which informants attribute the assessed behavior; 2) the ways in which informants perceive the behaviors that are most problematic; 3) the contexts in which informants observe the behavior.

This model, and specifically the third point, may explain both informant discrepancies and method discrepancies that we found in our study. Regarding these latters, as suggested by some authors (Ballespì et al., 2012a; Bishop, Spence, & McDonald, 2003), the observed indicators are provided by psychologists/experts in BI, who code the child's behavior at the moment or after observing the child.

Differently, parents and teachers, who do not have expertise in recognizing BI, respond to questionnaires based on their memory or an idea of their everyday observation of child's behavior.

Although the discrepancies we found, a general consensus was found in our study among mothers, fathers, and teachers' perceptions regarding the BIQ stability over time and the absence of gender differences. Indeed, our results revealed that both parent and teacher questionnaires had a good consistency over time, with especially father and teacher reports showing significantly higher correlation coefficients compared to mothers. This result suggests that, in caregivers' perceptions, Behavioral Inhibition represents a stable trait in preschool age, and this is in line with findings that we reported regarding the continuity of the observed BI in Study I (p. 77). For what concerns gender differences, in our study we did not find any significant effect. Although previous studies in literature have showed females as more fearful than males according to teachers' perception (Coté et al., 2002), and mothers and fathers' perceptions (Gagne, Miller, & Goldsmith, 2013), for what concerns studies that have specifically used the BIQ questionnaire, no gender differences were found (Bishop, Spence, & McDonald, 2003; Broeren & Muris, 2010; Kim et al., 2011). Thus, our finding agrees with these studies and it seems in line with results from our previous study exploring gender differences in the observed BI trait (See Study I, p. 76).

Some limitations of this study should be highlighted. First, the two episodes chosen from the Lab-Tab observational procedure for the assessment of BI trait do not cover the variability and differentiation of child's behaviors that parents and teachers can observe during daily life.

Moreover, the adaptation of the paradigm to the school environment, realized with the consent by the authors, made it possible to obtain observational indexes from a standardized situation outside the lab. However, while the adaptation to the school setting made the sample recruitment and the data collection simpler, it was also less precise than in the laboratory, a setting that is always the same for all children.

Although this limitation, this study represents the first attempt to examine and compare observational measures and parent/teacher reports of BI on Italian population. Future research should further investigate the reliability of methods of assessment for BI and explore caregivers' ability to identify Behavioral Inhibition in childhood in order to obtain a more accurate identification of the trait.

STUDY III.

Background

Although many studies in literature have recognized Behavioral Inhibition as a risk factor for child and adolescent anxiety disorders and internalizing difficulties, its role for social problems has been less explored. In addition, while some studies have reported peer difficulties as an outcome for inhibited children, most of them have adopted parents' reports or laboratory measures (Buss et al., 2013) without examining *peer relationships* of inhibited children *within the classroom*, except for two studies (Gazzelle & Faldowski, 2014; Tarullo, Mliner, & Gunnar 2011). Further studies are therefore recommended in this direction.

It should be noted that, although the potential psychopathological risk associated with BI, the trajectories of this temperament trait are quite variable (Henderson et al., 2014). Some authors (Degnan & Fox, 2010) have argued that specific parental characteristics (e.g., parental anxiety, parenting style), by interacting with BI, may be involved in the increased psychopathological risk for inhibited children (See "4.4 *The psychopathological risk for inhibited children: Endogenous and exogenous factors*", p. 47). For instance, maternal anxiety has shown to increase the risk for anxiety in inhibited children (Rosenbaum et al., 2000), and maternal overcontrolling (Affrunti et al., 2014) or permissive styles (Lewis-Morrarty et al., 2015) have been associated with anxiety problems in inhibited children. However, most of the studies have focused on maternal variables, while no studies have taken into account both maternal and paternal factors.

Aims and Hypotheses

In the light of the evidences presented above, and considering the lack of researches on Italian population, this study aimed to investigate whether Behavioral Inhibition was a predictor of peer difficulties and internalizing problems in a sample of Italian preschool-aged children. Also, the study aimed to identify specific profiles of children based on their different levels of Behavioral Inhibition, maternal and paternal anxiety, and maternal and paternal parenting style (i.e., authoritative and authoritarian style). Then, these profiles were compared in terms of peer difficulties and internalizing problems in order to evaluate whether they were specifically associated with the risk for child's impaired outcomes.

The specific aims and hypotheses of the study were:

1. To investigate whether Behavioral Inhibition initially measured predicted peer difficulties operationalized as low levels of peer preference, high levels of peer rejection and peer isolation (i.e., neglected status) across one school year (T1-T2) and two school years (T1-T3/ T2-T3). We expected that high levels of BI predicted low levels of peer preference and high levels of peer rejection and peer isolation;

2. To investigate whether Behavioral Inhibition initially measured predicted child anxious/depressed behaviors, withdrawn, and internalizing problems across one school year (T1-T2) and two school years (T1-T3/ T2-T3). We expected that high levels of BI predicted high levels of anxious/depressed behaviors, withdrawal, and internalizing problems;

3. a) To identify distinct profiles of children based on their levels of Behavioral Inhibition and their parents' levels of anxiety and parenting style at T1. We expected to find different profiles based on different levels of the considered variables. In particular, we hypothesized to find a specific profile of children showing high levels of BI, high parental anxiety and either authoritarian or authoritative parenting style;

   b) To investigate possible differences among the identified profiles of children regarding peer preference, peer rejection and peer isolation at T2 and at T3. We expected to find that profiles of children characterized by high BI showed significantly lower peer preference, higher peer rejection and peer isolation compared to the other profiles;

   c) To investigate possible differences among profiles of children in internalizing outcomes (e.g., withdrawal, anxious/depressed behaviors, internalizing problems) at T2 and at T3. We expected to find that children with high BI, high parental anxiety, and authoritarian or authoritative parenting style showed significantly higher levels of withdrawal, anxious/depressed behaviors, and internalizing problems compared to other clusters of children.

Method

The project consisted of a longitudinal case-control study, including a within-between subjects design. In order to detect individual differences on Behavioral Inhibition, two tasks were proposed to children in 3 consecutive moments. Besides, a sociometric technique was used at T1 and T3 in order

to explore peer relationships in kindergartens.

At each moment, specific questionnaires were also provided to children's parents in order to assess their anxiety symptoms and parenting style, and to teachers in order to detect children's internalizing outcomes (i.e., anxious/depressed behaviors, withdrawal).

Participants

The sample of this study consists of 60 Italian 4 and 5 aged children (24 males, 36 females; mean age $\pm$ SD= 4.2 $\pm$ 0.41), their mothers (N=60), and fathers (N=53) recruited for Study I, and teachers (N=7) recruited for Study II. The inclusion criteria for children and parents, the demographic characteristics of the sample, and descriptions of procedure were reported in Study I (pp. 56, 73).

All the children, except for a 4-year-old, their mothers and fathers completed both the assessments (T1, T2) across one school year. Thirty-six 4-aged children (14 males, 22 females), their mothers (N=34), fathers (N=27) and teachers (N=7) completed the measures also at T3.

The sample size, minimum required for the achievements of the aims, was estimated on the basis of the *power analysis* (G Power version 3.1.9.2) *(effect size = 0.2, p = 0.05)*: considering the expected statistical analysis, it was defined a total number of 52 children.

Procedure

The project has been approved by the Ethic Committee of the Department of Psychology, University of Bologna, in January 2014.

In order to assess the BI trait, the same procedure of the Study I was adopted (p. 56). At T1 and T3 a sociometric technique was adopted to explore peer relationships in kindergartens.

Besides, at each time point assessment (T1-T2-T3), questionnaires for assessing parental anxiety and parenting style were provided to mothers and fathers, while a questionnaire assessing child's internalizing problems was administered to teachers.

Measures

Measures administered to the child

Lab-Tab Preschool Version (Goldsmith et al., 1999). For the description of Stranger Approach, Risk Room episodes and their coding procedures see Study 1 (p. 58).

Sociogram. Specific questions were proposed to each child regarding with which classmates s/he liked to do something or not, using a procedure adapted from Moreno's Sociogram (1980) (Cavalea & Rinaldi, 2003). Specifically, during a free play moment in the classroom, the teacher asked each child to sit near her; then, she asked the child to nominate: 1) two children "who you like to play with" and two children "who you don't like to play with"; 2) two children "who you like to participate in a school activity (*here the teacher says which activity*) with" and two children "who you don't like to participate in a school activity with"; 3) two children "who you like to go on a picnic with" and two children "who you don't like to go on a picnic with".

Following established procedures (Coie & Dodge, 1983; Wentzel, 2003; Tarullo, Mliner, & Gunnar, 2011), the numbers of total positive nominations and the numbers of total negative nominations for each child provided by his/her classmates were standardized within classroom. The obtained values were used as indicators of respectively "Peer Preference" (e.g., the tendency for a child of being popular in her/his peer group) and "Peer Refuse/Rejection" (e.g., the tendency for a child of being rejected by her/his peer group). As suggested by Tarullo, Mliner, & Gunnar in their work (2011), a "Peer Impact" indicator (e.g., indicator of child's neglected status in her/his peer group) was also calculated as the sum of standardized scores in order to detect children with neglected/isolated peer status.

Measures administered to mothers and fathers

Penn State Worry Questionnaire PSWQ (Meyer et al., 1990; Italian version: Morani, Pricci, Sanavio, 2009). (See Appendix I). For the description of the instrument see Study I (p. 66).

Child Rearing Practices Report: CRPR (Block, 1981; Dekovic et al., 1991; Italian version: Zappulla, 2008). For the description of the instrument see Study I (p. 66).

Measures administered to teachers

Child Behavior Checklist 1.5/5 CBCL 1.5/5 (Achenbanch & Rescorla, 2000; Italian version: Frigerio et al., 2004). *(See Appendix IV)*. This is one of the most used tools for the assessment of child mental health (Moretti & Obsuth, 2010). The CBCL includes both a parent and a teacher version (*Teacher Report Form*), and it consists of 99 items evaluating emotional, social and behavioral difficulties in children. The respondents (parents or teachers) are asked to answer each item about

child's specific behaviors on a scale of 0-2, with 0 being not true of the child, 1 being very true and 2 often true of the child. The CBCL is composed of 8 subscales for parents and 7 for teachers: Emotional Reactivity, Anxious/Depressed, Somatic Complaints, Sleep Problems (*only in parent version*), Attention Problems, Aggressive Behaviors, Withdrawn, Other Problems. Based on these subscales, 3 total scales are computed: *Internalizing Problems, Externalizing Problems, Total Problems* (t-scores). Higher t-scores are indicative of more emotional-behavioral problems, with t-scores >60 considered being in the clinical range.

The CBCL has demonstrated remarkable utility, specifically with respect to being able to distinguish between clinical and non-clinical populations (Achenbach, 1991; Chen et al., 1994). Indeed, it has been found that the CBCL Internalizing Problems subscale could discriminate between children with and without anxiety disorders (Seligman, 2004). The CBCL has been validated on different populations, showing good psychometric properties (Nakamura et al., 2009), and it is available in several languages (e.g., Finnish, French, Italian, German, Polish, Chinese, Arabic). The validation on Italian population showed a satisfactory internal consistency (α>.78 for Total subscales, α>.65 for the other subscales) and it is in line with the results of most studies carried out in Western and Eastern countries, evidencing a good applicability of this instrument on Italian population.

For the aims of the study, we considered the teacher version of the Italian CBCL rather than the parent one because, as reported in literature (Maccoby & Martin, 1983), teachers can provide a reliable evaluation of a child's behavior because they are used to describe her/him in comparison with other children. The validation study of the teacher version of CBCL on Italian population reported that teachers' ratings had high reliability indexes, with Total scales showing α= 0.86-0.94 (Frigerio et al., 2004).

Data Analyses

For the description of how Lab-Tab indexes (i.e., Total BI indexes at T1 and at T2) were calculated see Study I (p. 68).

The normality of the distribution was verified and observed for all the variables involved in the data analyses and the following analyses were run in order to reach the aims of the study.

Aim 1: Behavioral Inhibition and peer difficulties. Linear Regression analyses were run considering Total BI index at T1/T2 as an independent variable, and Sociogram Peer Positive nominations, Sociogram Peer Negative nominations, and Sociogram Peer Impact at T2/T3 as dependent variables.

Aim 2: Behavioral Inhibition and internalizing outcomes. Linear Regression analyses were run considering Total BI index at T1/T2 as an independent variable, and CBCL Anxious/Depressed, CBCL Withdrawal, and CBCL Total Internalizing Problems as dependent variables at T2/T3.

Aim 3: Children's profiles based on Behavioral Inhibition and parental factors.

a) The cluster analysis has been successfully employed in temperament research (Janson & Mathiesen, 2008; Montirosso et al., 2015) and in studies on parenthood (Meteyer & Perry-Jenkins, 2009). In order to create patterns of individual differences reflecting child's inhibited behaviors (i.e., Total BI index at T1) and parental factors (i.e., mother and father's CRPR Authoritarian and Authoritative subscales scores and PSWQ scores at T1) a Hierarchical Cluster Analysis using Ward's method was adopted. The criteria used to select clusters included the possibility to differentiate the outcome measures and their accuracy (Aldenderfer & Blashfield, 1984). Cluster solutions with both maternal and paternal PSWQ scores and CRPR Authoritarian and Authoritative subscales scores at T1 were attempted. The *N*-groups solution producing the clearest distinctions between the clusters was selected.

After having identified *N* homogeneous groups, cluster scores for child's Total BI index, parental CRPR subscales and PSWQ were compared using a GLM Multivariate ANOVA in order to examine the distinction among cluster groups.

CrossTabs with Pearson's chi-squared test were adopted in order to explore whether the gender distribution was significantly different in cluster groups.

b) & c) Groups selected by cluster analysis were compared through either Independent t-tests or GLM Multivariate ANOVA considering the following variables: Sociogram Peer Positive nominations, Sociogram Peer Negative nominations, Sociogram Peer Impact, CBCL Anxious/Depressed, CBCL Withdrawal, CBCL Total Internalizing Problems, both at T2 and at T3.

Data analyses were conducted using Statistical Package for Social Science (SPSS) Version 21.

Results

Aim 1

Behavioral Inhibition and peer difficulties

Regarding the short-term outcomes (across one school year), results from Linear Regression analyses revealed that high levels of BI measured at T1 did not predict, at T2, low levels of Sociogram Peer Positive nominations (i.e., *peer preference*) (p= 0.984), high levels of Sociogram Peer Negative nominations (i.e., *peer rejection*) (p= 0.969), and high levels of Sociogram Peer Impact (i.e., *peer isolation*) (p= 0.968).

For what concerns the long-term outcomes (across two school years), high levels of BI measured at T1 did not predict, at T3, low levels of Sociogram Peer Positive nominations (i.e., *peer preference*) (p= 0.825), high levels of Sociogram Peer Negative nominations (i.e., *peer rejection*) (p= 0.823), and high levels of Sociogram Peer Impact (i.e., *peer isolation*) (p= 0.998). Besides, high BI measured at T2 did not predict, at T3, low levels of Sociogram Peer Positive nominations (i.e., *peer preference*) (p= 0.418), high levels of Sociogram Peer Negative nominations (i.e., *peer rejection*) (p= 0.829), and high levels of Sociogram Peer Impact (i.e., *peer isolation*) (p= 0.643).

Aim 2

Behavioral Inhibition and internalizing outcomes

Regarding the short-term outcomes (across one school year), results from Linear Regression analyses revealed that BI measured at T1 significantly predicted CBCL Anxious/Depressed (p= 0.019), CBCL Withdrawal (p= 0.030), and CBCL Total Internalizing Problems (p= 0.046) at T2.

For what concerns the long-term outcomes (across two school years), BI measured at T1 did not predict CBCL Anxious/Depressed (p= 0.464), CBCL Withdrawal (p= 0.418), and CBCL Total Internalizing Problems (p= 0.791) at T3. Besides, BI measured at T2 did not predict CBCL Anxious/Depressed (p= 0.948), CBCL Withdrawal (p= 0.605), and CBCL Total Internalizing Problems (p= 0.987) at T3. Results are shown in Table 22.

Table 22. Linear Regression analyses considering BI as predictor of Internalizing outcomes

| **Predictor** | | | | | |
Outcome	Adj. R^2	F	β	SE	p
Total BI index T1					
CBCL Anxious/Depressed T2	0.075	5.800	0.302	0.036	**0.019**
CBCL Withdrawal T2	0.063	4.954	0.281	0.057	**0.030**
CBCL Total Internalizing Problems T2	0.051	4.154	0.259	0.101	**0.046**
CBCL Anxious/Depressed T3	-0.013	0.548	0.124	0.063	0.464
CBCL Withdrawal T3	-0.009	0.673	0.137	0.078	0.418
CBCL Total Internalizing Problems T3	-0.026	0.071	0.045	0.149	0.791
Total BI index T2					
CBCL Anxious/Depressed T3	-0.029	0.004	-0.011	0.079	0.948
CBCL Withdrawal T3	-0.021	0.272	0.089	0.097	0.605
CBCL Total Internalizing Problems T3	-0.029	0.000	0.003	0.186	0.987

Aim 3

Children's profiles based on Behavioral Inhibition and parental factors

a) Identification of cluster groups

Results from Cluster Analysis revealed no satisfactory cluster group solutions for what concerns maternal anxiety (PSWQ scores) and maternal parenting style (CRPR).

Differently, a two-groups solution with child's Total BI index and *paternal* variables, specifically PSWQ and CRPR Authoritarian subscale scores, was found as producing the clearest distinctions between the clusters. In particular, clusters representing children's levels of BI and their fathers' levels of anxiety symptoms and authoritarian style were composed of two separate groups: Low BI Group (LBI) (N= 34, 69.4% of the whole sample) and High BI Group (HBI) (N= 15, 30.6% of the whole sample). The Low BI Group was composed of children having low levels of Behavioral Inhibition whose fathers had a low authoritarian style and low anxiety symptoms. The High BI Group was composed of children having high levels of Behavioral Inhibition whose fathers had a high authoritarian style and high anxiety symptoms.

The GLM Multivariate ANOVA revealed that the LBI and the HBI significantly differed in the levels of child's BI, fathers' CRPR Authoritarian style and PSWQ scores at T1 ($F_{(47,1)}$= 30.7, p= 0.0005). Table 23 contains descriptive statistics and MANOVA results.

Results from Cross-tabs revealed that the Low BI Group (LBI) was mostly composed of female children (70.6%), while the High BI Group (HBI) was composed of about the same number of males and females. However, the distribution of LBI and HBI cluster groups according to gender was not significantly different (X^2= 2.563, p= 0.109). Table 24 shows the frequencies of males and females in the two groups.

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Table 23. Descriptive statistics and MANOVA results for child's BI and paternal variables (CRPR Authoritarian style, PSWQ scores) in cluster groups

		LBI (N= 34) Mean (SD)	HBI (N= 15) Mean (SD)	F	p
Child	Total BI index T1	-2.0 (3.8)	5.4 (4.3)	37.723	**0.0005**
Father	CRPR Authoritarian style T1	38.2 (5.8)	49.6 (12.3)	19.697	**0.0005**
	PSWQ T1	32.0 (6.3)	39.3 (9.3)	10.295	**0.002**

<div align="center">CLUSTER GROUPS</div>

Table 24. Frequencies of males and females in LBI and HBI cluster groups

<div align="center">CLUSTER GROUPS</div>

		LBI (N= 34) N (%)	HBI (N= 15) N (%)	Total
Gender	Males	10 (29.4)	8 (53.3)	18
	Females	24 (70.6)	7 (46.7)	31
	Total	34	15	

b) Cluster groups and child's peer difficulties

Considering the small size of selected cluster groups (above all at T3), we adopted independent t-tests (de Winter, 2013) in order to investigate possible differences between LBI and HBI groups in Sociogram variables. Results showed, at T2, no significant differences between LBI and HBI in Sociogram Peer Positive nominations (i.e., *peer preference*) (p= 0.160), Sociogram Peer Negative nominations (i.e., *peer rejection*) (p= 0.505), and Sociogram Peer Impact (i.e., *peer isolation*) (p= 0.998).

Similarly, no significant differences between LBI and HBI in Sociogram Peer Positive nominations (i.e., *peer preference*) (p= 0.09), Sociogram Peer Negative nominations (i.e., *peer rejection*) (p= 0.480), and Sociogram Peer Impact (i.e., *peer isolation*) (p= 0.534) occurred at T3. Results are shown in Table 25.

Table 25. Independent t-tests between LBI and HBI cluster groups for child's peer difficulties

	CLUSTER GROUPS		*t*-test	*p*
	LBI (N= 34) Mean (SD)	HBI (N= 15) Mean (SD)		
Sociogram Peer Positive nominations T2	-0.1 (0.9)	0.3 (1.1)	-1.428	0.160
Sociogram Peer Negative nominations T2	-0.0 (1.1)	-0.1 (0.8)	0.369	0.714
Sociogram Peer Impact T2	-0.1 (1.5)	0.1 (1.5)	-0.672	0.505
Sociogram Peer Positive nominations T3	-0.2 (0.9)	0.3 (0.8)	-1.696	0.101
Sociogram Peer Negative nominations T3	0.1 (1.1)	-0.1 (0.6)	0.716	0.480
Sociogram Peer Impact T3	-0.1 (1.3)	0.1 (1.1)	-0.630	0.534

c) Cluster groups and child's internalizing outcomes

For what concerns internalizing outcomes for LBI and HBI groups, independent t-tests revealed that, at T2, HBI showed significantly higher levels of CBCL Anxious/Depressed compared to LBI (p= 0.018). The two groups did not differ in CBCL Withdrawal (p= 0.479), but showed a trend to statistical significance for higher levels of CBCL Total Internalizing Problems (p= 0.055).

Regarding T3, the High BI Group showed significantly higher levels of CBCL Anxious/Depressed compared to Low BI Group (p= 0.05). However, the two groups did not differ in CBCL Withdrawal (p= 0.742) and in CBCL Total Internalizing Problems (p= 0.229). Table 26 shows significant results from independent t-tests for cluster groups.

Table 26. Independent t-tests between LBI and HBI cluster groups for child's internalizing outcomes

	CLUSTER GROUPS		*t*-test	*p*
	LBI (N= 34)	**HBI** (N= 15)		
	Mean (SD)	**Mean (SD)**		
CBCL Anxious/Depressed T2	1.3 (1.2)	2.3 (1.7)	-2.445	**0.018**
CBCL Withdrawal T2	1.5 (2.4)	2 (1.9)	-0.713	0.479
CBCL Internalizing Problems T2	3.4 (3.7)	5.7 (4.0)	-1.965	0.055
CBCL Anxious/Depressed T3	1.2 (1.1)	2.4 (1.8)	-2.044	**0.050**
CBCL Withdrawal T3	1.6 (1.9)	1.8 (1.9)	-0.332	0.742
CBCL Internalizing Problems T3	3.5 (2.7)	4.8 (2.1)	-1.232	0.229

Discussion

Several studies in literature have found a psychopathological risk associated with child's Behavioral Inhibition, especially internalizing/anxious problems and, in some cases, peer difficulties (Degnan & Fox, 2007; Rubin, Coplan, & Bowker, 2009; Tarullo, Mliner, & Gunnar, 2011). This study aimed to investigate psychopathological outcomes associated with BI in a sample of Italian children aged 4-5.

Our results revealed no significant effects for BI as a predictor of low peer preference and high peer rejection and peer isolation, suggesting that inhibited children in our sample had good peer relationships at kindergarten anyway, although their reticence towards novelty. This result is in contrast with literature. For instance, Tarullo, Mliner, & Gunnar (2011) have examined peer relationships for inhibited children in kindergarten using a similar peer sociometric technique, finding that these children with BI were less integrated in positive peer play, less frequently involved in peer conflicts, and received fewer nominations as anyone's special friends. However, differently from their expectations, the authors reported that inhibited children were not more likely to be rejected by peers, and this result is similar to what we found in our study. As Tarullo, Mliner, & Gunnar (2011) suggest, it is possible that other variables have an impact on peer relationships for inhibited children, such as the moderating role of the classroom climate (Gazelle, 2006). Indeed, it has been shown that socially withdrawn children were rejected and victimized by peers only if they were in classrooms with negative emotional climate (Gazelle, 2006). In addition, it should be underlined how long children have known each other within the peer group. Indeed, we measured child's peer status at T2 and at T3, which means that children had known each other for already 1 and 2 school years. Thus, this may explain possible differences between the findings at T2 and at T3. Moreover, children's other temperament traits might have had an impact on our results. Therefore, further studies are needed to investigate which school factors (e.g., class climate) and child factors may lessen peer difficulties for inhibited children.

Our results revealed that child's Behavioral Inhibition was a significant predictor of anxious/depressed behaviors, withdrawal, and internalizing problems in the short-period (after one school year), confirming Behavioral Inhibition as a specific risk factor for internalizing difficulties in 4-years-aged children. This finding is highly supported in literature by studies on preschoolers using observational measures (Degnan & Fox, 2010; Clauss et al., 2012), as shown in *Chapter 4*, and suggests the importance to implement early interventions in order to promote socio-emotional functioning and wellbeing for preschool inhibited children.

However, differently from our expectations, no significant effects were found for long-term outcomes (across two school years). This difference may be due to the fact that we had a limited sample size (only 36 children) at T3, and this could have influenced the power of statistical analyses adopted. Moreover, it should be noted that the assessment of internalizing outcomes was realized considering teachers' perceptions of children's behavior. Although teachers' reports have been considered enough reliable in literature (Maccoby & Martin, 1983), we did not adopt any additional measures for assessing children's internalizing outcomes, so that we cannot exclude a small effect of possible biases. Thus, studies that use different measures and wider samples are recommended for the replication of this study on Italian population.

The present study also aimed to explore possible associations between BI and specific parental characteristics, identifying profiles of children characterized by different levels of BI and parent's anxiety and parenting style. Most of the studies on BI have investigated *maternal* behavior and characteristics, without taking into account paternal factors. Findings from these studies have shown maternal authoritarian/overcontrolling parenting style (Williams et al., 2009; Affrunti et al., 2014) and maternal anxiety (Battaglia et al., 1997; Rosenbaum et al., 2000; Lewis-Morrarty et al., 2015) as associated with child's BI. In our study, the results revealed no satisfactory cluster solutions using maternal parenting style and anxiety as variables in relation to BI. On the contrary, we found two distinct profiles of children based on their levels of BI and *paternal* factors: 1) children with high BI, high paternal anxiety, and high paternal authoritarian style (HBI); 2) children with low BI, low paternal anxiety, and low paternal authoritarian style (LBI). Thus, it is possible to affirm that paternal anxiety and paternal authoritarian style – but not maternal variables - are associated with child's BI in our sample of Italian preschoolers. This difference from the literature findings may be linked to several variables, such as the specific characteristics of father-child relationship. For instance, while the mother-child relationship may be more central in infancy, when comforting and soothing interactions that characterize mother-infant relationship are most adaptive, father-child relationship may increase in importance at older ages, starting with toddlerhood and preschool age (Boldt et al., 2014). In addition, Steele and Steele (2005) argued that father-child relationship may be particularly relevant for the child's dealing with the outer world of school and peers. This is in line with other studies that have linked the quality of father-child relationships with children's competence in school and peer relationship (Isley, O'Neil, & Parke, 1996; Ducharme, Doyle, & Markiewickz, 2002; William & Kelly, 2005). In addition, a study by Boldt and colleagues (2014) reported that a father-child relationship characterized by security and confidence when the child is 2 year-old predicted child's higher peer competence 6 years later, while no significant findings emerged for mothers. Thus, it is possible that father-child relationship characterized by high paternal anxiety and authoritarian style has a negative

impact on child's development, especially if the child is inhibited to novelty. Globally, it is possible that our results reflect the relevance of the father-child relationship in this child age range, however, until now no studies, to our knowledge, have taken into account the role of father for the development of inhibited children and future investigations are needed.

In our study, we examined which profiles of children (HBI or LBI) were "at increased risk" for impaired developmental outcomes. The results revealed that HBI and LBI groups of children did not differ in their peer difficulties at T2 and T3, suggesting that maybe class/school and child factors may have a moderating role in social difficulties for inhibited children, as previously hypothesized. However, we found that HBI children showed significantly higher levels of anxious/depressed behaviors compared to LBI children both at T2 and at T3. This finding suggests that the HBI group represents a group "at risk" for later anxious/depressed behaviors. These results are somehow in line with literature showing that inhibited children with an anxious and authoritarian/overcontrolling parent are at a greater risk for later internalizing problems and anxiety disorders (Shamir-Essakov et al., 2005; Lewis-Morrarty et al., 2015). However, as reported above, these studies have considered only mothers, so that future studies are needed.

In addition, a further reflection should be addressed. From our results we cannot say that fathers' anxiety and parenting style *increased* vulnerability for inhibited children to develop anxious/depressed behaviors. Indeed, we adopted a descriptive approach, without examining the *specific contribution* of each paternal factor to the increased psychopathological risk for inhibited children. Future studies should overcome this and other limitations of the present study, such as the limited sample size at each time point assessment. Indeed, especially at T3, the small sample size may have influenced the data analyses and the results. For instance, in the cluster analysis we could not insert many variables simultaneously because of the restricted sample size.

In addition, although we used 3 time point assessments across two school years, this may not be a sufficiently wide time range for generalizing our results. Studies exploring psychopathological outcomes for inhibited children on a more extensive time range are recommended.

Although these limitations, some strengths should be recognized. First, to our knowledge, this study represents the first attempt to study social and internalizing consequences of Behavioral Inhibition on Italian population. In addition, many studies on BI have focused on maternal variables but no studies have considered *paternal* characteristics too, except for one (Biederman et al., 2001). Our study focused on both maternal and paternal factors, showing these latters as characterizing the group of inhibited children at risk for internalizing outcomes. Examining paternal characteristics and behaviors may be particularly relevant to better understand which characteristics of family

environment may be more associated with child's Behavioral Inhibition, and further studies are recommended.

A further strength is represented by the use of a sociometric technique for examining peer relationships instead of using teachers' perceptions of child's social competence or friendships in the classrooms, as most of the studies have done (Buss et al., 2013; Bohlin, Hagekull, & Andersson, 2005). Indeed, the sociogram may be considered a more "direct" measure of assessment, not mediated by adult's perception.

In general, further studies examining psychopathological trajectories for inhibited preschoolers should be recommended in order to later implement specific interventions to promote their socio-emotional functioning and wellbeing.

CONCLUSIONS

There is a general consensus in international literature that Behavioral Inhibition (BI) is a temperament trait, which: 1) is characterized by fear, reticence, and disorganization when the child is confronting with novelty; 2) is relatively stable across childhood; and 3) represents a risk factor for the onset of child's impaired outcomes (i.e., internalizing problems, anxiety disorders).

However, some issues are still questioned. For instance, there is a lack of agreement for what concerns the characteristics of the construct, such as the unitary or multidimensional nature of BI. Indeed, a bunch of studies, and especially those by Kagan's research group (Garcia-Coll et al., 1984; Kagan et al., 1998a), has affirmed the idea of BI as a unitary construct, which is characterized by child's fear and reticence towards *both social and non-social* unfamiliar stimuli, with different behavioral manifestations according to child's age. On the contrary, other authors have revealed that the child's inhibited behaviors towards social and non-social novelty are independent and characterized by different correlates (Dyson et al., 2011; Kertes et al., 2009; Rubin et al., 1997; Kochanska et al., 1991). Thus, these authors have argued that BI is a complex multidimensional construct characterized by *either social and/or non-social* components. In order to clarify this issue, our first study investigated the unitary or multidimensional nature of BI in a group of Italian 4-5 aged children. Results revealed that inhibited behaviors in social and non-social situations were significantly correlated, supporting Kagan's original conceptualization of BI as a unitary construct (Garcia-Coll et al., 1984). It is important to consider that the correlations found were moderate, and this may reflect the fact that a child can display an extremely avoidant style in several contexts, but not necessarily in all of them, as reported by Kagan, Snidman, & Arcus (1998). Thus, different intensities of inhibited behaviors are expected in every child according to different contexts.

The first study also explored gender differences in the intensity of BI trait since mixed results were found in literature. Findings revealed no significant differences between males and females, in line with some (Dyson et al., 2011; Gagne, Miller, & Goldsmith, 2013; Johnson et al., 2016) but not all the studies in literature (Mullen, Snidman, & Kagan, 1993; Stevenson-Hinde & Shouldice, 1995; Martin et al., 1997). It is possible that these mixed results, as argued by Rubin and colleagues (2001), have been influenced by gender roles and stereotypes that may have an impact on the behavioral manifestations of BI according to child's age. Thus, as shown by Fox and colleagues (2015), while no gender differences occur in High Reactivity in 4-months-old infants, social and cultural aspects may have a greater impact on child's behavior in preschool age and later in life, leading females to show higher levels of fear and reticence towards novelty (Kagan, 1998b).

Longitudinal investigations covering broad periods, from early childhood to pre-adolescence or adolescence, may help to clarify this issue, and are strongly recommended.

As previously noted, there is a general consensus in literature that Behavioral Inhibition is relatively stable over time. However, a certain degree of discontinuity exists, with some inhibited children showing an uninhibited profile later in life (Degnan & Fox, 2007). For this reason, some authors (Kagan, 1994; Park et al., 1997; Rubin et al., 1997; van Brakel et al., 2006) have taken into account the role of specific endogenous and exogenous factors in the continuity of BI. However, this issue has not been deepened enough. Our first study investigated both the continuity of BI and factors involved in its trajectories over time in a group of Italian preschoolers. Specifically, it has been evidenced a good stability of BI across two school years, and it has been reported the contribution of maternal anxiety and child's Inhibitory Control in increasing BI levels over 2 school years. Although some studies have examined maternal anxiety as associated with child's BI (Degnan & Fox, 2007), to our knowledge no studies have taken into account maternal anxiety in relation to its *continuity* over time. Similarly, no studies have considered the temperament trait of Inhibitory Control until now. In the light of the results shown, further studies are needed to better explore factors involved in different trajectories for inhibited children over time. Importantly, as recommended by Rothbart & Bates (2006), the role of other temperament traits should be analyzed in relation to these trajectories, which may be based on an interplay between child and family factors.

Mixed results in literature that we mentioned above and reported in Part I of the present work may be partially explained by different methodologies used by various studies and laboratories. Indeed, although observational measures are usually considered as more reliable methods of assessment compared to parent and teacher reports (Kagan, 1998b), many studies have adopted these latters in order to evaluate BI. In addition, in several cases they have used general temperament questionnaires for assessing BI instead of more specific measures (See Chapter 3).

Moreover, when both observational measures and parent/teacher reports have been adopted, low to moderate correlations have been found between them, suggesting a certain degree of discrepancy between observational paradigms and caregivers' perceptions of child's BI. Although these results, only a very few studies (Ballespì et al., 2012a, 2012b; Kim et al., 2011; Bishop, Spence, & McDonald, 2003) have deeply examined the reliability of different methods for assessing child's BI and have investigated the caregivers' ability to accurately identify extremely inhibited children. Considering that this issue is crucial for a good investigation of BI construct, further studies are strictly recommended. Therefore, we specifically developed our second study in order to examine the concordance between the observational measures of BI and parent and teacher reports

of BI, to investigate the caregivers' capability of recognizing inhibited children, and to explore maternal, paternal and teachers' perceptions of BI. The results revealed significant and moderate correlations between observational measures and *teacher* reports, suggesting that teachers were particularly sensitive to child's BI features. Moreover, teachers, compared to mothers and fathers, recognized a higher number of contexts where child's Behavioral Inhibition can be elicited, and perceived children with higher levels of BI compared to parents' descriptions. Finally, teachers recognized extremely inhibited children both at T1 and T2, while fathers were capable of recognized them only at T2, and mothers neither at T1 nor at T2.

Taken together, our results suggest that teachers' perceptions are more accurate in recognizing inhibited behaviors in preschool-aged children, maybe due to the fact that they are accustomed to observe different children's behaviors (e.g., children's reaction to novelty) because of their job and have a larger and differentiated comparison group (i.e., class) (Ballespì et al., 2012a). In addition, as reported by Kagan (1998b), although parents, and specifically mothers, have frequently the opportunity to observe their child's behavior in a variety of natural situations, there are many unique influences on maternal descriptions of children that are absent when children were observed through standardized paradigms. Kagan (1998b) reported a case of a mother who described her child as outgoing and sociable to adult or peer strangers. After she had watched her daughter interacting with two unfamiliar peers in Kagan's lab, the author reported that she was really surprised to discover that her daughter was extremely inhibited and reticent during the interaction (Kagan, 1998b, p. 199). In both clinical and developmental perspectives, exploring mother, father, and teacher's perceptions of child's temperament is particularly relevant. As argued by some authors (Mangelsdorf, Schoppe, & Buur, 2000; Rothbart & Bates, 2006), a multi-informant method of assessment, as well as the use of both observational measures and questionnaires, may allow a more comprehensive picture of child's BI and further studies are recommended in this direction.

Finally, results from the second study seem to confirm outputs from the first study. Indeed, we found a good stability of BI over time and no gender differences in mothers, fathers, and teachers' perceptions of BI trait, similarly to our results from the observational measures in the Study I.

Further studies should deeply examine different methods for assessing BI in early childhood, above all considering the importance of an accurate assessment for the prevention of child's impaired outcomes. Indeed, many studies in literature have reported BI as a risk factor for anxiety disorders in childhood and adolescence. In line with these findings, our third study showed that BI initially measured predicted child's withdrawal, anxious/depressed behaviors, and internalizing problems across one school year. Moreover, the study revealed that high levels of *fathers'* – but not

mothers' - anxiety and authoritarian parenting style were associated with child's high levels of BI at T1; all these factors characterized a specific profile of children who showed higher levels of anxious/depressed behaviors at T2 and T3 compared to children with low BI, low paternal anxiety and low authoritarian style. This result is absolutely new considering that all studies exploring family factors in relation to child's BI and outcomes have only focused on *maternal* anxiety and parenting style. Further studies involving paternal characteristics, such as anxiety, parenting or personality, should be specifically addressed, considering that fathers have an important impact on their children's emotional and social development (Rosenberg & Wilcox, 2006).

Finally, for what concerns our third study, we also explored peer difficulties for inhibited children, since some studies (Henderson et al., 2004; Coplan et al., 2007; Coplan et al., 2008; Rubin, Coplan, & Bowker, 2009) in literature have found low social competences and peer rejection for inhibited children. However, we did not find a risk for inhibited children for low peer preference and peer social isolation or rejection. As argued by other authors (Gazelle, 2006, 2008; Diener & Kim, 2004), some factors may contribute to the risk for peer difficulties for inhibited children, such as classroom climate; thus, further studies are recommended in this direction.

The three studies presented above represent the first attempt to explore the BI construct on Italian population and they specifically contributed to investigate issues that are still unsolved in literature. Although we are aware of the limitations of these studies, above all in terms of small sample size and limited time-range, the present work may contribute to better address further investigations on questioned issues. Specifically, further studies should extend literature on psychopathological trajectories for inhibited children, using complex models in order to explore child and family factors that could be involved. In addition, a specific focus should regard the resilience process (Degnan & Fox, 2007) that allows some inhibited children to lessen the intensity and frequency of inhibited behaviors and not to develop impaired developmental outcomes. Finally, we think that an accurate and rigorous investigation of methods for assessing BI is essential and it represents the first step for an adequate research on Behavioral Inhibition and its associated psychopathological risk.

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REFERENCES

Achenbach T., Rescorla L. (2000). *Manual for the ASEBA Preschool Forms and Profiles*. Burlington, VT: University of Vermont, Research Center for Children, Youth, and Families.

Achenbach T.M. (1991). *Integrative guide for the 1991 CBCL/4-18, YRS and TRF profiles*. Burlington: Department of Psychiatry, University of Vermont.

Achenbach T.M., Dumenci L., Rescorla L.A. (2002). Ten-Year Comparisons of problems and competencies for national samples of youth. *Journal of Emotional and Behavioral Disorders*, 10,4, 194-203.

Adams S., Kuebli J., Boyle P. A., Fivush R. (1995). Gender differences in parent-child conversations about past emotions: A longitudinal investigation. *Sex Roles*, 33, 5-6, 309–323.

Affrunti N.W., Geronimi E.M.C., Woodruff-Borden J. (2014). Temperament, peer victimization, and nurturing parenting in child anxiety: A moderated mediation model. *Child Psychiatry and Human Development, 45,* 483-492.

Agrati D., Browne D., Jonas W., Meaney M., Atkinson L., Steiner M., Fleming A.S. (2015). Maternal anxiety from pregnancy to 2 years postpartum: transactional patterns of maternal early adversity and child temperament. *Archives of Women's Mental Health*, 18, 5, 693–705.

Aldenderfer M.S., Blashfield R.K. (1984). *Cluster analysis*. Beverly Hills, CA: Sage.

American Psychological Association (2007). *APA Dictionary of Psychology*. Washington, DC: American Psychological Association.

Andersson K. (1999). Reactions to social and non-social novelties in 2-year-olds. *Infant and Child Development*, 8, 4, 211-228.

Anzman S.L., Birch L.L. (2009). Low Inhibitory Control and Restrictive Feeding Practices predict weight outcomes. *The Journal of Pediatrics*, 155, 5, 651-656.

Arcus D., McCartney K. (1989). When baby makes four: Family influences in the stability of Behavioral Inhibition. In J.S. Reznick (Ed.), *Perspectives on Behavioral Inhibition*. Chicago: University of Chicago Press.

Asendorpf J.B. (1990). Development of inhibition during childhood: Evidence for situational specificity and a two-factor model. *Developmental Psychology*, 26, 721–730.

Asendorpf J.B. (1991). Development of Inhibited Children's Coping with Unfamiliarity. *Child Development*, 62, 6, 1460–1474.

Asendorpf J.B. (1991). Development of inhibited children's coping with unfamiliarity. *Child Development*, 62, 1460-1474.

Asendorpf J.B. (1994). The malleability of behavioral inhibition: A study of individual

developmental functions. *Developmental Psychology*, 30, 912–919.

Asendorpf J.B., Denissen J.J.A., van Aken M.A.G. (2008). Inhibited and aggressive preschool children at 23 years of age: Personality and social transitions into adulthood. *Developmental Psychology*, 44, 4, 997-1011.

Asendorpf J.B., van Aken M.A.G. (1994). Traits and relationship status: Stranger versus peer group inhibition and test intelligence versus peer group competence as early predictors of later self-esteem. *Child Development*, *65*, 1786–1798.

Atella L.D., DiPietro J.A., Smith B.A., St James-Roberts I. (2003). More than meets the eye: Parental and infant contributors to maternal and paternal reports of early infant difficultness. *Parenting: Science and Practice*, 3, 265-284.

Attili G. (1993). *Alle basi della personalità: Teorie, metodi e ricerche sul temperamento*. Giunti: Firenze.

Austin M.P., Hadzi-Pavlovic D., Leader L., Saint K., Parker G. (2005). Maternal trait anxiety, depression and life event stress in pregnancy: relationships with infant temperament. *Early Human Development*, 81, 183–90.

Ballespí S., Jané M.C., Domènech-Llaberia E. (1999). Escala d'Inhibición Conductual per preescolars - verió per pares (EICP-P). Manuscript no pubished.

Ballespí S., Jané M.C., Riba M.D. (2012a). The Behavioural Inhibition Scale for children aged 3 to 6 (BIS 3-6): Validity based on its relation with observational measures. *Journal of Psychopathology and Behavioral Assessment*, 34, 487-496.

Ballespì S., Jané M.C., Riba M.D. (2012b). Who should report abnormal behavior at preschool age? The case of Behavioral Inhibition. *Child Psychiatry and Human Development*, 43, 48-69.

Ballespí S., Jané M.C., Riba M.D., Domènech-Llaberia E. (2003). Preschool Behavioural Inhibition Scale – Teacher's form (PBIS-T): Psychometric properties. *Psicothema*, 15, 205-210.

Battaglia M., Bajo S., Strambi L.F., Brambilla F., Castronovo C., Vanni G., Bellodi L. (1997). Physiological and behavioral responses to minor stressors in offspring of patients with panic disorder. *Journal of Psychiatric Research,* 31, 365-376.

Bayly B., Gartstein M. (2013). Mother's and fathers' reports on their child's temperament: Does gender matter? *Infant Behavior & Development*, 36, 171-175.

Bergman K., Sarkar P., O'Connor T.G., Modi N., Glover V. (2007). Maternal stress during pregnancy predicts cognitive ability and fearfulness in infancy. *Journal of American Academy of Child and Adolescent Psychiatry*, 46, 11, 1454-1463.

Berlyne D.E. (1960). *Conflict, arousal, and curiosity*. McGraw-Hill series in Psychology.

Biederman J., Faraone S.V., Keenan K., Knee D., Tsuang M.T. (1990). Family-genetic and psychosocial risk factors in DSM-III attention deficit disorder. *Journal of the American Academy of Child and Adolescent Psychiatry,* 29, 526-533.

Biederman J., Hirshfeld-Becker D.R., Rosenbaum J.F., Herot C., Friedman D. Snidman N., Kagan J., Faraone S.V. (2001). Further evidence of association between Behavioral Inhibition and social anxiety in children. *American Journal of Psychiatry*, 158, 10,1673-1679.

Biederman J., Rosenbaum J.F., Bolduc-Murphy E.A., Faraone S.V, Chaloff J., Hirshfeld D. R., Kagan J. (1993). A 3-year follow-up of children with and without behavioral inhibition. *Journal of the American Academy of Child and Adolescent Psychiatry*, 32, 4, 814–821.

Bishop G., Spence S.H., McDonald C. (2003). Can parents and teachers provide a reliable and valid report of Behavioral Inhibition? *Child Development*, 74, 6, 1899-1917.

Blair M.M., Glynn L.M., Sandman C.A., Davis E.P.(2011). Prenatal maternal anxiety and early childhood temperament. *Stress*, 14, 6, 644–51.

Block J.H. (1965, 1981). *The Child Rearing Practices Report (CRPR): A set of Q items for the description of parental socialization attitudes and values*. University of California, Berkeley.

Bohlin G., Hagekull B., Andersson K. (2005). Behavioral inhibition as a precursor of peer social competence in early school age: the interplay with attachment and nonparental care. *Merrill-Palmer Quarterly*, 51, 1–19.

Boldt L.J., Kochanska G., Yoon J.E., Nordling J.K. (2014). Children's Attachment to both parents from Toddler Age to Middle Childhood: Links to adaptive and maladaptive outcomes. *Attachment & Human Development*, 16, 3, 211–229.

Bongers I.L., Koot H.M., van der Ende J., Verhulst F.C. (2003). The normative development of child and adolescent problem behavior. *Journal of Abnormal Psychology*, 112, 2, 179-192.

Bosquet M., Egeland B. (2006). The development and maintenance of anxiety symptoms from infancy through adolescence in a longitudinal sample. *Development Psychopatology*, 18, 2, 517-50.

Broberg A., Lamb M., Hwang P. (1990). Behavioral Inhibition and its stability and correlates in sixteen – to forty-month-old children. *Child Development*, 61, 1153-1163.

Brody L.R. (1999). *Gender, emotion, and the family*. Cambridge, MA: Harvard University Press.

Broeren S., Muris P. (2010). A psychometric evaluation of the Behavioral Inhibition Questionnaire in a Non-Clinical Sample of Dutch children and adolescents. *Children Psychiatry Human Development,* 41, 2, 214-229.

Broeren S., Muris P., Diamantopoulou S., Baker J.R. (2013). The course of childhood anxiety symptoms: Developmental trajectories and child-related factors in normal children. *Journal of Abnormal Child Psychology*, 41, 81–95.

Buck R. (1997). Nonverbal communication of affect in preschool children: Relationships with personality and skin conductance. *Journal of Personality and Social Psychology*, 4, 225–236.

Buitelaar J.K. (2005). ADHD: Strategies to unravel its genetic architecture. *Journal of Neural Transmission Supplementum*, 69, 1–17.

Buss D., Block J. H., Block J. (1980). Preschool activity level. Personality correlates and

Buss K.A., Brooker R.J., Leuty M. (2008). Girls most of the time, boys some of the time: Gender differences in toddlers' use of maternal proximity and comfort seeking. Infancy, 13, 1, 1-29.

Buss K.A., Davis E.L., Kiel E.J. (2011). Allostatic and environmental load in toddlers predicts anxiety in preschool and kindergarten. *Development and Psychopathology*, 23, 4, pp. 1069–1087.

Buss K.A., Davis E.L., Kiel E.J., Brooker R.J., Beekman C., Early M.C. (2013). Dysregulated fear predicts social wariness and social anxiety symptoms during kindergarten. *Journal of Clinical Child and Adolescent Psychology*, 42, 5, 603–616.

Buss K.A., Davis, E.L., Kiel R.J., Brooker C., Beekman M.C. (2013). Dysregulated fear predicts social wariness and social anxiety symptoms during kindergarten. *Journal of Clinical Child & Adolescent Psychology*, 42, 5, 603-616.

Buss, A. & Plomin, R. (1975). *A temperament theory of personality development*. New York:

Buss, A. & Plomin, R. (1984). *Temperament: Early developing personality traits*. Hillsdale,

Calkins S.D., Fox N.A., Marshall T.R. (1996). Behavioral and physiological antecedents of inhibition in infancy. *Child Development*, 67, 523–540.

Carter A.S., Briggs-Gowan M.J., Jones S.M., Little T.D. (2003). The Infant-Toddler Social and Emotional Assessment (ITSEA): factor structure, reliability, and validity. *Journal of Abnormal Child Psychology*, 31, 5, 495-514.

Caspi A., Harrington H., Milne B., Amell J.W., Theodore R.F., Moffitt T.E. (2003). Children's behavioral styles at age 3 are linked to their adult personality traits at age 26. *Journal of Personality*, 71, 495-513.

Caspi A., Shiner,R. L. (2006). Personality development. In W. Damon & R. Lerner (Series Eds.), & N. Eisenberg (Vol. Ed.), *Handbook of child psychology*, Vol. 3. Social, emotional, and personality development. New York: Wiley.

Cavalea, G., Rinaldi, M. (2003). *Sociogramma dei Gruppi. Software per la somministrazione, l'analisi dei dati e l'interpretazione*. Erikson, Trento.

Chaplin T. M. (2015). Gender and Emotion Expression: A Developmental Contextual Perspective. *Emotion Review : Journal of the International Society for Research on Emotion*, 7, 1, 14–21.

Chaplin T. M., Aldao A. (2013). Gender Differences in Emotion Expression in Children: A Meta-Analytic Review. *Psychological Bulletin*, 139, 4, 735–765.

Chavez A., Martinez C. (1984). Behavioral measurements of activity in children and their relation to food intake in a poor community. In E. Pollitt, P. Amante (Series Eds.) *Energy Intake and Activity*. New York: Alan R. Liss.

Chen W.J., Faraone S., Biederman J., Tsuang M.T. (1994). Diagnostic accuracy of the children behavior checklist scales for attention-deficit hyperactivity disorder: A receiver-operating characteristic analysis. *Journal of Consulting and Clinical Psychology*, 62, 1017-1025.

Chen W.J., Faraone S.V, Biederman J., Tsuang M.T. (1994). Diagnostic accuracy of the Child Behavior Checklist scales for attention-deficit hyperactivity disorder: a receiver-operating characteristic analysis. *Journal of Consulting and Clinical Psychology*, 62, 5, 1017–25.

Chen X., Chen H., Li D., Wang L. (2009). Early childhood behavioral inhibition and social and school adjustment in Chinese children: A 5-year longitudinal study. *Child Development*, 80, 6, 1692–1704.

Chen X., Hastings P.D., Rubin K.H., Chen H., Cen G., Stewart S.L. (1998). Child-rearing attitudes and Behavioral Inhibition in Chinese and Canadian toddlers: A cross-cultural study. *Developmental Psychology*, 34, 4, 677-686.

Chen X., Li D., Li Z., Li B., Liu M. (2000). Sociable and prosocial dimensions of social competence in Chinese children: Common and unique contributions to social, academic and psychological adjustment. *Developmental Psychology*, 36, 302-314.

Chess S., Thomas A. (1999). Goodness of fit: Clinical applications from infancy through adult life. Ann Arbor, MI: Edwards Brothers.

Chorpita B.F., Albano A.M., Barlow D.H. (1998). The structure of negative emotions in a clinical sample of children and adolescents. *Journal of Abnormal Psychology,* 107, 74-85.

Chronis-Tuscano A., Degnan K.A., Pine D.S., Perez-Edgar K., Henderson H.A., Diaz Y., Fox N.A. (2009). Stable Early Maternal Report of Behavioral Inhibition Predicts Lifetime Social Anxiety Disorder in Adolescence. *Journal of the American Academy of Child and Adolescent Psychiatry*, 48, 9, 928–935.

Clark D., Listro C.J., Lo S.L., Durbin C. E., Donnellan M.B., Neppl T.K. (2016). Measurement invariance and child temperament: An evaluation of sex and informant differences on the Child Behavior Questionnaire. *Psychological Assessment*, 28, 12, 1646-1662.

Clauss J.A., Blackford J.U. (2012). Behavioral inhibition and risk for developing social anxiety disorder: a meta-analytic study, *Journal of the American Academy of Child and Psychiatry*, 51, 10, 1066-1075.

Coe R. (2002). It's the effect size, stupid. What effect size is and why it is important. In *British Educational Research Association annual conference* (pp. 1–18). doi:3062.

Cohen J. (1983). The cost of dichotomization. *Applied Psychological Measurement*, 7, 249-253.

Cohen J. (1988). *Statistical power analysis for the behavioral sciences (2. Auflage)*. Hillsdale, NJ: Erlbaum.

Coie J.D., Dodge K.A. (1983). Continuities and changes in children's social status: A five-year longitudinal study. *Merrill-Palmer Quarterly: Journal of Developmental Psychology*, 29, 261–282.

Conradt E., Fei M., LaGasse L., Tronick E., Guerin D., Gorman D., Marsit C.J., Lester B.M. (2015). Prenatal predictors of infant self-regulation: the contributions of placental DNA methylation of NR3C1 and neuroendocrine activity. *Frontiers in Behavioral Neuroscience,* 9, 130.

Coplan R.J., Arbeau K.A., Armer M. (2008). Don't fret, be supportive! Maternal characteristics linking child shyness to psychosocial and school adjustment in kindergarten. *Journal of Abnormal Child Psychology*, 36, 359-371.

Coplan R.J., Girardi A., Findlay L.C., Frohlick S.L. (2007). Understanding solitude: Young children's attitudes and responses towards hypothetical socially-withdrawn peers. *Social Development*, 16, 390-409.

Coplan R.J., Prakash K., O'Neil K., Armer M. (2004). Do you 'want' to play? Distinguishing between conflicted shyness and social disinterest in early childhood. *Developmental Psychology*, 40, 244–258.

Coplan R.J., Wilson J., Frohlick S.L., Zelenski J. (2006). A person-oriented analysis of behavioral inhibition and behavioral activation in childhood. *Personal Individual Differences*, 917-27.

Côté S., Tremblay R.E., Nagin D., Zoccolillo M., Vitaro F. (2002), The development of impulsivity, fearfulness, and helpfulness during childhood: patterns of consistency and change in the trajectories of boys and girls. *Journal of Child Psychology and Psychiatry*, 43, 609–618.

Crockenberg S.B., Acredolo C. (1983). Infant temperament ratings: A function of infants, or mothers, or both? *Infant Behavior & Development*, 6, 61–72.

Crockenberg S.B., Smith P. (1982). Antecedents of mother-infant interaction and infant irritability in the first three months of life. *Infant Behavior and Development*, 5, 2,105–119.

Crockenberg S.C., Leerkes E.M. (2006). Infant and maternal behavior moderate reactivity to novelty to predict anxious behavior at 2.5 years, *Development and Psychopathology*, 18, 17-34.

Crozier W.R. (2000). Shyness and social relationships: Continuity and change. In: Crozier WR, editor. *Shyness: Development, Consolidation, and Change*. New York: Routledge.

Davè S., Nazareth I., Sherr L., Senior R. (2005). The association of paternal mood and infant temperament: A pilot study. *The British Journal of Developmental Psychology*, 23, 4, 609-621.

Davidson R.J., Rickman M. (1999). Behavioral inhibition and the emotional circuitry of the brain: Stability and plasticity during the early childhood years. In: Schmidt LA, Schulkin J, editors. *Extreme Fear, Shyness, and Social Phobia: Origins, Biological Mechanisms, and Clinical Outcomes*. New York: Oxford University Press.

Davis E.P., Glynn L.M., Schetter C.D., Hobel C., Chicz-Demet A., Sandman C.A. (2007). Prenatal exposure to maternal depression and cortisol influences infant temperament. *Journal of American Academy of Child and Adolescent Psychiatry*, 46, 6, 737-746.

Davis E.P., Sandman C.A. (2010). The timing of prenatal exposure to maternal cortisol and psychosocial stress is associated with human infant cognitive development. *Child Development*, 81, 1, 131-148.

Davis E.P., Sandman C.A. (2012). Prenatal psychobiological predictors of anxiety risk in preadolescent children. *Psychoneuroendocrinology*, 37, 8, 1224–1233.

De Los Reyes A., Kazdin A.E. (2005). Informant discrepancies in the assessment of childhood psychopathology: A critical review, theoretical framework, and recomandation for further study. *Psychological Bulletin*, 131, 483-509.

de Weerth C., Buitelaar J.K. (2005). Physiological stress reactivity in human pregnancy--a review. *Neuroscience and Biobehavioral Reviews*, 29, 295–312.

DeCoster J., Gallucci M., Iselin A.M.R. (2011). Best practices for using median splits, artificial categorization, and their continuous alternatives. *Journal of Experimental Psychopathology*, 2, 197-209.

Degnan K.A., Almas A.N., Fox N.A. (2010). Temperament and the environment in the etiology of childhood anxiety. The Journal of Child Psychology and Psychiatry, 51, 4, 497-517.

Degnan K.A., Almas A.N., Henderson H.A., Hane A.A., Walker O.L., Fox N.A. (2014). Longitudinal trajectories of social reticence with unfamiliar peers across early childhood. *Developmental Psychology*, 50, 2311-2323.

Degnan K.A., Fox N.A. (2007). Behavioral inhibition and anxiety disorders: multiple levels of a resilience process, *Development and Psychopathology*, 19, 729-746.

Degnan K.A., Henderson H.A., Fox N.A., Rubin K.H. (2008). Predicting social wariness in

middle childhood: The moderating roles of child care history, maternal personality, and maternal behavior. *Social Development*, 17, 471–487.

Dekovic M., Janssen J.M.A.M., Gerris J.R.M. (1991). Factor structure and construct validity of the Block Child Rearing Practices Report (CRPR). *Psychological Assessment: A Journal of Consulting and Clinical Psychology*, 3, 2, 182-187.

Dell'Osso L., Abelli M., Pini S., Carpita B., Carlini M., Mengali F., Tognetti R., Rivetti F., Massimetti G. (2015). The influence of gender on social anxiety spectrum symptoms in a sample of university students. *Rivista Psichiatrica,* 50, 6, 295-301.

Della Vedova A.M. (2014). Maternal psychological state and infant's temperament at three months. *Journal of Reproductive and Infant Psychology*, 32, 520–534.

Derryberry D., Rothbart M.K. (1988). Arousal, affect, and attention as components of temperament. *Journal of Personality and Social Psychology*. doi:10.1037/0022-3514.55.6.958 developmental implications. *Child Development*, 51, 401-408.

Diamond, S. (1957). *Personality and temperament*. New York: Harper.

Diener M.L., Kim D.Y. (2004). Maternal and child predictors of preschool children's social competence. *Journal of Applied Developmental Psychology*, 25, 3-24.

Doey L., Coplan R.J., Kingsbury M. (2014). *Sex Roles*, 70, 255.

Donovan W.L., Leavitt L.A., Walsh R.O. (1998). Conflict and depression predict maternal sensitivity to infant cries. *Infant Behavior & Development*, 21, 505-517.

Dougherty L.R., Smith V.C., Olino T.M., Dyson M.W., Buffert S.J., Rose S.A., Klein D.N. (2013). Maternal Psychopathology and early child temperament predict young children's salivary cortisol 3 years later. *Journal of Abnormal Child Psychology*, 41, 4, doi: 10.1007/s10802-012-9703-y.

Ducharme J., Doyle A.B., Markiewicz D. (2002). Attachment security with mother and father: Associations with adolescents' reports of interpersonal behavior with parents and peers. *Journal of Social and Personal Relationships*, 19, 203–231.

Dyson M.W., Klein D.N., Olino T.M., Dougherty L.R., Durbin C.E. (2011). Social and Non-Social Behavioral Inhibition in preschool-age children: Differential associations with parent reports of temperament and anxiety. *Child Psychiatric Human Development*, 42, 390-405.

early childhood. New York: New York University Press.

Edwards S.L., Rapee R.M., Kennedy S.J., Spence S.H. (2010). The assessment of anxiety symptoms in preschool-aged children: The Revise Preschool Anxiety Scale. *Journal of Clinical Child & Adolescent Psychology,* 39, 3, 400-409.

Eisenberg N., Champion C., Yue Ma. (2004). Emotion-Related Regulation: an emerging construct, *Merril-Palmer Quarterly*, 50, 3, 236-258.

Eisenberg N., Cumberland A., Spinrad T.L. (1998). Parental socialization of emotion. *Psychological Inquiry*, 9, 241-273.

Eisenberg N., Sadovsky A., Spinrad T.L., Fabes R.A., Losoya S.H., Valiente C., Reiser M., Cumberland A., Shepard S.A. (2005). The relations of problem behavior status to children's negative emotionality, effortful control, and impulsivity: Concurrent relations and prediction of change. *Developmental Psychology*, 41, 193-211.

Else-Quest N. M., Hyde J. S., Goldsmith H. H., Van Hulle C. A. (2006). Gender differences in temperament: a meta-analysis. *Psychological Bulletin*, *132*, 1, 33–72.

Essex M.J., Klein M.H., Slattery M.J., Goldsmith H.H., Kalin N.H. (2010). Early risk factors and developmental pathways to chronic high inhibition and social anxiety disorder in adolescence. *American Journal of Psychiatry*, 167, 1, 40–46.

Fagan J. (1990). The interaction between child sex and temperament in predicting behavior problems of preschool age children in day care. *Early Child Development and Care*, 59, 1, 1–9.

Fivush R., Buckner J.P. (2000). Gender, sadness, and depression: The development of emotional focus through gendered discourse. In: Fischer AH, editor. *Gender and Emotion: Social psychological perspectives*. Cambridge, England: Cambridge University Press.

Fox N.A. (2004). Temperament and early experience form social behavior. *Annals of the New York Academy of Sciences*, 1038, 171-178.

Fox N.A., Henderson H.A., Marshall P.J., Nichols K.E., Ghera M.M. (2005). Behavioral Inhibition: linking biology and behavior within a developmental framework. *Annual Review of Psychology*, 56, 235-262.

Fox N.A., Henderson H.A., Rubin K.H., Calkins S.D., Schmidt L.A. (2001). Continuity and discontinuity of behavioral inhibition and exuberance: Psychophysiological and behavioral influences across the first four years of life. *Child Development*, 72, 1–21.

Fox N.A., Snidman N., Haas S.A., Degnan K.A., Kagan J. (2015). The Relations between Reactivity at 4 Months and Behavioral Inhibition in the Second Year: Replication across Three Independent Samples. *Infancy*, 20, 1, 98–114.

Frigerio A., Cattaneo C., Cataldo M., Schiatti A., Molteni M., Battaglia M. (2004). Behavioral and emotional problems among Italian children and adolescents aged 4 to 18 years as reported by parents and teachers. *European Journal of Psychological Assessment*, 20, 124-133.

Gagne J.R., Miller M.M., Goldsmith H.H. (2013). Early – but modest- gender differences in focal aspects of childhood temperament. *Personality and Individual Differences*, 55, 95-100.

Garcia Coll C., Kagan J., Reznick J.S. (1984). Behavioral Inhibition in young children. *Child Development*, 55, 1005–1019.

Garcia-Coll C., Kagan J. and Reznick J.S. (1984). Behavioral Inhibition in young children. *Child Development*, 55, 1005-1019.

Gazelle H. (2006). Class climate moderates peer relations and emotional adjustment in children with an early history of anxious solitude: A Child-Environment model. *Developmental Psychology*, 42, 1179-1192.

Gazelle H. (2008). Behavioral profiles of anxious solitary children and heterogeneity in peer relations. *Developmental Psychology*, 44, 1604-1624.

Gazelle H., Faldowski R.A. (2014). Peer Exclusion is Linked to Inhibition with Familiar but not Unfamiliar Peers at Two Years of Age. *Infant and Child Development*, 23, 220–228.

Gazelle H., Ladd G.W. (2003). Anxious solitude and peer exclusion: A diathesis-stress model of internalizing trajectories in childhood. *Child Development*, 74, 257-278.

Gazelle H., Peter D., Karkavandi M.A. (2014). Commentary: Bashful boys and coy girls: A review of gender differences in childhood shyness. *Sex Roles*, 70, 285-308.

Geng F., Hu Y., Wang Y., Chen F. (2011). Two types of Behavioral Inhibition: Relations to effortful control and attention in school children. *Journal of Research in Personality*, 45, 662-669.

Gerardi-Caulton G. (2000), Sensitivity to spatial conflict and the development of self-regulation in children 24–36 months of age. *Developmental Science*, 3, 397–404.

Gest S.D. (1997). Behavioral inhibition: Stability and associations with adaptation from childhood to early adulthood. *Journal of Personality and Social Psychology*, 72, 467–475.

Gill K.L., Link S.D. (2000). *Factors affecting concordance between laboratory assessment and maternal perception of infant temperament*. Poster presented at the Biennal Meeting of the International Society of Infant Studies.

Gladstone G., Parker G.B., Mitchell P.B., Wilhelm, K.A. (2005). Relationship between self-reported childhood Behavioral Inhibition and lifetime anxiety disorders in a clinical sample. *Depression and Anxiety*, 22, 103-113.

Gladstone G.L, Parker G.B. (2006). Is behavioral inhibition a risk factor for depression? *Journal of Affective Disorders*, 95, 85-94.

Glover V. (2014). Maternal depression, anxiety and stress during pregnancy and child outcome; what needs to be done. *Best Practice & Research Clinical Obstetrics & Gynaecology*, 28, 1, 25-35.

Goldsmith H. H. (1996). Studying temperament via construction of the Toddler Behavior Assessment Questionnaire. *Child Development*, 67, 218-235.

Goldsmith H.H., Buss A.H., Plomin R., Rothbart M.K., Thomas A., Chess S., McCall R.B. (1987). Roundtable: What is Temperament? Four Approaches. *Child Development*, 5, 2, 505–29.

Goldsmith H.H., Reilly J., Lemery K.S., Longley S., Prescott A. (1995). Unpublished manuscript. *Laboratory temperament assessment battery: Preschool version*.

Goldsmith, H.H., Reilly, J., Lemery, K.S., Longley, S., Prescott, A. (1999). *The Laboratory Assessment Temperament Battery – Preschool Version. Description of Procedures*. Arlington: University of Texas, Department of Psychology.

Grüner K., Muris P., Merckelbach H. (1999). The relationship between anxious rearing behaviours and anxiety disorders symptomatology in normal children. *Journal of Behavior Therapy and Experimental Psychiatry*, 30, 1, 27–35.

Guerin D. W., Gottfried A. W., Oliver P. H., Thomas C. W. (2003). *Temperament. Infancy through adolescence*. New York: Kluwer Academic.

Gunnar M.R., Quevedo K. (2007). The neurobiology of stress and development. *Annual Review of Psychology*, 58, 145–173.

Gutteling B.M., de Weerth C., Willemsen-Swinkels S.H., Huizink A.C., Mulder E.J., Visser G.H., Buitelaar J.K. (2005). The effects of prenatal stress on temperament and problem behavior of 27-month-old toddlers. *European Child and Adolescent Psychiatry*, 14, 41–51.

Hamre, B., Pianta, R. (2001). Early teacher–child relationships and the trajectory of children's school outcomes through eighth grade. *Child Development*, 72, 625-638.

Hane A.A., Fox N.A. (2007). A closer look at the transactional nature of early social development: The relations among early caregiving environments, temperament, and early social development and the case for phenotypic plasticity. In: Santoianni F., Sabatano C. (Eds), *Brain Development in Learning Environments: Embodied and Perceptual Advancements*. Newcastle, UK: Cambridge Scholars Publishing.

Hane A.A., Fox N.A., Henderson H.A., Marshall P.J. (2008). Behavioral reactivity and approach-withdrawal bias in infancy. *Developmental Psychology*, 44, 1491-1496.

Hane A.A., Fox N.A., Polak-Toste C., Ghera M.M., Guner B.M. (2006). Contextual basis of maternal perceptions of infant temperament. *Developmental Psychology*, 42, 6, 1077–1088.

Harris A, Seckl J. (2011). Glucocorticoids, prenatal stress and the programming of disease. *Hormones Behavior*, 59, 279-289.

Hayward C., Killen J.D., Kraemer H.C., Taylor C.B. (1998). Linking self reported childhood Behavioral Inhibition to adolescent social phobia. *Journal of the American Academy of Child and Psychiatry,* 37, 12, 1308-1316.

Henderson H.A., Fox N.A. (1998). Inhibited and uninhibited children: Challenges in school settings. *School Psychology Review*, 27, 4, 492-505.

Henderson H.A., Fox N.A., Rubin K.H. (2001). Temperamental contributions to social behavior: The moderating roles of frontal EEG asymmetry and gender. *Journal of the American Academy of Child & Adolescent Psychiatry*, 40, 68–74.

Henderson H.A., Marshall P.J., Fox N.A., Rubin K.H. (2004). Psychophysiological and behavioral evidence for varying forms and functions of nonsocial behavior in preschoolers. *Child Development*, 75, 251-263.

Henderson H.A., Pine D.S. and Fox N.A. (2015). Behavioral Inhibition and Developmental Risk: A dual-processing perspective. *Neuropsychopharmacology Reviews*, 40, 207-224.

Henrichs J., Bongers-Schokking J.J., Schenk J.J., Ghassabian A., Schmidt H.G., Visser T.J., Tiemeier H. (2010). Maternal thyroid function during early pregnancy and cognitive functioning in early childhood: the generation R study. *The Journal of Clinical Endocrinology and Metabolism*, 95, 9, 4227–4234.

Hirshfeld D.R., Biederman J., Brody L., Faraone S.V., Rosenbaum M.D. (1997). Expressed emotion toward children with behavioral inhibition: Associations with maternal anxiety disorder. *Journal of the American Academy of Child & Adolescent Psychiatry,* 36, 7, 910-917.

Hirshfeld DR, Rosenbaum JF, Biederman J, Bolduch E.A., Faraone S.V., Snidman N., Reznick J.S., Kagan J. (1992). Stable behavioral inhibition and its association with anxiety disorder. *Journal of the American Academy of Child & Adolescent Psychiatry*, 31, 103–111.

Hirshfeld-Becker D.R., Biederman J. (2002). Rationale and Principles for Early Intervention with Young Children at Risk for Anxiety Disorders. *Clinical Child and Family Psychology Review*, 5, 3, 161–172.

Hirshfeld-Becker D.R., Biederman J., Calltharp S., Rosenbaum E.D., Faraone S.V., Rosenbaum J.F. (2003). Behavioral Inhibition and Disinhibition as hypothesized precursors to psychopathology: Implications for pediatric bipolar disorder. *Biological Psychiatry*, 53, 985-999.

Hirshfeld-Becker D.R., Biederman J., Faraone S.V., Robin J.A., Friedman D., Rosenthal J.M., Rosenbaum J.F. (2004). Pregnancy complications associated with childhood anxiety disorders. *Depression and Anxiety*, 19, 152–162.

Hirshfeld-Becker D.R., Biederman J., Henin A., Faraone S.V., Davis S., Harrington K., Rosenbaum J.F. (2007). Behavioral Inhibition in Preschool Children at risk is a specific predictor of middle childhood social anxiety: A Five-Year Follow-up. Journal *of Developmental & Behavioral Pediatrics*, 28, 225-233.

Hirshfeld-Becker D.R., Micco J., Henin A., Bloomfield A., Biederman J., Rosenbaum J.

(2008). Behavioral Inhibition. *Depression and Anxiety*, 25, 357-367.

Hirshfeld-Becker D.R., Rosenbaum J.F., Biederman J.F., Bolduc E.A., Faraone S.V., Snidman N., Reznick J.S., Kagan J. (1992). Stable behavioral inhibition and its association with anxiety disorder. *Journal of the American Academy of Child and Adolescent Psychiatry*, 31, 103-111.

Hudson J.L., Rapee R.M. (2001). Parent–child interactions and anxiety disorders: An observational study. *Behaviour Research and Therapy*, 39, 1411-1427.

Huizink A.C., de Medina P.G.R., Mulder E.J.H., Visser G.H.A. and Buitelaar J.K. (2003). Stress during pregnancy is associated with developmental outcome in infancy. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 44, 6, 810-818.

Isley S., O'Neil R., Parke R.D. (1996). The relation of parental affect and control behaviors to children's classroom acceptance: A concurrent and predictive analysis. *Early Education and Development*, 7, 7–23.

Izard C. (1982). Measuring emotions in human development. In C. Izard (Eds.), *Measuring Emotions in Infants and Children*. New York, NY: Cambridge University Press.

Jané M.C., Canals J., Ballespí S., Viñas F., Esparó G., Domènech-Llaberia E. (2006). Parents and teachers reports of DSM–IV psychopathological symptoms in preschool children: Differences between urban–rural Spanish areas. *Social Psychiatry and Psychiatric Epidemiology,* 41, 386-393.

Janson H., Mathiesen K.S. (2008). Temperament profiles from infancy to middle childhood: development and associations with behavior problems. *Developmental Psychology*, 44, 5, 1314–1328.

Johnson V. C., Olino T. M., Klein D. N., Dyson M. W., Bufferd S. J., Durbin C. E., Hayden E. P. (2016). A longitudinal investigation of predictors of the association between age 3 and age 6 behavioural inhibition. *Journal of Research in Personality*, *63*, 51–61.

Kagan J. (1992). Behavior, biology, and the meanings of temperamental constructs. Pediatrics, 90, 3, 510-513.

Kagan J. (1994). *Galen's Prophecy: Temperament in Human Nature*. New York: Basic Books.

Kagan J. (1994). *Galen's prophecy*. Basic Books. New York.

Kagan J. (1998a). The quiet return of categories. *Social Research*, 65, 2, 449-461.

Kagan J. (1998b). Biology and the child. In W. Damon & N. Eisenberg (Eds.), *Handbook of child psychology: Vol. 3. Social, emotional and personality development* (5th ed., pp. 177–235). New York, NY: Wiley.

Kagan J., Arcus D., Snidman N., Hendler J., Greene S. (1994). Reactivity in infants: A cross-

national comparison. *Developmental Psychology*, 30, 3, 342-345.

Kagan J., Reznick J.S., Snidman N. (1986). Temperamental inhibition in early childhood. In R. Plomin J. Dunn (Eds.), *The study of Temperament: Changes, continuities and challenges* (pp.53-57). Hillsdale, NJ: Erlbaum.

Kagan J., Reznick J.S., Snidman N. (1987). The physiology and psychology of Behavioral Inhibition in Children. Child Development, 58, 1459-1473.

Kagan J., Reznick J.S., Snidman N. (1988). Biological bases of childhood shyness. *Science*, 240, 167–171.

Kagan J., Snidman N. (1991). Temperamental factors in human development. *American Psychologist*, 46, 8, 856-862.

Kagan J., Snidman N. (2004). *The long shadow of temperament*. Cambridge Massachusetts: Harvard University Press.

Kagan J., Snidman N., Arcus D. (1995). The role of temperament in social development. *Annals of the New York Academy of Sciences*, 771, 485-490.

Kagan J., Snidman N., Arcus D. (1998). Childhood derivatives of high and low reactivity in infancy. Child Development, 69, 6, 1483-1493.

Kagan J., Snidman N., Hendler J., Greene S.M., Nugent K.J. (1991). Predicting inhibited and uninhibited behaviour. *Irish Journal of Psychology*, 12, 2, 248–262.

Kagan J., Snidman N., Kahn V., Towsley S. (2007). The preservation of two infant temperaments into adolescence. *Monographs of the Society for Research in Child Development,* 72, 2, 1-95.

Kagan J., Snidman N., Zentner M., Peterson E. (1999). Infant temperament and anxious symptoms in school age children. *Development and Psychopathology*, 11, 2, 209–224.

Kagan, J., Reznick, J.S., Snidman N. (1985). Temperamental inhibition in early childhood. In: Plomin R., Dunn, S. (eds). *The study of Temperament: Changes, Continuities, and Challenges*. Erlbaum, pp 53-65.

Kendler K.S., Baker J.H. (2007). Genetic influences on measures of the environment: A systematic review. *Psychological Medicine*, 37,5, 615-626.

Kerr M., Lambert W.W., Stattin H., Klackenberg-Larsson I. (1994). Stability of inhibition in a Swedish longitudinal sample. *Child Development*, 65, 138–146.

Kertes D.A., Donzella B., Talge N.M., Garvin M.C., Van Ryzin M.J., Gunnar M.R. (2009). Inhibited temperament and parent emotional availability differentially predict young children's cortisol responses to novel social and non-social events. *Developmental Psychobiology*, 51, 521-532.

Kiel E. J., Buss K. A. (2006). Maternal accuracy in predicting toddlers' behaviors and associations with toddlers' fearful temperament. *Child Development*, 77, 355–370.

Kiel E.J., Buss K.A. (2013). Toddler inhibited temperament maternal cortisol reactivity and embarrassment and intrusive parenting. *Journal of Family Psychology*, 27, 512-517.

Kiel E.J., Premo J.E., Buss K.A. (2016). Gender moderates the progression from fearful temperament to social withdrawal through protective parenting. *Social Development*, 25, 2, 235-255.

Kieras J.E., Tobin R.M., Graziano W.G., Rothbart M.K. (2005). You can't always get what you want: Effortful control and children's responses to undesirable gifts. *Psychological Science*, 16, 391-396.

Kim J., Klein D.N., Olino T.M., Dyson M.W., Dougherty L.R., Durbin C.E. (2011). Psychometric properties of the Behavioral Inhibition Questionnaire in preschool children. *Journal of Personality Assessment*, 93, 545-555.

Kitamura T., Ohashi Y., Minatani M., Haruna M., Murakami M., Goto Y. (2015). Disagreement between parents on assessment of child temperament traits. *Pediatrics International*, 57, 6, 1090–1096.

Kochanska G. (1991). Patterns of Inhibition to the unfamiliar in children of normal and affectively III mothers. *Child Development*, 62, 250-263.

Kochanska G., Coy K.C., Tjebkes C. T., Husarek S. (1998). Individual differences in emotionality in infancy. *Child Development*, 69, 375-390.

Kochanska G., Kuczynski L., Radke-Yarrow M. (1989). Correspondence between mothers' self-reported and observed child-rearing practices. *Child Development*, 60, 56-63.

Kochanska G., Murray K., & Harlan E. T. (2000). Effortful control in early childhood: Continuity and change, antecedents, and implications for social development. *Developmental Psychology*, 36, 220-232.

Kopp C.B., Neufeld S.J. (2003). Emotional development during infancy. In: Davidson RJ, Scherer KR, Goldsmith HH, eds. *Handbook of affective sciences* (pp. 347-374). Oxford, United Kingdom: Oxford University Press.

Krueger R.F., Tackett J.L. (2005). Progress and innovation: Personality disorders and the vanguard of psychopathology research. *Journal of Personality Disorder,* 19, 540-546.

LaGasse L., Gruber C., Lipsitt LP (1989). The infantile expression of avidity in relation to later assessments. In J.S. Reznick (Ed.), Perspectives on Behavioral Inhibition (pp.159-176). Chicago: University of Chicago Press.

Larson, R., & Richards, M. H. (1994). *Divergent realities: The emotional lives of mothers, fathers, and adolescents*. New York: Basic Books.

Larsson I., Svedin C.G. (2002). Teachers' and parents' reports on 3- to 6-year-old children's sexual behavior - A comparison. *Child Abuse and Neglect*, 26, 3, 247–266.

Laucht M., Becker K., & Schmidt M. H. (2006). Visual exploratory behavior in infancy and novelty seeking in adolescence: Two developmentally specific phenotypes of DRD4? *Journal of Child Psychology and Psychiatry*, 47, 1143-1151.

Laursen, B., & Collins, W. A. (1994). Interpersonal conflict during ado- lescence. *Psychological Bulletin, 115,* 197–209.

Lemery K. S., Essex M. J., Smider N. A. (2002). Revealing the relation between temperament and behavior problem symptoms by eliminating measurement confounding: Expert rating and factor analyses. *Child Development*, 73, 867-882.

Lemery K. S., Goldsmith H. H., Klinnert M. D., Mrazek D. A. (1999). Developmental models of infant and childhood temperament. *Developmental Psychology*, 35, 189-204.

Leve L.D., Chamberlain P., Reid J.B. (2005). Intervention outcomes for girls referred from juvenile justice: Effects on delinquency. *Journal of Consulting and Clinical Psychology*, 73, 1181-1185.

Lewis-Morrarty E., Degnan K., Chronis-Tuscano A., Pine D.S., Henderson H.A., Fox N.A. (2015). Infant attachment security and early childhood Behavioral Inhibition interact to predict adolescent social anxiety symptoms. *Children Development*, 86, 2, 598-613.

Lindhout I.E., Markus M.T., Hoogendijk T.H.G., Boer F. (2008). Temperament and parental child rearing style: unique contributions to clinical anxiety disorders in childhood. *European Child and Adolescent Psychiatry*, 18, 439-446.

Lonigan C., Vasey M. (2009). Negative affectivity, effortful control, and attention to threat-relevant stimuli. *Journal of Abnormal Child Psychology*, 37, 387-399.

Maccoby E.E., Martin J.A. (1983). Socialization in the context of the family: Parent-child interaction. In P. Mussen (Ed.) *Handbook of Child Psychology*, Vol.4. New York: Wiley.

Mangelsdorf S., Gunnar M., Kestenbaum R., Lang S., Andreas, D. (1990). Infant proneness-to-distress temperament, maternal personality, and mother–infant attachment: Associations and goodness-of-fit. *Child Development*, 61, 820-831.

Mangelsdorf S.C., Schoppe S.J., Buur H. (2000). The meaning of parental reports: A contextual approach to the study of temperament and behavior problems in childhood. In V.J.Molfese, E.L. Molfese (Eds.), *Temperament and personality development across the life span*. Mahwah, NJ: Erlbaum.

Martin R.P., Wisenbaker J., Barker J., Huttunen M.O. (1997). Gender differences in temperament at six months and five years. *Infant Behavior and Development*, 20, 339-347.

Mayer J. D. (2005). A tale of two visions: Can a new view of Personality help integrate Psychology? *The American Psychologist*, 60, 4, 294–307.

McAdams D. P., Pals J. L. (2006). A new Big Five: fundamental principles for an integrative science of personality. *The American Psychologist*, 61, 3, 204–217.

McDermott J.M., Perez-Edgar K., Henderson H.A., Chronis-Tuscano A., Pine D.S., Fox N.A. (2009). A history of childhood Behavioral Inhibition and enhanced response monitoring in adolescence are linked to clinical anxiety. *Biological Psychiatry*, 65, 5, 445–448.

McShane, K. E., Hastings, P. D., Smylie, J. K., Prince, C., & Tungasuvvingat Inuit Family Resource Centre (2009). Examining evidence for autonomy and relatedness in urban Inuit parenting. Culture and Psychology, 15, 411-431.

Meteyer K.B., Perry-Jenkins M. (2009). Dyadic Parenting and Children ' s Externalizing Symptoms. *Family Relations*, 58, 289–302.

Meyer T.J., Miller M.L., Metzger R.L., Borkovec T.D. (1990). Development and validation of the Penn State Worry Questionnaire. *Behaviour Research and Therapy*, 28, 6, 487–495.

Mick M.A., Telch M.J. (1998). Social anxiety and history of Behavioral Inhibition in young adults. *Journal of Anxiety Disorders*, 12, 1-20.

Moehler E., Kagan J., Oelkers-Ax R., Brunner R., Poustka L., Haffner J., Resch F. (2008). Infant predictors of behavioural inhibition. *British Journal of Developmental Psychology*, 26, 145–150.

Montirosso R., Casini E., Provenzi L., Putnam S.P., Morandi F., Fedeli C., Borgatti R. (2015). A categorical approach to infants' individual differencesduring the Still-Face paradigm. *Infant Behavior and Development*, 38, 1, 67–76.

Morani S., Pricci D., Sanavio E. (2009). Penn State Worry Questionnaire e Worry Domains Questionnaire. Presentazione delle versioni italiane ed analisi della fedeltà. *Psicoterapia Cognitiva e Comportamentale*, 5, 3, 195-209.

Moreno J.L. (1980). *Principi di sociometria, psicoterapia di gruppo e sociodramma*. Milano: ETAS.

Moretti M., Obsuth I. (2010). Child Behavior Checklist. *Corsini Encyclopedia of Psychology*, doi: 10.1002/9780470479216.corpsy0165.

Mullen M., Snidman N., Kagan J. (1993). Free-play behavior in inhibited and uninhibited children. *Infant Behavior Development*, 16, 383–89.

Muris P., Meesters C., Merckelbach H., Huinsebeck P. (2000). Worry in children is related to perceived parental rearing and attachment. *Behavior Research and Therapy*, 38, 5, 487-497.

Muris P., Meesters C., Spinder M. (2003). Relationships between child- and parent-reported Behavioural Inhibition and symptoms of anxiety and depression in normal adolescents. *Personality and Individual Differences*, 34, 759-771.

Muris P., Merckelbach H., Schmidt H., Gadet B., Bogie N. (2001). Anxiety and depression as correlates of self-reported Behavioral Inhibition in normal adolescents. *Behaviour Research and Therapy*, 39, 1051-1061.

Muris P., Merckelbach H., Wessel I., Ven M. (1999). Psychopathological correlates of self-reported Behavioral Inhibition in normal children. *Behaviour Research and Therapy*, 37, 575-584.

Murray, L., Creswell, C., Cooper, P.J. (2009). The development of anxiety disorders in childhood: An integrative review. *Psychological Medicine*, 39, 1413-1423.

Nakamura B.J., Ebesutani C., Bernstein A., Chorpita B.F. (2009). A psychometric analysis of the Child Behavior Checklist DSM-Oriented Scales. *Journal of Psychopathology and Behavioral Assessment*, 31, 178-189.

Neale M.C., Cardon L.R. (1992). *Methodology for Genetic Studies of Twins and Families*. Dordrecht, The Netherlands: Kluwer Academic Publishers Group.

New York, NY, US: McGraw-Hill Book Company.

Nigg, J.T. (2006). Temperament and developmental psychopathology. *Journal of Child Psychology and Psychiatry*, 47, 3(4), 395-422.
NJ: Erlbaum.

Nolvi S., Karlsson L., Bridgett D.J., Pajulo M., Tolvanen M., Karlsson H. (2016). Maternal postnatal psychiatric symptoms and infant temperament affect early mother-infant bonding. *Infant Behavior and Development*, 43, 13–23.

O'Donnell K., O'Connor T.G., Glover V. (2009). Prenatal stress and neurodevelopment of the child: focus on the HPA axis and role of the placenta. *Developmental Neuroscience*, 31, 285–292.

Oberklaid F., Amos D., Liu C.Y., Jarman F. C. (1993). Growing pains: Clinical and behavioral correlates in a community based sample of 8 year olds. *American Journal of Diseases of Children*, 147, 446.

Oberlander T.F., Weinberg J., Papsdorf M., Grunau R., Misri S., Devlin A.M. (2008). Prenatal exposure to maternal depression, neonatal methylation of human glucocorticoid receptor gene (NR3C1) and infant cortisol stress responses. *Epigenetics*, 3, 2, 97–106.

Olson S. L., Bates J. E. Bayles, K. (1989). Predicting long-term developmental outcomes from maternal perceptions of infant and toddler behavior. *Infant Behavior and Development*, 12, 77-92.

Ostlund B.D., Conradt E., Crowell S.E., Tyrka A.R., Marsit C.J., Lester B.M. (2016). Prenatal

Stress, Fearfulness, and the Epigenome: Exploratory Analysis of Sex Differences in DNA Methylation of the Glucocorticoid Receptor Gene. *Frontiers in Behavioral Neuroscience*, *10*, 147.

Panela E.C., Walker O.L., Degnan K.A., Fox N.A., Henderson H.A. (2015). Early Behavioral Inhibition and Emotion Regulation: Pathways towards social competence in middle childhood. *Child Development*, 86, 4, 1227-1240.

Parade S.H., Leerkes E.M. (2008). The impact of maternal characteristics and sensitivity on the concordance between maternal reports and laboratory observations of infant negative emotionality. *Infancy*, 4, 517-539.

Parade S.H., Ridout K.K., Seifer R., Armstrong D.A., Marsit C.J., Mcwilliams M.A., Tyrka A.R. (2016). Methylation of the Glucocorticoid Receptor Gene Promoter in Preschoolers: Links With Internalizing Behavior Problems. *Child Development*, 87, 1, 86–97.

Pardini D., Lochman J., Wells K. (2004). Negative emotions and alcohol use initiation in High-Risk Boys: The moderating effect of good Inhibitory Control. *Journal of Abnormal Child Psychology*, 32, 5, 505-518.

Park S., Belsky J., Putnam S., Crnic K. (1997). Infant emotionality, parenting, and 3-year inhibition: Exploring stability and lawful discontinuity in a male sample. *Developmental Psychology*, 33, 218–227.

Pass, L., Arteche, A., Cooper, P., Creswell, C., Murray, L. (2012). Doll play narratives about starting school in children of socially anxious mothers, and their relation with Subsequent Child School Based Anxiety. *Journal of Abnormal Child Psychology*, doi: 10.1007/s10802-012-9645-4.

Pauli-Pott U., Mertesacker B., Bade U., Haverkock A., Beckmann D. (2003). Parental perceptions and infant temperament development. *Infant Behavior and Development*, 26, 1, 27–48. doi:10.1016/S0163-6383(02)00167-4

Perez-Edgar K., Bar-Haim Y., McDermott J.M., Chronis-Tuscano A., Pine D.S., Fox N.A. (2010). Attention biases to threat and Behavioral Inhibition in early childhood shape adolescent social withdrawal. *Emotion*, 10, 3, 349-357.

Perren S., Alsaker, F.D. (2006). Social behavior and peer relationships of victims, bully-victims, and bullies in kindergarten. *Journal of Child Psychology and Psychiatry*, 47, 45-57.

Pesonen A., Raikkonen K., Strandberg T., Jarvenpaa A. (2005). Continuity of maternal stress from the pre- to postnatal period: association with infant's positive, negative, and overall temperamental reactivity. *Infant Behavior & Development*, 28, 36–47.

Pfeifer M., Goldsmith H.H., Davidson R.J., Rickman M. (2002). Continuity and change in inhibited and uninhibited children. *Child Development*, 73, 1474–1485.

Poggi Davis E., Glynn M.L., Dunkel Schetter C., Hobel C., Chicz-Demet A., Sandman C.A.

(2007). Prenatal exposure to maternal depression and cortisol influences infant temperament. *Journal of American Academy of Child and Adolescent Psychiatry*, 46, 6, 737-746.

Posner M. I., Rothbart M. K. (2007). *Educating the human brain*. Washington, DC: American Psychological Association.

Prior M.T, Smart D.S.W., Sanson A., Oberklaid F. (2000). Does Shy-Inhibited Temperament in Childhood Lead to Anxiety Problems in Adolescence? *Journal of American Academy of Child and Adolescent Psychiatry*, 39, 461–468.

Putnam S. P., Gartstein M. A., Rothbart M. K. (2006). Measurement of fine-grained aspects of toddler temperament: The early childhood behavior questionnaire. *Infant Behavior and Development*, 29, 386-401.

Putnam, S. P., & Rothbart, M. K. (2006). Development of short and very short forms of the Children's Behavior Questionnaire. *Journal of Personality Assessment*, 87, 1, 102–112.

Rapee R.M. (2001). Generalised Anxiety Disorder. In M.W. Vasey & M.R. Dadds (Eds.), *The Developmental Psychopathology of Anxiety*. New York: Oxford University Press.

Rapee R.M. (2014). Preschool environment and temperament as predictors of social and nonsocial Anxiety Disorders in middle adolescence. *Journal of the American Academy of Child & Adolescent Psychiatry*, 53, 320-328.

Rapee R.M., Spence S.H. (2004). The etiology of social phobia: Empirical evidence and an initial model. *Clinical Psychology Review*, 24, 737-768.

Reznick J.S., Kagan J., Snidman N., Gersten M., Baak K., Rosenberg A. (1986). Inhibited and Uninhibited Children: A Follow-Up Study. *Child Development*, 57, 3, 660–680.

Rhoades, B.L., Greenberg, M.T., Dimitrovich, C.E. (2009). The contribution of Inhibitory Control to the socio-emotional competence. *Journal of Applied Developmental Psychology*, 30, 310-320.

Richters J.E. (1992). Depressed mothers as informants about their children: A critical review of the evidence for distortion. *Psychological Bulletin*, 112, 3, 485–499.

Rooth A. K. & Rubin K. H. (2010). *Gender and parents' reactions to children's emotion during the preschool years*. New Directions for Child and Adolescent Development. Wiley Subscription Services, Inc., A Wiley Company.

Rosenbaum J.F., Biederman J., Bolduc E.A., Hirshfeld D.R., Faraone S.V., Kagan J. (1992). Comorbidity of parental anxiety disorders as risk for childhood-onset anxiety in inhibited children. *American Journal of Psychiatry*, 149, 475-481.

Rosenbaum J.F., Biederman J., Hirshfeld-Becker D.R., Kagan J., Snidman N., Friedman D., Nineberg A., Gallery D.J., Faraone S.V. (2000). A controlled study of Behavioral Inhibition in

children of parents with panic disorder and depression. *American Journal of Psychiatry*, 157, 2002-2010.

Rosenberg J., Wilcox W.B (2006). *The importance of fathers in the healthy development of children.* Child Abuse and Neglect User Manual Series. Manuscript published by U.S. Department of Health and Human Services, Administration for Children and Families, Office on Child Abuse and Neglect.

Rosicky J. (1993). *The assessment of temperamental fearfulness in infancy.* Presented at the Society for Research in Child Development, New Orleans.

Rothbart M. K. (1981). *Measurement of temperament in infancy*. Child Development, 52, 569-578.

Rothbart M. K. & Bates, J. E. (2006). Temperament. In W. Damon & R. Lerner (Series Eds.), & N. Eisenberg (Vol. Ed.), *Handbook of child psychology*, *Vol. 3. Social, emotional, and personality development*. New York: Wiley.

Rothbart M. K. & Derryberry, P. (1981). Development of individual differences in temperament. In M. E. Lamb & A. Brown (Ed.), *Advances in developmental psychology*. Hillsdale, NJ: Erlbaum.

Rothbart M.K., Ahadi S.A., Hershey K.L., Fisher P. (2001). Investigations of temperament at three to seven years: the Children's Behavior Questionnaire. *Child Development*, 72, 1394-1408.

Rothbart M.K., Bates J.E. (2006). Temperament. In W. Damon, R. Lerner, N. Eisenberg (Eds.), *Handbook of child psychology: Vol. 3. Social, emotional, and personality development* (6th ed., pp. 99– 166). New York: Wiley.

Rothbart M.K., Ellis L.K., Rueda M.R., Posner M. I. (2003). Developing mechanisms of temperamental effortful control. *Journal of Personality*, 71, 1113-1143.

Rouse M. H., Goodman S. H. (2014). Perinatal depression influences on infant negative affectivity: Timing, severity, and co-morbid anxiety. *Infant Behavior and Development*, 37, 4, 739–751.

Rowe D.C., Plomin R. (1977). Colorado Child Temperament Inventory. *Journal of Personality Assessment*, 41, 2, 150-156.

Rubin K. H., Cheah C. S. L., Fox N. A. (2001). Emotion regulation, parenting, and display of social reticence in preschoolers. *Early Education & Development, 12,* 97–115.

Rubin K., Coplan R.J., Bowker J. (2009). Social withdrawal in childhood. *Annual Review of Psychology*, 60, 111-1131.

Rubin K.H. (1993). The Waterloo longitudinal project: Correlates and consequences of social withdrawal from childhood to adolescence. In K. H. Rubin & J. B. Asendorpf (Eds.), *Social withdrawal, inhibition and shyness in children*. Hillsdale, NJ: Erlbaum.

Rubin K.H., Borwick D. (1984). The communication skills of children who vary with regard to sociability. In H. Sypher & J. Applegates (Eds.), *Social cognition and communication*. Hillsdale, NJ: Erlbaum.

Rubin K.H., Burgess K.B., Hastings P.D. (2002). Stability and social–behavioral consequences of toddlers' inhibited temperament and parenting behaviors. *Child Development*, 73, 483–495.

Rubin K.H., Chen X., McDougall P., Bowker A., McKinnon J. (1995). The Waterloo Longitudinal Project: predicting adolescent internalizing and externalizing problems from early and mid-childhood. *Developmental Psychopathology*, 7, 751-64.

Rubin K.H., Coplan R.J., Fox N.A. et al. (2007). Emotionality, emotion regulation, and preschoolers social adaptation. *Developmental Psychopathology*, 7, 1, 49-62.

Rubin K.H., Hastings P.D., Stewart S.L., Henderson H.A., Chen X. (1997). The consistency and concomitants of Inhibition: Some of children, all of the time. *Child Development*, 68, 3, 467-483.

Rubin K.H., Hemphill, S. A., Chen, X., Hastings, P., San- son, A., LoCoco, A., Zappulla C., Chung O.B., Park S.Y., Sim Doh H., Chen H.,Sun L., Yoon C.H., Cui L. (2006). A cross-cultural study of behavioral inhibition in toddlers: East-West-North-South. *International Journal of Behavioral Development*, 30, 3, 219–226.

Rutter M. (1987). Temperament, personality, and personality-disorder. *British Journal of Psychiatry*, 873-874.

Rydell A.M., Diamantopoulou S., Thorell L.B., Bohlin G. (2009). Hyperactivity, shyness, and sex: Development and socio-emotional functioning. *British Journal of Developmental Psychology*, 27, 625-648.

Sameroff A. (2009). *The Transactional Model of Development: How children and context shape each other*. Washington, DC, US: American Psychological Association.

Sanson A., Pedlow R., Cann W., Prior M., Oberklaid F. (1996). Shyness Ratings: Stability and Correlates in Early Childhood. *International Journal of Behavioral Development*, 19, 4, 705-725.

Scarpa A., Raine A., Venables P.H., Mednick S.A. (1995). The stability of inhibited/uninhibited temperament from ages 3 to 11 years in Mauritian children. *Journal of Abnormal Child Psychology*, 23, 607–618.

Scarpa A., Raine A., Venables P.H., Mednick S.A. (1997). Heart rate and skin conductance in behaviorally inhibited Mauritian children. *Journal of Abnormal Psychology*, 106, 2, 182-190.

Schuetze P., Zeskind P.S. (2001). Relationship between women's depressive symptoms and perceptions if infant distress signals varying in pitch. *Infancy*, 2, 483-499.

Schwartz M.D., Taylor K.L., Willard K.S., Siegel J., Lamdam R.M., Moran, K. (1999). Distress, personality and mammography utilization among women with a family history of breast cancer. *Health Psychology,* 18, 327-332.

Seifer R., Sameroff A.J., Barrett L.C., Krafchuk E. (1994). Infant Temperament Measured by Multiple Observations and Mother Report. *Child Development*, 65, 5, 1478–1490.

Seligman L.D., Ollendick T.H., Langley A.K., Baldacci H.B. (2004). The utility of measures of child and adolescent anxiety: A meta-analytic review of the revised children's manifest anxiety scale, the state-trait anxiety inventory for children, and the child behavior checklist. *Journal of Clinical Child and Adolescent Psychology*, 33, 557-565.

Shamir-Essakow G., Ungerer J.A., Rapee RM. (2005). Attachment, Behavioral Inhibition, and anxiety in preschool children. *Journal of Abnormal Child Psychology*, 33, 131-143.

Sheskin DJ (2004) Handbook of parametric and nonparametric statistical procedures. 3rd ed. Boca Raton: Chapman & Hall /CRC.

Shiner R., Caspi A. (2003). Personality differences in childhood and adolescence: Measurement, development and consequences. *Journal of child Psychology and Psychiatry*, 44, 2-32.

Shoda Y., Mischel W., Peake P.K. (1990). Predicting adolescent cognitive and self-regulatory competencies from preschool delay of gratification: Identifying diagnostic conditions. *Developmental Psychology*, 26, 978-986.

Smith A.K., Rhee S.H., Friedman N.P., Robinson J.L., Corley R.P., Hewitt J.K. (2012). The magnitude of genetic and environment influences in parental and observational measures of Behavioral Inhibition in toddlerhood. *Behavior Genetics*, 42, 764-777.

Sourander A., Jensen P., Davies M., Niemelä S., Elonheimo H., Ristkari T., Helenius H., Sillanmaki L., Piha J., Kumpulainen K., Tamminen T., Moilanen I., Almqvist F. (2007). Who is at greatest risk for adverse long-term outcomes? The Finnish From a Boy to a Man study. *Journal of the American Academy of Child & Adolescent Psychiatry*, 46, 1148-1161.

Sourander A., Piha J. (1997). Parent, teacher, and clinical ratings on admission to child psychiatric inpatient treatment: A study of cross-informant correlations using the CBCL, Rutter scales and the CGAS. *Nordic Journal of Psychiatry*, 51, 365-370.

Steele H., Steele M. (2005). Understanding and resolving emotional conflict: The London parent-child project. In: Grossmann KE, Grossmann K, Waters E, editors. *Attachment from infancy to adulthood: The major longitudinal studies*. New York: Guilford Press.

Stevenson-Hinde J. & Glover A. (1996). Shy girls and boys: A new look. *Journal of Child Psychology and Psychiatry*, 37, 181–187.

Stevenson-Hinde J., Shouldice A. (1995). 4.5 to 7 Years: Fearful Behaviour, Fears and Worries. *Journal of Child Psychology and Psychiatry*, 36: 1027–1038.

Stewart S.L., Rubin K.H. (1995). The social problem solving skills of anxious-withdrawn children. *Development and Psychopathology*, 7, 323-336.

Svihra M., Katzman M. (2004). Behavioural Inhibition: A predictor of anxiety. *Paediatrics and Child Health*, 9, 8, 547-550.

Tarullo A.R., Mliner S., Gunnar M.R. (2011). Inhibition and exuberance in preschool classroom: Associations with peer social experiences and changes in cortisol across the preschool year. *Developmental Psychology*, doi: 10.1037/a0024093.

Thomas A. & Chess S. (1977). *Temperament and development*. New York: Brunner/Mazel.

Thomas A., Chess S., Birch H., Hertzig M., Korn S. (1963). *Behavioral individuality in*

Thorell L.B., Bohlin G., Rydell A.M. (2004). Two types of Inhibitory Control: Predictive relations to social functioning. *International Journal of Behavioral Development*, 28, 3, 193-203.

Van Ameringen M., Mancini C., Oakman J. (1998). The relationship of Behavioral Inhibition and shyness to anxiety disorders. *The Journal of Nervous & Mental Disease*, 186, 425-431.

Van Brakel A.M.L. (2007). Behavioural Inhibition as a risk factor for the development of childhood anxiety disorders. PhD dissertation: Maastricht, Netherlands.

Van Brakel A.M.L., Muris P., Bogels S.M., Thomassen C. (2006). A multifactorial model for the etiology of anxiety in a non-clinical adolescents: Main and interactive effects of Behavioral Inhibition, attachment, and parental rearing. *Journal of Child's and Family Studies*, 15, 569-579.

Van den Bergh B.R., Mulder E.J., Mennes M., Glover V. (2005). Antenatal maternal anxiety and stress and the neurobehavioral development of the fetus and child: Links and possible mechanisms. A review. *Neuroscience & Biobehavioral Reviews*, 29, 2, 237-258.

Van den Boom D.C. (1989). Neonatal irritability and the development of attachment. In *Temperament in childhood*. (pp. 299–318). Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=1990-97271-016&lang=ja&site=ehost-live

Volbrecht M.M., Goldsmith H.H. (2010). *Early temperamental and family predictors of shyness and anxiety*. Developmental Psychology, 46, 5, 1192-1205.

Wachs T.D. (1992). *The nature of nurture*. Newbury Park, CA: Sage.

Walker O.L., Degnan K.A., Fox N.A., Henderson H.A. (2013). Social problem solving in early childhood: Developmental change and the influence of shyness. *Journal of Applied Developmental Psychology*, 34, 185-193.

Watson D., Clark L. A. (1984). Negative affectivity: The disposition to experience negative aversive emotional states. *Psychological Bulletin*, 96, 465–490.

Weinberg M.K., Tronick E.Z., Cohn J.F., Olson K.L. (1999). Gender differences in emotional expressivity and self-regulation during early infancy. *Developmental Psychology*, 35, 175–188.

Weinstock M. (2005). The potential influence of maternal stress hormones on development and mental health of the offspring. *Brain, Behavior, and Immunity*, 19, 4, 296–308.

Wentzel K.R. (2003). Sociometric Status and Adjustment in Middle School: A Longitudinal Study. *The Journal of Early Adolescence, 23*, 5-28.

Werner E.A., Myers M.M., Fifer W.P., Cheng B., Fang Y., Allen R. and Monk C. (2007). Prenatal predictors of infant temperament. *Developmental Psychobiology*, 49, 5, 474-484.

White L.K., McDermott J.M., Degnan K.A., Henderson H.A., Fox N.A. (2011). Behavioral Inhibition and anxiety: the moderating roles of Inhibitory Control and attention shifting. *Journal of Abnormal Child Psychology*, 39, 735-747.
Wiley.

Williams L.R., Degnan K.A., Perez-Edgar K.E., Henderson H.A., Rubin K.H., Pine D.S., Steinberg L., Fox N.A. (2009). Impact of Behavioral Inhibition and parenting style on internalizing and externalizing problems from early childhood through adolescence. *Journal of Abnormal Child Psychology*, 37, 8, 1063-75.

Williams S.K., Kelly F.D. (2005). Relationships among involvement, attachment, and behavioral problems in adolescence: Examining father's influence. *Journal of Early Adolescence*, 25, 168–196.

Wittchen H.U., Stein M.B., Kessler R.C. (1999). Social fears and social phobia in a community sample of adolescents and young adults: Prevalence, risk factors and co-morbidity. *Psychological Medicine*, 29, 309-323.

Wood J., Mcleod B.D., Sigman M., Hwang W.C., Chu B.C. (2003). Parenting and Childhood anxiety: Theory, empirical findings, and future directions. *Journal of Child Psychology and Psychiatry*, 44, 134-151.

Zappulla C. (2008). Le diverse forme dell'isolamento sociale durante la prima infanzia: inibizione, timidezza e comportamenti solitari. Nucleo monotematico. *Età Evolutiva*, 89, 63-67.

Zentner M. & Bates J.E. (2008). Child temperament: An integrative review of concepts, research programs, and measures. *European Journal of Developmental Science*, 2, 1-2, 7-37.

Zhengyan W., Huichang C., Xinyin C. (2003). The stability of children's behavioral inhibition: A longitudinal study from two to four years of age. *Acta Psychology Sinica*, 35, 93–100.

APPENDIX

Penn State Worry Questionnaire (PSWQ)

(Meyer et al., 1990; Italian validation: Morani, Pricci, Sanavio, 2009)

Legga attentamente ogni affermazione e valuti quanto Lei è in accordo con essa, cerchiando il numero appropriato nello spazio apposito sotto a ciascuna affermazione. Non ci sono risposte giuste o sbagliate. Non si soffermi troppo su ogni affermazione: la prima risposta è spesso la più accurata.

1	2	3	4	5
Per nulla d'accordo		Abbastanza d'accordo		Completamente d'accordo

1. Anche se non ho tempo a sufficienza per svolgere tutte le mie attività, non mi preoccupo.
                        1   2   3   4   5

2. Le mie preoccupazioni mi invadono e non riesco a liberarmene.
                        1   2   3   4   5

3. Non tendo a preoccuparmi per le cose.
                        1   2   3   4   5

4. Molte situazioni sono fonte di preoccupazione per me.
                        1   2   3   4   5

5. Non posso fare a meno di preoccuparmi anche se so che non dovrei.
                        1   2   3   4   5

6. Ho notato che quando sono sotto pressione mi preoccupo molto.
                        1   2   3   4   5

7. Sono sempre preoccupato/a per qualcosa.
                        1   2   3   4   5

8. Riesco a liberarmi dalle preoccupazioni con facilità.
                        1   2   3   4   5

9. Appena finisco un compito, inizio a preoccuparmi per qualunque altra cosa devo fare.
                        1   2   3   4   5

10. E' raro che io mi preoccupi per qualcosa.
                        1   2   3   4   5

11. Quando non c'è altro che io possa fare riguardo ad un problema, allora smetto di preoccuparmi.
                        1   2   3   4   5

1	2	3	4	5
Per nulla d'accordo		Abbastanza d'accordo		Completamente d'accordo

12. Da sempre sono una persona che si preoccupa.

                                                       1   2   3   4   5

13. Sono così abituato/a a preoccuparmi che spesso non me ne rendo conto.

      1   2   3   4   5

14. Una volta che inizio a preoccuparmi, non posso fermarmi.

      1   2   3   4   5

15. Passo gran parte del mio tempo a preoccuparmi.

      1   2   3   4   5

16. Finché una cosa non è fatta continua ad essere al centro delle mie preoccupazioni.

      1   2   3   4   5

APPENDIX II

Behavioral Inhibition Questionnaire (BIQ) – *Parent version*

(Bishop, Spence, McDonald, 2003; Agostini et al., *in preparation*)

Le seguenti affermazioni descrivono il comportamento dei bambini in diverse situazioni. Ciascuna affermazione Le chiede di valutare se quel comportamento si verifica nel Suo bambino: quasi mai (1), non frequentemente (2), una volta ogni tanto (3), qualche volta (4), spesso (5), molto spesso (6), quasi sempre (7). La preghiamo di cerchiare il numero corrispondente. Cerchi di fornire una valutazione il più accurata possibile, basandosi su come pensa sia il Suo bambino confrontato ad altri che hanno circa la stessa età.

1	2	3	4	5	6	7
Quasi mai	Non frequente-mente	Una volta ogni tanto	Qualche volta	Spesso	Molto spesso	Quasi sempre

1. Si accosta a situazioni o attività nuove con molta esitazione.

       1   2   3   4   5   6   7

2. Si avvicina facilmente ad un gruppo di bambini che non conosce per unirsi ai loro giochi.

       1   2   3   4   5   6   7

3. E' molto silenzioso quando ci sono dei nuovi ospiti (adulti) per casa.

       1   2   3   4   5   6   7

4. E' cauto in attività che implicano una sfida di tipo fisico (es. arrampicarsi, saltare da una certa altezza…).

       1   2   3   4   5   6   7

5. Si ambienta facilmente quando ci troviamo a casa di persone che non conosciamo bene.

       1   2   3   4   5   6   7

6. Gli piace stare al centro dell'attenzione.

       1   2   3   4   5   6   7

7. Si sente a proprio agio nel chiedere ad altri bambini di giocare con lui.

       1   2   3   4   5   6   7

8. E' timido quando incontra per la prima volta altri bambini.

       1   2   3   4   5   6   7

9. Si separa facilmente dal/i genitore/i quando viene lasciato, per la prima volta, in situazioni nuove (es. scuola dell'infanzia, asilo, servizi ricreativi per l'infanzia…).

       1   2   3   4   5   6   7

1	2	3	4	5	6	7
Quasi mai	Non frequente-mente	Una volta ogni tanto	Qualche volta	Spesso	Molto spesso	Quasi sempre

10. Gli piace esibirsi di fronte ad altre persone (es. cantare, ballare…).

                  1   2   3   4   5   6   7

11. Si adatta facilmente a situazioni nuove (es. asilo, scuola dell'infanzia, servizi ricreativi per l'infanzia…).

                  1   2   3   4   5   6   7

12. E' riluttante nell'avvicinarsi ad un gruppo di bambini che non conosce per chiedere di unirsi a loro.

                  1   2   3   4   5   6   7

13. Si mostra sicuro di sé nelle attività che richiedono una sfida di tipo fisico (es. scalare, saltare da una certa altezza…).

                  1   2   3   4   5   6   7

14. E' indipendente.

                  1   2   3   4   5   6   7

15. Sembra a suo agio nelle situazioni nuove.

                  1   2   3   4   5   6   7

16. E' molto loquace con gli adulti che non conosce.

                  1   2   3   4   5   6   7

17. Appare esitante nell'esplorare nuovo materiale di gioco.

                  1   2   3   4   5   6   7

18. E' a disagio quando viene lasciato solo, per la prima volta, in situazioni nuove (es. scuola dell'infanzia, asilo, servizi ricreativi per l'infanzia…).

                  1   2   3   4   5   6   7

19. E' molto amichevole con i bambini che ha appena conosciuto.

                  1   2   3   4   5   6   7

20. Tende a guardare gli altri bambini, piuttosto che ad unirsi a loro nei giochi.

                  1   2   3   4   5   6   7

21. Non gli piace essere al centro dell'attenzione.

                  1   2   3   4   5   6   7

22. E' "appiccicoso" quando ci troviamo in casa di persone che non conosciamo molto bene.

                  1   2   3   4   5   6   7

23. Si accosta facilmente a situazioni o attività nuove.

                  1   2   3   4   5   6   7

24. E' estroverso.

                  1   2   3   4   5   6   7

1	2	3	4	5	6	7
Quasi mai	Non frequente-mente	Una volta ogni tanto	Qualche volta	Spesso	Molto spesso	Quasi sempre

25. Appare nervoso o a disagio nelle situazioni nuove.

    1   2   3   4   5   6   7

26. Chiacchera facilmente con gli ospiti (adulti) che non conosce, quando questi vengono a trovarci a casa.

    1   2   3   4   5   6   7

27. Sono necessari diversi giorni perché si adatti alle situazioni nuove (es. scuola dell'infanzia, asilo, servizi ricreativi per l'infanzia…).

    1   2   3   4   5   6   7

28. Si mostra riluttante ad esibirsi davanti ad altre persone (es. cantare, ballare…).

    1   2   3   4   5   6   7

29. Esplora facilmente un nuovo materiale di gioco.

    1   2   3   4   5   6   7

30. E' molto silenzioso con adulti che non conosce.

    1   2   3   4   5   6   7

Behavioral Inhibition Questionnaire (BIQ) – *Teacher version*

(Bishop, Spence, McDonald, 2003; Agostini et al., *in preparation*)

Le seguenti affermazioni descrivono il comportamento dei bambini in diverse situazioni. Ciascuna affermazione Le chiede di valutare se quel comportamento si verifica nel bambino: quasi mai (1), non frequentemente (2), una volta ogni tanto (3), qualche volta (4), spesso (5), molto spesso (6), quasi sempre (7). La preghiamo di cerchiare il numero corrispondente. Cerchi di fornire una valutazione il più accurata possibile, basandosi su come pensa sia il bambino confrontato ad altri che hanno circa la stessa età.

1	2	3	4	5	6	7
Quasi mai	Non frequente-mente	Una volta ogni tanto	Qualche volta	Spesso	Molto spesso	Quasi sempre

1. Si accosta a situazioni o attività nuove con molta esitazione.

<div align="center">1   2   3   4   5   6   7</div>

2. Si avvicina facilmente ad un gruppo di bambini che non conosce per unirsi ai loro giochi.

<div align="center">1   2   3   4   5   6   7</div>

3. E' molto silenzioso quando ci sono dei nuovi ospiti (adulti) a scuola o nei servizi per l'infanzia.

<div align="center">1   2   3   4   5   6   7</div>

4. E' cauto in attività che implicano una sfida di tipo fisico (es. arrampicarsi, saltare da una certa altezza…).

<div align="center">1   2   3   4   5   6   7</div>

5. Gli piace stare al centro dell'attenzione.

<div align="center">1   2   3   4   5   6   7</div>

6. Si sente a proprio agio nel chiedere ad altri bambini di giocare con lui.

<div align="center">1   2   3   4   5   6   7</div>

7. E' timido quando incontra per la prima volta altri bambini.

<div align="center">1   2   3   4   5   6   7</div>

1	2	3	4	5	6	7
Quasi mai	Non frequente-mente	Una volta ogni tanto	Qualche volta	Spesso	Molto spesso	Quasi sempre

8. Si separa facilmente dal/i genitore/i quando viene lasciato, per la prima volta, in situazioni nuove (es. scuola dell'infanzia, asilo, servizi ricreativi per l'infanzia…).

<div align="center">1   2   3   4   5   6   7</div>

9. Gli piace esibirsi di fronte ad altre persone (es. cantare, ballare…).

<div align="center">1   2   3   4   5   6   7</div>

10. Si adatta facilmente a situazioni nuove (es. asilo, scuola dell'infanzia, servizi ricreativi per l'infanzia…).

<div align="center">1   2   3   4   5   6   7</div>

11. E' riluttante nell'avvicinarsi ad un gruppo di bambini che non conosce per chiedere di unirsi a loro.

<div align="center">1   2   3   4   5   6   7</div>

12. Si mostra sicuro di sé nelle attività che richiedono una sfida di tipo fisico (es. scalare, saltare da una certa altezza…).

<div align="center">1   2   3   4   5   6   7</div>

13. E' indipendente.

<div align="center">1   2   3   4   5   6   7</div>

14. Sembra a suo agio nelle situazioni nuove.

<div align="center">1   2   3   4   5   6   7</div>

15. E' molto loquace con gli adulti che non conosce.

<div align="center">1   2   3   4   5   6   7</div>

16. Appare esitante nell'esplorare nuovo materiale di gioco.

<div align="center">1   2   3   4   5   6   7</div>

17. E' a disagio quando viene lasciato solo, per la prima volta, in situazioni nuove (es. scuola dell'infanzia, asilo, servizi ricreativi per l'infanzia…).

<div align="center">1   2   3   4   5   6   7</div>

18. E' molto amichevole con i bambini che ha appena conosciuto.

<div align="center">1   2   3   4   5   6   7</div>

19. Tende a guardare gli altri bambini, piuttosto che ad unirsi a loro nei giochi.

<div align="center">1   2   3   4   5   6   7</div>

1	2	3	4	5	6	7
Quasi mai	Non frequente-mente	Una volta ogni tanto	Qualche volta	Spesso	Molto spesso	Quasi sempre

20.   Non gli piace essere al centro dell'attenzione.

<div align="center">1   2   3   4   5   6   7</div>

21.   Si accosta facilmente a situazioni o attività nuove.

<div align="center">1   2   3   4   5   6   7</div>

22.   E' estroverso.

<div align="center">1   2   3   4   5   6   7</div>

23.   Appare nervoso o a disagio nelle situazioni nuove.

<div align="center">1   2   3   4   5   6   7</div>

24.   Chiacchera facilmente con gli ospiti (adulti) che non conosce, quando questi vengono a scuola, all'asilo o al servizio ricreativo per l'infanzia.

<div align="center">1   2   3   4   5   6   7</div>

25.   Sono necessari diversi giorni perché si adatti alle situazioni nuove (es. scuola dell'infanzia, asilo, servizi ricreativi per l'infanzia…).

<div align="center">1   2   3   4   5   6   7</div>

26.   Si mostra riluttante ad esibirsi davanti ad altre persone (es. cantare, ballare…).

<div align="center">1   2   3   4   5   6   7</div>

27.   Esplora con gioia un nuovo materiale di gioco.

<div align="center">1   2   3   4   5   6   7</div>

28.   E' molto silenzioso con adulti che non conosce.

<div align="center">1   2   3   4   5   6   7</div>

Child Behavior Checklist 1.5/5 (CBCL 1.5/5) – *Teacher version*

(Achenbach & Rescorla, 2000; Frigerio et al., 2004)

Questo questionario deve riflettere la Sua percezione del comportamento del bambino anche se altre persone potrebbero non condividere la Sua opinione. Si senta libero di esprimere commenti aggiuntivi accanto ad ogni voce e nello spazio previsto.

Di seguito è riportato un elenco di affermazioni che descrivono i bambini. Per ogni voce che descrive il bambino, allo stato attuale o negli ultimi due mesi, si prega di mettere una crocetta: sullo zero 0) se l'affermazione non è vera; sull'uno 1) se l'affermazione è in parte o qualche volta vera; sul due 2) se l'affermazione è molto vera o per lo più vera. Si prega di rispondere a tutte le affermazioni nel miglior modo possibile, anche se alcune non sembrano essere applicabili a questo bambino.

0 = Non vero   1 = In parte o qualche volta vero   2 = Molto vero o spesso vero

1.	Ha dolori (senza una causa medica)	0	1	2
2.	Si comporta come una bambino più piccolo	0	1	2
3.	Ha paura a provare cose nuove	0	1	2
4.	Evita di guardare gli altri negli occhi	0	1	2
5.	Non riesce a concentrarsi, non presta attenzione a lungo	0	1	2
6.	Non riesce a stare fermo, seduto; è irrequieto, iperattivo	0	1	2
7.	Non sopporta di avere cose fuori posto	0	1	2
8.	Non sopporta di aspettare, vuole tutto subito	0	1	2
9.	Mastica cose non commestibili	0	1	2
10.	E' attaccato agli adulti o è troppo dipendente	0	1	2
11.	Cerca costantemente aiuto	0	1	2
12.	Apatico o non motivato	0	1	2
13.	Piange molto	0	1	2
14.	E' crudele verso gli animali	0	1	2
15.	E' insolente	0	1	2

0 = Non vero   1 = In parte o qualche volta vero   2 = Molto vero o spesso vero

16.	Le sue richieste devono essere soddisfatte immediatamente	0	1	2
17.	Distrugge le sue cose	0	1	2
18.	Distrugge cose che appartengono alla sua famiglia o ad altri bambini	0	1	2
19.	Sogna ad occhi aperti o si perde nei suoi pensieri	0	1	2
20.	E' disobbediente	0	1	2
21.	E' disturbato da qualsiasi cambiamento nella routine quotidiana	0	1	2
22.	E' crudele, prepotente o malvagio verso gli altri	0	1	2
23.	Non risponde quando le persone gli parlano	0	1	2
24.	Ha difficoltà nel seguire le direttive	0	1	2
25.	Non va d'accordo con gli altri bambini	0	1	2
26.	Non sa come divertirsi, si comporta come un piccolo adulto	0	1	2
27.	Non sembra sentirsi in colpa dopo essersi comportato male	0	1	2
28.	Disturba gli altri bambini	0	1	2
29.	E' facilmente frustrato	0	1	2
30.	Si ingelosisce facilmente	0	1	2
31.	Mangia o beve cose che non sono cibo – non includere dolci (descrivere_____)	0	1	2
32.	Ha paura di certi animali, situazioni o luoghi al di fuori della scuola (descrivere_____)	0	1	2
33.	E' facile ferire i suoi sentimenti	0	1	2
34.	Si fa spesso male, è soggetto ad incidenti	0	1	2
35.	Litiga spesso	0	1	2
36.	Si butta in ogni cosa	0	1	2
37.	E' troppo turbato quando è separato dai genitori	0	1	2
38.	Ha un comportamento esplosivo e imprevedibile	0	1	2
39.	Ha mal di testa senza causa medica	0	1	2
40.	Picchia gli altri	0	1	2
41.	Trattiene il respiro	0	1	2
42.	Fa male a persone o animali senza volerlo	0	1	2
43.	Appare triste senza una buona ragione	0	1	2
44.	E' di cattivo umore	0	1	2

0 = Non vero   1 = In parte o qualche volta vero   2 = Molto vero o spesso vero

45.	Ha nausea, si sente male (senza causa medica)	0	1	2
46.	Ha movimenti nervosi, tics (descrivere_____)	0	1	2
47.	E' nervoso, troppo sensibile o teso	0	1	2
48.	Non porta a termine i compiti assegnati	0	1	2
49.	Ha paura della scuola	0	1	2
50.	E' troppo stanco	0	1	2
51.	E' agitato	0	1	2
52.	Viene preso in giro dagli altri bambini	0	1	2
53.	Attacca fisicamente le persone	0	1	2
54.	Si mette le dita nel naso, si stuzzica la pelle o altri parti del corpo (descrivere_____)	0	1	2
55.	Si tocca troppo i genitali	0	1	2
56.	E' goffo, poco coordinato	0	1	2
57.	Ha problemi agli occhi senza causa medica (descrivere_____)	0	1	2
58.	Le punizioni non cambiano il suo comportamento	0	1	2
59.	Passa rapidamente da un'attività all'altra	0	1	2
60.	Presenta eruzioni cutanee o altri problemi della pelle (descrivere_____)	0	1	2
61.	Si rifiuta di mangiare	0	1	2
62.	Si rifiuta di fare giochi attivi	0	1	2
63.	Dondola la testa e il corpo in avanti e indietro ripetutamente	0	1	2
64.	Non attento, si distrae facilmente	0	1	2
65.	E' bugiardo o imbroglione	0	1	2
66.	Strilla, urla molto	0	1	2
67.	Appare insensibile all'affetto	0	1	2
68.	E' ipersensibile o si imbarazza facilmente	0	1	2
69.	E' egoista, non vuole condividere nulla	0	1	2
70.	Mostra scarso affetto nei confronti delle persone	0	1	2
71.	Mostra poco interesse per le cose intorno a lui	0	1	2
72.	Non teme di farsi del male	0	1	2
73.	E' troppo riservato o timido	0	1	2
74.	Non piace agli altri bambini	0	1	2
75.	E' troppo attivo	0	1	2
76.	Ha problemi di linguaggio (descrivere_____)	0	1	2

0 = Non vero   1 = In parte o qualche volta vero   2 = Molto vero o spesso vero

77.	Guarda fisso nel vuoto o appare estraniato	0	1	2
78.	Ha mal di stomaco o crampi (senza causa medica)	0	1	2
79.	Si adatta eccessivamente alle regole	0	1	2
80.	Presenta strani comportamenti (descrivere_____)	0	1	2
81.	E' testardo, irritabile	0	1	2
82.	Ha improvvisi cambiamenti di umore o di stati d'animo	0	1	2
83.	Tiene spesso il broncio	0	1	2
84.	Parla o piange nel sonno	0	1	2
85.	Ha accessi di collera	0	1	2
86.	Si preoccupa troppo dell'ordine o della pulizia	0	1	2
87.	E' troppo pauroso o ansioso	0	1	2
88.	Non è collaborante	0	1	2
89.	Non attivo, lento, senza energie	0	1	2
90.	E' infelice, triste, depresso	0	1	2
91.	E' particolarmente rumoroso	0	1	2
92.	E' turbato da persone o situazioni nuove	0	1	2
93.	Vomita, ha conati (senza causa medica)	0	1	2
94.	E' sporco nell'aspetto	0	1	2
95.	Si allontana	0	1	2
96.	Vuole molta attenzione	0	1	2
97.	Piagnucola	0	1	2
98.	Sta isolato, non si coinvolge con gli altri	0	1	2
99.	E' preoccupato	0	1	2

100. Scriva qui di seguito qualsiasi altro problema che il bambino presenta e che non è stato elencato prima:

_____ 0   1   2

_____ 0   1   2

_____0   1   2

Il bambino è affetto da qualche malattia o disabilità (sia fisica che mentale)?   Sì   NO

Prego descrivere:

_____

_____

_____

Cosa vi preoccupa di più di questo bambino?

_____

_____

_____

_____

_____

Descrivete gli aspetti migliori di questo bambino.

_____

_____

_____

_____

_____

_____