The Consistency and Concomitants of Inhibition:

Some of the Children, All of the Time

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Abstract

Toddlers displaying extremely inhibited behavior may be at risk for becoming socially withdrawn. However, behavioral inhibition may be a multifaceted characteristic and its concurrent relation to toddler wariness with peers has not been examined. In this study, 108 toddlers (54 females) and their mothers were observed in novel situations involving unfamiliar settings, adults, and peers. Vagal tone, temperament, separation-reunion behavior, and maternal oversolicitousness also were assessed. There was little consistency of inhibited behavior across the three situations. Consistently inhibited toddlers had fearful temperaments, showed distress following maternal separation, and had mothers who were warm and controlling but unresponsive to children’s cues during interaction. Toddlers with highly fearful temperaments and highly oversolicitous mothers were the most inhibited across contexts.
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In their efforts to identify the aetiology of children's personalities and social behaviors, developmentalists have attempted to determine the relevant dispositional dimensions of temperament that may underlie children's actions that are displayed consistently across situations, and continuously over time (Hinde, 1989). One such dispositional construct is **behavioral inhibition**. Behavioral inhibition has been defined variously as (a) an inborn bias to respond to unfamiliar events by showing anxiety (Kagan, 1989); (b) a specific vulnerability to the uncertainty all children feel when encountering unfamiliar events that cannot be assimilated easily (Reznick, Gibbons, Johnson, & McDonough, 1989); and (c) one end of a continuum of possible initial behavioral reactions to unfamiliar objects or challenging social situations (Kochanska, 1991; Stevenson-Hinde, 1989). These definitions highlight some common elements: **Behavioral inhibition** is (a) a pattern of responding or behaving, (b) possibly biologically determined, such that (c) when unfamiliar and/or challenging situations are encountered, (d) the child shows signs of anxiety, distress or disorganization.

The "standard" paradigm for assessing behavioral inhibition usually is not applied before about two years of age. The technique involves introducing a toddler and her or his mother to an unfamiliar room containing novel toys. Thereafter, an unfamiliar adult woman enters the room and encourages the child to interact with her. Behavioral inhibition is reflected in the toddler's latency to speak to the stranger, latency to approach the stranger or unfamiliar objects, and time spent proximal to the mother and/or physical distance from the mother (Kagan, 1989; Stifter, Fox, & Porges, 1989). Some researchers have included other variables, such as latency to separate from the mother, and frequency of retreating back to the mother (Reznick, et al, 1989).

A body of evidence has emerged indicating that extremely inhibited two- and three-year olds are likely to be characterized as **inhibited with peers** in later childhood (e.g., Kagan, 1989; Kagan, Reznick, & Snidman, 1987, 1989; Kochanska & Radke-Yarrow, 1992; Reznick et al., 1985). This represents a finding of some significance given recent reports that inhibition with peers is associated with indices of internalizing problems in early childhood (e.g., Rubin, Coplan, Fox, & Calkins, 1995). However, concern may be directed towards this research, vis-à-vis, at least one conceptual issue. That is, typically, the assessment of behavioral inhibition at two years of age combines
behaviors when the child and his or her mother are alone in an unfamiliar setting with behaviors in unfamiliar episodes with an adult stranger present (Kochanska, 1991). It seems reasonable to suspect that a wary, fearful response to a novel environment comprised solely of objects (in the company of the mother) is quite different from a wary, fearful response to an adult stranger. And, to the extent that inhibition to unfamiliar settings or objects and to unfamiliar people may represent different phenomena, researchers currently exploring the relations between early inhibition and later difficulties with peers may be undermining the predictive strength of their data bases by conflating similar, but distinct, systems of behavior.

Concern for this issue motivated the program of research reported herein. There is little evidence that, at any given age, indices of behavioral inhibition are consistent across situations. Moreover, the relevant research extant suggests that there may be different forms of inhibition in toddlerhood (e.g., Kochanska, 1991), and not all are equally effective for predicting different forms of inhibition or social withdrawal during peer interactions in the preschool years and beyond (Kochanska & Radke-Yarrow, 1992).

In her recent research, Kochanska (1991; Kochanska & Radke-Yarrow, 1992) has argued that the standard method for examining the behavioral inhibition of two- to three-year olds begins with an essentially non-social context, in which children's inhibition to a novel environment and novel objects is revealed. Assessment continues in a social context, during which the children are confronted with unfamiliar adults. Factor analysis has indicated that identical indices of inhibition (e.g., contact with mother; latency to approach novel objects/adults) in the non-social and adult-social contexts do not represent a unitary construct (Kochanska, 1991). As well, the separate inhibition scores for the two settings were correlated only for a subsample of children whose mothers were diagnosed with unipolar depression; consistency across situations was not evidenced for toddlers of non-depressed or bipolar depressed mothers. When these children were observed again at five years of age in a play setting with an unfamiliar peer and their mothers, toddlers' adult-social inhibition significantly correlated with measures of passivity, social withdrawal, negative affect, and a lack of affective play (pretend emotions) (Kochanska & Radke-Yarrow, 1992), while the young children who had shown more non-social inhibition as toddlers spent less time engaged in play with the unfamiliar peer. Whether this latter group of children engaged in solitary activity that was constructive and adaptive (Coplan, Rubin, Fox, Calkins, & Stewart, 1994; Rubin et al., 1995) is not known.
This research suggests that there may be different forms and functions of inhibited behavior in toddlerhood, each reflecting the action of different behavioral systems (Hinde, 1989; Stevenson-Hinde, 1989). As each system may produce what appears as the same behavior, toddlers who experience high levels of all forms of inhibition may appear to behave consistently across contexts; this was the case for the children of unipolar depressed mothers in Kochanska’s (1991) study. However, if different factors contribute to the strength of these systems, it would be possible for a toddler to be, for example, highly wary of adult strangers but not inhibited in non-social contexts.

As noted above, in Kochanska and Radke-Yarrow’s (1992) study, both adult-social and non-social inhibition were predictive of subsequent peer-social inhibition and the lack of interactive behavior, respectively. And as we have noted, it is unclear whether either type of inhibition could be assumed to reflect social wariness and anxiety or a voluntary, non-anxiety based preference for not interacting with others. It is difficult to conclude from their research, therefore, that there is a single "social inhibition behavioral system" that operates separately from a "non-social inhibition behavioral system". Indeed, it may be that toddlers' behavioral inhibition, as it is traditionally measured (combining non-social and adult-social contexts), might be the most effective procedure for predicting all of the behavioral manifestations of young children's inhibition in the peer-social context. Nevertheless, as Kochanska and Radke-Yarrow did not examine the predictive strength of a single index of toddler inhibition, this possibility remains to be addressed.

It is important to note that some researchers have proposed that inhibition is a behavioral construct best examined at its extremes. For example, Kagan and his colleagues (Arcus & Kagan, 1995; Kagan, 1989; Kagan et al., 1987) have proposed that from 10-to-20 percent of all toddlers are extremely inhibited, and a like number are extremely uninhibited. Purportedly, temperamental extremes mark these children as qualitatively different than, and as distinguishable from, "average" or "less extreme" toddlers, just as extreme groups of adults (e.g., clinically depressed adults) likely are, in some ways, qualitatively distinct from less extreme adults. Kagan's own research shows that examining all children obscures any longitudinal continuity in inhibition; it is only by identifying and tracking the development of the extreme groups that significant cross-temporal correlations are found. To this end, proponents of the extreme group method of classifying children might support the argument that highly inhibited children would demonstrate this characteristic across situations and over time. Thus, the lack of situational consistency found by Kochanska (1991) for all but the most inhibited toddlers (children of mothers with unipolar...
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depression) likely could be viewed as supporting this latter contention. However, Kochanska’s report of non-significant correlations between the two contexts (non-social and adult-social) for the group of children who were the least inhibited (children of bipolar depressed mothers) would not support the aforementioned conceptualization of inhibition.

In actuality, there are indications from the work of Kagan and colleagues that the extreme group approach results in less than perfect short-term stability even when contexts are held constant (Garcia Coll, Kagan, & Reznick, 1984). When 21-month-old toddlers were assessed in two identical laboratory visits spaced one month apart, one-third of the children who showed extreme levels of adult-social inhibition in the first visit failed to do so in the second. No indication was given that there were variables distinguishing the toddlers who displayed consistent behavioral inhibition from those who were inconsistent. Twenty extremely inhibited and 20 extremely uninhibited toddlers assessed originally at 21 months were observed again at age 31 months. Twenty-one of these 40 toddlers were seen both at home, with an adult stranger present, and in a laboratory setting with a same-age, same-sex, opposite-extreme of inhibition toddler (Garcia Coll et al., 1984). The inhibition scores for these two contexts were non-significantly correlated.

Given the state of current research findings, in the present investigation we had several purposes. First, we examined whether behavioral inhibition, during the toddler period, is a unitary construct that is displayed consistently in novel situations (non-social), during interactions with unfamiliar adults (adult-social), and during interactions with unfamiliar peers (peer-social). A second purpose was to investigate whether the temperamental, physiological, or socialization concomitants were similar across the various forms of behavioral inhibition. Ostensibly, if behavioral inhibition was a unitary construct, the correlates of the various forms of the phenomenon would be similar, if not identical.

With respect to our first aim, several factors were considered. Kochanska's (1991; Kochanska & Radke-Yarrow, 1992) research already has demonstrated that a degree of inconsistency exists within the standard toddler paradigm. Thus, in this investigation, we sought to replicate Kochanska's finding, and to examine the relations between non-social, adult-social, and “traditionally-assessed” inhibition and toddlers' concurrent behavior with a same-age, same-sex peer. If a single inhibitory system or temperamental trait was driving the longitudinal correlations between early “traditionally-assessed” and later peer-social inhibition described by Kagan and his
associates (or between early adult-social and later peer-social inhibition, as argued by Kochanska and Radke-Yarrow), then there also should be a contemporaneous relation between “traditionally-assessed” toddler inhibition (or adult-social) and peer-social inhibition. If different behavior systems underlie displays of inhibition in these contexts, situational consistency should be low- to non-significant.

Several factors have been linked to the development of toddlers' behavioral inhibition as it is measured by researchers using the standard paradigm. Four of these were examined as possible concomitants of inhibition: (a) The physiological capacity to regulate emotional arousal; (b) temperamental qualities that may predispose toddlers to, or protect toddlers from, reacting to novel situations or people by displaying inhibition; (c) toddlers' reactions to brief separations and reunions with their parents, commonly used as an index of the quality of the relationship between a mother and child; and (d) parenting practices that may reinforce, or discourage, toddlers' continued displays of inhibition.

Such researchers as Fox and Calkins (1993), and Kagan and his colleagues (e.g., Kagan, Snidman, & Arcus, 1993), have suggested that some infants are born with a set of physiological characteristics that cause them to be wary in the face of novelty. One such factor that has been examined extensively is vagal tone, representing the variability in heart rate associated with the respiratory cycle. Vagal tone is thought to be a measure of the functional status, or efficiency, of the nervous system (Porges & Byrne, 1992), marking both general reactivity and the ability to regulate one's level of arousal. Several investigators have found reliable links between vagal tone and inhibition: Children with lower vagal tone (consistently high heart rate due to less parasympathetic influence) tend to be more behaviorally inhibited (Garcia Coll et al., 1984; Kagan, Reznick, Clarke, Snidman, & Garcia Coll, 1984) and less able to self-regulate (Fox, 1989; Porges, 1991). Clearly, low vagal tone is associated with a range of behaviors that usually are considered markers of behavioral inhibition. Moreover, researchers have found reliable associations between vagal tone and both non-social and adult-social forms of inhibition in 14- and 21-month-old infants (Fox, 1989; Garcia Coll et al., 1984), and between vagal tone and peer-social inhibition in three- and four-year-old children (Fox & Field, 1989). These data suggest the possibility that behavioral inhibition is a unitary construct, despite the aforementioned evidence to the contrary. Nevertheless, others might contend that separate behavioral systems could share physiological processes in their functioning, just as they share observable, behavioral qualities (e.g., Hinde, 1989). It seems logical to assume that an inability to regulate one's level of emotional arousal would
not be conducive to competent functioning in many contexts. It is unknown whether vagal tone, as a measure of dysregulation, is associated with inhibition as it is assessed across contexts.

It makes conceptual sense that inhibition may be linked with other aspects of children's temperament, as well as with their relationships with their parents, and their parents' socialization techniques. For example, in previous work (e.g., Rubin, Booth, Rose-Krasnor, & Mills, 1994), we have described how different forms of social incompetence could arise from early vulnerabilities due to differences in temperament. It would seem that having a low approach-high avoidance motivation (or high fearfulness) might make a dispositionally dysregulated infant likely to react with wariness in novel situations (Garcia Coll et al., 1984; Porges, 1994), as might such temperamental characteristics as negativity of affect (Garcia Coll et al., 1984), low activity level, and high distractibility (Fox & Field, 1989). Thus, in the present investigation, these aspects of children's temperament were considered, in order to examine how they were associated with the display of inhibition across contexts.

Additionally, researchers have suggested that behaviorally inhibited children (or infants who are "at risk" for becoming inhibited) have difficulty dealing with short separations from, and subsequent reunions with, their mothers (Fox & Calkins, 1993). These reactions have been interpreted, by some, as reflecting dispositionally-based wariness to the unfamiliar (e.g., Fox & Calkins, 1993; Izard et al., 1991; Kagan, 1989), and by others as representing the behavioral demonstration of an insecure attachment relationship (e.g., Bretherton, 1985). Children with these "resistant" attachment patterns may carry a general distrust or wariness of others into other relationship situations, such as with their peers (Rubin, Hymel, Mills, & Rose-Krasnor, 1991; Sroufe & Fleeson, 1988). We examined whether difficulties with separations and reunions were associated with independent markers of (a) toddler disposition or temperament (vagal tone, temperament), and (b) the forms of inhibition displayed in different contexts.

Finally, mothers' styles of behaving while interacting with their children were considered. Certain parenting practices might make physiologically and/or temperamentally vulnerable children more or less likely to become anxious or wary in the peer group (Rubin, Stewart, & Coplan, 1995), as has been posited by researchers as an explanation for finding developmental discontinuities in children's inhibition (e.g., Calkins, 1994; Kagan, 1989). In particular, parents who are, in a sense, "overprotective" or “oversolicitous” may contribute to the stability of inhibition. By being highly affectionate and shielding of their children, when it is neither appropriate nor sensitive...
to do so, parents may take control of situations in which they expect that their children might feel anxious. In controlling what their children are exposed to and how such situations are handled, these parents may prevent their children from engaging in necessary, self-initiated coping techniques. Lacking practice in behavioral self-regulation, children who are poor physiological self-regulators may not learn to overcome their dispositional vulnerabilities.

Few examinations of behavioral inhibition have examined the role of parents' socialization practices, but there are indications of their importance. In an unpublished report, Arcus and Kagan (1995) observed the behaviors of mothers for several months after their four-month-old infants were identified as "highly reactive". When mothers responded to their infants' distress with physical affection but did not interfere, instruct or reprimand when the distress accompanied inappropriate behavior, greater fear of strangers and novel events was evident when the infants were 14 months of age. Examinations of the interactions between socially withdrawn preschoolers and their mothers do suggest that they share overly involved relationships (Hinde, Tamplin, & Barrett, 1993), although results are mixed as to the affective tone of their interactions (LaFreniere & Dumas, 1993). The weight of the arguments, however, suggest that parent characteristics reflecting an oversolicitous or "smothering", or warm and involved but insensitive parenting style may be expected to accompany at least some forms of children's inhibition.

In summary, in this study we examined the associations between the two possible kinds of behavioral inhibition examined in the "standard" toddler inhibition paradigm and toddlers' inhibition with their peers. We expected that a relatively small proportion of toddlers would display extreme inhibition consistently across contexts. As well, several factors that were expected to be concomitants of consistently-displayed extreme inhibition were considered. Specifically, toddlers who evidenced such consistency were expected to have (a) lower vagal tone, (b) greater temperamental fearfulness, and possibly more negative affect, lower activity levels, and greater distractibility, (c) more anxious and prolonged reactions to separations from and reunions with their mothers, and (d) mothers who displayed more physical affection and controlling behavior, but were not as sensitive to their children’s requests for maternal attention than either uninhibited toddlers or toddlers who displayed inconsistent inhibition.

Method

Participants
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One hundred and eight toddlers (54 females) and their mothers took part in this investigation. Potential participants were identified by newspaper birth announcements, and recruited through telephone solicitation. Of the two-parent families contacted, 75 percent agreed to take part in this investigation. All lived in and around the cities of Kitchener and Waterloo, a population center of approximately 250,000 in southern Ontario.

Ninety-seven percent of the participants were Caucasian; 96 percent of the couples were married. Mothers were, on average, 31.05 years old (SD = 4.12; range 23 to 41); the mean age of fathers was 32.49 years (SD = 3.91; range 24 to 43). On average, both mothers and fathers had some college education. The mean score of families on the Hollingshead Social Status Index (Hollingshead & Redlich, 1958) was 46.47 (SD = 10.80, range = 18 to 66).

Mothers and toddlers visited the laboratory on two occasions. The first visit took place within three months of each toddler's second birthday (M age = 24.99 months, SD = 1.08). One hundred four (52 females) of the participants returned for a second visit. Second visits were scheduled within 12 weeks of the first session.

Procedures

First session. For each dyad, the first visit began with the measurement of the toddler's vagal tone, using a UFI iso/Fetrode signal amplifier connected to a Delta-Biometrics Vagal Tone Monitor-II (VTM; Porges, 1985). The VTM took measures of the toddler's vagal tone every ten seconds. Toddlers sat on their mothers’ laps, and had three EKG electrodes placed on their chests. The children then watched a brief videotape of a low-action cartoon. In order to examine toddlers’ reactions to unfamiliar social stimuli, when the videotape was finished, a male stranger entered the room and stared at the toddler without speaking for 60 seconds, then left the room. No vagal tone data were collected for three children who became too upset to complete this procedure; an additional seven children moved constantly in the stranger’s presence, thereby rendering invalid their vagal tone data for this component.

Then, each toddler-mother dyad experienced an adapted version of the Behavioral Inhibition Paradigm (e.g., Garcia Coll et al., 1984; Kochanska, 1991); components included in this investigation are described herein. Each dyad entered an unfamiliar room containing one large and one small chair, and a low table. The child was allowed to play with an assortment of attractive toys for 10 minutes while the mother sat in the large chair and filled out a questionnaire (free play 1). Then, an experimenter, whom the child had already met, entered with a basket, asked the child to tidy up the toys, and left (clean-up); afterwards, the experimenter removed the toys. An unfamiliar woman entered the room with a toy dump truck and some blocks. She sat quietly for one minute, played
with the truck for one minute, then (if the toddler had not yet approached), encouraged the child to join her in play. After this third minute, she left, returning with a toy robot that moved, made noises, and emitted smoke. The experimenter did not say anything for the 30 seconds, then invited the child to play with the robot for one minute. In her third visit to the room, she brought an inflatable tunnel that she encouraged the child to crawl through. After she left, a third woman dressed as a clown, entered the room. The clown was silent for 30 seconds, then invited the child to approach for one minute, then removed enough of her disguise for the child to realize this was another experimenter whom he or she had been met before. The mother and child were allowed another free-play period, for three minutes (free play 2). Following this was a separation-stranger-reunion sequence (e.g., Booth, Rose-Krasnor, Rubin, & McKinnon, 1994), lasting up to three minutes. After a third and final free play session lasting six minutes (free play 3), the mother and child were brought a snack.

Identifying children for Session Two pairings. Two toddler-mother dyads participated in the second visit to the laboratory. Same-sex toddlers were paired based on their inhibition-related behavior in the first visit. "Wary" toddlers were identified as those who did not approach the truck, robot, or tunnel. "Average" toddlers were identified as those who approached one or two of these three objects. "Not wary" toddlers were identified as those who approached all three. Each toddler was paired with an "average" toddler for the second session, such that pairings were comprised of wary-average, average-average or not wary-average children.

Session two. A large unfamiliar room was used for the second visit. This room was divided in half by a large, two-sided bookcase; the bookcase extended across two-thirds of the width of the room. The first mother-child dyad was brought into the room and led to the far side of the bookshelf, where there were six toys and a large and a small chair; the mother was asked to sit in the large chair. Then, the second dyad was brought to the near side of the shelves, where there were six similar but not identical toys and two chairs; again, the mother was asked to sit in the large chair. Two closed circuit TV cameras with a split-screen monitor filmed the dyads. Data observed in the following components were used in this investigation. The first episode lasted for 10 minutes: The toddlers were allowed to play with the toys and wander freely, but their mothers were asked to remain seated. Then, two experimenters entered the room, moved the barrier against one wall, and placed all of the toys in the middle of the room. This was followed by 25 minutes of free play (Episode 2); mothers were asked to remain seated for the first five minutes of this period, then were free to move about the room. Following Episode 2, a low table was brought
into the room, onto which was placed juice and cookies for the toddlers, and juice/coffee/tea for the mothers (Snack-Time). The table was placed against the wall opposite the toy shelves. The two large chairs were placed at either end of the table, and the two small chairs were placed beside each other, facing the wall. Participants were told that it was “snack-time”, but mothers were not instructed to keep their children seated at the table. Snack time continued for 15 minutes.

Inhibition Coding

Session 1. The amount of time each toddler spent in physical contact with his or her mother in the first and second free play episodes was recorded and used as the measure of non-social inhibition. The child's adult-social inhibition was based on their maintenance of contact with mother in the truck, robot, and tunnel episodes, the child's latency to approach the stranger and/or touch the truck, and robot, and latency to pass through the tunnel (all of which required approaching, to within touching distance, the stranger). It is important to note that virtually no children spontaneously went near the clown both prior to, and following an invitation to approach. Because of a lack of variability of response, the clown episode was dropped from further analysis.

Four data points were obtained for the truck episode; during the first minute, the duration of contact with the mother and latency to spontaneously approach the unfamiliar adult was recorded. During the third minute, the duration of contact with the mother and latency to approach the unfamiliar adult was recorded after an invitation to approach was given (for children who approached the stranger spontaneously in the first minute, third minute latency was scored as zero). Two data points were obtained for each of the subsequent robot and tunnel episodes -- (a) duration of maternal contact following an invitation to play with the robot or crawl through the tunnel, and (b) latency to touch the robot or crawl through the tunnel was also measured. These scores were standardized via Z-transformations, and then aggregated.

Reliability was computed for ten percent of the sample using percent agreement given that all measures were based on recordings of time. The average inter-coder reliability for the inhibition behaviors was 89.8 %, ranging from 80 % (contact with mother in first free play) to 100 % (contact with mother and latency for tunnel episode).

Session 2. The Toddler Play Observation Scale (Rubin & Stewart, 1994) was used to code the Session 2 interactions. This involved 10-second time sample observations of the particular play forms (unoccupied, solitary,
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onlooking, and parallel behaviors; imitative play; conversations with peers; rough and tumble play; and interactions with adults), affect, and proximity to and contact with the playmate and mother as displayed by each toddler. As well, the frequencies of anxious and aggressive behaviors were recorded. For this investigation, the following data points were obtained from each of the first two episodes: toddler's maintenance of contact with his or her own mother; time spent engaged in unoccupied behavior (inactive and unfocused, not including time spent actively watching the other peer); and frequency of anxious behaviors (e.g., finger pulling, thumb sucking, and hair twisting). These were normalized via $Z$-transformations and aggregated to form an index of peer-social inhibition. The coders for Session 2 were not involved in the coding of Session 1, and were blind to the group categorizations (wary/average/not wary) of the toddlers they observed. Reliability was computed for ten percent of the sample using kappa coefficients for the time-sampled data and percent agreement for the frequency counts of anxious behavior. Kappa coefficients for play behaviors (including unoccupied behavior) and the contact variables were .92 and .99 respectively; percent agreement for the presence/absence of anxious behaviors was 82 percent.

Vagal Tone

For each toddler, a file of sequential heart periods was transferred from the VTM to a personal computer. MXEDIT software (Delta-Biometrics, Inc.) was used to visually display the heart period data, edit outliers caused by toddler movement, and calculate mean heart period and vagal tone (measured within each 10 sec. epoch of recording). Mean toddler vagal tone in the cartoon and stranger components were highly stable ($r = .76, p<.001$; paired $t (96) = -.61, ns$). Therefore, a single index of vagal tone was created by weighting each mean by its total recording period and then aggregating the two proportionalized means.

Temperament

Included in one of the questionnaires completed by mothers was the Toddler Behavior Assessment Questionnaire (Goldsmith, 1988), used to provide measures of five temperamental dimensions: Activity Level, Social Fearfulness, Anger Proneness, Pleasure Expression, and Interest/Persistence. The TBAQ comprises several seven-point Likert-style scales, anchored with the terms Never and Always, each asking how often, during the last month, a child has engaged in a particular behavior. Researchers have consistently reported Cronbach $\alpha$ scores for the five dimensions in the .80s (Goldsmith & Campos, 1990). In this sample, the Cronbach $\alpha$ for Social fearfulness was .80 ($\alpha$s for activity level = .68; Pleasantness = .70; Interest Level = .82; and Anger Proneness = .85). As well,
scores on the Social Fearfulness dimension correlated non-significantly with the other aspects of temperament, and a factor analysis placed it on its own factor. Therefore, for this investigation, Social Fearfulness was used as a measure of toddlers’ approach-avoidance. Eighty-five mothers completed and returned usable data for this measure.

**Separation/stranger/reunion behaviors**

The intensity of toddlers' reactions to each component of the separation/stranger/reunion sequence was coded by noting the presence or absence of several behaviors. During separation, toddlers' crying (no/yes), continued playing (little/moderate/high) and level of distress (low/moderate/high) were coded. Once the stranger entered, toddlers were coded as settling on their own (not needed/yes/no), or settling through the stranger's efforts (not needed/yes/no). Upon reunion, toddlers were coded for settling on their own (not needed/yes/no), asking the mother for comforting (not needed/yes/no), settling through the mother's efforts (not needed/yes/no), crying again once settled (not applicable/no/yes), and showing anxious (no/yes) and whiny affect (no/yes). The Difficulty with Separation/Reunion score comprised the sum of these 11 behaviors (underlined code). Inter-coder reliability for these behaviors was 93%, ranging from 91% (cries during separation) to 97% (settle through stranger's efforts).

**Maternal oversolicitiveness**

Observations were made of each mother's behavior in the clean-up and third free play episodes of Session 1, and during the snack-time episode of Session 2. During the clean-up episode, mothers were coded as intrusively controlling the child’s activity if they completed more than 50% of the tidying of toys and not intrusively controlling if they did 50 percent or less. In the third free play period, the proportion of their children’s bids for attention or involvement to which the mothers responded was recorded (ranging from 0% to 100%; two children made no bids for attention; their mothers did not receive a score for this variable), as was their use of physical affection (e.g., kissing, cuddling -- coded as present or absent).

During the snack-time episode, mothers’ displays of positive affect and unsolicited interventions towards their children were recorded using time-sampling procedures. Each minute, mothers’ positive affect was recorded as absent, moderate (positive tone of voice, mild praise, smiling, laughing), or high (physical affection, strong praise or verbal affection, e.g., “You’re so great! Mommy loves you!”). Unsolicited intervention was defined by the mother’s interruption of her child’s independent or social behavior with the apparent goal of assisting the child,
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despite the lack of evidence that the child was experiencing difficulty, distress, or was requesting maternal intervention. Each minute, mothers were coded as using such behavior never, once, or more than once.

The Session 2 coders for maternal behavior were involved in neither the coding of maternal behavior in Session 1, nor in the coding of toddler behavior in Sessions 1 and 2. The same coders recorded maternal and toddler behavior in Session 1; however, they were blind to all hypotheses of this investigation. Inter-rater reliability, based on 10% of the sample, was 82% for intrusive control in the clean-up episode; and 87% and 91% for responsiveness and physical affection respectively in the third free play episode. Kappa coefficients for the time-sampled Session 2 snack-time positive affect and unsolicited intervention behaviors were .79 and .86 respectively.

Taken together, the aforementioned variables were composited to form an index of maternal oversolicitousness. The variables were scaled such that high scores corresponded to oversolicitous behaviors: intrusively controlling, unresponsive, physically affectionate, high positive affect, and more than one unsolicited intervention. Each variable was standardized via Z-score transformation and the five scores were aggregated. Mothers who received high scores on this index were very warm, unresponsive, and inappropriately controlling in both sessions.

Results

Toddler Inhibition in Sessions 1 and 2.

The 10 latency and mother-contact behaviors coded in Session 1 were intercorrelated (one-tailed, see Table 1). Forty-four of the 51 correlations were positive; 30 were significant at \( p < .05 \) or better and an additional four at \( p < .10 \). None of the seven negative correlations approached statistical significance. The significant correlations appeared to form three patterns. The contact with mother and latency variables for the truck, robot and tunnel episodes were strongly and positively intercorrelated (26 out of 28 at \( p < .05 \) or better). Contact with mother in the first free play episode was positively correlated with contact with mother in the second free play episode. As might be expected if adult-social and non-social inhibition were separate behavior systems, only two out of 16 correlations between the free play episodes and the other three episodes were positive and significant.

Factor analysis (varimax rotation) was computed for the 10 behavioral indices of inhibition in Session 1. Based on the results of a scree plot of eigenvalues greater than one, two factors were retained. The two factors did not clearly distinguish “normal adult” (truck, robot, tunnel) wary behaviors from non-social (free play) behaviors.
The first factor, accounting for 39% of the variance (eigenvalue = 3.67), had the highest loadings of each truck (factor loading for first minute of truck episode = .63; minute 3 = .81), robot (.89) and tunnel (.70) maternal contact variable. The second factor (14.4% of the variance; eigenvalue = 1.36) had the highest loadings of each free play maternal contact variable (free play 1 = .63; free play 2 = .39) and the four latency variables (latency to approach truck, minute 1 = .57; minute 3 = .63; robot = .49; tunnel = .67). It is noteworthy, however, that each latency variable, with the exception of that derived from the “robot” episode, had a factor loading of greater than or equal to .34 on the primary, maternal contact factor. Thus, the second factor clearly distinguished the free-play mother-contact variables from mother-contact in the other episodes, but did not strongly distinguish mother-contact from the latency variables.

Given the factor analytic and correlational data, one could best conclude that the results indicated only very modest support for the division of adult-social and non-social inhibition. In order to compare our findings with the results of earlier studies in which single or “traditional” indices of inhibition were coded (e.g., Fox & Calkins, 1993; Kagan et al., 1985) and the results of Kochanska’s research (1991; Kochanska & Radke-Yarrow, 1992) using separate indices of non-social and adult-social inhibition, we examined the efficacy of both approaches with our data.

An index of adult-social inhibition was created by aggregating the 8 behaviors observed in the truck, robot and tunnel components. Non-social inhibition was determined by summing the amount of time spent in contact with mother in the two free play components. To obtain a marker of traditional inhibition, the adult-social and non-social scores combined.

A factor analysis of the Session Two inhibition behaviors indicated that a single factor solution was appropriate. All six behaviors observed in the two episodes of Session 2 loaded strongly on this one factor (Episode 1: unoccupied = .41; contact with mother = .67; anxious behaviors = .59; Episode 2: unoccupied = .54; contact with mother = .80; anxious behaviors = .72) These results justified the creation of a single index of peer-social inhibition (eigenvalue = 2.43, accounting for 41% of the variance).

One-tailed correlations were computed to examine the associations between the four aggregate measures of inhibition. Adult-social and non-social inhibition were non-significantly but positively correlated with one other (r = .12, power = .38; Howell, 1992). However, peer-social inhibition was significantly and positively correlated with
both of these measures ($r = .22, p < .05, \text{power} = .72; r = .28, p < .01, \text{power} = .89$ respectively), as well as with the traditional inhibition score ($r = .28, p < .01, \text{power} = .89$). Toddlers who were more inhibited in the first session, in each way that inhibition was measured, also were more inhibited in the second session; however, these relations were not overwhelmingly strong.

Given the modest correlational pattern observed thus far, Kagan’s (1989) suggestion that inhibition data should be examined categorically was followed in an attempt to examine the associations between the three indices of inhibition from Session 1 and the peer-social inhibition scores (Session 2). As has been done in previous examinations of young children’s temperament, quartiles were used to define the extreme groups for each measure (e.g., Prior, Sanson, & Oberklaid, 1989). Children whose scores were in the top 25% were identified as highly inhibited; children in the bottom 25% were identified as uninhibited, whilst those in the middle 50% were identified as average. Restricted variance and positive skewness did not allow the identification of extremely non-socially uninhibited children; consequently, this measure was not used in the following $\chi^2$ cross tabulation analyses. Chi-square analyses were computed to examine the relations between inhibition in Sessions 1 and 2. The $\chi^2$ comparing the extreme groups for traditional and peer-social inhibition was significant, $\chi^2(4) = 10.40, p < .05$ ($n = 103$); there was a significant over-representation of toddlers in the “High-High” cell (see Table 2). The cross tabulation of peer-social and adult-social inhibition groups was non-significant, $\chi^2(4) = 5.54, p > .10$ ($n = 103$).

The results of the $\chi^2$ analyses supported the correlational data; there was only a moderate tendency for children to show cross-situational consistency in the demonstration of inhibited behavior. This consistency was strongest when a single index of inhibition was derived from the traditional paradigm: 12 toddlers were extremely inhibited in both the traditional and peer-social contexts. When the adult-social measure of inhibition from Session 1 was used, only 10 toddlers were found to be consistently inhibited from Session 1 to Session 2.

It is important to emphasize that there were more extremely inhibited toddlers who did not display consistent inhibition than there were those who did. Thirteen of the toddlers who were extremely inhibited in the traditional paradigm were not extremely inhibited with their peers. Fourteen of the toddlers who were extremely inhibited in the peer assessment had acted in an average or extremely uninhibited manner in the traditional paradigm. To reiterate then, of 39 children who showed extreme levels of inhibition in one of their two visits to the laboratory, only 12 were extremely inhibited in both sessions. These 12 toddlers were the focal children for our
examination of the concomitants of consistently displayed inhibition. In order to determine those factors distinguishing these children from their 27 counterparts who showed inhibition inconsistently, comparison groups were defined.

**Identifying Patterns Of Cross-Situational Inhibition.**

The 12 **Consistently Inhibited** toddlers (5 boys and 7 girls) were contrasted with (a) **Traditionally Inhibited** toddlers who were extremely inhibited (top quartile) in the traditional paradigm, but were below the mean for inhibition scores in the peer-social context (n = 8 boys, 4 girls); (b) **Peer-Social Inhibited** toddlers who were extremely inhibited in the peer-social context, but were below the mean for inhibition scores in the traditional paradigm (n = 4 boys, 8 girls); (c) **Average** toddlers who were in the average group for both inhibition scores as observed in both paradigms (n = 14 boys, 13 girls); and (d) **Uninhibited** toddlers who were in the bottom quartile for inhibition for (at least) one of the two assessments, and were below the mean for inhibition on the other assessment (n = 16 boys, 15 girls). Thus, five groups, numbering 94 toddlers (47 boys and 47 girls), were included in all remaining analyses.

The Consistently Inhibited toddlers only were expected to be distinct in displaying consistent inhibition; they were not expected to differ in the magnitude of their traditional inhibition from Traditionally Inhibited toddlers, nor in their expression of inhibition in Session 2 from the Peer-Social Inhibited toddlers. To confirm this, a Sex (2) x Extreme Group (5) x Session (2) repeated-measures ANOVA was performed, with Session treated as a within-subjects variable. As expected, there was a significant Extreme Group x Session interaction, F(4,84) = 44.58, p < .001 (see Table 3); there were neither main effects nor interactions involving sex.

Post-hoc LSD tests (p < .05) were used to examine the between-groups comparisons within each of the sessions. In the traditional session, Traditionally Inhibited toddlers were more inhibited than all other groups of children. Consistently Inhibited toddlers were more inhibited than the remaining three groups. As well, Average toddlers were more inhibited than Peer-Social Inhibited and Uninhibited toddlers.

In the peer-social session, Consistently Inhibited toddlers were more inhibited than all other groups of children. As well, the Peer-Social Inhibited toddlers were more inhibited than the remaining three groups.

Paired t-tests (with α set at p < .02 to account for the number of comparisons) were used to examine the inhibition scores of each group across the two sessions. Notably, the amount of inhibition shown by the
Consistently Inhibited toddlers in the two sessions did not differ significantly ($t(11) = -1.96$); this was not the case for the other two groups of inhibited children (see Table 3). The amount of inhibition shown by Uninhibited ($t(30) = -2.07$) and Average ($t(26) = 0.41$) toddlers did not differ significantly across the two contexts.

The Concomitants of Consistently Extreme Inhibition.

One-tailed inter-correlations of the four posited concomitants of inhibition, and their correlations with the continuous measures of non-social, adult-social, traditional, and peer-social inhibition were computed. Vagal tone, the measure of temperamental social fearfulness, the aggregate measure of maternal oversolicitousness, and the aggregate measure of negative separation-reunion reactions were included in the analyses. Mother-rated social fearfulness and difficulty dealing with a brief separation and a reunion with the mother were both significantly and positively correlated with both adult-social ($r_s = .22, p < .05, n = 85$; and $r_s = .31, p < .01, n = 103$, respectively) and peer-social inhibition ($r_s = .27, p < .01, n = 83$; and $r_s = .21, p < .05, n = 100$ respectively). Separation-reunion distress was significantly correlated with traditional inhibition ($r_s = .31, p < .01, n = 103$). Social fearfulness was significantly and negatively correlated with the non-social index of inhibition ($r_s = -.18, p < .05$). As well, toddlers with lower vagal tone showed significantly higher adult-social inhibition and traditionally assessed inhibition, $r_s = -.18$ and $.17, ps < .05, n = 104$. Children who had difficulty with separations and reunions were seen by their mothers as significantly more socially fearful ($r_s = .41, p < .001, n = 81$). No other correlations were significant.

In order to determine if these four variables distinguished children who displayed extreme inhibition consistently across contexts from toddlers who did not, separate Sex x Extreme Group ANOVAs were calculated for each variable. This procedure was necessitated because list-wise deletion of variables due to missing data precluded the computation of a MANOVA. The means and standard deviations for these variables, for the entire sample, and for toddlers in the five comparison groups, are presented in Table 4. Included in this table are the results of one-way, post-hoc comparisons for all significant effects of the ANOVAs. (Also included in this table, for each variable, are the number of children for whom a valid datapoint was obtained.) Note that the ns for each analysis vary slightly, as different participants were missing some questionnaires, videotapes, or vagal tone data.

Although not all of the expected effects were statistically significant, the means in Table 4 indicate that all of the variables characterized Consistently Inhibited toddlers in hypothesized ways: They had the lowest vagal tones, the highest social fearfulness scores, the most oversolicitous mothers and the most negative
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significant Extreme Group main effects were found for toddlers’ negative reactions to separation/reunion, \( F(4,80) = 3.50, p < .05 \), and for mothers’ oversolicitous behaviors, \( F(4,77) = 2.63, p < .05 \). There was a trend towards a main effect for mothers’ ratings of toddlers’ social fearfulness, \( F(4,65) = 2.37, p < .06 \). There were no significant effects for the ANOVA on toddlers’ vagal tone, all \( F < 1.5 \).

Although the Extreme Group main effect for social fearfulness did not reach the conventional level of significance, comparisons using LSD tests \( (p < .05) \) were used to test for the hypothesized differences between Consistently Inhibited toddlers and the other groups. These tests revealed that Consistently Inhibited children were described by their mothers as more socially fearful than were Average and Uninhibited toddlers. LSD comparisons also were used to examine the significant main effects for mothers’ oversolicitous behaviors and toddlers’ distress during separations and reunions. The mothers of Consistently Inhibited toddlers were significantly more likely than were the mothers of Traditionally Inhibited, Peer-Social Inhibited and Uninhibited toddlers to demonstrate oversolicitous behavior. Finally, in response to a separation and reunion with mother, Consistently Inhibited toddlers showed the most negative reactions, becoming more upset and being more difficult to soothe than Average, Peer-social Inhibited, and Uninhibited toddlers.

Regression Analyses Predicting Inhibition

Regression analyses were computed to determine whether inhibition could be predicted from toddler sex, physiology, temperament, attachment-related distress, and maternal oversolicitousness. The use of interaction terms in regression analyses allowed us to test the hypothesis that mothers’ oversolicitous behaviors, or toddlers’ attachment-related distress during separations and reunions, might moderate the relations between inhibition and temperamental or physiological measures of vulnerability. Three measures of inhibition were predicted: traditional, peer-social, and combined traditional and peer-social inhibition (see Table 5). The latter joint inhibition score was created by standardizing the two indices of inhibition, scaling them to include only positive numbers, and then multiplying the two terms. Five independent and four interaction predictors were entered into the regression equation in the following order (accounting for the ostensible primacy of biological variables in the prediction of inhibition): sex of child, vagal tone, temperamental social fearfulness, maternal oversolicitousness, separation/reunion distress, oversolicitousness x vagal tone, distress x vagal tone, oversolicitousness x social
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fearfulness, and distress x social fearfulness. These interaction terms were created by normalizing, scaling, and then multiplying the individual variables.

The regression analysis predicting traditional inhibition revealed that vagal tone and social fearfulness made significant unique contributions to the variance accounted for. Having accounted for those variables, neither mothers’ oversolicitous behaviors nor toddlers’ separation/reunion distress made significant, unique contributions to the prediction of traditional inhibition, either independently or in the interactions examined. Overall, relatively little of variance in traditional inhibition could be accounted for (adjusted $R^2 = .11$, $p < .10$).

For the regression analysis predicting peer-social inhibition, temperamental fearfulness was the only significant main effect predictor. As well, the interaction between maternal oversolicitousness and fearfulness significantly predicted peer-social inhibition ($R^2$ change = .06, $p < .05$), and overall the regression was significant (adjusted $R^2 = .13$, $p < .05$). To examine the nature of the oversolicitousness x social fearfulness interaction, a median split was used to divide mothers into low ($n = 41$) and high ($n = 35$) oversolicitous groups. The correlation between toddlers’ temperamental fearfulness and peer-social inhibition was examined for each of these groups. For toddlers with mothers who were relatively low in oversolicitousness, this correlation was non-significant ($r = .12$). For toddlers with mothers who were relatively high in oversolicitousness, the correlation was significant ($r = .50$, $p < .01$). A subsequent $z$-test indicated that difference between these correlations was significant, $z = 1.79$, $p < .05$.

The regression analysis for the joint measure of traditional and peer-social inhibition also indicated that significant predictive contributions were made by temperamental fearfulness, both alone and in interaction with maternal oversolicitousness. The overall $R^2$ was .26 ($p < .001$). Examination of the significant interaction indicated that when mothers were relatively low in oversolicitousness, their toddlers’ fearfulness and joint inhibition were non-significantly correlated ($r = .15$), whereas this correlation was significant for toddlers of mothers who showed relatively more oversolicitousness ($r = .49$, $p < .01$). A subsequent $z$-test indicated that the difference between these correlations approached significance ($z = 1.61$, $p < .06$).

Discussion

This investigation was undertaken to determine the extent to which toddlers’ inhibition was consistent across varying contexts, and to identify physiological, temperamental, socialization and attachment-related characteristics that might distinguish consistently inhibited toddlers from those children who did not show such
consistency. Most of our expectations were supported; there were relatively few toddlers who were extremely
inhibited with unfamiliar settings, adults and peers, and those few children were clearly distinguishable from their
age-mates on the concomitants assessed. Some surprising relations among these concomitants became apparent in
the analyses; these served to illuminate potential key components in the development of inhibition.

The lack of consistency in toddlers' inhibition across the non-social, adult-social, traditional (all measured
in Session 1) and peer-social (measured in Session 2) contexts was striking. Unlike that which Kochanska (1991)
found in her research, our factor analytic examination of latency and contact with mother in the “traditional”
paradigm did not indicate that markers of inhibition in the non-social context were distinct from equivalent
behaviors in the adult-social episodes. However, in support of Kochanska’s findings, the intercorrelation of these
separate measures of inhibition was non-significant. Further, whether inhibition was treated as a continuous variable
and correlations between contexts were examined, or whether extreme groups were identified within the different
contexts, the Session 1 inhibition measures were, at best, moderately associated with inhibition in the peer-social
context. Using the former method, less than 10 % of the variance in any given kind of inhibition could be accounted
for by toddlers' inhibition as measured in another context. And when the extremely inhibited children were
identified as distinct groups, no more than 30 percent of toddlers highly inhibited in either the traditional or peer-
social context showed such levels in the other context; there was even less consistency when inhibition, as it
appeared in only the two social contexts, was considered. Considered in the light of previous research
demonstrating limited short-term stability (Garcia Coll et al., 1984) and cross-context consistency (Kochanska,
1991), it is clear that inhibition, as it is evidenced at 24 months of age, is both multi-faceted and context-dependent.
It may be that the similar behaviors thought to represent or reflect inhibition in the different contexts actually are the
observable manifestations of different underlying motivations or behavior systems (Hinde, 1989; Stevenson-Hinde,
1988). Fear of an unfamiliar adult with novel toys is neither identical to, nor reliably associated with, fear or
wariness of an unfamiliar peer; neither of these emotionally-driven behaviors appear equivalent to whatever
motivates maintaining contact with a caregiver in a novel setting when no other humans are nearby.

Our findings are particularly noteworthy given the longitudinal research extant. Although there is
considerable evidence that preschool- and school-aged children's wary and fearful behavior with their peers can be
predicted from their "traditionally assessed inhibition" (non-social plus adult-social inhibition) in the toddler years,
researchers have done so with the claim that they were measuring similar expressions of the same underlying characteristic. This presumption may be unfounded. For example, toddlers’ non-social and adult-social inhibition previously have been found to predict different components of peer wariness at five years of age (Kochanska & Radke-Yarrow, 1992). Our results demonstrate that a minority of toddlers are extremely inhibited in both traditional and peer-social contexts contemporaneously; logically, one would expect few children to be inhibited in both contexts when a span of several years separates the assessments. It is likely that a proportion of any sample of toddlers could have high levels of both peer-social and traditional inhibition, and when research has evidenced predictive stability in inhibition across contexts (e.g., Kagan, 1989), it may have been these children who appeared “stable” in their inhibition. Rather than providing strong evidence for the expression of a single dispositional trait, toddlers’ traditional inhibition thus might have appeared to be the critical link to the expression of older children's social withdrawal in the company of peers. However, it may well be that inhibition with peers at two years of age is actually the stronger and more appropriate predictor of wariness and withdrawal from peers in later years. This is a possibility that should be examined in future research.

One noteworthy finding is that the number of consistently inhibited toddlers that we identified was strikingly similar to the Kagan’s (1989) estimate that about ten percent of young children may be characterized as extremely inhibited. Nevertheless, we must note that this ten percent figure had been selected a priori as a cut-off point to define extreme groups. Within our own data, twelve toddlers emerged as consistently inhibited only because we used quartiles to define extreme scores in the two sessions. Had different cut-off scores been used in this investigation, as is true of any study that defines extreme groups using continuous variables, these values would have been different.

From our results, we would contend that those children at greatest risk of future problems of social withdrawal and its concomitants (e.g., negative self perceptions of competence; see Rubin, Stewart, & Coplan, 1995 for a review) are those who demonstrated extremely inhibited behavior across contexts. Unlike toddlers who were inconsistent in their displays of inhibition, Consistently Inhibited toddlers did not appear comfortable or competent in either observational setting. Indeed, this group of toddlers expressed significantly more inhibited behavior in the peer context than did the Peer-Social Inhibited children. Nevertheless, the behavioral profiles of Traditionally and Peer-Social Inhibited toddlers should not be dismissed as indicative of potential risk for subsequent difficulties. For
example, Traditionally Inhibited toddlers may develop difficulties interacting with, and relating to, school personnel. Peer-Social Inhibited toddlers may have difficulty initiating and maintaining interactions and relationships with their agemates. Neither of these possibilities describe adaptive outcomes. Again, researchers would do well to consider these possibilities.

Further support for believing the Consistently Inhibited toddlers will face greater developmental challenges than other children emerged in the examination of the concomitants of inhibition. The extreme group comparisons showed that toddlers who were inhibited in both contexts, compared to Average and/or Uninhibited toddlers, were more temperamentally fearful, showed greater distress to separations and reunions with their mothers, and had oversolicitous mothers who were warm but intrusive, controlling and not responsive to their toddlers’ cues. Additionally, compared to both Traditionally and Peer-Social Inhibited children, Consistently Inhibited toddlers had more oversolicitous mothers; they were also more distressed by separations and reunions than the Peer-Social Inhibited toddlers. Although vagal tone was significantly and negatively correlated with traditional and adult-social inhibition, it was the case that vagal tone did not clearly distinguish Consistently Inhibited toddlers from the other groups.

Thus, our findings stand out in two ways. First, we have clarified, within the group of toddlers whom past researchers have identified as inhibited, who it is that may demonstrate levels of these risk factors that should evoke concern. Second, we found that indices of parental behavior and the quality of the parent-child relationship must be considered together with more dispositionally-attributable factors in conceptualizing the underpinnings of behavioral inhibition.

A somewhat different picture emerged when the concomitants were used together to predict the measures of inhibition as continuous variables. The regression analyses did not provide strong results for inhibition as assessed in the traditional paradigm or with unfamiliar peers. A dispositional basis for traditional inhibition was apparent, as toddlers were significantly more inhibited when they had lower vagal tones and higher temperamental fearfulness scores. However, neither separation-reunion distress nor maternal oversolicitousness accounted for significant, unique portions of the variance, and almost 90% of the variance in traditional inhibition remained unexplained. In the peer-social paradigm, more inhibition was shown when temperamental fearfulness was greater; this was particularly true when toddlers also had mothers who were oversolicitous. However, neither vagal tone nor
separation-reunion distress contributed significantly to the prediction of inhibition with peers, and again almost 90% of the variance was not accounted for.

When traditional and peer-social inhibition were combined and examined as a joint measure, more of the variance (26%) could be explained than when either index was examined alone. Obtaining greater explanatory power for the joint-social measure than either of its constituents on their own suggests that a more stable or reliable index of inhibition is created by aggregating data across contexts. Still, only two of the predictors emerged as significant unique contributors. Toddlers who were evaluated by their mothers as highly fearful showed higher joint levels of inhibition; again, when mothers were highly oversolicitous, toddlers who were higher in temperamental fearfulness were most likely to be very inhibited in both contexts. Clearly, this supports the above contention that mothers’ behavior with their toddlers in anxiety-arousing contexts is linked to the toddlers’ consistent displays of inhibition. A mother who is warm and very highly involved in her temperamentally fearful child’s activities, while at the same time failing to demonstrate responsivity to her child’s cues or sensitivity to her child’s needs, in effect may keep her child from having the opportunity to practice his or her coping skills, overcome the dispositional wariness, and develop a sense of self-efficacy. By inappropriately employing the behaviors typically regarded by parenting researchers as positive or authoritative (e.g., Maccoby & Martin, 1983), this style of parenting may “smother” any nascent self-confidence or independence in the dispositionally fearful toddler, and may suggest that it is appropriate to be fearful in novel situations. It remains to be seen whether variations in parents’ socialization practices with children who are inhibited will result in differences in the extent to which they become socially (in)competent and (in)capable of engaging in successful extra-familial social relationships. As well, it must be acknowledged that “oversolicitousness” may have been elicited from mothers who observed their children behaving in an inhibited fashion within laboratory contexts. It would behoove researchers to observe parent-child interactions in the home and in other naturalistic settings with peers in order to ascertain whether this pattern of parenting behavior is generalized across settings.

With respect to the other predictors, it perhaps is not surprising that vagal tone did not emerge as a significant predictor of joint-social inhibition: it was significantly but modestly correlated with traditional inhibition and non-significantly correlated with peer-social inhibition. However, distress in response to separation-reunion was correlated significantly with both traditional and peer-social inhibition, and strongly distinguished the
Consistently Inhibited toddlers from Peer-Social Inhibited, Average, and Uninhibited toddlers. Likely, it did not emerge as a significant predictor of any form of inhibition in the regression analyses due to being entered as the last main-effect variable. A measure of maternal behavior involving intrusiveness and (un)responsiveness and two measures of toddlers’ temperament were accounted for first; both parenting behavior and child temperament have been suggested as contributors to the development of attachment-related behavior (e.g., Bretherton, 1985; Fox & Calkins, 1993). When the relations between our concomitants were examined, separation-reunion distress was found to be correlated highly with temperamental fearfulness; however, it was correlated non-significantly with maternal oversolicitousness. Thus, it would appear that the dispositional measure of fearfulness accounted for all of the variance in either the separate or joint measures of inhibition that might have been attributed to separation-reunion distress based on the correlation and extreme group analyses. To the extent that we were tapping attachment-related behaviors, these results suggest that temperament may play an important role in the development of attachment.

In summary, it would appear as if the display of inhibited behavior varies by context and circumstance, and the factors associated with consistently-displayed inhibition are not necessarily present for children who show inhibition in some novel circumstances but comfort and competence in others. Moreover, it seems likely that the development of children’s social skills and peer relationships may vary from one group of highly inhibited toddlers to another. Thus, in the future, researchers would do well to include more detailed examinations of the variability of inhibition and the factors contributing to the development of different forms of inhibition.
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Table 1

Correlations Between the Variables used to Measure Inhibition in Session One.

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+ p < .10; * p < .05; ** p < .01; *** p < .001
Table 2

Distribution of Toddlers' Extreme Group Classifications for Traditional and Peer-Social Distribution (standardized residuals included in parentheses) \( N = 103 \).

<table>
<thead>
<tr>
<th>Peer-Social Inhibition</th>
<th>Traditional Inhibition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Low</td>
<td>8 (0.90)</td>
</tr>
<tr>
<td>Average</td>
<td>14 (0.60)</td>
</tr>
<tr>
<td>High</td>
<td>3 (-1.60)</td>
</tr>
</tbody>
</table>

** \( p < .01 \)**
Table 3
Mean Session One and Session Two Inhibition Scores for the Interaction of Extreme Group and Observation
Session (standard deviations included in parentheses)

<table>
<thead>
<tr>
<th>Extreme Group</th>
<th>Inhibition</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Traditional</td>
<td>Peer-Social</td>
<td></td>
</tr>
<tr>
<td>Consistently Inhibited</td>
<td>1.13 b=</td>
<td>1.81 a</td>
<td>(0.71)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1.33)</td>
</tr>
<tr>
<td>Traditionally Inhibited</td>
<td>1.83 a&gt;</td>
<td>-0.47 c</td>
<td>(0.86)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.22)</td>
</tr>
<tr>
<td>Peer-Social Inhibited</td>
<td>-0.51 d</td>
<td>&lt;1.03 b</td>
<td>(0.34)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.90)</td>
</tr>
<tr>
<td>Average</td>
<td>-0.27 c =</td>
<td>-0.30 c</td>
<td>(0.33)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.22)</td>
</tr>
<tr>
<td>Consistently Uninhibited</td>
<td>-0.76 d</td>
<td>-0.60 c</td>
<td>(0.32)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.21)</td>
</tr>
</tbody>
</table>

**NOTE**: Means in a column not sharing a common letter are significantly different.

Means in a row not sharing an equal sign (=) are significantly different.
Table 4

Mean Scores for the Concomitants of Consistent Extreme Inhibition, Presented for All Children and by Comparison Group (standard deviations in parentheses).

<table>
<thead>
<tr>
<th>Concomitant</th>
<th>Vagal Tone</th>
<th>Social Fearfulness</th>
<th>Maternal Oversolicitousness</th>
<th>Separate/Reunite Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Groups</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All children</td>
<td>.01</td>
<td>65.49</td>
<td>.06</td>
<td>3.17</td>
</tr>
<tr>
<td></td>
<td>(0.98)</td>
<td>(17.08)</td>
<td>(1.95)</td>
<td>(2.56)</td>
</tr>
<tr>
<td>n =</td>
<td>105</td>
<td>85</td>
<td>96</td>
<td>104</td>
</tr>
<tr>
<td>Consistently Inhibited</td>
<td>-.34 a</td>
<td>80.71 a</td>
<td>1.46 a</td>
<td>5.00 a</td>
</tr>
<tr>
<td></td>
<td>(0.77)</td>
<td>(14.45)</td>
<td>(1.61)</td>
<td>(2.35)</td>
</tr>
<tr>
<td>n =</td>
<td>11</td>
<td>7</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>Traditionally Inhibited</td>
<td>-.22 a</td>
<td>65.70 ab</td>
<td>-.28 b</td>
<td>4.02 ab</td>
</tr>
<tr>
<td></td>
<td>(1.28)</td>
<td>(18.77)</td>
<td>(2.21)</td>
<td>(3.35)</td>
</tr>
<tr>
<td>n =</td>
<td>12</td>
<td>10</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Peer-Social Inhibited</td>
<td>.55 a</td>
<td>70.11 ab</td>
<td>-.27 b</td>
<td>2.72 b</td>
</tr>
<tr>
<td></td>
<td>(1.44)</td>
<td>(16.03)</td>
<td>(1.42)</td>
<td>(2.31)</td>
</tr>
<tr>
<td>n =</td>
<td>10</td>
<td>9</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>Average</td>
<td>.05 a</td>
<td>60.67 b</td>
<td>.33 ab</td>
<td>2.33 b</td>
</tr>
<tr>
<td></td>
<td>(0.77)</td>
<td>(15.22)</td>
<td>(2.01)</td>
<td>(1.97)</td>
</tr>
<tr>
<td>n =</td>
<td>27</td>
<td>21</td>
<td>24</td>
<td>25</td>
</tr>
<tr>
<td>Consistently Uninhibited</td>
<td>-.01 a</td>
<td>62.00 b</td>
<td>-.47 c</td>
<td>2.74 b</td>
</tr>
<tr>
<td></td>
<td>(0.95)</td>
<td>(18.24)</td>
<td>(1.70)</td>
<td>(2.35)</td>
</tr>
<tr>
<td>n =</td>
<td>31</td>
<td>28</td>
<td>30</td>
<td>31</td>
</tr>
</tbody>
</table>

NOTE: Means in a column not sharing a common letter are significantly different.
Table 5

Regression Analyses Predicting Toddlers’ Displays of Traditional, Peer-Social, and Joint Traditional and Peer-Social Inhibition

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Traditional</th>
<th>Peer Social</th>
<th>Joint Inhibition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\Delta R^2$</td>
<td>$p$</td>
<td>$\Delta R^2$</td>
</tr>
<tr>
<td>1. sex of child</td>
<td>.02</td>
<td>ns</td>
<td>.01</td>
</tr>
<tr>
<td>2. vagal tone</td>
<td>.07</td>
<td>.05</td>
<td>.00</td>
</tr>
<tr>
<td>3. social fearfulness</td>
<td>.09</td>
<td>.01</td>
<td>.11</td>
</tr>
<tr>
<td>4. oversolicitousness</td>
<td>.01</td>
<td>ns</td>
<td>.01</td>
</tr>
<tr>
<td>5. separation/reunion distress</td>
<td>.03</td>
<td>.ns</td>
<td>.00</td>
</tr>
<tr>
<td>6. vagal tone x oversolicitousness</td>
<td>.00</td>
<td>ns</td>
<td>.01</td>
</tr>
<tr>
<td>7. vagal tone x separation/reunion distress</td>
<td>.00</td>
<td>ns</td>
<td>.01</td>
</tr>
<tr>
<td>8. fearfulness x oversolicitousness</td>
<td>.00</td>
<td>ns</td>
<td>.06</td>
</tr>
<tr>
<td>9. fearfulness x separation/reunion distress</td>
<td>.01</td>
<td>ns</td>
<td>.01</td>
</tr>
</tbody>
</table>

Multiple R = .47  
Adjusted $R^2$ = .11  
$F (9,63)$ = 1.96+  

$+ p < .06; * p < .05; *** p < .001$