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# SOCIAL WITHDRAWAL BEHAVIOR IN INFANCY: A HISTORY OF THE CONCEPT AND A REVIEW OF PUBLISHED STUDIES USING THE ALARM DISTRESS BABY SCALE

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ABSTRACT: This article reviews the studies using or validating the Alarm Distress Baby Scale (ADBB; A. Guedeney & J. Fermanian, 2001) within different countries, different populations, and different settings. After a brief summary of the theoretical backgrounds of infant social behavior, the results of the main controlled and methodologically comparable studies are summarized and discussed. Second, the results of some observational studies as well as different models of factor analysis are presented. The modified, five-item ADBB (m-ADBB) Scale is described. Finally, perspectives for future research and training are presented.[1]

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The term *social withdrawal* has been used in the clinical study of infancy without having a clear definition. René Spitz (1946) was among the first to use this term in his famous clinical description of anaclitic depression in infancy. Engel and Reichsman (1956) in Engel and Schmale (1972) described sustained social withdrawal behavior as a defense mechanism in a marasmic and developmentally retarded infant, Monica, who came to their pediatric service with severe failure to thrive (FTT) when she was 14 months old. Observations of young children separated from their caregivers led Robertson and Bowlby (1952) to describe a three-stage emotional reaction in young children—protest, despair, and withdrawal behavior—and eventually detachment in the face of prolonged separation.

## ANIMAL MODELS OF DEPRESSION AND WITHDRAWAL

The link between depression–withdrawal reaction in infants and learned helplessness behavior has been made relatively recently. In the famous, ethically disputable experimentation by Seligman,

Abramson, Semmel, and von Baeyer (1979), a dog was electrically shocked in an inescapable situation. Seligman referred to this situation as "learned helplessness," which led the dog to resignation. The model of learned helplessness has since become a model for depression, and the learned helplessness paradigm has become a key screening test for antidepressant activity (Seligman et al., 1979). Bowlby (1973) described attachment and withdrawal systems as distinct, but having the same function and triggered by the same situations, and both systems easily conflict.

Panksepp (2006) recently proposed a schema of the main types of emotional systems in mammalians: lust, care, panic, play, fear, rage, and seeking. Withdrawal behavior has been conceptualized as part of the panic and fear systems (Panksepp, 2006). Therefore, the approach/withdrawal behavioral system is fundamental in the analysis of behavioral development (Greenberg, 1995). Comparative psychologists have described developmental pathways of this behavior and have identified genes implicated in this endophenotype (Gottesman & Gould, 2003).

## THEORY FOR SOCIAL WITHDRAWAL BEHAVIOR IN INFANTS

Social and emotional development in early infancy is widely recognized as important for all aspects of functioning throughout the life span (Guedeney, 2000; Guedeney, Moe, Puura, Mäntymaa, &

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[1]Note that the term *mother* in this article is used to represent primary caregivers of any gender.

Tamminen, 2010; Sroufe, 1995). The infant's ability to relate to the social world develops within the close and continuous interactions between parent and infant. Typically developing infants display these skills during the first 2 months after birth, and even though infants may differ in their style and degree of responses to various stimuli (i.e., have different temperaments), they still are responsive to social interaction with an adult (Fox, 2004). Withdrawal within a certain range is a normal feature of infant behavior in parent–infant interactions, and a way for the infant to regulate the flow of interaction (Brazelton, Koslowski, & Main, 1974; Greenspan & Wieder, 1993).

### Parent–Infant Asynchrony and Infant Social Withdrawal Behavior

A key element in early development is arguably the ability within the parent–infant triad to synchronize with each another, particularly during the first 18 months of the infant's life (Feldman, 2007; Mäntymaa, 2006). Synchrony is, according to Feldman (2007), the "co-regulatory lived experience within attachment relationships that provides the foundation for the child's latter capacity for intimacy, symbol use, empathy, and the ability to read the intentions of others" (p. 330). It is the synchrony of the relationship between mother and child as well as between father and child that is an important determiner of infant developmental outcomes. Feldman (2007) discussed synchrony in terms of the parent–infant dyad as a temporal and organizing feature of the relationship. Increased or sustained social withdrawal reaction in infants can be observed in suboptimal parent–infant interactions, such as between severely depressed mothers or mothers with borderline personality disorder and their infants. The infant's "depressed" style of interacting may be carried over to other relationships as well, and be apparent even when the infant interacts with a nondepressed adult (Field et al., 1988).

Maternal and child factors both contribute to synchrony between parent and child, with child withdrawal and maternal depression being associated with failed synchrony and associated developmental psychopathology. Feldman (2007) stressed the importance of infant sustained withdrawal behavior as a sign of a dysregulation of parent–infant synchrony. The infant's reactions to the interruption or to the violation of expectations within the interaction are both obvious and durable in the "Still-Face" paradigm (Cohn & Tronick, 1983), or in the experimental desynchronization setting designed by Murray and Trevarthen (1986). The infant's reaction to these different conditions follows a path clearly delineated by Robertson and Bowlby already in 1952, with the key sequence of surprise, protestation, withdrawal, and despair. Tronick & Weinberg (1997) stressed the effect of maternal depression on the extension of "Dyadic States of Consciousness". Remaining in a sustained withdrawal state may therefore have consequences on the range and quality of intersubjective experience of the child as well as on several dimensions of mental development (Tronick & Weinberg, 1997).

### Parental Psychopathology and Infant Social Withdrawal Behavior

Several factors can have a deleterious effect on early infant social and emotional development. Medical and social risk factors include infant prematurity or illness, genetic risk factors, living in inadequate or inappropriately stimulating environments, and early disruptions in the mother–child relationship as well as inadequacy of parental care (Feldman, 2007). Maternal mental illness poses a risk for infant attachment and socioemotional development, and its effects on the child can manifest in high levels of infant social withdrawal behavior (Field et al., 1988; Teti, Gelfand, Messinger, & Isabella, 1995). Father's mental health also plays a role in the infant's emotional development, although this role has much less been studied (Mäntymaa, Puura, Kaukonen, Salmelin, & Tamminen, 2008; Ramchandani, Stein, Evans, O'Connor, & the ALSPAC Study Team, 2005). The influence of potential risk factors on infant development is thus dependent on qualities of both the parent and the infant, which together determine the mutual adaptation capacity of the dyad (Mäntymaa, 2006) and its capacity to develop parent–infant synchrony within the first 18 months of life.

### Specific Situations Yielding Withdrawal Behavior in Infants

Based on extended clinical experience, Fraiberg (1982) described a group of pathological defenses observed in infants between 3 and 18 months old who experienced severe danger and deprivation. These early defenses—"avoidance," "freezing," and "fighting"—are, according to Fraiberg, summoned from a biological repertoire. Following Engel and Schmale (1972), Ironside (1975) proposed the concept of infant development distress. Menahem (1984) described a conservation withdrawal reaction in infants. Along the same line of thought, some clinicians (mainly pediatricians) have described the psychological state of some infants with FTT (Powell & Low, 1983) or with specific malnutrition conditions. In severe forms of protein-energy malnutrition such as kwashiorkor, infant social withdrawal is intense and prolonged, and its abatement is a reliable sign of recovery (Guedeney, 1995; McMahan True, Pisani, & Oumar, 2001). This demonstrates how intense social withdrawal reactions of affected children can be, occurring within their disordered attachment relationships with caregivers and confirming the strong association between infant social withdrawal and attachment disorders (Guedeney, 1997, 2000; Zeanah, Boris, Bakshi, & Lieberman, 2000). According to Dollberg, Feldman, Keren, and Guedeney (2006), sustained withdrawal behavior in infants can be seen as "a chronic diminution of the attachment system, which is gradually generalized into a diminished engagement and lowered reactivity to the environment at large" (p. 295).

## TEMPERAMENT AND SOCIAL WITHDRAWAL BEHAVIOR

Dispositional factors have mainly been studied through the concept of temperament, considered to be a biologically based tendency to emotional reactivity (Bus & Plomin, 1984). Some children are conceptualized to be more reactive than are others and may

therefore show more facial expressivity, more verbal reaction, and more physical activity than may others in the same situation or are slower to self-regulate after being aroused. These temperamental characteristics are labeled as "difficult" or "irritable" temperament (Buss & Plomin, 1984). Temperament also has an impact on maternal parenting, which tends to be more negative and disengaged when the child has a difficult temperament; therefore, in addition to being directly linked to the child's behavior, temperament also may have an indirect impact via its influence on maternal attitude, which in turn influences the child's stress reactions. While measurement of infant temperament may have some overlap with social behavior, it is important to realize that these two constructs are separate. Temperament refers to the infant's degree and style of responsiveness to varying internal and external stimuli (e.g., noise, heat, and social stimuli) whereas social behavior in infancy refers to degree and style of responsiveness just to social stimuli. Thus while infants may, within temperament measures, be considered "shy" or "slow to warm up to others," they will still be responsive to adults. Some studies have confirmed that social withdrawal behavior and temperament are orthogonal dimensions: The Pediatric Attachment Style Indicator (PASI; Favez & Berger, 2011) is a research protocol for observing patterns of interaction between parents and children during pediatric health supervision visits, modeled on expected behaviors of secure and insecure infants in the Strange Situation paradigm. To validate the PASI, distress behavior of the toddler was coded with the Alarm Distress Baby Scale (ADBB; Guedeney & Fermanian, 2001) at different times during the pediatric examination. Toddler temperament was assessed by pediatricians through the Emotionality, Activity, and Sociability Temperament Survey (EAS; Buss & Plomin, 1984). Expressed distress with the ADBB was linked to attachment at each phase of the examination whereas temperament was not (Favez & Berger, 2011).

## DEVELOPMENT OF THE BABY ALARM DISTRESS SCALE (ADBB; GUEDENEY & FERMANIAN, 2001) AND THE FIRST FRENCH VALIDATION STUDY

The main idea in designing the ADBB was to build an instrument simple enough to be used effectively by nurses in clinical practice. Despite the rapid developmental changes in the course of infancy, it seemed possible to assess a sustained withdrawal reaction in infants between 2 and 24 months of age. The ADBB was initially designed to fit with the medical examination in a Well Baby Clinic, as was Winnicott's (1941) set "situation," providing a regularly defined situation that allows for observations and comparison of the way infants react. The starting point for building the scale was a 14 item Approach-Withdrawal Scale to help differentiate between organic and nonorganic FTT (Rosenn, Loeb, & Bates, 1980). The Rosenn et al. (1980) study, defining behavior that differentiated between organic and nonorganic FTT (NOFTT), showed that abnormal "interpersonal" behaviors were more common than were "non-interpersonal" behaviors in hospitalized infants with NOFTT. Another inspiration for the development of the ADBB was a scale designed by Gauvain-Piquard, Rodary, Rezvani, and Serbouti (1999) to assess pain in infants and young children, as sustained pain yields strong social withdrawal reactions. The first draft of the scale was named the Baby Alarm Distress scale (BADS), then became the Alarm Distress Baby Scale (ADBB); in French, ADBB sounds like "Aider Bébé" ("Helping the Baby").

The first published study was conducted in Paris at the Parisian Institut de Puériculture well-baby clinic and published in the *Infant Mental Health Journal* (Guedeney & Fermanian, 2001). The article describes the building process of the scale and the validation study on a population of 60 infants aged 2 to 24 months. Only new patients were eligible so that neither the pediatrician nor the nurse would be influenced by any previous knowledge of the familial and medical background of the child. For this first validation, the upper age limit of 24 months was picked to demonstrate that sustained withdrawal reaction could be assessed during a period of rapid and dramatic developmental growth and before the use of language. The lower age limit of 2 months was chosen to avoid most of the prenatal influences on social withdrawal behavior. The ADBB was shown to have good content validity, based on the advice of an expert panel. Criterion validity also was good—first, as a measure of the infant's social withdrawal reaction, with a very good correlation between nurse and pediatrician on the ADBB ($r = 0.84$); and second, as a screening procedure for detecting infants at developmental risk. The developmental risk was rated high or low on the basis of the 17 risk factors identified in an epidemiological study conducted in the same Parisian district (Choquet, Facy, Laurent, & Davidson, 1982). In our study, we considered an infant as high risk if there were six or more risk factors. Based on this, the cutoff score of 5 was found to be optimal for screening purposes, with a sensitivity of 0.82 and a specificity of 0.78.

### Using the ADBB in Clinical Practice

The ADBB consists of eight items: (a) facial expression, (b) eye contact, (c) general level of activity, (d) self-stimulating gestures, (e) vocalizations, (f) response to stimulation, (g) relationship, and (h) attraction. Each item is rated from 0 (*no unusual behavior*) to 4 (*severe unusual behavior*) (i.e., scores range from 0 to 32; see the Appendix for the latest version of the scale). In essence, any routine examination of the infant can be utilized to assess infant social behaviors. It is important that the clinician attempts to socially engage the infant—by talking, smiling, and touching. First, the infant needs to become used to the situation—thus, at least 10 minu are required if assessing infant behavior using the ADBB. The scale may be used in different settings, provided that a sufficient amount of stimulation is given to the child in a reproducible manner. The pediatric examination, by a nurse or a pediatrician, is such a situation, but a developmental testing situation may be used as well, provided that the child is awake, fed, and clean. A face-to-face situation can be used to assess withdrawal behavior within the caregiver–infant interaction. In a pediatric setting, the nurse, the pediatrician, or an observer may easily score with the scale, immediately following the consultation. The scale works as a facilitator for observing the behavior of the child and for

assessing his or her response to the relationship and the stimuli offered. If the score is 5 and over (i.e., over threshold), the child needs to be reevaluated optimally within 2 weeks to check if the level of social withdrawal behavior is stable. If social withdrawal behavior is persistent, the next step will be to investigate if this behavior is observed within relationships to any adult or if it is specific to one relationship only. This differentiation will orient the clinician to different etiological pathways. The ADBB is not meant to be a diagnostic tool but to be a screening tool targeting a behavior alarm signal that subsequently needs to be confirmed, interpreted, and further investigated.

## SUMMARY OF METHODOLOGICALLY COMPARABLE STUDIES USING THE ADBB: MAIN RESULTS AND DISCUSSION

### *Finland: Comparison of Global Rating Scale for Mother–Infant Interaction (GRS) and ADBB (Puura, Guedeney, Mäntymaa, & Tamminen, 2007)*

This study used a subsample of a larger longitudinal early intervention study in Finland, the European Early Promotion Project (Puura et al., 2002). The purpose of the study was to investigate if and how ADBB scores correlate with the Global Rating Scale for Mother–Infant Interaction (GRS; Murray, Fiori-Cowley, Hooper, & Cooper, 1996), a well-established method for rating interaction behavior of young infants in more detail. The hypothesis of the study was that the ADBB would distinguish those infants with good interaction behavior on the GRS from infants with little or no positive engagement in play and inert or flat behavior according to the GRS infant scales. A sample of 127 eight- to eleven-week-old infants was videotaped in free interaction with their mothers, and infant interaction behavior was rated with both methods by blinded researchers. The ADBB, scored based on videotaped interactions, detected 80% of infants rated as having poor interaction skills on the GRS. Mothers of infants with ADBB scores above threshold performed less optimally during interactions with their infants when compared to mothers of infants with ADBB scores below threshold. As in the initial French ADBB study (Guedeney & Fermanian, 2001), a cutoff point of 5 or more proved to be optimal with satisfactory sensitivity (0.82) and specificity (0.78).

### *Prevalence of Withdrawal Behavior at Different Ages, Assessed at Two Different Time Points (Puura et al., 2010).*

This study, designed by the same Finnish team, gave the first estimation of the prevalence of withdrawal behavior at different ages, taking advantage of the Finnish Well Baby Clinics Network that provides primary care to more than 90% of the families in Finland. A random sample of 491 parents with 4-, 8-, and 18-month-old infants was asked to participate in the study. Parents of 363 infants (74%) agreed to participate. Infants were examined by general practitioners (GPs) during routine checkups, and symptoms of social withdrawal were assessed by the GPs during the visit. Prior to the study, all participating GPs had received training with the scale until they demonstrated sufficient reliability with the expert ($\kappa = 0.70$). Approximately 3% of infants in this normative, nonclinical population sample showed sustained social withdrawal behavior as a sign of distress, with two assessments at a 2-week interval.

### *Sustained Withdrawal Behavior in Clinic Referred and Nonreferred Infants in Israel (Dollberg et al., 2006)*

Thirty-six clinic-referred and 43 control infants were evaluated in this community sample study in Petah Tikvah, Israel. Families were visited at home, mother–child free-play and feeding interactions were videotaped, and mothers completed self-report measures. Interactions were coded for sustained withdrawal using the ADBB and for global relational patterns using the Coding of Interactive Behavior scale (Feldman, 1998). Two independent teams of coders, blind to the infant's status (referred or nonreferred), coded the videotaped mother–infant interactions. Higher ADBB scores were found for the referred group, with many infants (38.9%) scoring above the clinical cutoff (vs. 11.6% in the control group). More negative relational patterns were found for the socially withdrawn group in terms of higher maternal intrusiveness, lower reciprocity, and lower child involvement. Associations were found between maternal and child behavior during play and feeding and child sustained withdrawal behavior at play. Maternal depressive symptoms were higher in the referred group and correlated with maternal and child relational patterns. This study showed that withdrawal behavior could be assessed within the relationship with a caretaker. It confirmed the usefulness of at-home, videotaped feeding situations for assessing parent–infant relationships.

### *Maternal Depression and Infant Withdrawal Behavior: The First Australian Validation (Matthey, Guedeney, Starakis, & Barnett, 2005)*

The first goal of this study was to examine whether there was a relationship between maternal mood and infant social behavior during interaction with a clinician, as assessed using the ADBB during a routine physical checkup of the infant. Forty-seven mothers participated in the study, with infants attending either a local early childhood clinic for a routine infant checkup or a residential unit if there were baby care issues (e.g., sleeping or feeding difficulties). The three authors independently scored the videotapes with the ADBB. Fifteen of 44 infants (34.1%) scored above the threshold of 5 or more on the ADBB, which is a similar rate to that of the 2010 French sample of 60 infants (30% above the cutoff score of "5 or more"). ADBB scores were not related to the infant's reported "social temperament" with strangers. Follow-up analyses indicated that mothers reporting increased irritability, anxiety, sadness, or depression since giving birth had infants with significantly higher ADBB scores than did those denying any such mood symptoms since birth ($Ms = 5.6$ and $1.6$, respectively), $p = .001$.

### French Cross-Sectional Study on 640 Infants Seen in a Parisian Screening Center (Guedeney, Foucault, Bougen, Larroque, & Mentré, 2006).

The "Département des Examens de Santé de l'Enfant" of the "Caisse Primaire d'Assurance Maladie de Paris" assesses infants born to families living on social welfare in Paris and the Ile de France Région. The center provides checkups for infants aged 14 to 18 months free of charge. This study took advantage of this free public-screening center activity to further test the clinical validity of the ADBB, in checking some identified risk factors for relational withdrawal behavior in this population. Withdrawal behavior was assessed using the ADBB by three pediatric staff nurses. The three nurses had been trained by the author of the scale in the course of four training sessions using a set of 30 video clips of infants, until they reached good interrater reliability ($\kappa = 0.8$).

Thirteen percent of the 640 infants [$n = 83$, 95% CI (10.4%; 15.6%)] scored "5 or above" on the ADBB. There was a relationship between withdrawal behavior and having psychological difficulties as reported by parents, 14 vs. 39%, $p < .0004$. Withdrawal behavior as assessed with the ADBB was significantly linked with the following variables: infant male gender, $p < .01$, not living with both parents or not living with the mother (i.e., in foster care or living with a relative), $p < .08$, being adopted, $p < .0005$, being one of twins, $p < .01$, being taken care of at home rather than in daycare, $p < .03$, having psychological problems, $p < .0001$, and having developmental delay, $p < .0001$, using the French validated Brunet-Lezine test (Josse, 1997). No significant correlations were found between withdrawal and the socioeconomic status of the family, their ethnic origin, the infant's rank of birth, or any medical pathology other than FTT and low developmental quotient. Among psychological difficulties, as reported by parents to the nurse, sleep disorders were most frequent ($n = 59$; 43%), followed by relational and behavioral difficulties ($n = 34$; 25%), and feeding disorders ($n = 5$; 4%). Social withdrawal also was significantly associated with living under high-risk social conditions (e.g., child being in joint custody or with living in a foster family). Withdrawn infants were more likely to be taken care of at home than in daycare, as compared to not-withdrawn infants.

### Brazilian Replication of the Original ADBB Validation Study (Facuri-Lopes, Ricas, & Cotta Mancini, 2008).

This study was conducted in 2002 and replicated the French 2001 study with a larger sample ($n = 122$) in a well-baby clinic in Belo Horizonte, Brazil. The ADBB was scored during routine pediatric consultations. Behaviors were rated immediately after the physical examination. All examinations were video recorded, focusing both on the children's spontaneous behaviors and their reactions to the pediatrician during physical examination. Four investigators (two pediatricians and two nurses who were not specialized in pediatric care) scored the video recordings, and were blind to the results of the child's developmental and clinical assessment by the child's psychiatrist and blind to each other's coding results. Two parameters considered as gold standards were used to test the concurrent criterion validity of the ADBB. One parameter was a global clinical evaluation of the child's behavior throughout physical examination by means of a visual analogic scale (VAS). The other parameter was a clinical psychiatric evaluation of the child in his or her home environment. After the pediatric physical examination, the child psychiatrist globally assessed the child's social withdrawal behavior using a VAS. Once the consultation was over, the first author carried on the clinical psychopathological and developmental evaluation of the child by interviewing the mother and observing the mother–child interaction. The rate of children with psychopathological signs detected in the clinical evaluation of the sample was 11.5% ($n = 14$). Test-retest reliability revealed good interrater agreement ($r = 0.91$), but agreement was significantly higher between pediatricians (ICC $= 0.82$) than between nurses (ICC $= 0.61$). However, nurses who participated in this study had significantly less experience in observing infant development in this age group than did the pediatricians. Comparisons between children from the subgroup with withdrawal behavior and the total sample were conducted on the following variables: gender; total number of children in the family; birth rank; parental age; social class (including mother's schooling: age, social class with father's education); with working or nonworking mother, and with the level of health risk in the area of the residence. No significant statistical differences were found between the two groups on any variable. The cutoff score of 5 and above again yielded the best compromise between sensitivity (0.79) and specificity (0.81). Positive predictive value was low (0.35), but still acceptable for a screening instrument while negative predictive value was high (0.97). This study confirmed the clinical validity of the scale, confirmed the cutoff score of "5 and above" (as suggested in the French, Finnish, and Australian studies), and brought a confirmatory factor analysis (discussed later).

### First Study on Long-Term Developmental Impact of Social Withdrawal in Infants (Milne, Greenway, Guedeney, & Larroque, 2009).

The aim of this study was to follow up infants who were assessed in early infancy, at approximately 6 months of age, to determine the developmental impact of social withdrawal at approximately 30 months of age. In a previous community study, 139 mother–infant dyads were assessed (Milne, Greenway, & Hansen, 2007) on a variety of dimensions, including social withdrawal (ADBB). Fifteen mothers did not agree to further participation, and 61 were lost for follow-up. Of 62 families who agreed to participate, 4 had to be excluded because the infants had been diagnosed with medical or developmental disorders since the first assessment. Of the final sample of 58 infants, 31 were male, and 28 were female. Mean maternal age ($\pm SD$) at the first assessment was 30.4 ($\pm 4.8$) years; mean infant age was 6.6 ($\pm 4.1$) months. Mean infant age at follow-up was 31.3 ($\pm 4.9$) months. All families resided in outer urban Melbourne, an area rated by the Australian Bureau of Statistics as being socioeconomically disadvantaged. Most mothers (98.5%) were second-generation (or more) Australian. There was no significant difference between families who were lost to

follow-up and those who participated at both time points regarding maternal age, infant age, infant gender, parental level of education, or levels of maternal depression as assessed when the child was 6 1/2 months old. Infants of families who did not participate in the follow-up were significantly more likely to score above the cut point of 5 or more on the ADBB (49 vs. 28%, compared to those who participated at both time points), $p = .011$. At 6 months of age, when mothers and infants were first assessed, the main investigator (L.M., a trained infant clinician) interacted with the infant for about 10 min. The encounter was videotaped for later scoring by another researcher trained in the scoring of the ADBB. At follow-up, around 30 months, the researchers visited families in their homes. The Bayley Scales of Infant Development-III (BSID-III; Bayley, 2005) were administered by trained research clinicians, and mothers completed two questionnaires about their child's behavior: the Behavior Assessment System for Children (BASC-2; Reynold & Kamphaus, 2004). Mothers were interviewed about the development of their child since they first participated in the study. Significant negative correlations were found between infant social withdrawal and cognitive and language scales scores (BSID-III) and Social and Communication scores (BASC-2). Significant positive correlations were found between infant social withdrawal at 6 months and increased scores on Atypicality and Attention scales at 30 months. Infants who showed signs of withdrawal as toddlers had higher scores, on average, on the Social Skills subscale of the BASC-2, suggesting that they had more difficulty with the interpersonal aspects of social adaptation. Similarly, withdrawn infants at 6 months showed poor communication skills at 30 months regarding their functional communication abilities (as measured by the BASC-2) and their formal expressive and receptive language skills, as independently assessed using the BSID-III. Importantly, infant withdrawal was associated with only two types of behavioral problems, as reported by the mother: atypicality and attention problems. Atypicality measures the tendency of the child to behave in odd or peculiar ways, as marked by their disconnection or lack of awareness of their surroundings.

### Social Withdrawal in Infants Following Prenatal Exposure to Alcohol in Cape Town, South Africa (Molteno, Jacobson, Colin Carter, Dodge, & Jacobson, 2013)

The presence of infant social withdrawal was included in a study of the effects of prenatal alcohol exposure in a cohort of infants from an urban community in Cape Town. Prenatal alcohol exposure may lead to a spectrum of disorders ranging from fetal alcohol syndrome (FAS), the most severe outcome, to alcohol-related neurodevelopmental disorder (in which the distinctive FAS dysmorphology is lacking and neurobehavioral deficits are generally less severe). In addition to cognitive deficits, socioemotional development also is significantly affected in children and adolescents following prenatal alcohol exposure. Given that prenatal alcohol exposure causes diffuse neurological damage, it was hypothesized that it also might impact affective responses in infancy. In the study, 159 mothers and infants from the Cape mixed-race community participated. Mothers were interviewed about their alcohol consumption using a time

line follow-back approach to determine frequency and amount of drinking on a day-by-day basis. Sociodemographic and psychological correlates were examined. The ADBB was applied to 85 infants at 6 1/2 months. Temperament was assessed in 113 subjects by maternal report when the infant was 13 months of age, using the EAS Temperament Survey (Buss & Plomin, 1984). Because of its role in affective development in infancy, iron deficiency was examined as an alternative explanatory variable for observed effects of prenatal alcohol exposure on infant affective outcome. At 5 years, the children were diagnosed for fetal alcohol syndrome by expert dysmorphologists, and child depression was assessed using the Draw-A-Person. The children also were administered the Junior South African Individual Scales and the Wechsler Intelligence Scales, Fourth Edition (WISC-IV; see Molteno et al., 2013) at 9 years of age. An association between daily alcohol intake and frequency of drinking during pregnancy and infant social withdrawal at 6 1/2 months after delivery was demonstrated. There was no relation between infant social withdrawal and sociodemographic factors or maternal psychopathology, including maternal depression. Lower levels of activity in the more heavily exposed infants were reported by mothers on the EAS at 13 months. In conjunction with higher levels of social withdrawal observed at 6 1/2 months on the ADBB, these findings are consistent with the known blunted response seen in alcohol-exposed newborns (Oberlander et al., 2010). Infant social withdrawal was associated with iron deficiency; however, on a regression analysis, the effects of prenatal alcohol intake and iron deficiency on infant withdrawal remained unchanged, indicating that neither of these factors was mediated by the other. Infant social withdrawal was predictive of severity of fetal alcohol spectrum disorder diagnosis and child depression at age 5 years and child IQ at 5 and 10 years. Therefore, withdrawal behavior at 6 months of age appears to be an early warning for developmental deficits in the context of prenatal exposure to alcohol, as well as a predictor for ulterior cognitive delay, independent of maternal postnatal depression.

### ADBB Within the French EDEN Cohort Study: Birth Weight and Withdrawal Behavior at 12 Months (Guedeney, Marchand-Martin, Cote, Larroque, and the EDEN Mother–Child Cohort Study Group, 2012)

The objectives of the study were to assess the prevalence of social withdrawal behavior in infants aged 12 months who participated in the French Perinatal Risk Factor Study EDEN (Etude des Déterminants de l'Environnement Néonatal; Guedeney et al., 2012). The EDEN prospective Birth Cohort Study aimed to identify prenatal and early postnatal nutritional, environmental, and social determinants associated with children's health and their normal and pathological development (http://eden.vjf.inserm.fr). A total of 1,586 infants were included in the study. Fourteen percent of the children who had an ADBB assessment had a score of 5 and over, a value comparable to the findings of the 2006 Parisian study (Guedeney, Foucault, Bougen, Larroque, & Mentré, 2008). Social withdrawal at 12 months was associated with low birth weight, $p < .003$, low gestational age, $p < .02$, and intrauterine

growth retardation, $p < .02$. Social withdrawal was independently associated with several maternal and paternal risk factors. The level of social withdrawal behavior increased significantly with increased levels of maternal life stressors. This longitudinal study of a large volunteer sample demonstrated clear associations between social withdrawal behavior at 1 year of age and low birth weight and preterm birth, possibly mediated by parental vulnerabilities. One limitation of the study is the fact that the sample was socially more privileged than the general population; this was reinforced by a higher proportion of those lost to follow-up among poorer and less educated families.

### *Unfolding Pathways From Infant Social Withdrawal Behavior to Infant Psychopathology: Costa and Figueiredo's (2011) Longitudinal Study*

In this study, the interplay of both infant behavioral and physiological features as well as the mutual influence of infants and mothers on the quality of mother–infant interaction were considered. The study aimed at (a) identifying some profile groups of infants according to their behavioral and physiological characteristics, considering their neurobehavioral organization, social withdrawal behavior, and endocrine reactivity to stress; and (b) analyzing group differences in the quality of mother–infant interaction. Ninety-seven 8-week-old infants were examined using the Neonatal Behavioral Assessment Scale (NBAS; Brazelton & Nugent, 1995) and the ADBB. Cortisol levels were measured before and after routine inoculation at 8 and 12 weeks of age. At 12 to 16 weeks, mother–infant interaction was assessed using the Global Rating Scales of Mother–Infant Interaction (Murray et al., 1996). The three variables considered in the analysis were converted to standard scores: NBAS Total Score ($M = 4.17 \pm 0.54$), ADBB Total Score ($M = 1.49 \pm 1.92$), and cortisol level ($M = 0.30 \pm 0.37$). The stepwise discriminant analysis extracted two discriminant functions and retained ADBB, NBAS, and cortisol as significant variables. The first function was defined by the ADBB Total Score and explained 89.6% of the variability. This function significantly discriminated between the three clusters. The second function was defined by NBAS and cortisol, and it explained 10.4% of the variability. Three groups of infants were identified: "withdrawn," "extroverted," or "underaroused." An analysis of variance showed significant differences between the groups on neurobehavioral organization, social withdrawal, and cortisol. All variables contributed significantly to the differentiation of clusters: NBAS, $F = 39.825$, $p < .000$, ADBB, $F = 62.697$, $p < .000$, and $\delta$ cortisol, $F = 19.148$, $p < .000$. The Bonferroni post hoc test showed that the withdrawn infants group had lower performances on the NBAS as compared to extroverted and to underaroused groups, with underaroused infants having lower performances on NBAS as compared to extroverted infants. Furthermore, withdrawn infants showed more signs of social withdrawal as compared to extroverted and underaroused infants while underaroused infants showed more signs of social withdrawal as compared to extroverted infants. Underaroused infants had significantly lower en-

docrine reactivity as compared to withdrawn and to extroverted infants. Significant differences among the groups were found regarding both infant and maternal behaviors in the interaction and the overall quality of mother–infant interaction. Subsequent univariate analyses indicated that mothers of withdrawn infants were less sensitive, felt less happy than did mothers of underaroused infants, and were less sensitive in their interactions with their child than were mothers of extroverted infants. Underaroused infants had lower endocrine responses to acute stress, and their mothers were the most competent in the interaction. This might be indicative of the critical role the caregiver's behavior has on the modulation of the infant's regulation of biological responses to stressors.

Importantly, even though both extroverted infants and withdrawn infants had comparable endocrine response to acute stress, they were quite different in their behavioral characteristics. Extroverted infants showed better performance on neurobehavioral organization and a lower level of social withdrawal. In addition, they expressed more positive behaviors in the interaction, and the overall quality of mother–infant interaction was better. These findings support the theory that behavioral features early in life influence the development of significant relations. Regarding the comparison of withdrawn infants with the other two groups of infants, the results of this study were consistent with those of Puura et al. (2007), who reported that withdrawn infants showed poorer performance during interaction with their mothers as compared to nonwithdrawn infants.

Identification of infants with different behavioral and physiological profiles will contribute to the understanding of developmental trajectories that could lead to (mal-)adaptive development. This study confirms the importance of sustained social withdrawal behavior as an intermediate factor in the unfolding of early psychopathology. This finding also was confirmed by Viaux-Savelon et al. (2010), who analyzed the follow-up of 102 infants referred to a public university hospital infant clinic in Paris, using the Diagnostic Classification DC:0–3 (ZERO TO THREE, 1994). Multiple correspondence analyses showed that two dimensions corresponding to DC:0–3 Axes I and II emerged. They emphasized three clinical profiles characterized by (a) good infant functioning, parent's awareness of their own difficulties, and a better prognosis in terms of psychopathology; (b) moderate child symptoms, overinvolved relating of parents, and a good/intermediate psychopathological outcome; and (c) severe child symptoms, underinvolved relating, and a less favorable psychopathological outcome, signaling the risk for developmental disorders. All withdrawn infants were in the less favorable short-term outcome group.

The results of this study also are in line with another recent study based on the Child Behavior Check List (CBCL 1.5–5; Achenbach & Rescorla; 2000), with parents from 23 societies around the world reporting on their 19,106 children aged 18 to 71 months. Converging of all samples yielded a seven-syndrome model (Ivanova et al., 2010): anxious/depressed ($M$ loading $= 0.62$), attention problems, emotionally reactive, sleep, somatic complaints, and withdrawn. The withdrawn syndrome was defined by eight items: acts too young for age, avoids looking in the

eye, does not answer when talked to, refuses to play active games, seems unresponsive to attention, shows little affection to people, shows little interest in things around him or her, and is withdrawn (i.e., does not get involved with others). Thus, social withdrawal is likely an important item in defining child psychopathology, whatever the culture. However, it is not clear to what extent the children and toddlers with social withdrawal behaviors in this sample were withdrawn when infants.

### Taking Into Account Both Parents' Mental Health (Mäntymaa et al., 2008)

Generally, the impact of fathers' mental health on child development during the first years of life has not gained much research attention. Recently, however, Ramchandani et al. (2005) reported in a large population-based study that depression in fathers during the postnatal period was independently associated with adverse emotional and behavioral outcomes in children at age 3 1/2 years. Although by no means the only factor, paternal depression seems to be an important factor in the etiology of sustained withdrawal in infancy.

In earlier studies assessing sustained withdrawal in infants, Matthey et al. (2005) found that infant withdrawn social behavior was related to the maternal reports of experiencing more sadness, irritability, depression, and anxiety since having given birth, but not to current maternal depressive symptoms. The authors emphasized the importance of assessing mother's mood difficulties over a longer period of time and not just concurrently. Fathers were not included in their study. Matthey et al. (2005) examined the association of infants' sustained social withdrawal with parents' self-reported current depressive symptoms and perceived mental health. Infants aged 4, 8, and 18 months ($n = 260$) were examined with the ADBB. Parents' depressive symptoms and perceived mental health during the preceding year were elicited through questionnaires. Seven percent of mothers reported depressive symptoms exceeding the cutoff of ≥13 on the Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden, & Sagovsky, 1987). Only 9 fathers (5%) scored over the EPDS cutoff point indicative of likely depression, using a lower cutoff point. Both mothers' current depressive symptoms and fathers' perceived moderate or poor mental health during the preceding year independently increased infant risk of withdrawal, $p < .002$. When both parents had mental health problems, the infant was much more likely to be withdrawn: Infant withdrawal behavior was high in cases of maternal depressive symptoms, $p < .03$, but not when father was depressed. However, withdrawal in the infant was correlated with mental health in the year perceived as poor for the mother, $p < .02$, as well as for the father, $p < .02$, and became very significant when both parents perceived their mental health as moderate or poor in the preceding year, $p < .0002$.

### Two Validation Studies (Argentina: Oliver, 2011; Italy: De Rosa et al., 2010) Have Confirmed the Clinical and Construct Validity of the Scale

In the Argentinian validation study, the same method was applied as that in the Brazilian validation study (Facuri-Lopes et al., 2008).

The study took place in the Buenos Aires German hospital, with 43 girls and 56 boys aged 2 to 24 months, consecutively seen for routine pediatric examination. Kappas between raters was .67, on average, after training. With the DC:0–3 as the diagnostic reference, a cutoff score of 4 and over yielded a sensitivity of 0.62 and a specificity of 0.73; a cutoff score of 5 and over gave a lower sensitivity, 0.52, but a better specificity, 0.83. The results of the factor analysis from this sample are described later.

The Italian study took place during a pediatric consultation at Gemelli University Hospital in Rome. Eighty-one families reporting to the clinic for the first time were assessed during a routine pediatric examination. No family declined to take part in the study. The ADBB assessment was scored immediately after the examination by a trained pediatrician or a psychologist, and a second time 6 months later. After the first assessment, infants were then referred to a child psychiatrist, blind to the results of the ADBB assessments, for diagnostic assessments using the DC:0–3 (ZERO TO THREE, 1994). After the second ADBB assessment, families were seen for one interview by a certified child psychiatrist for a mental assessment of both parents and an assessment of parent–child relationships as well as an assessment of the mother's mental health and physical status. The results showed a strong negative correlation between ADBB scores and the DC:0–3 Parent–Infant Relationship Global Assessment Scale scores, $r = -0.83, p < .001$ (PIR-GAS, DC:0–3, ZERO TO THREE, 1994). An ADBB cutoff score of 5 and over yielded the best trade-off between specificity (0.85) and sensitivity (0.82), with a positive predictive value of 0.36 and a negative predictive value of 0.95. These figures are comparable to those found by Facuri-Lopes et al. (2008) in Brazil and by Oliver (2011) in Argentina. Breastfed infants had lower ADBB scores than did formula-fed infants. Infant withdrawal behavior was increased 14-fold by maternal organic postnatal condition, ninefold by maternal psychological postnatal disorders, and fourfold by maternal postnatal depressed mood, as assessed by the EPDS.

### OBSERVATIONAL STUDIES USING THE ADBB (SEE TABLE 2)

### Entering Daycare as Infants: The Parisian ADBB and Attachment Study (Guedeney, Grasso, & Starakis, 2004)

A small, longitudinal study was conducted in Paris in a public daycare setting. The goal of the study was to investigate the physical as well as the psychological effects on young infants with early entry dates into daycare, which happens in France, on average, as early as 2 months after delivery. Infant withdrawal behavior was assessed at several time points as was the child's temperament, mother's anxiety level, and security of attachment in the child at 12 months of age, for 23 infants entering daycare ($M$ age = 9 months). All physical and behavioral events for the child were recorded during a 9-month period. No relationship was found between security of attachment, child temperament, and becoming ill after entering daycare nor with temperament and withdrawal behavior of the child. However, securely attached children showed the highest levels of relational withdrawal on the ADBB during

**TABLE 1.** *Controlled Studies Using the Alarm Distress Baby Scale (ADBB) Controlled Studies Using the Alarm Distress Baby Scale (ADBB)*

| Author(s) | Date of Publication | Country | Goal | Population | Method | Reliability Checking |
|---|---|---|---|---|---|---|
| Guedeney & Fermanian | 2001 | France | First Validation of ADBB | $N = 60$ Well-Baby Clinic 2–24 Months | ADBB vs. Developmental Risk Factors 1-Year Follow-Up | Expert vs. Nurse and Pediatrician |
| Matthey, Guedeney, Starakis, & Barnett | 2005 | Australia | Maternal Mood vs. ADBB | $N = 47$ Daycare 13–52 Weeks | ADBB vs. EPDS | Independent Blind Rating by 3 Experts |
| Guedeney, Foucault, Bougen, Larroque, & Mentré | 2005 | France | Clinical Validation | $N = 650$ Pediatric checkup 14–18 Months | Cross-Dectional ADBB Pediatric Examination | Rating by 3 Trained Nurses |
| Puura, Mäntymaa, & Tamminen | 2007 | Finland | ADBB as a Screening Instrument | $N = 127$ 8–11 Weeks EEP Subsample | Comparison of EDBB Scores With GRS | Rating on Video by Experts |
| Dollberg, Feldman, & Keren | 2006 | Israel | ADBB in Clinic-Referred vs. Community | 36 Clinic-Referred vs. 43 Community Controls | ADBB Scores vs. CIB | Rating on Video by 2 Experts |
| Guedeney, Marchand-Martin, Cote, & Larroque | 2006 | France | Correlates of Withdrawal Behavior at 12 Months | $N = 1,275$ ADBB at 12 Months | Study Follow-Up at 3 and 5 Years | Rating by 3 Trained Midwifes |
| Molteno, Jacobson, Oberlander, Dodge, & Jacobson | 2005–2012 | South Africa | Withdrawal Behavior at 6 1/2 Months in Alcohol-Exposed Infants During Pregnancy | $N = 85$ Infants and 85 Controls | Follow-Up at 5 and 9 Years | Rating by Two Trained Researchers |
| Facuri-Lopes, Ricas, & Cotta- Mancini | 2008 | Brazil | Clinical Validation | $N = 122$ Well-Baby Clinic 2–24 Months | ADBB Scores vs. Clinical Assessment by Child Psychiatrist | Ratings by 2 Experts |
| Mäntymaa et al. | 2010 | Finland | Prevalence in Well-Baby Clinic Population | $N = 363$ 4, 8, 18 Months | ADBB/EPDS 2 ADBB at 2-Weeks Interval | Rating by GPs Trained Until M $\kappa = .7$ |
| Milne, Greenway, Guedeney, & Larroque | 2009 | Australia | $N = 58$ | Consequences of Withdrawal at 6 Months When 30 Months of Age | Bayley-III BASC-2 | Rating by Two Independent Trained Researchers |
| Costa & Figuereido | 2011, 2012 | Portugal | $N = 97$ 8 weeks old | Longitudinal Study of Developmental Profiles | ADBB/NBAS/ Cortisol/GRS | One Trained Rater |
| Oliver | 2011 | Argentina | $N = 99$ 2–24 months | Argentinian Validation | ADBB/DC:0– 3/Argentinian Development Testing PRUNAPE | $\kappa = .67$ |
| De Rosa et al. | 2010 | Italy | $N = 81$ 2–24 | Italian Validation Correlation With Maternal Pathology | ADBB/EPDS/DC:0–3 | $\kappa = .8$ for ADBB Raters |

EPDS = Edinburgh Postnatal Depression Scale; GRS = Global Rating Scale for Mother–Infant Interaction; CIB =; Bayley-III = Bayley Scales of Infant Development (3rd ed.); BASC-2 = Behavior Assessment System for Children; NBAS = Neonatal Behavioral Assessment Scale; PRUNAPE =.

the regular pediatric examinations carried out in the daycare center, with more frequent illness as compared to the seasonal rate when they return from holiday breaks.

### A French Study Using the ADBB, the EPDS, and the Parent Infant Pediatric Examination (PIPE;) as Screening Instruments in the Postpartum Period (Rochette & Mellier, 2007)

Fifty-four nonclinical dyads were followed in Lyon (France) in a well-baby clinic using clinical assessment, the ADBB, the EPDS, and an interactional measure of the quality of parent–child play (PIPE; Fiese, Poehlmann, Irwin, Gordon, & Curry-Bleggi, 2001). The study showed that assessing withdrawal behavior using three measures at different ages (3, 6, and 12 months) allowed for a good

screening of mother–child interactional disorders. The predictive value of a disorder in the mother–child relationship was 0.5 when one ADBB score was 5 and over, it rose to 0.65 when two consecutive ADBB screening results were above threshold, and it reached 0.92 when three consecutive ADBB results were positive.

### Withdrawal Behavior in Family Videos (Wendland, Gautier, Wolff, Brisson, & Adrien, 2010)

Although sustained withdrawal behavior is a key symptom of a diagnosis of autism spectrum disorder (ASD), to date, it has received little attention in studies of precursory signs of pervasive developmental disorder (PDD). Wendland et al. (2010) aimed to identify early signs of sustained withdrawal behavior in infants from birth

**TABLE 2.** *Observational Studies With the Alarm Distress Baby Scale (ADBB)*

| Authors | Date of publication | Country | Goal | Population | Method | Reliability Checking |
|---|---|---|---|---|---|---|
| Assumpçao, Kuczynski, Da Silva Rego, & Castanho de Almeida Rocca | 2002 | Brazil | Observation in Daycare | $N = 90$ 0–2 Years | Observational FA | Pediatrician/Nurse $r = 0.80$ |
| Guedeney, Grasso, & Starakis | 2004 | France | Effects of Getting Into Daycare on Health and Withdrawal Behavior | $N = 23$ 2 Months | 1-Year Follow-Up ADBB | One Trained Rater $\kappa = .8$ With Fisrt Author |
| Rochette & Mellier | 2007 | France | ADBB as a Screening Tool in Postpartum | $N = 85$ 3, 6, 12 Months | ADBB/EPDS/PIPE | Training of Raters Until $\kappa = .8$ |
| Re et al. | 2010 | Australia | ADBB in Infants With Cardiac Surgery | $N = 24$ 8 Weeks | ADBB/EPDS/STAI/PSI | Two Trained Raters, $\kappa = .8$ |
| Wendland, Gautier, Wolff, Brisson, & Adrien | 2010 | France | Early Sign of Autism ADBB in Family Videos With Autism Spectrum Disorder Children vs. Normally Developing Children | $N = 12$ 0–18 Months | ADBB/ECA-N | One Trained Rater, $\kappa = .91$ |

FA = ; EPDS = Edinburgh Postnatal Depression Scale; PIPE = Parent Infant Pediatric Examination; STAI = Spielberger Trait Anxiety Inventory; PSI = Parent–Infant Stress Index; ECA-N = Echelle de Comportements Autistiques-Nourrisson.

to 18 months of age, later diagnosed as ASD, based on the analysis of home movies. The validity of the ADBB in the screening for early signs of ASD was tested by comparison with a specific scale of autistic behaviors in infants: the "Echelle de Comportements Autistiques-Nourrisson" (ECA-N) (Infant Scale for Autistic Behaviors; Wendland et al., 2010). Compared to normal infants, infants with a PDD had higher and more persistent scores of sustained withdrawal behavior during their first 18 months, $n = 36$, $p < .0001$. While infants with PDD showed important interindividual differences on the ADBB and the ECA-N assessments, their individual score profiles in the ADBB and the ECA-N were similar. The correlation between the scores of the ADBB and the ECA-N may confirm the potential predictive value of sustained withdrawal behavior in the early screening of autism. Recently, more research attention has been given to early identification of autism, questioning whether there are in fact early definitive signs (Ozonoff et al., 2011). Findings have suggested that there potentially might be some aspect of sustained withdrawal in infancy that may point to ASD. Replication of such a study on a longitudinal and controlled sample would be necessary.

### Infants With Cardiac Surgery, Infant Withdrawal, and Maternal Distress (Re et al., 2008)

Re et al. (2008) studied maternal distress, using the EPDS (Cox et al., 1987), the Spielberger Trait Anxiety Inventory, and the Parent–Infant Stress Index (PSI), along with the ADBB, on 24 mother–infant pairs. All infants required cardiac surgery in the first weeks of life. Coders had reached a high level of agreement with ADBB training clips ($\kappa = 0 .94$). High levels of withdrawal behavior were found in this high-risk sample: Forty-eight percent of the infants were withdrawn, with 57% of mothers being depressed using the EPDS with score of $\geq 12$. None of the infants

born to mothers with low distress scores showed social withdrawal behaviors.

### Results of Studies Investigating ADBB Factor Analysis

In the initial Paris 2001 study, following Rosenn et al. (1980), the construction of the scale hypothesized two dimensions: one dimension that was linked with relationships (Interpersonal) and one linked with infant biological/temperamental characteristics (Noninterpersonal). Reliability was satisfactory, with good internal consistency for both subscales (Cronbach's $\alpha = 0.80$ for the Interpersonal scale and 0.79 for the Noninterpersonal scale) and for the global scale (Cronbach's $\alpha = 0.83$). Test-retest procedures showed good stability over time ($r = 0.90$ and 0.84 for the two different raters) at a 2-week interval. Factor analysis extracted two orthogonal factors, which accounted for 63.3% of the variance. The first factor consisted of five items: 2 (eye contact), 3 (general level of activity), 4 (self-stimulating gestures), 7 (relationship), and 8 (attractivity). The second factor consisted of three items: 1 (facial expression), 5 (vocalization), and 6 (response to stimulation). In summary, this first ADBB study confirmed the construct validity of the scale, with two hypothesized factors: one major factor, thereafter called the "Interpersonal" factor, possibly linked to the quality of parent–infant relationships, and a minor factor with less weight—the "Noninterpersonal" factor—hypothesized to be linked to the child's more biological/temperamental disposition.

### First study outside of France; conducted in Brazil in a daycare (Assumpçao, Kuczynski, Da Silva Rego, & Castanho de Almeida Rocca, 2002). Ninety infants between 0 and 2 years old were assessed with the aforementioned scale. In this Sao Paulo study, both types of examiners (i.e., pediatricians and nurses) were qualified in mental health issues. The interrater reliability was assessed by

the Spearman rank correlation ($s = 0.86$). This study found four ADBB factors, accounting for 63.5% of the variance. Factor I consisted of facial expression and general level of activity, Factor 2 was composed of eye contact and response to stimulation, Factor 3 of self-stimulating gestures and the relationship to the observer, and Factor 4 of vocalizations. There were no items loading on more than one factor.

In the Australian validation study, Matthey et al. (2005) described two factors accounting for 58.4% of the variance. The first and major factor (accounting for 52.7% of the variance) consisted of facial expression, eye contact, relationship with the observer, and attraction of the infant to the observer. The second minor factor (accounting for 5.7% of the variance) consisted of general level of activity, vocalizations, and briskness of response to stimulation. Item 4 (self-stimulating gestures) did not load on either factor.

In the Brazilian ADBB validation study (Facuri-Lopes et al., 2008), the factor structure from the construct validity analysis revealed two components, accounting for 49.6% of the variability. One component encompassed facial expression (Item 1), eye contact (Item 2), level of activity (Item 3), briskness of response to stimulation (Item 6), and ability to engage into a relationship (Item 7). The other component gathered self-stimulating gesture (Item 4), vocalization (Item 5), and ability of the child to attract and maintain attention (Item 8). The low percentage of explained variability by the initial factor structure and the low weight attributed to Item 4 in this factor analysis led to a second factor analysis defining three components. This analysis-explained variability rose to 61.9%. Item 4 was now defined as a third and isolated component. Visual contact (Item 2) and relationship with the examiner (Item 7) also changed position and were now clustered with attraction (Item 8) and vocalization (Item 5). This factor solution differed from the first one; the item level of activity (Item 3) migrated to the group considered spontaneous or noninterpersonal behavior, item vocalizations (Item 5) migrated to the group considered interpersonal behavior, and self-stimulating gestures (Item 4) showed high correlation with a third component. The findings from this second factor analysis seem reasonable from a clinical point of view. These results are comparable to those found by Guedeney et al. (2008) in France with 640 infants aged 14 to 18 months, as described earlier.

In the Argentinian ADBB validation study (Oliver, 2011), Cronbach's $\alpha$ was 0.72 for the global scale. Factor analysis revealed three factors: one was identified as the interpersonal dimension, one as the noninterpersonal dimension, and the third being represented by Item 4 (self-stimulating gestures) alone.

In the Paris transsectional study (Guedeney et al. (2008), a principal component analysis confirmed the third axis found by Matthey et al. (2005) and by Facuri-Lopes et al. (2008): Axis I (explaining 37.3% of variance), the main interpersonal dimension of the construct, arguably linked with desynchronization of the parent–infant relationship, gathers Items 2 (visual contact), 7 (relationship), and Item 8 (attraction); Axis II (16.3% of variance), noninterpersonal dimension, arguably linked with temperament, gathers Item 1 (facial expression), Item 3 (general body activity),

Item 5 (vocalization), and Item 6 (reaction to stimulation), with 53.6% of the variance being explained by both Axes I and II. Axis III (13.3% of variance) was linked only with Item 4 (self-stimulating gestures). A step-by-step procedure using Cronbach's $\alpha$ analysis clarified dimensionality of ADBB components. A strong link between Items 7 and 8 was found, $p < .0001$. This confirmation analysis indicates that all items are needed, with the possible exception of Item 6 (reaction to stimulation). This analysis strengthens the choice of items in the short version of the ADBB, the m-ADBB (Matthey, Ĉrncec, & Guedeney, 2005).

## THE M-ADBB

Matthey et al. (2005) developed the m-ADBB to be used as a screening tool in Australia, but it is still awaiting further validation. This version—*the m-ADBB*—includes only five areas: (a) facial expression, (b) eye contact, (c) vocalization, (d) activity level, and (e) relationship. In addition, the scoring is changed to three global levels: "Satisfactory," "Possible problem," or "Definite problem" for each area. Matthey et al. (2013) are currently conducting studies on the training and interrater reliability of the m-ADBB. One "Definite problem" or two "Possible problems" on the m-ADBB indicates that further assessment on the infant should be done—ideally conducting a second testing within a few weeks to determine if the infant's signs of "withdrawal" were transient or enduring. Matthey et al. (2005; 2013) found that many infants showing "withdrawal" signs on an initial assessment were no longer showing them just a few weeks later or with their mother, and this accords with findings by Puura et al. (2010) in their retesting of infants with the health professional.

The first published study using the m-ADBB was made by Hartley et al. (2010) at Stellenbosch University Hospital in South Africa on a sample of mothers and children with HIV. The study examined the relationship between maternal postpartum depression and infant social withdrawal at 10 to 12 months of age in HIV-infected mothers and infants. The study also ascertained whether infant social withdrawal could be significantly predicted by maternal postpartum depression. The sample consisted of 83 HIV-infected mother–infant dyads. Mothers were assessed for postpartum depression with the EPDS, and infant social withdrawal behavior was rated using the m-ADBB. Authors were trained with the m-ADBB using Matthey and Ĉrncec's training kit and support. Reliability of the m-ADBB yielded an acceptable Cronbach's $\alpha$ of 0.8. 42.2% of the mothers scored above the cutoff point for depression on the EPDS, and a third of infants (31%) were socially withdrawn. Notably, current maternal depression did not predict infant social withdrawal as measured by the m-ADBB, and this was in line with the findings by Matthey et al. (2005). They found, using the ADBB, that a reported history of mood difficulties since the birth, rather than current mood, was related to infant withdrawal. Infant social withdrawal also was not significantly associated with FTT or gender in the Hartley et al. (2010) study. Several limitations deserve mention. First, the m-ADBB was not administered to HIV-negative controls for comparison. Second, maternal

depression was assessed at a single time point, and so may have missed mothers affected by depression in the preceding 10- to 12-month period. These limitations may account for the lack of association between maternal depression and infant withdrawal.

## TRAINING WITH THE ADBB

In Uruguay, Plevak, Schelotto, Bonifacino, and Mussetti (2013) conducted a study on training pediatricians with the scale. They found that the pediatrician's feelings of therapeutic efficacy significantly increased after training with the scale. Recent training with the ADBB in France and Sweden demonstrated that a simplified version of the ADBB helped clinician and researcher to more easily reach reliability. The simplified version dropped the definition of each level for each item, emphasizing the scoring from 0 to 4 of each item (see the Matthey et al., 2005, 2013, version of the scale in the Appendix). In addition, these trainings showed that using the m-ADBB first to score a video clip and then the full ADBB on the same clip yielded a better and faster interrater reliability (see the 2012 version of the ADBB scale, below). A website is available at www.adbb.net, in English and in French, with scales, manual for use, translations, and relevant papers.

## PERSPECTIVES AND FUTURE DIRECTIONS OF RESEARCH

One of the most important tasks in the field of infant psychopathology is to identify the relationship disturbances between parents and their infants associated with specific diagnostic categories of infant mental health. Sustained infant social withdrawal behavior is a key clinical dimension in the context of, for example, infant depression. Early identification of infants at risk allows for early inquiry about its cause, be it in the caregiver's relationships with child, in the child, or both. In addition, infant sustained social withdrawal behavior is an important clinical feature that can be utilized to assess developmental transformation over time. This is particularly important because early childhood is a period of rapid developmental transformation (Zeanah, 1997). To monitor effectiveness of treatment approaches, a target behavior needs to be identified that remains stable despite the rapid changes in the phenotypes of child psychopathology over the first years of life. Infant social withdrawal behavior thus appears to be an ideal target behavior, and the ADBB can be utilized to reliably monitor its development over time.

Development is an active process, and the optimal mental development within the child's potentialities is not achieved when the child is withdrawn for a period of time. From a research viewpoint, social withdrawal behavior is an interesting endophenotype, as there is a clear relationship between withdrawal behavior and biological regulatory phenomena such as, for example, cortisol reactivity to stress (Costa & Figueiredo, 2011, 2012). In addition, there is a common interface between social withdrawal and temperamental genetic susceptibility (Fox, 2004) as well as with genetic susceptibility to attachment disorganization (Bakermans-Kranenburg & van IJzendoorn, 2007). Social withdrawal behavior

in infants, as assessed with the ADBB, is an important defense mechanism and therefore an important alarm signal to screen for, both in the context of preventive services and of clinical treatment settings (Glascoe & Macias, 2003; Guedeney et al., 2011). More studies are needed to further specify possible causal mechanisms leading to social withdrawal in early infancy and to identify infants with special needs and in specific risk situations. In addition, infant social withdrawal needs to alert clinicians to investigate if there are any parental mental health issues. Similarly, if a parent has mental health problems, the infant's social behavior and possible withdrawal needs to be examined. Families in which both parents experience poor mental health should be identified and treated because the infants of these families in particular seem to be at risk for social withdrawal. This also is a plea for jointly assessing parent's and infant's mental health when a child is referred to an infant clinic or when the child is in a situation with developmental risks such as prematurity or a malformation such as cleft palate (Grollemund et al., 2012), as treatment of such malformations needs to include parent–infant therapies in addition to adult psychiatric services for the parent and to early intervention services for the child. Comprehensive assessment and treatment approaches for families need to include screening of parents during child evaluations and to explore parent–infant relationship dynamics in the same clinic (Vidair et al., 2011). Future research will need to focus on validation of the m-ADBB, on the valid use of the scale with very young children (before 2 months of age), and on the predictive validity of the scale as well as on the best pathways to reaching and keeping reliability in using both scales.

## APPENDIX

*Alarm Distress Baby Scale (ADBB; A. Guedeney, 2012)*

Each item is rated on a scale from 0 to 4:

> **0: No unusual behavior, or doubt**
> **1: Slightly unusual behavior, but sure about it**
> **2: Clear unusual behavior**
> **3: Very obvious unusual behavior**
> **4: Massive unusual behavior at all times**

This scale is best rated by the observer on the basis of her/his observations, immediately following the clinical interview. Initially, spontaneous behavior is assessed, then following stimulation (smile, voice, gesture, touch, etc.), and the evolution along time. The rating is what seems more significant during the whole examination procedure. **In case of doubt, use the lowest rating.**

1- **FACIAL EXPRESSION:** Observer assesses any reduction of facial expressiveness, through changes in facial expression, rather than intensity of expression.

0:         1:         2:         3:         4:

2- **EYE CONTACT:** Observer assesses the reduction of eye contact: usually the child locks eyes with the observer and maintains

eye contact; observer assesses if eye contact is difficult to get and to sustain.

0:          1:          2:          3:          4:

3- **GENERAL LEVEL OF ACTIVITY:** Observer assesses any failure of motion of the head, torso and limb without taking into account hands and fingers activity.

0:          1:          2:          3:          4:

4- **SELF-STIMULATING GESTURES :** Observer assesses the frequency with which the child is engrossed with his/her own body activity: fingers, hand, hair, thumb sucking, repetitive rubbing etc., in a sort of mechanical , nonpleasurable way that seems odd and detached from the rest of the activity and does look like self comfort. One clear and odd gesture is enough to score for a 1.

0:          1:          2:          3:          4:

5- **VOCALIZATIONS:** Observer assesses the lack of vocalization expressing pleasure, but also lack of vocalization expressing displeasure or pain: frequency of vocalization is what is assessed here along observation.

0:          1:          2:          3:          4:

6- **BRISKNESS OF RESPONSE TO STIMULATION:** Observer assesses the sluggishness of response to pleasant or unpleasant stimulation during the examination (smile, voice, touch). The amount of response is not being assessed here, but only the delay in the response. One clear and swift answer to a stimulation is enough to score 0.

0:          1:          2:          3:          4:

7- **RELATIONSHIP:** Observer assesses the infant's ability to engage in a relationship with him/her or with anyone present in the room, other than his/her caretaker, and the ability of the child to sustain relationship during the observation.

0:          1:          2:          3:          4:

8- **ATTRACTION:** The effort needed by the observer to keep in touch with the child is assessed here, along with the pleasure initiated by the contact with the child and the subjective feeling of length of time during the examination; contact with a nonwithdrawn child yields no effort to sustain attention on the child during all examination.

0:          1:          2:          3:          4:

**LAST NAME:          FIRST NAME:          TOTAL:**
**DATE: / / / AGE: / /MONTHS / / DAYS**
**EXAMINER**

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# RELATION BETWEEN SOCIAL WITHDRAWAL SYMPTOMS IN FULL-TERM AND PREMATURE INFANTS AND DEPRESSIVE SYMTOMS IN MOTHERS: A LONGITUDINAL STUDY

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ABSTRACT: The objective of this longitudinal study was to investigate the prevalence of infants' social withdrawal and mothers' depressive symptoms in a cohort of full-term infants and their mothers and in a cohort of moderately premature infants and their mothers at 3, 6, and 9 months' postpartum. The Alarm Distress Baby Scale (ADBB) was used to assess social withdrawal; the Edinburgh Postnatal Depression Scale (EPDS) was administered to ascertain postpartum depressive symptoms. The results revealed a higher proportion of premature infants with social withdrawal at 6 months' postpartum and significantly higher ADBB composite scores at 3 and 6 months of age, as compared with the full-term infants. A higher proportion of mothers in the premature cohort had symptoms of postpartum depression at the 3-month assessment, and they reported a significantly higher EPDS composite score at 3 months' postpartum. There was a significant relation between maternal depressive symptoms at 3 and 6 months and infants' social withdrawal at 9 months, and a significant concurrent relation between the two variables at 6 and 9 months in the full-term cohort. The findings suggest a need to screen for both infant social withdrawal and maternal depressive symptoms in moderately prematurely born infants and their caregivers.

Abstracts translated in Spanish, French, German, and Japanese can be found on the abstract page of each article on Wiley Online Library at http://wileyonlinelibrary.com/journal/imhj.

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Infants are born with social and cognitive capacities that enable them to participate in human encounters right from the start (Stern, 1985; Trevarthen, 1979; Trevarthen & Aitken, 2003; Zeedyk, 2006). Born as social beings, newborns are able to adjust their behavior to the environment; that is, they behave differently when with another human compared to being alone and exploring an object (Ronnqvist & von Hofsten, 1994). The skills available to a newborn child include the ability to initiate and retain eye contact, vocalize, use facial expressions, imitate the facial expressions of others, and use body and head movements to initiate and maintain an interaction or to provoke a reaction if nothing interesting is happening (DeCasper & Fifer, 1980; Field, Cohen, Garcia, & Greenberg, 1984; Heimann, 1989, 2002; Meltzoff & Moore, 1977, 2001; Nagy, 2006; von Hofsten, 1982). These skills constitute basic human social behaviors.

Instances of withdrawal are part of the infant's normal regulatory reaction (Field, 1977; Guedeney, 1997). Withdrawal acts to regulate the flow of stimulation when the infant needs to calm down during happy communication or if tired, and withdrawal usually occurs as a reaction to minor transient perturbations within early parent–infant interactions, as evident from experimental studies (Tronick, 2007). Even very short episodes of nonresponsiveness on the mother's part may create withdrawal or protest reactions (Adamson & Frick, 2003), but the infant is capable to re-enter into a rewarding and engaging interaction as soon as she or he regains the parent's full attention. However, the level of social activity varies between individual children. Some are more motivated to partake in social games while others are more hesitant. Temperament is one factor responsible for such individual differences (Goldsmith et al., 1987), and maternal sensitivity and parental interaction style are two other possible sources (Ainsworth, 1978; Field, 1992).

Nevertheless, an infant's reluctance to participate actively in social activities might be due to nonoptimal experiences such as repeated or prolonged unresolved perturbation of the interaction with the caregiver. A withdrawal reaction may therefore be an early warning signal of serious distress, indicating an increased risk for nonoptimal development. Social withdrawal reaction can be a precursor of infant depression (Herzog & Rathbun, 1982), and according to Guedeney (2007), social withdrawal is a key symptom of infant depression, but also an important feature of other conditions such as failure to thrive, malnutrition, pain, attachment disorders, relationship disorders, posttraumatic stress disorders, and autism (Guedeney, 1997).

Social withdrawal behavior in infants also is related to biological risk associated with prematurity, parents' mental health, and social risk associated with caregivers' age and education (Roberts, Bellinger, & McCormick, 2007). Although the majority of preterm infants do not develop major impairments, it is acknowledged that the risk increases with decreasing gestational age (Allen, 2008). So far, studies have focused on the most premature children, but there is growing recognition of difficulties related to moderate prematurity (32–36 weeks; Norwegian Directorate of Health, 2007). Neonatal outcomes of moderate prematurity are increased mortality and morbidity (Escobar et al., 2006), often related to respiratory diseases, hypothermia, hypoglycemia, feeding problems, jaundice, and infections (Gouyon, Iacobelli, Ferdynus, & Bonsante, 2012). Long-term outcome of premature birth and low birth weight is often expressed as minor motor and social delay, the latter often manifested as social withdrawal behavior (Guedeney, Marchand-Martin, Cote, & Larroque, 2012; Hediger, Overpeck, Ruan, & Troendle, 2002).

In addition to the biological risk that is identified by prematurity, preterm birth represents psychological distress for caregivers. Psychological distress, in terms of postpartum depression, also is common, and 10 to 15% of all women have moderate to severe depressive symptoms in the postpartum period (Eberhard-Gran & Slinning, 2007). Maternal depression in the postpartum period can impact a mother's capacity to relate to her infant (Field, 1984). Field, Healy, Goldstein, and Guthertz (1990) observed that if mothers were depressed, the mother–infant interaction in the postpartum period was more disturbed in comparison with nondepressed mother–infant dyads. Infants of depressed mothers have been described to be more engaged in self-directed regulatory behavior such as looking away, having dull-looking eyes, showing loss of postural control, and carrying out orally self-comforting behavior (Tronick, 2007). These descriptions are close to the concept of withdrawal behavior (Guedeney, 2007).

In sum, risk factors associated both with infants' health condition and parents' mental health may contribute to the development of social withdrawal in infants. This is evidenced in studies that have reported that the distribution of social withdrawal tends to be higher in high-risk samples (13–38.9%) (Dollberg, Feldman, Keren, & Guedeney, 2006; Guedeney, Foucault, Bougen, Larroque, & Mentre, 2008; Guedeney et al., 2012; Milne, Greenway, Guedeney, & Larroque, 2009), as compared to low-risk samples (2.7–11.6%) (Dollberg et al., 2006; Mäntymaa et al., 2008; Puura et al., 2010). The high-risk samples in these studies were identified in terms of sleeping, eating, and crying difficulties, problems between parents and infant, behavior problems in the child (Dollberg et al., 2006; Guedeney et al., 2008), and low socioeconomic status (Milne et al., 2009). A Finnish research group reported that both high levels of depressive symptoms and parents' perceived mental health were associated with infants' social withdrawal in a low-risk sample (Mäntymaa et al., 2008). However, Matthey, Guedeney, Starakis, and Barnett (2005) found that social withdrawal in infants was related to the mothers' report of irritability, sadness, anxiousness, and depressiveness following birth, but not to concurrent mood. In a recent study, Malloch et al. (2012) found that moderately premature infants expressed significantly more social withdrawal than did full-term infants at 1 month of age.

Social withdrawal is an alarm signal of infant distress regardless of the cause (Guedeney et al., 2008). However, the detection of social withdrawal in well-baby clinics may be difficult if the professionals lack knowledge about infant mental health. Thus, using a brief screening instrument such as the ADBB can facilitate a more structured observation of infant social behavior (Guedeney et al., 2008). The scale is constructed to assess an infant's social behavior during interaction with a stranger (nurse or other

health professional), thus avoiding putting the parent under a perceived pressure to exhibit good caregiving competence (Matthey et al., 2005). The usability of assessing social withdrawal with the ADBB has been evidenced in many studies and in several countries (Guedeney et al., 2008) as well as in public health centers (Puura et al., 2010).

The present study reports the first results from a Norwegian prospective longitudinal study of infant social withdrawal based on 302 infants and their mothers. The sample consisted of two cohorts; one full-term cohort and a cohort of moderately premature infants. The aims of the present study were to investigate and compare (a) the levels of social withdrawal symptoms in the full-term and premature infants at 3, 6, and 9 months of age; (b) the levels of maternal postpartum depressive symptoms in the two cohorts at 3, 6, and 9 months' postpartum; and (c) if there were any relations between maternal self-report of depressive symptoms and infant social withdrawal behavior.

It was hypothesized that premature infants would show a significantly higher degree of social withdrawal symptoms than full-term infants during the first 9 months' postpartum. Further, it was hypothesized that mothers with premature infants would report higher levels of depressive symptoms postpartum compared to mothers of full-term infants. It also was hypothesized that maternal self-report of depressive symptoms would be related to infant social withdrawal behavior, irrespective of group affiliation.

## METHOD

### Participants and Recruiting

The total sample consisted of two cohorts: one comprising full-term infants ($n = 238$) and their parents, and one consisting of premature infants born gestational week 30 to 36 ($n = 64$) and their parents.

The recruitment of participants took place in the municipality of Trondheim, the third-largest city in Norway. The participants in the full-term group were enrolled from well-baby clinics in the four districts that collaborated in the project. To ensure that the enrollment of the premature cohort was reached within the recruiting period, all well-baby clinics in Trondheim contributed to enrollment. Health checkups at well-baby clinics in Norway are free, and close to 100% of all parents with infants follow the regular follow-up program for infants during their first years of life (Norwegian Directorate of Health, 2011).

Parents were informed about the study at the regular home visit about 1 week after birth and received an information leaflet about the study. Families who volunteered for the study were asked to give a written consent about participation at the regular health checkup when their infant was 6 weeks old. To be eligible to participate in the study, the infant should have a gestational age between 30 and 42 weeks, and the parents had to speak fluent Norwegian and had to be motivated to participate at all follow-up assessments of the study (at infant ages 3, 6, and 9 months). Exclusion criteria were infants (a) with acute and chronic neurological problems, (b) with

known medical diagnoses, (c) with visual or auditory impairment, and (d) who were small for gestational age (birth weight below the 3rd *SD* on statistical growth curves). The research protocol was approved by the Regional Ethical Committee for Medical Research in Eastern and Southern Norway and The Norwegian Social Science Data Service.

### Measures

*The ADBB.* This clinical instrument is aimed at evaluating social behaviors that can be easily observed during a brief observation of children 2 to 24 months of age (Guedeney & Fermanian, 2001). These behaviors are organized into eight items: (1) Facial Expression, (2) Eye Contact, (3) General Level of Activity, (4) Self-Stimulating Gestures, (5) Vocalizations, (6) Response to stimulation, (7) Relationship, and (8) Attraction. Each item is rated on a scale from 0 (*no unusual behavior*) to 4 (*severe unusual behavior*), and a trained observer only needs an observation of 10 to 15 min to score the ADBB (Guedeney, personal communication, October 01, 2007). Guedeney and Fermanian (2001) used a cutoff score of 5 and reported a sensitivity of .82, a specificity of .78, and construct validity measures varying from .63 to .67. Similar results have been reported from several studies using the ADBB in different cultures (e.g., Israel: Dollberg et al., 2006; Australia: Matthey et al., 2005; Finland: Puura, Guedeney, Mäntymaa, & Tamminen, 2007). A cutoff of $\geq 5$ also was used in the present study. The internal consistency reported has been within acceptable levels ($\alpha = .75–.80$) (Dollberg et al., 2006; Guedeney & Fermanian, 2001).

Ten public health nurses and one pediatrician participated as ADBB raters for the full-term cohort. All raters were experienced professionals, and the majority of them had worked for many years in well-baby clinics. The nurses and the pediatrician were trained to reliability for the ADBB scoring system before the study started. They attended a 2-day introduction course held by Antoine Guedeney (A.G.), one of the developers of the scale. The course consisted of theory and an introduction to the ADBB with observation and scoring in plenum of videotapes of infants during a routine health examination. Each participant received a set of training tapes to practice assessment of withdrawal symptoms in infants by using the ADBB, and all 11 professionals then individually scored several tapes. The training continued over a 4-month period, including five group meetings where the scoring was discussed and evaluated with a supervision team (S-team). Before the project started, interrater reliability was calculated for all raters. The public health nurses scored seven video clips, and the pediatrician scored four video clips. Agreement on caseness ($\geq 5$) was acceptable (89% agreement; Cohen's $\kappa = .78$).

Two professionals (one experienced health nurse and author, U.T.-V., and one specialist in clinical child psychology) participated as ADBB raters for the premature cohort. Both were trained to reliability by A.G. with three other professionals (the authors; H.C.B., K.S., V.M.) from the S-team. In accordance with A.G., the same criteria for reliability on caseness, as mentioned earlier, was used. Because of their status as supervisors, there should be no

more than a 1-point difference in rating per case. After the rating of 10 video clips, there was an exact agreement on caseness for all raters while two of the raters made one rating with more than 1-point difference on one video clip. Ratings from each rater were entered in a 4 × 4 contingency table, using STATISTICA 19. The first calculation of Cohen's $\kappa$ for all five raters on four video clips gave a satisfactory $\kappa$ ($\kappa = .80–.96$), and the second calculation of Cohen's $\kappa$ for four raters on six new video clips also yielded a satisfactory $\kappa$ ($\kappa = .92–1.0$).

Members of the S-team met with the 10 public health nurses and the pediatrician on a regular basis (a total of six supervision meetings during the 3-year data-collection period).

*The edinburgh postnatal depression scale (EPDS; Cox, Holden, & Sagovsky, 1987).* This scale is a 10-item self-report instrument that assesses postpartum depressive symptomatology during the last 7 days: (1) I have been able to laugh and see the funny side of things, (2) I have looked forward with enjoyment to things, (3) I have blamed myself unnecessarily when things went wrong, (4) I have been anxious or worried for no good reason, (5) I have felt scared or panicky for no very good reason, (6) Things have been getting on top of me, (7) I have been so unhappy that I have had difficulty sleeping, (8) I have felt sad or miserable, (9) I have been so unhappy that I have been crying, (10) The thought of harming my self has occurred to me (Cox et al., 1987). Items are rated on a scale of 0 to 3 that describe the increased severity of the symptoms. Adding the ratings together produce a composite score ranging from 0 to 30, with higher scores indicating elevated risk for postpartum depression. The unique quality of the EPDS compared to other measures of depression is that it does not consist of items that are common to nearly all new mothers (e.g., feeling tired, changes in appetite and sexual drive) but rather of signs that bear a relation to more recurrent problems. The EPDS has been validated in two Norwegian studies and has shown high sensitivity and specificity, with a cutoff score of $\geq 10$ (Eberhard-Gran, Eskild, Tambs, Schel, & Opjordsmoen, 2001) and of $\geq 11$ (Berle, Aarre, Mykletun, Dahl, & Holsten, 2003), respectively. For the present study, we chose $\geq 10$ as cutoff, which also has been recommended for community-based screening (Eberhard-Gran et al., 2001).

### Procedure

All infants were followed longitudinally and assessed at 3, 6, and 9 months of age (corrected ages for premature infants). For the full-term infants, the examinations were carried out during the regularly scheduled visits to the well-baby clinics. All examinations were taped with a digital video camera placed in the room. The necessary information for scoring the ADBB was obtained during these routine examinations. Examinations were primarily performed by the public health nurses, but at 6 months, the pediatrician who participated as examiner in the study evaluated and rated a subset of the sample ($n = 22$). Thus, no extra examination that might burden the child or mother was needed. For the premature infants, examinations were carried out as extra observation at the

well-baby clinics or during the regularly scheduled visits by two of the specialists of the research team. Infants with severe withdrawal behavior or other significant symptoms of developmental delay or impairments were either invited to a follow-up consultation and further assessment or referred, if necessary, for further evaluation and treatment.

In addition to the examinations of the infants, mothers filled out the EPDS at all assessment points. The public health nurses collected background information from the child's birth register form, such as the infant's medical status at birth (gestational age, birth weight, and Apgar scores) and the parents' age, education, and parity.

### Statistical Methods

Variables analyzed in this study were both continuous and categorical. First, descriptive statistics on background variables are reported. Then, the prevalence of infant social withdrawal, specified as a cutoff score $\geq 5$ on total ADBB scores at ages 3, 6, and 9 months, is presented. Similarly, the prevalence of postpartum depressive symptomatology is reported, defined by the cutoff score of $\geq 10$ (subclinical level) on the EPDS at 3, 6, and 9 months' postpartum.

Both parametric (e.g., independent $t$ test, Pearson product–moment correlation) and nonparametric (e.g., Mann–Whitney $U$ test, Spearman's $r$) methods were used to analyze differences between observed means and correlations between different age points. Since both methods revealed a very similar pattern, results from the parametric analysis are presented throughout. However, in those few instances when differences did occur, the nonparametric result also is presented.

Cross-tabulation and Fischer's exact test were used to explore the relation between birth status and caseness of ADBB ($\geq 5$) and caseness of EPDS ($\geq 10$) at 3, 6, and 9 months' postpartum.

To assess the continuity of infant social withdrawal and maternal postpartum depressive symptoms, the percentage of infants and mothers that remained at or above the cutoff scores on the ADBB and the EPDS at a second assessment after 3 months' postpartum (independent of which time points) was calculated.

All statistical analyses were carried out using SPSS, Version 19.

### RESULTS

Descriptions of background variables for the two cohorts are given in Tables 1 and 2. There were significant differences between the two cohorts in birth weight, gestational weight, birth complications, and fathers' educational level.

The prevalence of infants with high levels of social withdrawal symptoms in the two groups (ADBB total score $\geq 5$) and the prevalence of maternal postpartum depressive symptomatology (EPDS total score $\geq 10$) at 3, 6, and 9 months' postpartum are shown in Table 3.

**TABLE 1.** *Background Information for the Full-Term Group and the Premature Group*

| | Cohort | | | | |
|---|---|---|---|---|---|
| Source | Full-Term (*n*) | Premature (*n*) | *t* | *df* | CI 95% |
| Birth Weight | 3,625.50 (238) | 2,353.16 (64) | 18.88** | 300 | 1139.64–1405.06 |
| GA | 39.93 (227) | 34.73 (64) | 23.12** | 78.06 | 4.75–5.65 |
| Apgar | 9.67 (238) | 9.44 (62) | 1.50 | 71.86 | −0.08–0.55 |
| Parity | 0.57 (187) | 0.77 (64) | −1.37 | 84.47 | −0.48–0.09 |
| Mother's Age | 30.08 (237) | 30.80 (64) | −1.02 | 299 | −2.11–0.67 |
| Father's Age | 33.13 (231) | 33.73 (64) | −0.66 | 293 | −2.40–1.19 |

*Note.* There is not equality of variance. GA = gestational age.
**$p < .01$.

**TABLE 2.** *Cross-Tablulation of Parents' Educational Level and Birth Complications*

| | Cohorts | | | | |
|---|---|---|---|---|---|
| | Full-Term | | Premature | | |
| Variables | *n* | % | *n* | % | $\chi^2$ |
| Mother: Level of Education | 234 | | 62 | | 7.22 |
| ≤9 Years | 15 | 6.4 | 2 | 3.2 | |
| High School | 54 | 23 | 19 | 30.6 | |
| 1–3 Years of College or University | 130 | 55 | 25 | 40.3 | |
| >3 Years University | 35 | 14 | 16 | 25.8 | |
| Father: Level of Education | 229 | | 63 | | 12.02** |
| ≤9 Years | 8 | 3.4 | 0 | 0 | |
| High School | 67 | 29.3 | 24 | 38 | |
| 1–3 Years of College or University | 106 | 46.3 | 17 | 26.9 | |
| >3 Years of University | 48 | 20.9 | 22 | 34.9 | |
| Birth Complication | 220 | | 64 | | 21.27** |
| No | 182 | 82.7 | 36 | 56.2 | |
| Yes | 38 | 17.2 | 28 | 43.8 | |

*Note.* For all analyses, two cells had an expected count less than 5, and an exact significance test was selected for Pearson's $\chi 2$.
**$p \leq .01$.

**TABLE 3.** *Prevalence of Alarm Distress Babay Scale (ADBB) Score ≥5 and the Prevalence of EPDS Score ≥10 for the Full-Term Group and the Premature Group*

| | Cohort | | | |
|---|---|---|---|---|
| | Full-Term | | Premature | |
| Measures | *n* | % | *n* | % |
| ADBB cutoff ≥5 | | | | |
| 3 Months | 11 | 4.62 | 7 | 11.29 |
| 6 Months | 5 | 2.18 | 7 | 11.47 |
| 9 Months | 7 | 3.12 | 2 | 3.50 |
| EPDS cutoff ≥10 | | | | |
| 3 Months | 13 | 5.88 | 14 | 22.95 |
| 6 Months | 13 | 5.80 | 4 | 6.67 |
| 9 Months | 13 | 6.10 | 4 | 6.67 |

9-month assessment (see Table 4). The results were supported by the Mann–Whitney *U* test, except for a significant difference between the full-term and the premature infants at 9 months, $U = 7547$, N1 = 224, N2 = 57, $p = .014$.

There also was a significant difference in mean EPDS total score between mothers of full-term infants and mothers of premature infants at 3 months, but not at the 6- and 9-month assessments (see Table 5). The Mann–Whitney *U* test supported the results, except for a marginally significant difference in EPDS score at 3 months, $U = 7742.500$, N1 = 221, N2 = 61, $p = .074$.

We then investigated if there were any relations between maternal self-report of depressive symptoms (EPDS) and observed infant social withdrawal behavior (ADBB). For this purpose, at each age point, Pearson product–moment correlation coefficients were computed between these two measures. In addition, lagged correlations were computed to assess possible relations between maternal depressive symptoms and infant withdrawal across age. As expected, in the full-term cohort, maternal depressive symptoms as reported at 3 and 6 months bore a significant relation to infant social withdrawal behavior assessed at 9 months (see Table 6). There also was a significant concurrent association between these two variables at infant age 6 and 9 months. Except for a nonsignificant correlation between maternal depressive symptoms reported at 3 months and infants' social withdrawal assessed at 9 months, the Spearman *r* correlation showed the same pattern. However, and contrary to our expectations, in the premature cohort, there were essentially no significant relations between maternal depressive symptoms and infant social withdrawal, except for one negative correlation between EPDS at 6 months and ADBB at 9 months.

Calculation of continuity in social withdrawal for the full-term infants showed that 3 (27.3%) of 11 infants who were at or above a cutoff ≥5 at 3 months of age scored at or above cutoff on later assessment. Similarly, the calculation for the premature group showed that of the 6 who scored at or above a cutoff ≥5

A significantly higher proportion of premature infants (11.47%) than full-term infants (2.18%) scored at or above the cutoff of 5 on the ADBB at 6 months' postpartum, $\chi^2(1, n = 290) = 10.48$, exact $p = .004$, but not at 3 and 9 months' postpartum. Further, at 3 months a significantly higher proportion of mothers of premature infants (22.95%) scored at or above 10 on the EPDS, $\chi^2(1, n = 282) = 16.08$, $p < .001$, as compared with the mothers of full-term infants (5.88%). No such relations were found at 6 and 9 months.

The results revealed significant differences in mean total ADBB scores between the full-term and the premature infants at 3 and 6 months, and a marginally significant difference at the

**TABLE 4.** *Independent T-Test, Mean, and Median Alarm Distress Baby Scale (ADBB) Scores in Full-Term and Premature Infants at 3, 6, and 9 Months' Postpartum*

| | Cohort | | | | | | | | | | |
| | Full-term | | | | Premature | | | | | | |
| Source | M | Mdn | Q1 | Q3 | M | Mdn | Q1 | Q3 | t | df | CI 95% |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ADBB (3 months) | 0.89 | 0.00 | 0.00 | 1.00 | 1.58 | 1.00 | 0.00 | 2.25 | −2.41* | 78.09 | −1.30–.12 |
| ADBB (6 months) | 0.89 | 0.00 | 0.00 | 1.00 | 2.02 | 1.00 | 0.00 | 3.00 | −3.61** | 75.24 | −1.75–.51 |
| ADBB (9 months) | 0.73 | 0.00 | 0.00 | 1.00 | 1.23 | 0.00 | 0.00 | 2.00 | −1.91† | 75.99 | −1.02–.02 |

*Note.* For these results, there is not equality of variance.
*$p < .05$. **$p < .01$. †$p = .059$.

**TABLE 5.** *Independent T-Test, Mean, and Median Edinburgh Postnatal Depression Scale (EPDS) Scores for Mothers of Full-Term and Premature Infants at 3, 6, and 9 Months' Postpartum*

| | Cohort | | | | | | | | | | |
| | Full-term | | | | Premature | | | | | | |
| Source | M | Mdn | Q1 | Q3 | M | Mdn | Q1 | Q3 | t | df | CI 95% |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EPDS (3 months) | 3.75 | 3.00 | 1.00 | 5.00 | 5.13 | 4.00 | 2.00 | 9.00 | −2.25* | 78.82 | −2.60–.16 |
| EPDS (6 months) | 3.43 | 3.00 | 1.00 | 5.00 | 3.87 | 3.00 | 1.00 | 6.75 | −.84 | 282 | −1.46–.59 |
| EPDS (9 months) | 2.62 | 2.00 | 0.00 | 4.00 | 3.12 | 2.50 | 0.00 | 4.00 | −.95 | 271 | −1.53–.54 |

*Note.* For the results at 3 months' postpartum, there is not equality of variance.
*$p < .05$.

**TABLE 6.** *Correlations of Infant Social Withdrawal and Maternal Depression at 3, 6, and 9 Months for the Full-Term and the Premature Cohort*

| | EPDS 3 Months | EPDS 6 Months | EPDS 9 Months |
|---|---|---|---|
| Full-Term Cohort | | | |
| ADBB 3 Months | .075 | .069 | .053 |
| ADBB 6 Months | .042 | .134* | .062 |
| ADBB 9 Months | .141* | .204** | .260** |
| Premature Cohort | | | |
| ADBB 3 Months | −.135 | −.158 | −.207 |
| ADBB 6 Months | .006 | −.044 | −.117 |
| ADBB 9 Months | −.203 | −.284* | −.045 |

EPDS = Edinburgh Postnalatal Depression Scale; ADBB = Alarm Distress Baby Scale.
*$p < .05$. **$p < .01$.

at 3 months, 1 (16.7%) also scored at or above cutoff on later assessment.

Calculation of continuity of depressive symptoms among mothers with full-term infants showed that of the 13 mothers who scored at or above a cutoff ≥10 at 3 months' postpartum, 6 (46.2%) continued to score at or above the same cutoff on later assessment. Similarly, calculation of continuity in depressive symptoms

of mothers with premature infants showed that of the 14 mothers who scored at or above a cutoff ≥10 at 3 months' postpartum, 5 (35. 7%) continued to score at or above the same cutoff on later assessment.

## DISCUSSION

The present longitudinal study investigated the prevalence of infant social withdrawal and maternal postpartum depressive symptoms as well as the possible relation between these two domains in a cohort of full-term infants and a cohort of premature infants, and their mothers. As expected, a significantly higher degree of social withdrawal symptoms was observed among the premature infants in comparison with the full-term cohort. The group differences were most profound during the first 6 months. Mothers of the premature infants evidenced significantly higher depressive symptoms at 3 months' postpartum compared to mothers of full-term infants, but they also had a clear decrease in depressive symptoms over time when reassessed at 6 and again at 9 months' postpartum. These results were mainly supported by nonparametric tests, except for a significant difference in social withdrawal at 9 months and a marginally significant difference in postpartum depression at 3 months.

The prevalence of social withdrawal in the full-term infants was fairly low at all assessments (2.2–4.6%), as compared to other

studies of social withdrawal in infants (e.g., Guedeney et al., 2012). However, most of the earlier ADBB studies also comprised risk samples, except for two Finnish studies and one Israeli study that included a control group. Our results concur with the two Finnish studies (Mäntymaa et al., 2008; Puura et al., 2010) that reported a prevalence of social withdrawal from 6.9 to 7.3% at the first assessment and 2.7 to 4% at the second assessment made 2 weeks later. The prevalence of social withdrawal in Dollberg et al.'s (2006) study was higher (11.6%) in the control group of nonreferred infants and more comparable to the prevalence of social withdrawal among the premature infants in the present study, especially at the assessments at 3 (11.3%) and 6 (11.4%) months. Compared to studies that have combined both nonrisk and risk samples (Guedeney et al., 2008; Guedeney et al., 2012; Matthey et al., 2005), prevalence of social withdrawal among the premature infants in the present study also was rather low. For example, Guedeney et al. (2012), which included both full-term and premature infants, reported a prevalence of social withdrawal in 12-month-olds of 14%. In contrast, prevalence of social withdrawal among the preterm infants in the present study was only 3.5% at 9 months of age. These differences might, in our view, be explained by factors such as the mothers' mental health and educational level. Furthermore, the number of mothers who scored above the clinical level on the EPDS was lower in our study than that reported by Guedeney et al. (2012) and others. Here, also, the explanation might be found in differences in the educational level between the participants in our study as compared to those in the study by Guedeney et al. (2012), being more equal to the two Finnish studies (Mäntymaa et al., 2008; Puura et al., 2010).

Another factor that might have influenced our results is the long parental leave in Nordic societies as compared to other European countries (Waldfogel, 2001). This implies that one of the caregivers can stay home with his or her infant during the first 12 months after birth without worrying about his or her work or salary, and instead have the primary task as caregiver for the infant. The similarity in the prevalence of social withdrawal between this study and the two Finnish ones also could be due to similarities in study design and the service of well-baby clinics. The studies included the ADBB assessment as a part of the regular checkup at the well-baby clinic. In addition, close to 100% of all parents with infants use this service, which offers frequent well-baby visits during infancy (Norwegian Directorate of Health, 2011; Puura et al., 2010). This means that almost all parents are informed about how to stimulate their infant and about important developmental milestones.

Few mothers in the full-term cohort experienced moderate to high levels of depressive symptomatology at any of the assessment points, according to the cutoff value used in the current study, whereas a significant proportion of the mothers of the premature infants experienced depressive symptoms at 3 months' postpartum. A literature review has shown prevalence rates of 10 to 15% in Western cultures (EPDS >9–12) and a significantly higher rate in high-risk samples (Halbreich & Karkun, 2006). Recent Norwegian studies have been in accordance with international findings and

have reported prevalence rates of depressive symptomatology in the postpartum period from 8.9 to 16.5%, with an EPDS cutoff $\geq 10$ (Dorheim, Bondevik, Eberhard-Gran, & Bjorvatn, 2009; Eberhard-Gran, Eskild, Tambs, Samuelsen, & Opjordsmoen, 2002), and 10% with a cutoff $\geq 11$ (Berle et al., 2003). Thus, our findings suggest that even the premature cohort included in the current study constitutes an unexpected low-risk sample in terms of mothers' mental health.

As expected, mothers of the premature infants experienced more depressive symptoms as compared to the mothers in the full-term cohort, but only at the 3-month assessment. Preterm birth and poorer neonatal outcome for these infants may have put more strain on the parents during the first months in the postpartum period. Because of our exclusion criteria, no infants suffered from severe impairments and problems. One possible reason for the positive change in the mothers' mental health is that the premature infants exhibited a positive developmental trajectory relatively soon. Such a positive developmental process might have affected the parents' distress level in a promising direction.

In this study, we report a relation between maternal self-report of depressive symptoms and infant social withdrawal behavior. We had anticipated that the presence of maternal depressive symptoms might be associated with infant withdrawal, or conversely, that infant social withdrawal, whatever its cause, would raise parental concerns and grievance. To our knowledge, there have been no other studies with longitudinal assessments of social withdrawal behavior during infancy coupled with data on maternal report of depressive symptoms. Thus, the present study gave us a unique opportunity to assess the possible longitudinal relations between maternal depressive symptoms and infant withdrawal behavior during most of the first year of life. Interestingly, data based on the full-term cohort yielded statistically significant lagged correlations between maternal self-report of depressive symptoms at 3 and 6 months, and infant withdrawal behavior assessed by the ADBB at 9 months. Although significant, these correlations were rather low and therefore account for a rather small proportion of the observed variance. Nevertheless, the data suggest that the concepts of maternal depressive symptoms and social withdrawal behavior of full-term infants in some way are related. The variables intervening between these two constructs may be conceptualized in terms of reduced maternal sensitivity, mothers' failure to mentalize the infant, and/or a nonoptimal mother–child attachment relationship. When infants reach the age of 9 months, one also would expect a concurrent relation between these two domains, as demonstrated in the present dataset. The results also support Matthey et al. (2005), who found that mothers' self-reports of their mood since birth were associated with concurrent ADBB scores; however, the Australian study did not longitudinally assess infant social withdrawal.

The only consistent relations between maternal depressive symptoms and infant withdrawal behavior in the premature cohort was an unexpected negative correlation between maternal self-report of depressive symptoms at 6 months' and infant withdrawal behavior at 9 months' postpartum. One interpretation

could be the possibility that mothers' self-report on the EPDS in this cohort reflects their worries about the biomedical risk factors connected to premature birth rather than maternal mood. Thus, such worries might have guided the mothers to stimulate their infants, resulting in developmental improvements expressed as lower infant withdrawal symptoms at 9 months. It is probable that one would need a longer time lag to detect a relation between early maternal depressive symptoms and later withdrawal behavior among premature infants.

In this study, we found a higher degree of continuity of social withdrawal among the full-term infants than that among the premature infants. To our knowledge, there have been no other studies with longitudinal assessments of social withdrawal during infancy. Puura et al. (2010) had a second assessment 2 weeks after the first assessment, which showed a higher stability (37%) than what we found for the two cohorts in the present study. A comparison between these studies is still dubious because of the difference in time lags between the assessment points. Nevertheless, since moderately premature infants are in higher risk than full-term infants (Gouyon et al., 2012), we expected to see higher stability of social withdrawal behavior in the premature cohort. Moreover, the stability of depressive symptoms was highest among mothers of full-term infants when we employed a cutoff score $\geq 10$ (EPDS). A closer inspection of the difference in examination routine between the two cohorts could explain these results. While the full-term cohort followed regularly scheduled visits at the well-baby clinics, the premature cohort was followed by two specialists in infant mental health at an extra observation or during their ordinary visits at the well-baby clinic. The visits with the specialist may have acted as brief interventions, where the parents could talk about their concern for the infant and also receive individual-directed advice. In a recent review, Brecht, Shaw, St. John, and Horwitz (2012) showed that the outcome results of some short-time interventions for prematurely born infants and their parents are positive when they target both parental stress and the parent–infant interaction. Such brief intervention could therefore act positively on minor depressive symptoms in the mothers, but also boost the infants' development in those areas in which they were delayed, such as social behavior.

A limitation of this study is the possible bias of using two specialists in infant mental health for examining the premature infants. This raises the possibility that our results partly reflect differences in support during examination of the two cohorts. However, public health nurses also provide information and support for those parents and infants who experience difficulties. Another limitation is that the interrater reliability for the public health nurses and pediatrician was calculated on caseness. This might have caused a more inaccurate rating of the degree of social withdrawal in the full-term infants. However, since the public health nurses' and the pediatrician's primary task was to detect manifest social withdrawal behavior in the infants, the present Cohen's $\kappa$ reported on caseness would not lead to an expectation of many false positives or false negatives. One strength of this study was that the public health nurses and the pediatrician met the supervision team for

guidance on a regular basis during the data collection, which also might have reduced the possibility of inaccuracy. Note, however, that the Norwegian version of the ADBB has not yet been validated against a more comprehensive measure of social development in infants.

The present study has important clinical implications. It shows that even moderately premature infants without any serious problems or impairment strive with social withdrawal symptoms during early infancy. Mothers' mental health problems are related to premature birth, but the high level of depressive symptoms 3 months' postpartum decreases during the infants' first 9 months. These results suggest that social withdrawal is an alarm signal to screen for in moderately premature infants.

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# SCREENING FOR SUSTAINED SOCIAL WITHDRAWAL BEHAVIORS IN SIX-MONTH-OLD INFANTS DURING PEDIATRIC PRIMARY CARE VISITS: RESULTS FROM AN AT-RISK LATINO IMMIGRANT SAMPLE WITH HIGH RATES OF MATERNAL MAJOR DEPRESSIVE DISORDER

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ABSTRACT: To examine relations between infant social withdrawal behavior and maternal major depression (MDD), 155 mother–infant dyads were evaluated at the 6-month primary care visit. Maternal depression was determined based on a psychiatric interview. Infant social withdrawal behavior was assessed with the Alarm Distress Baby Scale (ADBB; A. Guedeney & J. Fermanian, 2001) based on videotaped mother–infant interactions. Of the sample, 18.7% of mothers were diagnosed with MDD, and 39.4% of infants scored above the clinical ADBB cutoff. Infants of depressed mothers were more likely to score positive on the ADBB (75.8 vs. 31.0%, $p < .001$) and showed distinct patterns of withdrawal behavior. Within the group of withdrawn infants, however, no differential patterns of behavior could be identified for infants of depressed mothers as compared to infants of mothers with no depression. These findings confirm the validity of the ADBB for detection of infant social withdrawal in the context of MDD. At the same time, they support evidence that the ADBB identifies nonspecific infant distress behaviors. Future studies will need to determine if and how positive ADBB screening results in the absence of maternal MDD might be associated with other maternal psychiatric disorders such as anxiety or borderline personality disorder. These results have important implications for screening guidelines in primary care.

Abstracts translated in Spanish, French, German, and Japanese can be found on the abstract page of each article on Wiley Online Library at http://wileyonlinelibrary.com/journal/imhj.

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Typically developing children have a wide array of social competencies 6 months after delivery and actively seek out social interactions (Izard et al., 1995; Trevarthen & Aitken, 2001). Sustained social withdrawal behavior at this age is an early nonspecific warning sign of risk for adverse developmental outcomes in later infancy and childhood (Hane, Fox, Henderson, & Marshall, 2008; Milne, Greenway, Guedeney, & Larroque, 2009). Increased social withdrawal behavior is associated with both biologic risk factors (e.g., prematurity) and environmental sources of toxic stress (e.g., maternal psychiatric disorders) (Braw et al., 2008; Feldman, 2007; Guedeney, 2007). The most thoroughly studied maternal psychiatric disorder in this context is maternal depression. Over the past decades, numerous research studies have contributed to a better understanding of maternal depression and its potentially adverse impact on child development (e.g., Evans et al., 2011; Hall, 2012; Knitzer, Theberge, & Johnson, 2008; Shonkoff, Garner et al., 2012; Teti, Messinger, Gelfand, & Isabella, 1995; Weissman et al., 2006). Research has shown that mothers with depression frequently have difficulties in scaffolding their infants' emotional needs (for a review, see Tronick & Reck, 2009). Infants might subsequently develop sustained social withdrawal behaviors to cope with their suboptimal parenting environment (Beebe et al., 2008; Feldman et al., 2009; Koulomzin et al., 2002). Unfortunately, this coping strategy can set a vicious cycle in motion, as depressed mothers might interpret their infant's withdrawn behavior as "rejecting" and subsequently have even more difficulties in engaging with them (Campbell, Cohn, & Meyers, 1995; Feldman, 2007; Reck et al., 2004).

Because of these research findings, the American Academy of Pediatrics (AAP) has issued guidelines recommending identification of depressed mothers during pediatric primary care visits (Hagan, Shaw, & Duncan, 2008; Jellinek, Patel, & Froehle, 2002a, 2002b) through the use of screening instruments such as the Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden, & Sagovsky, 1987; Garcia-Esteve, Ascaco, Ojuel, & Navarro, 2003). In addition, AAP policy statements have emphasized the need to screen for infant social withdrawal behavior in the context of maternal depression and other sources of toxic stress (Earls & the Committee on Psychosocial Aspects of Child and Family Health 2010; Garner et al., 2012). AAP screening guidelines in primary care recommend assessment of infant behavior to be based on both parent reports about infant development and on direct observation of infant behavior during primary care visits. However, there is a paucity of direct observational assessment tools for young infants that can feasibly be used in time- and resource-limited office settings.

The Alarm Distress Baby Scale (ADBB; Guedeney & Fermanian, 2001) is one of the few standardized observational tools developed specifically for use during primary care visits. It consists of eight behavioral items, such as facial expressions, eye contact, vocalizations, and self-stimulating gestures of the child, that are rated on a scale of 0 (*no unusual behavior*) to 4 (*severe unusual behavior*). A cut point of 5 has been identified to be optimal for early detection of children at risk for adverse developmental outcomes. The ADBB has been validated in several studies across the world (for a review, see Guedeney, 2013). Validation studies found significant associations between positive ADBB scores and child psychopathology (Dollberg, Feldman, Keren, & Guedeney, 2006; Guedeney, Foucault, Bougen, Larroque, & Mentre, 2008; Milne et al., 2009).

Despite the clear relationship between maternal depression and infant withdrawal behaviors, studies of the relationship between infant ADBB scores and depression have been mixed. On one hand, a number of studies have demonstrated significant associations between positive ADBB scores and indicators of maternal depression, such as maternal depressed parenting behaviors and maternal depressive symptoms in the postpartum period (Dollberg et al., 2006; Matthey, Guedeney, Starakis, & Barnett, 2005). Regarding current depressive symptoms, as assessed by the EPDS, for example, only one study to date has found significant associations (Mäntymaa et al., 2008). Four other studies examining relations between maternal depressive symptoms at the time of the assessment and infant ADBB scores did not find associations (Dollberg et al., 2006; Guedeney, Marchand-Martin, Cote, Larroque, & the EDEN Mother–Child Cohort Study Group, 2012; Hartley et al., 2010; Matthey et al., 2005). Importantly, in these studies, presence of depression was assessed based on screening instruments rather than through psychiatric diagnostic processes. However, no study to date, to our knowledge, has examined associations between infant ADBB scores and a maternal psychiatric diagnosis of major depressive disorder (MDD). This poses an important research gap also because current practice guidelines and reimbursement policies in primary care are built on evidence-based clinical categories, as classified in the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-IV*; American Psychiatric Association, 1994). The first aim of this study is thus to address this research gap and to investigate if and how ADBB scores in the child are associated with a diagnosis of MDD in the mother.

Based on a review of previous studies that have examined associations between maternal mood symptoms and infant ADBB scores, we aimed at minimizing confounding factors that might have contributed to equivocal results. We excluded infants with biological factors known to contribute to infant social withdrawal behavior, such as prematurity and failure to thrive (Hartley et al., 2010; Matthey et al., 2005). In addition, we chose to study an infant age range (5.5–6.5 months) that is significantly narrower than were the age ranges in previous ADBB validation studies, as there are still important gaps in the current knowledge base about normative developmental trajectories for some behavioral items. Research about infant self-touch behavior, for example, has suggested that there is a normative decrease over the first months of life (Montirosso, Cozzi, Tronick, & Borgotti, 2012; Rochat & Hespos, 1997; Yamakoshi & Takeshita, 2006). For other behaviors, there might be fundamental developmental discontinuities, making it necessary not to assume phenotypic similarities of behavioral warning signs across different age groups (Luby, 2005).

A secondary aim of this study is to examine utilization of the ADBB as a coding tool for videotaped mother–infant interactions in pediatric primary care. Originally, the ADBB was developed

for assessment of infant behavior by the primary care provider during routine well-child examinations (Guedeney & Fermanian, 2001; Puura et al., 2010). In this approach, infant behavior is rated based on infant interactions with the primary care physician. Subsequently, an alternative method for the administration of the ADBB has been proposed and studied (Dollberg et al., 2006; Puura, Guedeney, Mäntymaa, & Tamminen, 2007). In this alternative approach, infant behavior is assessed during videotaped mother–infant interactions. No study to date, however, has studied utilization of the ADBB on mother–infant videos filmed during primary care visits. Behavioral studies in experimental settings have demonstrated that infants of depressed mothers exhibit withdrawn social behaviors earlier and more distinctly during mother–infant interactions, as opposed to interactions with an unfamiliar adult (Dawson et al., 1999; Field et al., 1988; Hossain, Field, Gonzalez, Malphurs, & Del Valle, 1994; Pelaez-Nogueras, Field, Cigales, Gonzalez, & Clasky, 1994). If at-risk infants are identified and referred to specialty services at the earliest possible time, interventional strategies have shown to be most effective and efficient (Nylen, 2006). Assessing infant behavior during mother–infant interactions in primary care settings thus might be an important addition to the original ADBB approach. Based on the results of the current study, we will discuss advantages and disadvantages of both ADBB approaches in the context pediatric primary care.

Better understanding of the relationship between maternal depression and infant ADBB score would be particularly important for low-income, Latino immigrants, as immigration is known to be a significant stressor associated with increased risk for maternal MDD (Callister, Beckstrand, & Corbett, 2011; Le, Perry, & Ortiz, 2009; Rodriguez et al., 2010). Rates of other maternal psychiatric diagnoses such as maternal anxiety, posttraumatic stress disorder (PTSD), and borderline personality disorder are high in immigrant mothers as well (Kaltman, Green, Mete, Shara, & Miranda, 2010; Summer, Wong, Schetter, Myers, & Rodriguez, 2011). These disorders also can adversely affect child development (Hobson et al., 2009), and there is evidence that infants show increased social withdrawal in the context of these maternal psychiatric disorders, regardless if there is comorbid MDD (Crandell, Patrick, & Hobson, 2003). Current AAP practice guidelines, however, do not yet specify screening for maternal psychiatric disorders other than MDD, as research is ongoing, and screening tools still need to be operationalized for use in primary care settings. In the current study, we chose a design that enables us to compare patterns of social withdrawal behavior between children of mothers with and without MDD. No study to date has investigated if there might be differences within the group of withdrawn infants (scoring above ADBB cut point 5) depending on their mother's psychiatric status. Our study will thus add to the knowledge base informing ongoing efforts to optimize screening guidelines in primary care, beyond screening for maternal MDD.

The overarching goal of this study is to examine if and to what degree ADBB scores for infant social withdrawal behavior, as assessed during videotaped mother–infant interactions at the pediatric primary care visit 6 months after delivery, are associated with a diagnosis of maternal MDD in low socioeconomic status (SES) Latino immigrant families. Our specific hypotheses build on previous studies that have identified an ADBB cut point of 5 as optimal for the detection of *significant* social withdrawal behavior and a cut point of 10 as optimal for the detection of *severe* social withdrawal behavior (Guedeney & Fermanian, 2001). We hypothesize that infants of mothers with MDD will be more likely to score above each of these cut points, as compared to children of mothers with no MDD. In addition, previous studies have proposed distinct ADBB factors for "interpersonal" and "noninterpersonal" social withdrawal behavior (Facuri Lopes, Ricas, & Mancini, 2008; Guedeney & Fermanian, 2001; Milne et al., 2009). Based on previous validation studies that have examined associations between maternal depression and ADBB scores, we hypothesize that a diagnosis of MDD in the mother will be associated with elevated scores for interpersonal withdrawal behavior items (e.g., eye gaze at the mother) while scores for noninterpersonal withdrawal behavior items (e.g., general level of activity) will not be different. Regarding ADBB item "self-stimulating gestures," it is known that infants show increased self-touch behaviors in response to emotional distress during mother–infant interactions, especially in the context of maternal depression (Montirosso et al., 2012; Moszkowski & Stack, 2007; Tronick & Reck, 2009). We thus hypothesize that infants of depressed mothers will have significantly higher scores for this ADBB item, as compared to infants of mothers with no depression.

## METHODS

### *Participants*

This study analyzes a subsample of a larger research project investigating maternal perinatal mood disorders and infant development in pediatric primary care. The study was conducted in a pediatric primary care clinic at a large, university-based, inner city public hospital between August 2010 and August 2011. Research protocol and informed consent forms were approved by the Institutional Review Board at the New York University School of Medicine and the Research Committee of Bellevue Hospital Center (New York City Health and Hospitals Cooperation). Families were offered study enrollment at the time of their child's 6-month healthcare maintenance visit in the pediatric clinic.

Inclusion criteria for the child were age 6 months (defined as 5.5–6.5 months), born full-term, no known medical disorder, and no physical complaints at the time of the visit. Inclusion criteria for the mother were at least 18 years old and be English- or Spanish-speaking. A total of 85.5% of families who met inclusion criteria agreed to participate in the study. Results presented are based on data analysis of the first 155 families who agreed to participate. Of these, 87% were Latina. Ninety-three percent of the families had a low socioeconomic status (SES) background (Hollingshead Factor 4 or 5). Mean maternal age was 28 ($SD = 6.2$) years. Most (72%)

**TABLE 1.** *Sociodemographic Sample Characteristics and Comparison Between Mothers With and Without Major Depression (MDD+/MDD−). Results Are Shown as Mean (SD) for Continuous Variables, as* n *(%) for Categorical Variables*

| | | Total | MDD+ | MDD− | p |
|---|---|---|---|---|---|
| Mother | Maternal Age (years) | 28.4 (6.2) | 30.1 (6.3) | 28.0 (6.1) | n.s. |
| | Maternal Time in United States (years) | 8.2 (5.5) | 7.6 (5.1) | 8.3 (5.7) | n.s. |
| | Maternal Schooling (years) | 10.7 (3.7) | 9.7 (3.8) | 11.0 (3.6) | n.s. |
| | Mother Currently Employed | 32 (21%) | 8 (28%) | 24 (19%) | n.s. |
| | Current Tobacco Smoking | 6 (4%) | 0 (0%) | 6 (5%) | n.s. |
| | Current Alcohol Drinking | 24 (16%) | 2 (7%) | 22 (17%) | n.s. |
| | Lifetime Drug Use: Yes | 10 (7%) | 2 (7%) | 8 (6%) | n.s. |
| Family | Paternal Age (years) | 30.9 (670) | 31.9 (7.9) | 30.7 (6.8) | n.s. |
| | Parents Living Together | 120 (79%) | 15 (52%) | 105 (83%) | ≤.001 |
| | Father Involved in Childcare | 138 (89%) | 19 (66%) | 119 (94%) | ≤.001 |
| | Sufficient Financial Support | 139 (90%) | 21 (72%) | 118 (93%) | <.01 |
| | Sufficient Emotional Support | 135 (87%) | 18 (62%) | 117 (92%) | ≤.001 |
| | Sufficient Food Security | 129 (85%) | 18 (62%) | 111 (88%) | ≤.001 |
| | Number of Children | 2.1 (1.3) | 2.5 (1.6) | 2.0 (1.2) | n.s. |
| Child | Study Infant Age (months) | 6.4 (0.5) | 6.4 (0.6) | 6.4 (0.5) | n.s. |
| | Vaginal Delivery | 110 (72%) | 19 (66%) | 91 (72%) | n.s. |
| | Study Infant Male Gender | 83 (54%) | 16 (55%) | 67 (53%) | n.s. |
| | Study Infant Firstborn | 66 (43%) | 12 (41%) | 54 (43%) | n.s. |

of the infants were born via vaginal delivery; 54% were boys, and 43% were firstborns (see Table 1).

### Procedure

The study took place in the pediatric clinic at the time of the child's healthcare maintenance visit. It consisted of three parts. First, mothers completed questionnaires about sociodemographics, mood symptoms, and child behavior. Second, a board-certified, bilingual psychiatrist (M. A.-S.) conducted a standardized psychiatric interview with the mothers. Third, mothers and infants were videotaped for 10 min in a private room without study personnel present. Children were fed and changed as necessary prior to videotaping to ensure maximal child comfort. They were then seated in an infant seat facing their mother. Mothers were instructed to play with their child as they normally would. Maternal and infant behaviors were analyzed based on their videotaped interactions. Video coding took place after the visit in the pediatric clinic was completed.

### Measures

*MDD.* MDD was diagnosed according to *DSM-IV* diagnostic criteria based on a standardized psychiatric interview (Structured Clinical Interview for Axis I Disorders; First, Spitzer, Gibbon, & Williams, 1996) by a board-certified, bilingual psychiatrist (M. A.-S.).

### Infant sustained social withdrawal behavior.

*ADBB.* The ADBB consists of eight behavioral items: facial expression, eye contact, general level of activity, self-stimulating gestures, vocalizations, response to stimulation, relationship, and attraction. Each item is rated from 0 (*no unusual behavior*) to 4 (*severe unusual behavior*), resulting in 0 as the minimal and 32 as the maximal ADBB total score. Clinical validity and predictive validity were shown to be adequate in several studies with large samples at different ages (age range = 2–24 months). The cutoff score of 5 has yielded the best trade-off between specificity (.82) and sensitivity (.78) for the detection of developmental risk (Guedeney & Fermanian, 2001). An additional cutoff score of 10 characterizes children with *severe* sustained social withdrawal behavior. The ADBB has demonstrated good metrological properties as well as validity across study populations of differing ethnic and cultural backgrounds (Guedeney, 2013).

Previous ADBB validation studies have proposed different factorial structures for the ADBB. The grouping of individual items differs slightly between studies, but overall, there is agreement that the ADBB might represent two categories of social behavior: interpersonal and noninterpersonal social behavior (Facuri Lopes et al., 2008; Guedeney & Fermanian, 2001; Matthey et al., 2005; Milne et al., 2009). In the current study, we tested two of the proposed factor models: a two-factor model based on Guedeney and Fermanian (2001) and a three-factor model based on Facuri Lopes et al. (2008). In the three-factor model, the ADBB item self-stimulating behavior is listed as a separate third factor. In the two-factor model, it is one of five items loading on interpersonal behavior (Details for the grouping of items in the two models are listed in Table 2).

*ADBB training and reliability results.* The primary coder for all videos in this study was a board-certified pediatrician with infant mental health specialty training (N.B.) blinded to all mother and infant information (including maternal MDD status). As part of initial ADBB training, 22 training videos for children aged

**TABLE 2.** *ADBB Factor scores (M, SD): Comparison Between Mothers With and Without Major Depression (MDD+/MDD−)*

| ADBB Factors | | MDD− | | MDD+ | | |
|---|---|---|---|---|---|---|
| | | M | SD | M | SD | p |
| Guedeney & Fermanian (2001) | Factor 1 "interpersonal" (Items 2–4, 7, 8) | 1.93 | 1.87 | 3.62 | 1.80 | ≤.001 |
| | Factor 2 "notinterpersonal" (Items 1, 5, 6) | 1.37 | 1.39 | 2.52 | 1.68 | ≤.001 |
| Facuri Lopes et al. (2008) | Factor 1 "interpersonal" (Items 2, 5, 7, 8) | 2.2 | 2.07 | 4.10 | 1.95 | ≤.001 |
| | Factor 2 "notinterpersonal" (Items 1, 3, 6) | .93 | 1.14 | 1.55 | 1.27 | <.05 |
| | Factor 3 "self-stimulation" (Item 4) | .17 | .43 | .48 | .63 | <.05 |

1 to 30 months (*M* age = 11 months) were coded according to the ADBB coding manual (www.adbb.net; English version, 2007). Training videos, recorded during pediatric office visits in France and Australia, represented a variety of ethnic and cultural family backgrounds. The training process was supported by bimonthly conference calls with the author of the scale (A.G.) over a period of 6 months. Reliability was tested on 10 videos for children aged 2 to 15 months (*M* age = 6 months), videotaped in Paris. Interrater reliability scores were calculated against ADBB scores assigned to this set of videos by the author of the ADBB and his research team. Interrater reliability was 0.86 [95% confidence interval (CI) = 0.66–1).

The secondary coder for 25 randomly selected videos from the current study was the author of the ADBB (A.G.), also blinded to all mother and infant information. Interrater reliability for this set of videos was 0.84 (95% CI = 0.63–1). Coders agreed on individual items within 1 point in 100% of the cases. For each item, coders agreed on the exact code in more than 75% of the cases. Regarding ADBB total score, there was only one case for which coders disagreed by more than 2 points (Disagreement was 3 points.) In another case, a disagreement within 1 point for ADBB total score resulted in different categorical results for this video (One coder rated total ADBB as 4, the "no concern" category; the other coder rated as 5, the "significant concern" category.) Overall, there was agreement for total ADBB score (within 2 points) and for ADBB category (no concern, significant concern, severe concern) in 92% of the videos.

*ADBB Setting in the Current Study.* As discussed earlier, we decided to assess infant behavior during a videotaped mother–infant face-to-face, free-play paradigm. This decision resulted in slight modifications to the original ADBB coding manual that were made with the author's permission: Items 2 (eye contact) and 7 (relationship) were coded with the mother as the reference point, not the physician. Item 8 (attraction) underwent a slight shift in meaning, as coders assessed their own efforts to keep in touch with the child while watching the mother–infant interaction, as opposed to assessing their feelings experienced while directly interacting with the child themselves.

### Statistical Analysis

Assuming effect sizes of 0.6 *SD* (for impact of MDD on child behavior, as compared to no depression) and $\alpha = .05$, an estimated

sample size of $n = 60$ dyads (30 per category), was estimated to provide 80% power (Beck, 1999). Continuous variables were described using means and standard deviations, and categorical variables were described using frequencies and percentages. For associations between variables, chi-square test or the independent samples *t* test, as appropriate, was applied. Interrater reliability was assessed using intraclass correlation coefficient under the random-effects model. All statistical analyses were performed using SPSS 17.0 software.

### RESULTS

A total of 18.7% of mothers had a diagnosis of MDD 6 months after delivery. This rate is higher than average rates reported in Western European samples, but comparable to other at-risk Latino immigrant samples (Fortner, Pekow, Dole, Markenson, & Chasan-Taber, 2011; Halbreich & Karkun, 2006; Melville, Gavin, Guo, Fan, & Katon, 2010). Sociodemographic characteristics for mothers with and without depression, respectively, are shown in Table 1. Importantly, there were no differences between mothers with or without depression regarding mode of delivery, number of children, or gender of the child. There also were no differences in reported tobacco, alcohol, and drug use between the groups.

In the current study, all mothers were assessed by a standardized psychiatric interview 6 months after delivery. These interviews revealed that onset of major depressive symptoms was, on average, 10 months prior to the time of the interview (range = 0.5 months–6 years). Thus, for infants in the current study, total average exposure time to maternal depression was 6 months postnatally and 4 months prenatally. Of the infants, 39.4% showed sustained withdrawal behavior above the ADBB clinical cut point of 5, including 5% infants with *severe* sustained withdrawal behavior (above ADBB cut point 10). This rate is comparable to rates in previous studies that have assessed ADBB scores in at-risk community samples (Matthey et al., 2005; Milne et al., 2009; Puura et al., 2007). A total of 75.8% of infants with depressed mothers scored above cut point 5 (including 10.3% scoring above cut point 10), as compared to 31.0% of infants with nondepressed mothers (including 3.9% with scores above cut point 10); $\chi^2$ 19.934 ($p \leq .001$) (see Figure 1).

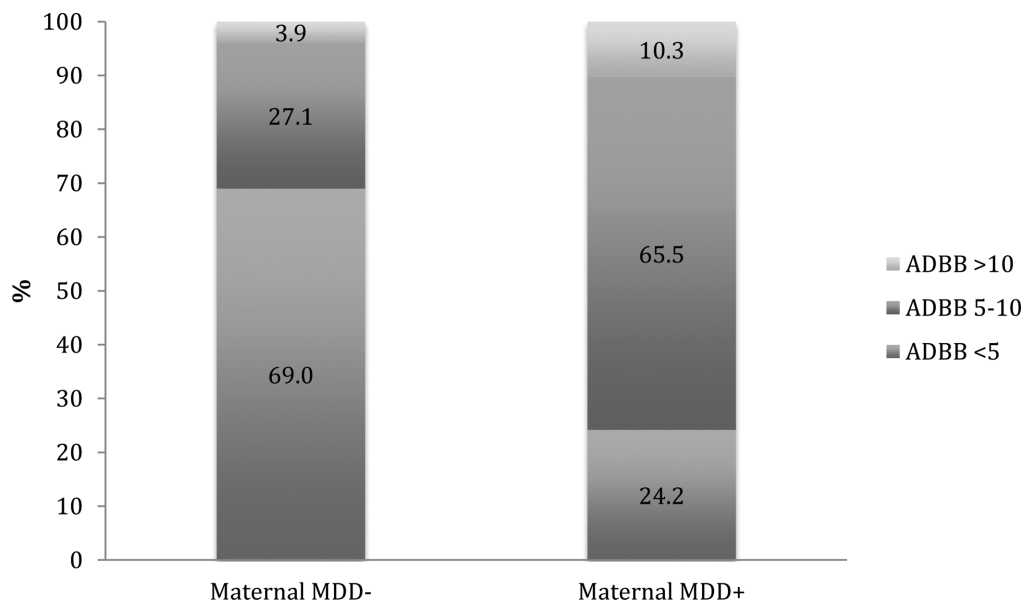Infants of mothers with depression (MDD) showed increased total ADBB scores, as compared to infants mothers with no

FIGURE 1. Alarm Distress Baby Scale (ADBB) total scores (categorical): Comparison between mothers with and without major depression (MDD+ and MDD−) for ADBB cut point 5 (significant withdrawal behavior) and ADBB cut point 10 (severe withdrawal behavior).

**TABLE 3.** *Alarm Distress Baby Scale (ADBB) Total Score (Continuous) and Individual Items (M, SD): Comparison Between Mothers With and Without Major Depression (MDD+/MDD−)*

| ADBB Items | MDD− | | MDD+ | | |
|---|---|---|---|---|---|
| | M | SD | M | SD | p |
| ADBB Total Score | 3.3 | 3.0 | 6.1 | 3.1 | ≤.001 |
| Item 1: Facial Expression | .52 | .66 | 1.10 | .94 | ≤.001 |
| Item 2: Eye Contact | .60 | .65 | .97 | .73 | <.01 |
| Item 3: Activity Level | .24 | .50 | .28 | .46 | n.s. |
| Item 4: Self-Stimulation | .17 | .44 | .48 | .63 | <.05 |
| Item 5: Vocalizations | .68 | .73 | 1.24 | .74 | ≤.001 |
| Item 6: Briskness of Response | .17 | .40 | .17 | .38 | n.s. |
| Item 7: Relationship | .39 | .49 | .79 | .41 | ≤.001 |
| Item 8: Attraction | .55 | .69 | 1.10 | .82 | ≤.001 |

depression (6.1 vs. 3.34; p ≤ .001); infants of mothers with depression had higher scores for all but two individual ADBB items. The two exceptions were Item 3 (general level of activity) and Item 6 (briskness of response to stimulation) (see Table 3). Infants of depressed mothers had significantly higher ADBB scores on all factors within both two- and three-factorial models; that is, both interpersonal and noninterpersonal social withdrawal behaviors were more frequently seen in children of depressed mothers (see Table 2). However, within the group of withdrawn infants (with ADBB scores above clinical cut point 5), no differential patterns of behavior could be identified for infants of depressed mothers, as compared to infants of mothers with no depression. There were no differences in any of the individual ADBB items nor in any

ADBB factor scores or ADBB total scores (all *p*s n.s.; data not shown).

## DISCUSSION

The primary aim of this study was to investigate if and how ADBB scores in the child are associated with a diagnosis of MDD in the mother. We found that children of mothers with MDD were significantly more likely to score above the clinical ADBB cut point of 5 (*p* < .001). The prevalence of positive ADBB screening results in the context of MDD was 76%. This finding confirms validity of the ADBB for detection of social withdrawal behavior in infants of depressed mothers. In addition, the current study contributes evidence that infants of mothers with MDD show distinct behavioral patterns of social withdrawal, with elevated scores for six of eight ADBB items. We had hypothesized that they would show increased interpersonal social withdrawal, but not increased noninterpersonal withdrawal behaviors. Contrary to our hypothesis, infants of depressed mothers showed withdrawal behavior across all ADBB factors, regardless if a two- or a three-factor model was used (see Table 2).

Results of the current study support evidence that a subset of ADBB scores might encompass a distinct "motoric" feature of social behavior competencies. Infants of mothers with major depression, as assessed by psychiatric interview, did not have increased scores for the two motoric ADBB items: Item 3 (general level of activity) and Item 6 (briskness of response to stimulation). This finding is in concordance with several other ADBB validation studies in which these two items loaded on the same noninterpersonal factor (Facuri Lopes et al., 2008; Matthey et al., 2005; Milne et al., 2009). In the current study, only full-term, healthy

infants without any medical disorders were included. It thus might not be surprising that their "motoric" levels were consistently normal, with or without maternal MDD. Regarding Item 1 (facial expressions), there is controversy if it might accurately be categorized as a noninterpersonal item when infant behavior is assessed during mother–infant interactions (Guedeney & Fermanian, 2001; Matthey et al., 2005). Studies examining infant behavior in experimental settings have shown reduced facial expressiveness for children of depressed mothers during interactions with their mother (Guedeney, 2007; Tronick & Reck, 2009). Results of the current study confirm evidence that ADBB scores for facial expressions might be viewed as interpersonal if infant behavior is assessed during mother–infant interactions.

Regarding ADBB Item 4 (self-stimulating gestures), results confirmed our hypothesis that children of depressed mothers show increased rates of self-stimulation during mother–infant interactions. Interestingly, mean scores for self-stimulating gestures in 6-month-old infants of depressed mothers (.48) in the current study were similar to mean scores of 2- to 3-month-old children (.44) in a Finnish ADBB study (Puura et al., 2007) with low maternal depression rates (<5%, personal communication, K. Puura, November 9, 2012). Future studies will need to further investigate if and how infant self-touch behavior develops over time in the absence or presence of maternal depression, and if findings of increased self-touch behavior at 6 months might constitute a developmental regression pathway for children of depressed mothers.

Importantly, 31% of infants born to mothers with no depression showed significant social withdrawal behaviors (with ADBB scores above the clinical cut point of 5). Infant social withdrawal behavior is known to be associated with a variety of risk factors, including biological risks (e.g., prematurity), and environmental sources of toxic stress, including, but not limited to, maternal MDD. In the current study, infants with biological risk factors were excluded. Thus, it is likely that sources of toxic stress other than MDD might have contributed to the high number of withdrawn infants within the group of infants born to nondepressed mothers. Other psychiatric disorders (e.g., maternal anxiety, PTSD, or borderline personality disorder) are known to be highly prevalent in high-risk, low SES immigrant populations (Kaltman et al., 2010; Summer et al., 2011). Research studies have demonstrated that these disorders also can result in infant social withdrawal behaviors, similar to the effects of maternal MDD (Crandell et al., 2003). Future studies will need to investigate if and how maternal psychiatric disorders, other than MDD, might be contributing to these findings in infants of mothers with no depression.

It was an exploratory aim of the current study to investigate if patterns of withdrawal behaviors might differ within the group of children who score positive on the ADBB (above cut point 5), depending if there is maternal MDD; we did not find any differences. Neither total ADBB score nor any of the individual ADBB item or factor scores were elevated for infants of depressed mothers, as compared to children of mothers with no depression who scored positive on the ADBB. This result is consistent with the conceptual model of the ADBB to screen for nonspecific behavioral signs

(Guedeney & Fermanian, 2001). Future studies, however, might be able to detect subtle differences in ADBB patterns when investigating individual ADBB items in relation to other psychiatric diagnoses in the mother. These studies might subsequently contribute to refinement of current screening and referral guidelines for maternal psychiatric disorders and infant social withdrawal behaviors in primary care (Garner et al., 2012).

The current study investigated infant behavior during the 6-month routine pediatric visit. We decided on studying infants at 6 months of age, as the repertoire of infant emotional expressivity develops significantly over the first months of life, increasing from three to eight distinct emotional expressions between two and 6 months of age (Izard et al., 1995). On the other hand, results of the current study also underline the importance of beginning screening and surveillance for maternal depression in pediatric primary care well before the 6-month visit, ideally prenatally, as is recommended by AAP guidelines (Chaudron, Szilagyi, Campbell, Mounts, & McInerny, 2007; Cohen & the Committee on the Psychosocial Aspects of Child and Family Health, 2009; Jones, Field, Fox, Lundy, & Davalos, 1997; Olson et al., 2002). Infants in the current study, on average, were exposed to their mother's depression already during the third trimester of pregnancy. Research studies have powerfully demonstrated how endocrine and neurophysiological factors in mothers with depression shape their infant's developmental environment in utero (Bergman, Glover, Sarkar, Abbott, & O'Connor, 2010; Glover, 2011; Kaplan, Evans, & Monk, 2008). It thus might not be surprising that 75.8% of infants born to depressed mothers showed withdrawal behaviors across behavior domains at 6 months of age.

In the current study, infant behavior was assessed by an infant mental health specialist based on videotaped mother–infant interactions. This modified method of administering the ADBB differs from the original ADBB approach in three aspects. First, the person who interacts with the child during administration of the ADBB is the mother, not the primary care provider. Second, interactions are coded based on videotaped behavior after the primary care visit, not during live examinations. Third, the coder of infant behavior is an infant mental health specialist, not a general practitioner. The main advantages of the original ADBB approach are its low time, resource, and training requirements. In this approach, primary care providers engage the infant socially during the routine examination in the presence of the mother and code infant behavior after the visit, with coding requiring approximately 2 to 3 min (Guedeney & Fermanian, 2001). There are no additional resources needed, and previous studies have shown that general practitioners can be trained in the ADBB within less than 10 training sessions (Puura et al., 2010).

Another advantage of the original ADBB approach is the assessment of infant behavior in reference to an adult who is not the mother. To make mental health diagnoses in children at any age, it is required that symptoms persist across settings and relationships. Thus, if children show concerning behavior while interacting with the primary care physician, this finding might be indicative of a more severe concern than if infants "only" show social withdrawal

behavior when interacting with their mother. This active role of the pediatrician in engaging the infant socially to elicit optimal responses, however, can place the provider in a difficult dilemma. If a severely depressed mother, for example, witnesses how her infant might brighten up when interacting with the pediatrician, her depressed mood and feelings of being a failure as a mother could worsen. Sensitive pediatricians carefully avoid such situations and aim instead at fostering the mother's sense of her own competency as a caregiver. Administration of the ADBB by pediatricians thus might endanger their therapeutic alliance with the mother.

Another disadvantage of the original ADBB approach is the risk of measurement biases. Previous ADBB studies have discussed difficulties in controlling for level of familiarity between care provider and families, as primary care visits are frequent in the first years of life (Matthey et al., 2005). Depending on the structure of the primary care institution, families might have seen their pediatrician five or more times already by the time the child is 6 months old. However, it also could be the first time for them to meet a particular physician if they receive care in a busy clinic with multiple providers and trainees. Low SES, at-risk families are less likely to receive care in small, single-provider private offices, and continuity of care is known to be particularly low in underserved populations (Flores, Olson, & Tomany-Korman, 2005). In addition, infants of depressed mothers are more likely to miss scheduled appointments and thus might be examined by a different provider at each visit (Minkovitz et al., 2005). Assessing infant social behavior based on videotaped interactions with the mother, as in the current study, can help minimize these measurement biases, especially if video coders are blinded to all maternal and infant factors, other than those that are obvious in the video (e.g., gender of the child). Previous authors reviewing different ADBB approaches have voiced concerns that mothers might feel uncomfortable to "perform" mother–infant interactions in front of their primary care provider (Matthey et al., 2005). In the current study, mother–infant free play was videotaped with nobody present in the room but mother and infant. This might have contributed to mothers feeling at ease and to high participation rates in the current study. Of all mothers who were offered enrollment, 85.5% agreed to participate.

In addition to reducing measurement biases, assessing infant behavior based on videotaped mother–infant interactions allows for the earliest possible identification of infants at risk, as outlined earlier. This modified ADBB approach requires more time and more resources than does the original ADBB setting. Time requirements, however, are minimal, as videotaping can be completed within 10 min during regular well-child visits. Cost requirements for assessment of infant behavior are higher if videos are reviewed by an infant mental health specialist with advanced degrees, as compared to assessments by general practitioners. Given the high costs of untreated maternal depression and associated adverse infant developmental outcomes for the healthcare system (Sills, Shetterly, Xu, Magid, & Kempe, 2006), future studies will need to investigate these risk/benefit ratios within a larger public healthcare framework.

A combined model of both ADBB approaches might be optimal to ensure early detection of infants at risk without compromising time and resource efficiency. Such a model could, for example, consist of using the original ADBB approach for surveillance of infant behavior during well-child visits and adding a standardized assessment of infant behavior by an infant mental health specialist 6 months after delivery, based on videotaped mother–infant interactions. Review of videotaped infant behavior under supervision by an infant mental health specialist could become an important part of provider training. In addition, videotaped mother–infant interactions could be utilized as part of evidence-based interventions for families at risk if utilized by an infant mental health specialist trained to provide Level 3 interventions (Hinshaw-Fuselier, Doyle Zeanah, & Larrieu, 2009).

The current study was limited because of its cross-sectional design and its focus on infant behavioral risk markers in the absence of biological risk markers. Future studies will need to investigate if and how patterns of social withdrawal in infants of depressed mothers might change over time, with first assessments of infant behavior starting before 6 months of age. Assessment will need to include biological markers known to be associated with sustained infant withdrawal behavior in the context of maternal depression (Buss et al., 2003; Costa & Figueiredo, 2012; Davidson, Ekman, Saron, Senulis, & Friesen, 1990; Dawson, Klinger, Panagiotides, Hill, & Spieker, 1992; Field, Fox, Pickens, & Nawrocki, 1995). In addition, the role of possible mediating effects of maternal parenting behavior in the context of differing psychiatric disorders and the role of potential social "buffers" such as fathers, siblings, and peers will need to be examined. Despite these limitations, the current study adds important evidence for the validity of the ADBB.

In conclusion, we confirmed that the ADBB reliably identifies social withdrawal behavior in infants of depressed mothers; 75.8% of infants with depressed mothers scored positive on the ADBB for significant withdrawal behavior. The current study supported validity of the previously established clinical cut point of 5. We also specified patterns of withdrawal behaviors for infants of mothers with depression across behavioral domains. Note that this was the first ADBB validation study to narrowly define "maternal depression" as "current maternal major depressive disorder", determined based on a standardized psychiatric interview. Future studies will need to examine if and how findings of the current study can be applied to interpretation of screening results for maternal depression (e.g., of maternal EPDS scores). Furthermore, results of the current study confirm evidence that infant social withdrawal behavior also is a frequent finding for infants of mothers with no diagnosis of major depression. These results likely reflect other sources of toxic stress common in high-risk, low SES immigrant populations, including other maternal psychiatric disorders such as maternal perinatal anxiety, PTSD, or borderline personality disorder. In the current study, 1 in 3 children of nondepressed mothers showed social withdrawal behavior above the clinical ADBB cut point. Future studies will need to investigate if and how social withdrawal behavior in infants of nondepressed mothers might be

associated with other maternal psychiatric disorders. This is of particular importance for at-risk, low SES, immigrant populations with high rates of maternal psychopathology and has significant implications for screening and referral guidelines in primary care.

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# THE ALARM DISTRESS BABY SCALE IN A LONGITUDINAL PORTUGUESE STUDY REANALYZED WITH ATTACHMENT DATA

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ABSTRACT: The relationship established between the infant and the caregiver is central to both parents and infants, and provides one of the most important environments in wich children develop. This study aimed to assess the effect of infant's psychophysiological functioning early in life on the quality of mother–infant interaction and on later attachment, and to explore the mediation effects of the quality of mother–infant interaction on the association between the infant's psychophysiological functioning and attachment security. A longitudinal prospective design was conducted with 94 infants and their mothers. Eight-week-old infants were assessed with the Neonatal Behavioral Assessment Scale (T.B. Brazelton & J.K. Nugent, 1995) and the Alarm Distress Baby Scale (A. Guedeney & J. Fermanian, 2001). At 8 to 12 weeks of age, cortisol levels were measured both before and after routine inoculation. Mother–infant interaction was evaluated at 12 to 16 weeks, using the Global Rating Scales (L. Murray, A. Fiori-Cowley, R. Hooper, & P. Cooper, 1996). The Strange Situation procedure (M. Ainsworth, M. Blehar, E. Waters, & S. Wall, 1978) was performed at 12 months. The overall quality of mother–infant interaction mediates the relation between infant's behavioral and physiological profile and infant attachment: The probability of been securely attached increased with good mother behavior and with good overall interaction. The co-construction of the mother–infant relationship depends on the infant characteristics and on patterns of interaction.

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The relationship established between the infant and the caregiver is the earliest and closest among the many relationships that individuals experience throughout their life. These interactions are central to the lives of both parents and infants, and provide one of the most important environments in which children develop as individuals and as members of their culture (Russell, Mize, & Bissaker, 2002). When discussing parent–child relationships, attention must be directed to the individuals as participants in the relationship, to the interpersonal aspects of the relationship, and to the broader social context and systems that influence parent–child relationships. Parent–child relationships are complex and multidimensional. They vary over time, differ from the perspective of the parent and of the child, and differ from one situation to another, and so on. Interaction problems at this time are associated with later developmental difficulties and attachment organization (Evans & Porter, 2009).

The idea that both mother and infant characteristics influence the quality of their behavior in the interaction is consistent with a transactional model of development (Bell, 1974; Sameroff, 1975). From the transactional perspective, infants' and caretakers' characteristics exert a mutual and reciprocal influence, leading to unique patterns of behavior. Therefore, differences in the quality of attachment relationships arise after a history of infant–caregiver interactions (Weinfield, Sroufe, Egeland, & Carlson, 1999). On the construction of this interaction background, both infant characteristics and maternal characteristics play a central role by influencing the interpretation and type of response to each other's behaviors (Sameroff, 2009).

Despite this, attachment theorists have conceived attachment as a relational construct independent of temperament while some temperament theorists have stated that attachment measures are alternative assessments of infant temperament (Rothbart & Ahadi, 1994). Nonetheless, several investigators have proposed that infant characteristics might influence the quality of attachment or, at least, the behavior displayed in the Strange Situation. Furthermore, temperament theorists have agreed that caregiving practices

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can modify the expression of temperament, although they have not explained exactly how attachment might affect temperamental development. On the other hand, attachment theories have argued that the infant temperament variance is overshadowed by the more mature caregiver's success or failure in accommodating it (Goldsmith & Alansky, 1987).

Bowlby (1969) argued that aspects of both the child's state and the novelty of the situation interfere with attachment behavior. Considering that proneness to distress influences the infants' state, then the nature of children's experience in situations relevant to attachment will differ (van den Boom, 1989). Temperament also might affect the development of attachment by mediating the course of mother–infant interaction (Goldsmith, Bradshaw, & Rieser-Danner, 1986; Goldsmith & Campos, 1986). Goldsmith, Bradshaw, and Rieser-Danner (1986) suggested that the attachment system activation, and especially proximity-seeking behavior, depends on infant fearfulness: In highly fearful child, a lower level of distress leads to fewer opportunities for experiencing the mother as a secure base for exploration. Other dimensions of temperament also have been associated to stranger sociability in several studies (Tavecchio & van IJzendoorn, 1987). Activity level, adaptability, positive mood, and high threshold of response (Scarr & Salapatek, 1970) as well as fear (Thompson & Lamb, 1984) were related to stranger sociability. These studies have provided some evidence on the role of infant's individual differences very early in life for the development of attachment relationships.

On the other hand, evidence about the association between maternal variables measured during mother–child interaction and security of attachment also has been well-documented. Mothers who were more sensitive to their infants' cues for proximity and contact early in the first year of life (Ainsworth, 1979, 1982; Ainsworth, Bell, & Stayton, 1971, 1974; de Wolff & van IJzendoorn, 1997; Finger, Hans, Bernstein, & Cox, 2009; Grossmann et al., 1985; Moran, Forbes, Evans, Tarabulsy, & Madigan, 2008), more responsive and encouraging in face-to-face interaction (Blehar, Lieberman, & Ainsworth, 1977; Goldsmith & Alansky, 1987; Isabella, Belsky, & von Eye, 1989), more emotionally open (Pauli-Pott & Mertesacker, 2009; Ziv, Aviezer, Gini, Sagi, & Koren-Karie, 2000), and more sensitive to their infants in free-play activities (Fuentes, Lopes dos Santos, Beeghly, & Tronick, 2006) were more likely to have securely attached infants. Mothers of securely attached infants are more affectionate (Bates, Maslin, & Frankel, 1985), gentler (Londerville & Main, 1981), accepting (Main, Tomasini, & Tolan, 1979), positive in their vocalizations (Roggman, Langlois, & Hubbs-Tait, 1987), and show more positive affect (Malatesta, Culver, Tesman, & Shepard, 1989), as compared to mothers of insecurely attached infants. Mothers of avoidant infants were characterized by overstimulation and intrusiveness while mothers of resistant infants were characterized by underinvolvement and unavailability (Isabella et al., 1989).

An essential issue is that there are multifactorial aspects, associated with the infant and the mother as well as with the interaction between them, involved in the development of attachment relationships. Bates, Maslin, and Frankel (1985) noted that infants

perceived as outgoing and fearless and infants perceived by their mothers as having low interest in them maintained less contact during the reunion episodes of the Strange Situation. These associations may have a biological basis, although the cause may be due to patterns of parent–infant interaction. When parents are the source of information, we may wonder wether the perception of the child is due to the child itself, the parent's inexperience, or pressures arising from the parent's mental health (MacKenzie & McDonough, 2009).

In 1989, van den Boom examined the links between neonatal irritability at Days 10 and 15 of life, the quality of mother–infant interaction at Month 6, and infant attachment assessed at 12 months. She found that neonatal irritability predicted later attachment classification, especially the avoidant category. Furthermore, mothers of irritable infants tended to develop a pattern of interaction characterized by a progressive underinvolvement and unresponsiveness with age. Looking at this data, van den Boom developed and implemented an intervention program to enhance maternal sensitive responsiveness with irritable infants. Infants in the experimental gourp were less likely to be categorized as insecurely attached at 12 months. van den Boom's studies are indicative of both the strength of biologically founded characteristics in predicting later attachment and the influence of maternal skills when training is added. They have illustrated that the interaction between the infant predisposition and mother behavior may develop into a trajectory of experience for the child, with important developmental outcomes (Rothbart & Ahabi, 1994).

One of the most pressing issues in contemporary attachment theory is to describe complete causal pathways to explain well-replicated correlations between early care and subsequent patterns of secure-base behavior. In this study, we analyzed the effect of infant's behavioral and physiological functioning early in life on the quality of mother–infant interaction and on later attachment. In addition, we have explored the mediation effects of mother–infant interaction on the association between infant's behavioral and physiological functioning and attachment security.

In a previous study (Costa & Figueiredo, 2012), three groups of infants with three different behavioral and physiological profiles ("withdrawn," "extroverted," and "underaroused") at 2 months were identified. The identification of these profiles was determined according to the infants' neurobehavioral performance, social withdrawal, and neuroendocrine reactivity to inoculation. Their withdrawn infants showed severe signs of social withdrawal, poor neurobehavioral performance, and high neuroendocrine reactivity; extroverted infants showed practically no signs of social withdrawal, and had a good neurobehavioral performance and an average to high neuroendocrine reactivity; and underaroused infants showed some signs of social withdrawal, average neurobehavioral performance, and low neuroendocrine reactivity.

Bearing in mind that "it takes two to become attached" (van den Boom, 1997, p. 593), the study of both infant behavioral and physiological functioning and early mother–infant interaction associated with infant attachment is of great interest. The purpose of this study is to consider bidirectional effects on the dyadic system

**TABLE 1.** *Sociodemographic and Medical Data*

| Maternal and Gestational Data | | (%) | Neonatal Data | | (%) |
|---|---|---|---|---|---|
| Maternal Age | ≤20 ∧ ≤34 | 96.0 | Time of Gestation | <37 | 7.2 |
| | >35 | 4.0 | | ≥37 ∧ ≤40 | 82.1 |
| | | | | >40 | 10.7 |
| Year of Education | <9 | 23.0 | Sex | Female | 46.9 |
| | ≥9 | 77.0 | | Male | 53.1 |
| Marital Status | Married | 81.0 | Reanimation at Birth | No | 94.6 |
| | Cohabiting | 19.0 | | Yes | 5.4 |
| Parity | Primiparous | 84.2 | Weight | <2,500 g | 1.7 |
| | Multiparous | 15.8 | | ≥2,500 g | 98.3 |
| Type of Gestation | Normal | 80.4 | Ponderal Index | <2.5 | 13.5 |
| | Risk | 19.6 | | ≥2.5 | 86.5 |
| Type of Delivery | Vaginal | 34.2 | Apgar Index: 1 min | <7 | 3.8 |
| | Cesarean | 65.8 | | ≥7 | 96.2 |
| Type ofAnesthesia | None | 2.6 | Type of feeding | Breast-Fed | 89.4 |
| | Epidural | 86.8 | | Bottle-Fed | 10.6 |
| | General | 10.5 | | | |

and the way in which they contribute to the co-construction of the infant–mother relationship.

## METHOD

### Sample

The sample was composed of 94 infants. Most infants were born after a normal and full-term gestation. More than half were born through a cesarean section and had no need for reanimation. At birth, infants height ranged from 45.90 to 54.00 cm ($M = 49.44$, $SD = 1.84$), cephalic perimeter ranged from 31 to 37 cm ($M = 34.60$, $SD = 1.29$), weight ranged from 2,450 to 4,055 g ($M = 3243$, $SD = 424$), ponderal index ranged from 2.24 to 3.29 ($M = 2.71$, $SD = 0.23$), and Apgar scores ranged from 5 to 10 ($M = 8.63$, $SD = 0.91$) at 1 min and from 8 to 10 ($M = 9.76$, $SD = 0.53$) at 5 min (see Table 1).

### Procedures

This research was conducted in the Primary Care Centers of Espinho and Santa Maria da Feira (Portugal) after the protocol was analyzed and approved by the ethical committee. Mothers were contacted when attending routine inoculation of their 1-month-old infant; 96% of the contacted mothers agreed to participate, 3% declined participation alleging lack of time, and 1% were not interested in participating. The exclusion criteria were not reading or writing Portuguese and/or multiple gestations. The aims and the procedures of the study were explained, and an informed consent was signed. All evaluation procedures were performed and videotaped either at home or at the Primary Care Center.

A sociodemographic questionnaire was completed on infants' medical data, and when the infant was 8 weeks old (±5 days), the Neonatal Behavioral Assessment Scale (NBAS; Brazelton & Nugent, 1995) was performed and videotaped. This examination was conducted in a particular sequence by trained and reliable examiners midway between feedings in a quiet and semidarkened room with a temperature of 22 to 27°C. The NBAS was scored immediately after being performed. At this time, the infant's social withdrawal behavior also was assessed using the Alarm Distress Baby Scale (ADBB; Guedeney & Fermanian, 2001). The ADBB was scored by the researcher who had carried out the NBAS procedure. Between 8 and 12 weeks of life, a saliva sample was collected from the infant's mouth before (5–10 min) and after (20–22 min) routine inoculation. Mother–infant interaction was evaluated at 12 to 16 weeks, using the Global Rating Scales (GRS; Murray, Fiori-Cowley, Hooper, & Cooper, 1996). The Strange Situation procedure was performed to assess infant attachment style between 12 and 14 months (Ainsworth et al., 1978).

### Measures

*Neonatal behavior.* The NBAS (Brazelton & Nugent, 1995) assesses the newborn's competencies across different developmental areas—autonomic, motor, states and social—and describes how these areas are integrated. The autonomic stability records signs of stress related to homeostatic adjustments of the central nervous system The motor factor measures motor performance and the quality of movement and tone. Range of state is a measure of infant arousal and state lability. The regulation of state reports the infant's ability to regulate his or her state in the presence of increasing levels of stimulation. The Orientation factor includes the ability to attend to visual and auditory stimuli and the quality of overall alertness in social interactions (Brazelton & Nugent, 1995).

The scale, composed of 28 behavioral and 18 reflex items, is suitable for examining newborns and infants up to 2 months old and is based on three key assumptions: (a) Infants are highly competent when they are born, (b) infants "communicate" through their behavior, and (c) infants are social organisms. By the end of the assessment, the examiner has a behavioral "portrait" of the infant, describing his or her strengths, adaptive responses, and possible vulnerabilities. The 28 items of the NBAS are scored on a 9 point scale. For the NBAS total score, behavioral and reflexes items were recoded so that a better performance corresponds to higher score and were then added.

*Social withdrawal.* The ADBB (Guedeney & Fermanian, 2001) consists of eight items to assess prolonged reaction of social withdrawal in infants. Items are rated from 0 to 4 (with low scores being optimal social behavior) on facial expression, eye contact, general level of activity, self-stimulation gestures, vocalizations, briskness of response to stimulation, relationship to the observer, and attractiveness to the observer. The ADBB total score derives from the sum of the eight items, and higher results represent more signs of social withdrawal. The cutoff point of 5 showed the best

sensitivity (0.82) and specificity (0.78) to detect infants at risk (Guedeney & Fermanian, 2001). Interrater reliability was calculated using the intraclass coefficient (.92). The Portuguese version of the scale has a reasonable internal consistency (Cronbach's $\alpha =$ .60) (Figueiredo & Costa, 2008).

*Mother–infant interaction.* The GRS (Murray, Fiori-Cowley et al., 1996) is a video-based assessment of the quality of mother–infant engagement that can be applied from 2 to 6 months' postpartum. The mother sat in front of the infant and was asked to play with him or her in any way they chose without the use of toys in a 5-min, face-to-face play session. A video camera was set up to film the event to obtain a full image of the infants' body, and the mother's full-face image also was filmed using a mirror placed adjacently to the infant. During a 5-min, video-recorded assessment of free play between mother and infant, the scales globally assess the quality of (a) maternal behavior, (b) infant behavior, and (c) overall interaction. Maternal behavior describes the degree to which a mother's behavior is appropriately adjusted to her infant. Mother's behavior was computed using the sum score of three subscales: (a) Good-poor—computed through the average score of five items (warm/positive vs. cold/hostile, accepting vs. rejecting, responsive vs. unresponsive, nondemanding vs. demanding, sensitive vs. insensitive), with a sum score near 5 rated as "good," and a sum score near 1 rated as "poor;" (b) Intrusive-remote—composed of four items (nonintrusive behavior vs. intrusive behavior, nonintrusive speech vs. intrusive speech, nonremote vs. remote, nonsilent vs. silent); (c) Depressive—computed through the average of four items (happy vs. sad, much energy vs. low energy, absorbed in the infant vs. self-absorbed, relaxed vs. tense), with the higher score indicating less depressive signs.

Infant behavior describes the infants' positive engagement in the interaction and behavior. Infant behavior was computed according to two subscales, describing the infants' positive engagement in the interaction, and behavior: (a) Good-poor—computed through the average of three items (attentive vs. avoidant, active communication vs. no active communication, positive vocalizations vs. no positive vocalizations), with a sum score near 5 rated as "good," and a sum score near 1 rated as "poor;" and (b) Inert-fretful—composed of four items (engaged with the environment vs. self–absorbed, lively vs. inert, attentive vs. avoidant, happy vs. distressed, nonfretful vs. fretful).

The final dimension assesses the quality of the overall interaction between mother and infant; it rates the nature of the engagement between mother and infant and was computed through the sum score of the overall interaction items. A higher the punctuation corresponds to a better performance. The overall interaction was rated using one subscale: Good-poor composed of the average score of five items (smooth/easy vs. difficult, fun vs. serious, satisfying vs. unsatisfying, much engagement vs. no engagement, excited engagement vs. quiet engagement); a sum score of 5 is considered "good interaction," and near 1 is considered "poor interaction."

*Infant attachment style.* The Strange Situation was performed (Ainsworth et al., 1978) and videotaped when the infants were between 12 and 14 months of age. Two expert coders classified infants as secure, insecure-avoidant, or insecure-resistant, as described in Ainsworth et al. (1978). Raters agreed on major classifications in 97.6% of the cases; disagreements were resolved by conference. The distribution of attachment classifications was (61.9%) secure, (21.6%) insecure-resistant, and (16.5%) insecure-avoidant. In this study, we considered the classification insecure (0) vs. secure (1).

## RESULTS

Using NBAS and ADBB scores as well as the levels of cortisol reactivity to inoculation, three behavioral and physiological profiles were determined through cluster analysis—"withdrawn," "extroverted," and "underaroused"—and are described elsewhere (Costa & Figueiredo, 2012).

A multivariate analysis of variance (MANOVA) followed by a univariate $F$ test and a Bonferoni post hoc test (Field, 2005) were performed to identify potential differences on the quality of mother–infant interaction according to the infant's behavioral and physiological profile after the validation of the assumptions. The validation of the assumption of homogeneity of variances-covariances using Box's () M test was guaranteed, $M = 93.635$, $F(37, 3349) = .957, p = .137$.

The MANOVA performed to identify potential differences in the quality of mother–infant interaction according to the infant's behavioral and physiological profile was significant, $\Lambda = .724$, $F(2, 94) = 2.634; p < .05$. Subsequent univariate analyses followed by Bonferroni post hoc test indicated a significant effect for infant behavior and overall interaction, but not for mother behavior (see Table 2). Withdrawn infants had lower scores for infant behavior, as compared to extroverted (CI 95% = −1.38, −.40), $p < .05$, and underaroused (CI 95% = −2.68, −.26), $p < .05$, infants. Withdrawn infants had lower scores on overall interaction, as compared to extroverted infants (CI 95% = −1.41, −.29), $p < .05$.

To explore if the infant's behavioral and physiological profile was associated with the secure versus the insecure attachment classification, the chi-square test was used. Significant associations were found between the infant's behavioral and physiological profile and attachment security, $\chi^2 = 5.442, p < .05$. More than half of withdrawn infants, one third of underaroused infants, and only one fourth of extroverted infants were insecurely attached at 12 months (see Table 3).

A MANOVA followed by a univariate $F$ test and Bonferoni post hoc test (Field, 2005) were performed to identify potential differences in the quality of mother–infant interaction in infants with secure versus insecure attachment after the validation of the assumptions. The validation of the assumption of homogeneity of variances-covariances using the Box's M test was guaranteed, $M = 88.563; F(35, 2769) = .995, p = .097$.

Regarding the quality of mother–infant interaction and infant attachment, the MANOVA was significant, $\Lambda = .724$,

**TABLE 2.** *Differences in the Quality of Mother–Infant Interaction in Three Groups of Infants With Different Psychophysiological Profiles*

| | Withdrawn (A) (n = 16) M (SD) | Extroverted (B) (n = 56) M (SD) | Underaroused (C) (n = 25) M (SD) | F | p | |
|---|---|---|---|---|---|---|
| Mother–Infant Interaction | | | | | | |
| Mother behavior | 4.03 (.73) | 4.25 (.38) | 4.41 (.52) | 1.881 | .164 | |
| Infant behavior | 2.97 (.93) | 4.33 (.65) | 3.61 (.88) | 6.709 | .003 | A vs. B; A vs. C |
| Overall interaction | 2.76 (.68) | 4.28 (.57) | 3.41 (.44) | 4.965 | .011 | A vs. B |

**TABLE 3.** *Association Between Infant Behavioral and Physiological Profile and Attachment Classification and Differences in the Quality of Mother–Infant Interaction According to Attachment Classification*

| | Insecure (n = 36) (%) | Secure (n = 58) (%) | $\chi^2$ | p |
|---|---|---|---|---|
| Infant Profile | | | | |
| Withdrawn | 66.7 | 33.3 | 5.442 | .046 |
| Extroverted | 25.0 | 75.0 | | |
| Underaroused | 38.9 | 61.1 | | |
| | M (SD) | M (SD) | F | p |
| Mother–Infant Interaction | | | | |
| Mother behavior | 51,67 (5,12) | 58,78 (3,73) | 4.982 | .037 |
| Infant behavior | 24,94 (3,75) | 30,16 (4,34) | 3.947 | .049 |
| Overall interaction | 15,56 (4,23) | 20,94 (3,12) | 4.987 | .041 |

$F(2, 94) = 2.634$, $p < .05$. Subsequent univariate analyses revealed that mean scores for mother behavior, $F(1, 94) = 4.982$, $p < .05$, infant behavior, $F(1, 94) = 3.947$, $p < .05$, and overall interaction, $F(1, 94) = 4.987$, $p < .05$, were significantly higher in securely attached infants as compared to insecure attached infants (see Table 3).

***Test of Mediation Model***

To determine if the quality of mother–infant interaction mediated the effect of the infant's behavioral and physiological profile on attachment security, several regression analyses were performed (Tabachnick & Fidell, 1996). In the first equation, the infant's behavioral and physiological profile was entered as an independent variable and the infant attachment as the criterion (dichotomous variable: 0 = insecure, 1 = secure). In the second equation, the infant's behavioral and physiological profile was entered as an independent variable and the quality of mother–infant interaction as the criterion. In the third equation, the quality of mother–infant interaction was entered as an independent variable and the infant attachment as the criterion (dichotomous variable: 0 = insecure, 1 = secure). The fourth equation was conducted with the infant's behavioral and physiological profile and the quality of mother–infant interaction as independent variables, and the infant attachment as the criterion (dichotomous variable: 0 = insecure, 1 = secure). A ". . .variable may be said to function as a mediator to

the extent that it accounts for the relation between the predictor and the criterion" (Baron & Kenny, 1986, pp. 1176).

To test if mother–infant interaction accounted for the relation between infant behavioral and physiological profile and attachment, we analyzed four conditions considered to be essential to show mediation (Baron & Kenny, 1986).

- Variations in an infant's behavioral and physiological profile account for variations in infant attachment,
- variations in an infant's behavioral and physiological profile account for variations in the quality of mother–infant interaction,
- variations in the quality of mother–infant interaction account for variations in the infant attachment, and
- a previously significant relation between an infant's behavioral and physiological profile and infant attachment is significantly reduced or no longer significant when the quality of mother–infant interaction is added to the model. If Path c is reduced to zero, then mother–infant interaction can be considered a single mediator whereas if Path c is not zero, multiple mediating factors may exist (Baron & Kenny, 1986).

The first logistic regression, revealed that an infant's behavioral and physiological profile, $\chi^2_{Wald}(2) = 4.926$, $p < .05$, has a significant effect on the probability of having a secure attachment (see Table 4). According to the model, $G^2(6) = 5.319$, $p > .05$, $\chi^2 = 35.015$, $R^2_{CS} = .086$, $R^2_N = .118$, $R^2_{MF} = .069$, being withdrawn decreases the probability of being securely attached to the mother while being underaroused decreases the probability of being securely attached to the mother, as compared to extroverted infants.

Three linear regression analyses were performed to test Path a1, a2, and a3, exploring if the infant's behavioral and physiological profile accounted for variations in mother behavior, infant behavior, and overall quality of interaction. The variation on an infant's behavioral and physiological profile did not account for variations on mother behavior, $F(2, 94) = 1.591$, $p > .05$, but it accounted for variations on infant behavior, $F(2, 94) = 23.247$, $p < .01$, and overall interaction, $F(2, 94) = 16.488$, $p < .05$ (see Table 5).

This result excludes mother behavior in the interaction as a potential mediator variable of the relation between an infant's

**TABLE 4.** *Predicting Infant Attachment From Infant Behavioral and Physiological Profile and Quality of Mother–Infant Interaction*

| Variable | $B$ | $SE$ | $\chi^2_{Wald}$ | $df$ | $p$ | Exp(B) | CI 95% |
|---|---|---|---|---|---|---|---|
| Infant Psychophysiological Profile | | | | | | | |
| Extroverted | | | 4.926 | 2 | .085 | 1.810 | |
| Withdrawn | −1.792 | .816 | 4.816 | 1 | .028 | .167 | (.034, .826) |
| Underaroused | −.647 | .633 | 1.044 | 1 | .307 | .524 | (.152, 1.811) |
| Mother–Infant Interaction | | | | | | | |
| Mother Behavior | .334 | .114 | 8.518 | 1 | .004 | 1.396 | (1.116, 1.747) |
| Infant Behavior | .144 | .281 | .263 | 1 | .608 | .866 | (.499, 1.502) |
| Overall Interaction | .737 | .381 | 3.981 | 1 | .058 | 1.190 | (.974, 4.484) |
| Mediating Effect | | | | | | | |
| Extroverted × Overall Interaction | | | | | | | |
| Withdrawn × Overall Interaction | .709 | .582 | 1.483 | 1 | .223 | 2.032 | (6.49, 6.358) |
| Underaroused × Overall Interaction | .038 | .498 | .006 | 1 | .939 | 1.039 | (.391, 2.758) |

**TABLE 5.** *Predicting the Quality of Mother–Infant Interaction From Infant Psychophysiological Profile*

| | $R^2$ | $F$ | $p$ | $\beta$ | $t$ | $p$ |
|---|---|---|---|---|---|---|
| Mother Behavior | | | | | | |
| Withdrawn | .033 | 1.591 | .209 | −.192 | −1.763 | .081 |
| Underaroused | | | | −.036 | −.328 | .744 |
| Infant Behavior | | | | | | |
| Withdrawn | .336 | 23.247 | .000 | −.610 | −6.771 | .000 |
| Underaroused | | | | −.135 | −1.497 | .138 |
| Overall Interaction | | | | | | |
| Withdrawn | .264 | 16.488 | .000 | −.540 | −5.693 | .000 |
| Underaroused | | | | −.112 | −1.184 | .239 |

behavioral and physiological profile and infant attachment because Path a1 was not confirmed (see Table 5).

To test Path b1, b2, and b3, a logistic regression was perfomed for mother behavior, infant behavior, and overall interaction. Mother behavior ($b_{MotherBehavior}(1) = .334$, $p < .05$, Odds Ratio $= 1.396$) had a significant effect on the probability of having a secure attachment (Path b1) while the overall quality of interaction ($b_{OverallInteraction}(1) = .737$, $p < .06$, Odds Ratio $= 2.090$) had a marginally significant effect on the probability of having a secure attachment. According to the model, $G^2(3) = 35.015$, $p < .001$, $\chi^2 = 29.088$, $R^2_{CS} = .504$, $R^2_N = .697$, $R^2_{MF} = .537$, the probability of being securely attached increased with good mother behavior and with good overall interaction. In contrast, infant behavior did not have a statistically significant effect ($b_{InfantBehav}(1) = .144$, $p > .05$, on the probability of having a secure attachment (see Table 3).

This result excludes infant behavior in the interaction as a potential mediator variable of the relation between infant behavioral

and physiological profile and infant attachment because Path b2 was not confirmed (see Table 3).

We then analyzed if the previously significant relation between infant behavioral and physiological profile and infant attachment decreased or disappeared after adding the overall interaction to the model to test the mediation model.

The logistic regression revealed that the association between infant behavioral and physiological profile and infant attachment decreased, but did not disappear, when the overall interaction was added in the equation, $G^2(2) = 1.603$, $p > .05$, $R^2_{CS} = .017$, $R^2_N = .023$, $R^2_{MF} = .013$ (see Table 3). The data thus met the requirements for mediation.

## DISCUSSION

The infant behavioral and physiological functioning early in life has a significant effect on the probability of having a secure attachment. More than half of withdrawn infants at 3 months are insecurely attached at 12 months, almost half of underaroused infants are insecurely attached, and only one fourth of extroverted infants are insecurely attached. Withdrawn infants are characterized by their high social withdrawal and low neurobehavior performance while underaroused infants are mainly characterized by their low neuroendocrine reactivity. Compared to extroverted infants, the probability of being securely attached decreases in withdrawn infants and in underaroused infants. This result is concordant with the results of previous studies that have shown that neurobehavior difficulties, low social responsiveness, unexcitability, not liking to play with others, low orienting ability, and higher distress reactivity and difficulty are related to insecure attachments (Bates et al., 1985; Calkins & Fox, 1992; Grossmann et al., 1985; Seifer, Schiller, Sameroff, Resnick, & Riordan, 1996; Waters, Vaughn, & Egeland, 1980). It is possible that early neonatal difficulties are the reflection of problems in integrative and adaptative mechanisms that still influence the infant's behavior later in life, namely social interaction behavior (Waters et al., 1980).

Regarding the quality of mother–infant interaction, the results show that mean scores for mother behavior, infant behavior, and overall interaction are higher in securely attached infants. Good mother behavior in the interaction is characterized by warmth, acceptance, responsiveness, and sensitiveness and had a significant effect on the probability of having a secure attachment. This study therefore provides evidence consistent with a transactional model of development regarding the fact that parent behaviors as well as infant behaviors influence the quality of interaction. This association between mother behavior and the overall pattern of interaction and later infant attachment corroborates the attachment theory that holds that attachment relationships develop within the context of infant–mother interactions (Ainsworth et al., 1978; Bowlby, 1969).

We also found that the overall quality of interaction characterized by smooth, fun, satisfying, and excited engagement had a marginally significant effect on the probability of being securely attached. The study of mother–infant relationship qualities is

crucial for understanding the transactional processes that contribute to the formation of different developmental pathways.

The infant's behavioral and physiological profile predicts infant behavior in the interaction as well as the quality of overall interaction, but not maternal behavior in the interaction. Extroverted infants are characterized by their good psychological performance while withdrawn infants are characterized by their poor psychological performance, and that seems to be reflected in the quality of mother–infant interactions. The results show that the better the psychological performance, the better the overall mother–infant interaction. Nugent et al. (1993) also noted a significant relation between neonatal behavior and the quality of mother–infant interaction. Similar results were obtained by Murray, Stanley, Hooper, King, and Fiori-Cowley (1996), who reported that poor motor performance and high levels of infant irritability in the neonatal period predicted worse infant behavior in face-to-face interactions with the mother at 2 months' postpartum. This study highligts the idea that infant characteristics influence the quality of his or her behavior in the interaction, and this is consistent with a transactional model of development (Bell, 1974; Sameroff, 1975). From the transactional perspective, parent's and infant's characteristics exert a mutual effect in each other, with important influence on the quality of interaction and with potential to transform it, leading to unique patterns of behavior.

In addition, the relationship between infant behavioral and physiological profile and infant attachment is mediated by the quality of overall interaction. As such, the overall interaction seems to be the primary pathway by which the infant's behavioral and physiological profile might impact on later attachment. Bates et al. (1985) also reported a correlation between infant characteristics and later attachment, and concluded that the cause of the correlation may be due to processes of the interaction. Goldsmith and Alansky (1987) demonstrated that sensitive, responsive, maternal interaction predicted the security of attachment while infant proneness to distress predicted resistance in the Strange Situation. In 1989, van den Boom found that infant's irritability predicted later attachment classification, especially the avoidant category, and that mothers of irritable infants get progressively less involved and more unresponsive to the infant over time. She proved that intervention programs aimed at enhancing maternal sensitive responsiveness with irritable infants had positive effects on infant attachment to the mother (van den Boom, 1989).

In withdrawn infants, maternal behavior seems to be particularly relevant for the development of secure/insecure attachments. We may then conclude that maternal behavior might have a differential impact on infant development according to his or her preexisting unique characteristics. Considering that infant behavior early in life influences the caretaking environment, difficulties at this time limit the quality of the mother–infant interaction (Waters et al., 1980). Caregiver behavior also is a function of infant behavior, and as such, early difficulties can be expected to limit the quality of the caregiving environment. Nonetheless, when mothers are able to overcome difficulties in coordinating their behavior with the withdrawn infant's functioning, this seems to have a protective effect on infant development. A probable explanation is that these mothers can provide more positive interaction experiences in the day-to-day activities for their infants. This is an important cue for clinical practice, once early intervention programs can be developed for mothers of withdrawn infants to help them overcome the difficulties inherent in their infant's behavior.

This study presents some limitations, including the fact that the sample consisted of primarily White, adult mothers with a simple gestation; the generalization of results is limited to this population. In adition, no data were collected regarding mothers' psychosocial status that could interfere with their behavior in the interaction. The fact that the NBAS and the ADBB were assessed by the same researcher also might had caused some bias. Nonetheless, the results of this study suggest that infant contributions to the development of particular patterns of mother–infant interaction and later attachment begin soon after birth. It also alerts to the fact that neither infant functioning nor caregiver behavior can be disregarded since both contribute to the development of the dyadic system and the relationship. Future research should address this issue in a larger sample to analyze the differential impact of both infant characteristics and mother–infant interaction on insecure-avoidant, insecure-resistant, and disorganized infants. Additional evidence also would be usefully regarding the timing of both infant difficulties and interaction problems on developmental outcomes.

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# SOCIAL WITHDRAWAL BEHAVIOR IN INSTITUTIONALIZED TODDLERS: INDIVIDUAL, EARLY FAMILY AND INSTITUTIONAL DETERMINANTS

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ABSTRACT: Eighty-five Portuguese children, aged 12 to 30 months, placed in residential institutions were assessed to investigate the influence of variations in the institutionalization experience of social withdrawal behavior, after taking into account potentially confounding individual characteristics and pre-admission experiences. In light of the limited attention in institutionalization research on social withdrawal, the determinants of the identified predictors of withdrawal symptoms also were examined. Current quality of care experienced in the institution, operationalized in terms of the absence (vs. presence) of a preferred attachment relationship, predicted social withdrawal, such that absence of such a relationship forecasted greater withdrawal. Moreover, existence of a preferred attachment relationship was itself predicted by better child socioemotional functioning, greater caregiver sensitive-responsiveness, and better quality of individualized care provided by the staff.

Abstracts translated in Spanish, French, German, and Japanese can be found on the abstract page of each article on Wiley Online Library at http://wileyonlinelibrary.com/journal/imhj.

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Infants are born with biologically based capacities to participate in human interaction (Emde, 1983), to seek social stimulation (Trevarthen & Aitken, 2001), and to establish a close, emotional bond with significant adults who are capable of caring for the offspring (Bowlby, 1969/1982). The social environment in which children develop is known to influence their behavior and well-being. Indeed, extensive research and clinical work has underscored the importance of good-quality early relationships, sometimes for development well into adulthood (Bowlby, 1969/1982; Carlson & Sroufe, 1995).

During mother–infant and other social exchanges, brief moments of withdrawal are usual, allowing the infant to regulate the rate and intensity of interactions (Brazelton, Koslowski, & Main, 1974; Puura et al., 2010; Weinberg & Tronick, 1994). In fact, relational withdrawal may be the infant's way of handling the interruption and/or violation of his or her expectations within caregiver–child interactions (Murray & Trevarthen, 1985; Puura et al., 2010). Persistent social withdrawal, however, is less common and is a distress signal, especially when accompanied by negative affect and/or limited positive emotion (e.g., smiling) or interest (e.g., eye contact) (Guedeney, 1997, 2007). Social withdrawal behavior may even reflect more serious and even organic relationship disorders (Dollberg, Feldman, Keren, & Guedeney, 2006; Guedeney & Fermanian, 2001), particularly when it leaves the child unavailable for interaction and the developmental opportunities it affords. Therefore, according to Guedeney et al. (2011), a withdrawal reaction may be a vital element in the infant's repertoire of behavioral responses to stress, and appears to be a key alarm symptom, with consequences for the child's longer term developmental trajectory.

Research has underscored the role of sustained withdrawal in the early onset of psychopathology (Guedeney, 1997, 2007). Children may appear socially withdrawn in a number of clinical disorders such as autism spectrum disorders, posttraumatic stress

syndrome, anxiety, and depression (Dollberg et al., 2006; Guedeney, Dumond, Grasso, & Starakis, 2004; Guedeney, Foucault, Bougen, Larroque, & Mentré, 2008). Moreover, infant social withdrawal is associated with attachment disorders (Guedeney, 1997; Zeanah, Boris, Bakshi, & Lieberman, 2000) and compromised cognitive and language development in toddlerhood (Milne, Greenway, Guedeney, & Larroque, 2009).

Having considered the nature and developmental sequelae of social withdrawal behavior, it is important to consider its determinants as well. Being premature, male, adopted, and living in foster care are all risk factors for infant social withdrawal (Guedeney et al., 2008; Guedeney, Marchand-Martin, Cote, Larroque, & the EDEN Mother–Child Cohort Study Group, 2012). Regarding child's characteristics, Dollberg et al. (2006) showed that unpredictable temperament is associated with a tendency to rely on sustained withdrawal reaction in response to the social environment. Interactive effects of temperament and parenting also can account for social withdrawal behavior (Rubin & Coplan, 2004).

Recently, Mäntymaa et al. (2008) found that infant's social withdrawal behavior is associated with depressed maternal behavior, possibly resulting from poorer quality of mother–child interaction (Tronick & Weinberg, 1997). Evidence also has indicated that withdrawal symptoms are related to maternal anxiety (Matthey, Guedeney, Starakis, & Barnett, 2005), lower sense of parental self-efficacy (Dollberg et al., 2006), and poorer quality caregiving. Specifically, mothers of withdrawn infants are more intrusive (Dollberg et al., 2006) and less attuned to their infant's needs than are other mothers (Murray, Fiori-Cowley, Hooper, & Cooper, 1996).

## SOCIAL WITHDRAWAL BEHAVIOR AND INSTITUTIONAL REARING

Several factors can have a detrimental effect on children's early social and emotional development, such as early disruptions in the parent–child relationship, inadequate parental care, or living in an environment that is insufficiently stimulating (Guedeney et al., 2011). Thus, it is not surprising that there has been a steady accumulation of empirical and clinical evidence documenting links between early institutional rearing and children's socioemotional difficulties and increased risk of psychopathology (e.g., Bos, Fox, Zeanah, & Nelson, 2009; Fisher, Ames, Chisholm, & Savoie, 1997; O'Connor et al., 2003; Smyke et al., 2007).

Recently, multiple studies on institutionalized and adopted children have revealed a link between children experiencing early adverse care and indiscriminate friendliness (IF) (Oliveira et al., 2012; Rutter, O'Connor, & the English and Romanian Adoptees Study Team, 2004; Smyke, Dumitrescu, & Zeanah, 2002; Zeanah & Fox, 2004). Yet, in contrast to IF, what might be regarded as the opposite tendency, social withdrawal behavior has not been a focus of recent work on institutionalization, even though it is frequently observed in clinical settings (Dollberg et al., 2006). In this report, we address this lacuna, examining potential effects of institutional rearing on social withdrawal behavior.

The lack of focus on social withdrawal behavior in what might be regarded as the second or modern phase of research on institutionalization stands in contrast to the first phase of work, as revealed in several classic studies on the topic (Bowlby, 1944; Goldfarb, 1945; Provence & Lipton, 1962; Spitz, 1945). After observing and recording what happened to a group of infants deprived of parental care, René Spitz (1946) described a set of symptoms for which he coined the term *anaclitic depression*. Infants suffering from this condition were unresponsive and apathetic as well as sad, apprehensive, and withdrawn, even though their basic physical and medical needs were met. In line with Spitz's observations (1945, 1946), Goldfarb (1945) reported that children with early institutional experience were more often emotionally withdrawn in early adolescence than were children reared in their nuclear families. Provence and Lipton (1962) also found that infants, while institutionalized during their first year of life, displayed a reduced range of emotional expression and tended to not address or approach their caregivers in the institution, even when in distress. Tizard (1977) and Tizard and Rees (1975) also noted that institutionalized children who had been admitted to a residential nursery before the age of 4 months were largely unresponsive and emotionally withdrawn at age 4 years and 5 months.

Although the classic research on institutionalized children has attributed their withdrawal—and other disturbances—to institutionalization itself, given how deprived most of these contexts were, the fact is that many noninstitutional factors also may have played a role. These include genetics (Caspers et al., 2009), prenatal exposure to alcohol (Landgren, Svensson, Strömland, & Grönlund, 2010), and individual experiences within the biological family prior to institutionalization, such as poverty, abuse, neglect, parental substance abuse, or mental illness (Kelly, Day, & Streissguth, 2000; Kobak, Cassidy, Lyons-Ruth, & Ziv, 2006; Miller, 2005). Even today, few studies of institutionalized children have assessed the role of such forces when it comes to disturbed and disordered behavior among institutionalized children, something the present inquiry is designed to do. One study meriting consideration, though, has found that children admitted to Greek orphanages because of family disruptions had an increased risk of emotional/behavioral difficulties relative to either children admitted into care for family financial reasons or noninstitutionalized controls (Vorria, Rutter, Pickles, Wolkind, & Hobsbaum, 1998). Such results clearly have underscored the importance of taking into account pre-institutionalization experiences before attributing problematic functioning, including social withdrawal behavior, to experiences in the institution itself.

In any event, research consistently has indicated that the quality of institutional care is one of the most important factors predictive of individual differences in institutionalized children's emotional and social development (Bakermans-Kranenburg et al., 2011; Smyke et al., 2007). Institutional care has been commonly characterized as a multilevel deprivation experience, involving several deficits not only in cognitive and motor stimulation as well as medical and nutritional care but also in the opportunities for social interaction and individualized caregiving (Hodges & Tizard,

1989; Sonuga-Barke et al., 2008; Tizard & Hodges, 1978). Indeed, in Muhamedrahimov's (2000) study, the socioemotional environment of children in Russian baby homes was characterized by severe deficits in the sensitivity and stability of caregivers. Caregivers rarely initiated social interaction, provided little warmth and affection, and rarely responded promptly to infants' emotional distress. The absence of a special or "primary" caregiver as well as few opportunities for social and emotional exchanges with caring adults sadly characterizes too many institutional settings (Miller, 2005); this is so even when reasonable adequate conditions exist regarding human resources and the meeting of basic needs concerning nutrition and hygiene. Vorria et al. (2003) found, for example, that Greek institutionalized infants spent most of their time in bed and, therefore, had little opportunity to interact with a caregiver.

Staff turnover and high infant/caregiver ratios are serious problems in many institutions, making it difficult, if not impossible, for the child to establish a long-lasting and unique relationship with a significant other. Sometimes, this has been due to the fact that staff have been overburdened (e.g., too many children, too few caregivers, or too much staff turnover) (Provence & Lipton, 1962). Other times, however, it was due to the fact that caregivers were discouraged from forming any type of emotional attachment to the children (Tizard, 1977). Some decades ago, Provence and Lipton (1962) noted that child characteristics of individuality, such as premature birth, may play an important role in determining which children are more and less adversely affected by the institutional care experience, and this may well be because characteristics of individuality (e.g., attractiveness, genetics, temperament) influence the care that the child receives (Bakermans-Kranenburg et al., 2011; Vorria et al., 2003; Zeanah & Fox, 2004). Not inconsistent with this claim is evidence from a study of foster mothers and their foster children that the anticipated effect of sensitivity on attachment security varied depending on the child's shyness (De Schipper, Oosterman, & Schuengel, 2012). Findings such as these underscore the possibility that children may differ in their vulnerability to institutional caregiving deprivation, depending on genetic predispositions (Stevens et al., 2009) or other factors that might influence the nature and quality of care that they receive, which in turn may affect the child–caregiver relationship (van IJzendoorn et al., 2011).

## CURRENT STUDY

In 2009, a total of 9,563 children younger than 18 years of age were living in residential institutions in Portugal (Instituto de Segurança Social, 2010), of which 850 were under 3 years of age. Data collected in the same year have shown that the majority of these children (57%) spent more than 2 years in the institution, and a significant number of children (37%) remained institutionalized for more than 4 years. Although social and emotional sequelae of institutional rearing have been extensively studied by the international scientific community, there is a lack of research addressing this topic in Portugal.

Therefore, and in light of the limited attention paid to social withdrawal in recent research on institutionalization and the lack of work taking into consideration the role of pre-institutional family factors before considering effects of contextual and relationship features of the institution, the first aim of the present inquiry was to explore etiological factors associated with social withdrawal behavior in Portuguese institutionalized children, aged between 12 and 30 months. The second aim of this study was to explore the determinants of the identified predictors of social withdrawal. Incorporating a multiple-levels-of-analysis perspective (Cicchetti & Blender, 2004), the current work is the first to investigate potential predictors of social withdrawal behavior in institutionally reared children, and of the identified predictors of social withdrawal, including the etiological role of early family risk factors, as well as of individual and institutional care characteristics, crucial for the growing understanding of competent social and emotional functioning in the face of significant adversity.

## METHOD

### *Participants*

The participants in this study were 85 institutional-reared children and 65 institutional caregivers.

*Institutional-reared children.* Eighty-five children (44 boys, 51.8%) placed in 19 Portuguese institutional care centers participated in this study. Participants were recruited for a broader research project, and were 12 to 30 ($M = 19.22$, $SD = 6.22$) months of age by the time of assessment. Age at admission to the institution varied from 0 to 24 ($M = 8.16$, $SD = 7.38$) months. The reasons for the child being withdrawn from the family and placed at the institution were diverse: negligence, including a myriad of social and economic situations that prevented the family from assuring the child's safety and basic needs ($n = 26$; 30.6%), lack of parental skills ($n = 25$; 29.4%), severely limited socioeconomic resources ($n = 1$; 1.2%), parental psychopathology/mental retardation ($n = 8$; 9.4%), child physical abuse ($n = 5$; 5.9%), child abandonment ($n = 14$; 16.5%), family violence ($n = 5$; 5.9%), and sexual abuse ($n = 1$; 1.2%).

Twenty-five percent ($n = 21$) of children came to the institution directly from the maternity ward, having no experience of living with their biological (or any other) families. Among the children who lived with their families prior to institutionalization, 27.4% ($n = 17$) were no older than 6 months when institutionalized, 32.3% ($n = 20$) were 7 to 12 months old, and 40.3% ($n = 25$) were between 13 and 24 months old. The length of time in institutional care varied from 5 to 29 ($M = 10.58$, $SD = 4.43$) months, with 35.3% ($n = 30$) institutionalized for 1 year or more.

*Assigned caregivers.* Sixty-five institutional caregivers participated in the study (62 women, 95.4%) and were between 20 and 56 years of age ($M = 36.32$, $SD = 10.14$). Twenty (30.8%) of the 65 participating care providers were caregivers for more than one child. The maximum number of children with the same assigned

caregiver was 4. The majority of caregivers ($n = 41$; 63.1%) did not receive any kind of specific training for their caregiving role. Six caregivers (9.2%) completed primary school, 9 (13.8%) finished Grade 6, 27 (41.5%) completed Grade 9, 18 (27.7%) graduated from high school, and 5 (7.7%) graduated from university. Caregivers worked, on average, for 7.45 hr per day ($SD = 2.65$) and 5.49 days a week ($SD = 1.00$).

### Procedure

The present study is part of a larger research project on institutionalized children in Portugal (Oliveira et al., 2012). After approval by Portuguese Social Services and the National Commission for Data Protection, the study was presented to the staff at each institution. Written informed consents were obtained from the biological parents, institution directors, and participating caregivers. After determining which children were eligible for study participation, the research team consulted institutional staff to determine the caregiver assigned to each child. Staff suggestions were confirmed by naturalistic observations of the research team. When the staff could not determine a caregiver with whom the child developed a special relationship, a caregiver that who the child well and was present in children's daily routines was selected to integrate the present study's assessments as the assigned caregiver to that child.

All assessments were conducted at the institutional setting. Observational data were obtained to assess children's social withdrawal behavior, caregiver sensitivity responsiveness, and the quality of institutional care. To enable characterization of children's early family risk circumstances prior to institutionalization, research staff gathered data from each institutionalized child's file. A trained examiner assessed each child's mental development, and the participating caregiver provided information on the child's temperament and socioemotional functioning.

### Measures

#### Child assessment

*Developmental status.* To assess cognitive, language, and motor development, the Bayley Scales of Infant and Toddler Development, Third Edition (BSID-III; Bayley, 2006) were administered by trained examiners. The BSID-III is an individual measure to assess the developmental functioning of infants and toddlers. Each subscale (Cognitive, Language, and Motor) includes a series of items that are administered and scored as 1 if successfully completed by the child. A summed raw score is then computed, and the percentile ranks are determined for each subscale.

*Social withdrawal behavior.* The Alarm Distress Baby Scale (ADBB; Guedeney & Fermanian, 2001) was used to assess children's social withdrawal behavior and was completed by raters based on a 5-min segment of children's behavior during the administration of the BSID-III (Bayley, 2006). The ADBB requires that an unfamiliar adult initiate interaction with the child in the presence of the caregiver. The scale consists of 8 items (e.g., Item

5 - observer assesses the lack of vocalization expressing pleasure, but also lack of vocalization expressing displeasure or pain; Item 6 - observer assesses the sluggishness of response to pleasant or unpleasant stimulation during the examination), rated 0 (*No usual behavior*) to 4 (*Severe unusual behavior*). The total score is calculated based on the sum of the child's score in all items; higher scores are indicative of higher levels of social withdrawal behavior. In this sample of 85 institutionalized toddlers, the ADBB mean social withdrawal score was 3.23 ($SD = 3.58$, $Mdn = 2$, range = 0–17). Two independent teams of graduate students, previously trained by a Portuguese specialist, coded the interactions. Interrater agreement was calculated based on 37 video clips and proved to be more than adequate before consensus scoring of disagreements on ratings (ICC mean $r_{ic} = .98$, range = .92–1.00).

*Temperament.* To assess child's difficult temperament as perceived by the caregiver, the Infant Characteristics Questionnaire (ICQ; Bates, Freeland, & Lounsbury, 1979; Portuguese version, Magalhães et al., 2010) was completed by the assigned caregiver. This questionnaire includes 32 items, rated on a Likert scale of 1 (*optimal score for positive temperamental traits*) to 7 (*less optimal*). Only the *difficult* dimension, composed of nine items (Cronbach's $\alpha = .72$), was used in the present study; reliability and validity have been established (Bates et al., 1979). Scores are totaled and compared with empirically derived cutoff points. Higher scores indicate a more difficult temperament.

*Socioemotional functioning.* The Ages & Stages Questionnaire: Social-Emotional (ASQ:SE; Squires, Bricker, & Twombly, 2002a; Portuguese version, Candeias, 2010) was completed by the child's assigned caregiver to assess children's skills and difficulties regarding social and emotional functioning (e.g., "Does your child look at you when you talk to him?" "Does your child cry, scream, or have tantrums for long periods of time?") . The discriminant validity of the instrument between risk and well-functioning children, regarding socioemotional development, has been empirically demonstrated (Squires, Bricker, & Twombly, 2002b). Four age-appropriate versions were used in the present study (12, 18, 24, and 30 months). Scores are totaled and compared with empirically derived cutoff points. Higher total scores are global indicators of children's socioemotional functioning problems (Squires et al., 2002b).

#### Early family risk factors

FAMILY CONTEXT. A sociodemographic questionnaire about the child and his or her biological family was completed using information in the child's files at the institution. Information about whether the child lived with the biological family prior to institutionalization was obtained. In addition, three theoretically oriented risk composites, each comprised of four items, were created to capture sources of risk to the child in the biological-family context (cf. Oliveira et al., 2012). Each risk condition in each composite was scored as 0 (*absent*) or (*present*); higher scores reflected greater risk. At least three items had to be available for a composite risk score to be formulated for any child:

- *Prenatal risk composite*: This composite assessed the presence of maternal physical disease (e.g., AIDS, hepatitis), maternal substance abuse during pregnancy, pregnancy without medical surveillance, and child premature birth.

    The following risk composites were created considering only the children who had had experiences within the biological family prior to coming to the institution.

- *Family-relational risk composite*: This composite assessed receipt of government financial aid, domestic violence (to the children and/or between parents or other family members living in the house), family previous referral by the social workers as a risk family (based on conditions such as maltreatment, neglect, or abandonment of other children) and institutionalized or adopted siblings.

- *Emotional neglect risk composite*: This composite was created in an attempt to capture the likely unavailability of the maternal figure. This composite assessed whether parental neglect was the reason for the child's institutionalization, and whether the mother engaged in prostitution, in substance abuse, or suffered from psychopathology or mental retardation.

### Institutional context

INSTITUTIONAL PLACEMENT AND DURATION.    The date of admission and the birth date of the child were gathered from the child's case file in the institution. This allowed us to calculate the child's age at admission to the institution and the length of time in institutional care.

CAREGIVER SENSITIVITY RESPONSIVENESS.    The Ainsworth, Blehar, Waters, and Wall (1978) Sensitivity/Insensitivity and Cooperation/Intrusiveness scales were used by highly trained raters to assess the quality of the caregiver's behavior during each of three semistructured and videotaped 5-min interaction episodes designed to challenge the dyad: play with toys, play without toys (following caregiver's departure, stranger entry, stranger departure, caregiver entry), and play with "difficult-to-use" toy. The ratings for the three episodes were averaged into one composite score. Interrater reliability was more than adequate (for sensitivity, ICC $r_{ic} = .91$; for cooperation, ICC $r_{ic} = .90$).

QUALITY OF INSTITUTIONAL CARE.    Two features of the institutional care environment were measured in an attempt to capture the quality of institutional care.

- *Structural and relational characteristics of the institution*. The Assessment of the Quality of Institutional Care (AQIC; Silva et al., 2010) was used to measure structural and relational aspects of the quality of institutional care, based on researchers' extensive observations during 2 years of data collection at the institutions. Three dimensions were assessed for each institution: (a) institutional resources and routines, in terms of human resources, equipment and material resources, and basic needs routines; (b) institutional

relational care, including the developmental activities implemented at the institutional setting, and stability and consistency of caregiving; and (c) individualized care provided by the staff to each child, regarding their availability, sensitivity, acceptance, and knowledge about the child. The availability, sensitivity, and acceptance items were rated based on three scales in Ainsworth et al. (1978): Availability versus Ignoring and Neglecting, Sensitivity versus Insensitivity, and Acceptance versus Rejection, respectively. The item of knowledge about the child was rated based on a scale designed by the research team (Silva et al., 2010).

Measurement of the first two dimensions—institutional resources/routines and relational care—was based on a Likert scale ranging from 1 (*no/never present*) to 3 (*sometimes/somewhat present*) to 5 (*yes/always present*). The total score for each dimension was calculated by summing ratings across items. For the third dimension reflecting individualized care, a scale of 1 (e.g., highly inacessible) to 9 (e.g., highly acessible) was used, for each of the four aforementioned items, as mentioned earlier. The total score for individualized care was calculated through the sum of the ratings of the four items. Interrater agreement was calculated based on intraclass correlations and proved more than adequate for all three dimensions of the AQIC: institutional resources and routines (ICC $M\, r_{ic} = .84$, range $= .64–.97$), institutional relational care (ICC $M\, r_{ic} = .87$, range $= .75–.88$), and individualized care (ICC $M\, r_{ic} = .79$, range $= .66–.91$). Because this measure was developed for use with the current sample, external measures of validity were not available.

- *Preferred caregiver*. Based on researchers' extensive observations at the institution, the existence of an individual with whom the child had developed a special relationship was assessed. Guided by attachment theory, children's behavior toward the assigned caregiver was rated on four separate scales used to determine whether the caregiver was a "preferred caregiver:" (a) "Proximity seeking" assessed whether the child regularly and actively sought to increase proximity with the caregiver, particularly in unfamiliar or stressful situations; (b) "separation distress" assessed whether the child showed signs of anxiety or distress when left by the caregiver in unfamiliar places or with unfamiliar people or even when he or she noticed that the caregiver had ended her work shift and/or was leaving the institution; (c) "positive responsiveness" assessed whether the child responded more and in a particularly positive way to the initiatives of the specific caregiver (e.g., accepting, displaying excitement, and answering in a reciprocal way) and acknowledged the presence of the caregiver after a separation period (by looking, smiling, greeting, vocalizing, showing a toy, or approaching the caregiver); and (d) "the caregiver as secure base/secure haven" assessed whether the child used the particular caregiver as a secure base for exploration, referencing him or her frequently and, if distressed, preferentially turning

to the caregiver for comfort. Each of the four scales was rated on a scale of 0 (*no evidence of the described behaviors*) to 2 (*clear and consistent evidence*). After summing ratings across the scales, the total preferred-caregiver score ranged from 0 to 8. The total score was used to make a categorical determination of whether the child had a preferred caregiver. Those children scoring equal to or greater than 7 were deemed to definitely have a preferred caregiver. Interrater agreement for the existence of the child's preferred caregiver was calculated for 9.5% of the sample and was acceptable (ICC mean $r_{ic} = .78$, range $= .64–.95$).

## RESULTS

Data analysis proceeded in a series of steps. First, simple bivariate relations (Pearson and point-biserial correlations) were examined between the social withdrawal total score and aspects of the child, family, and institutional contexts. Next, a linear regression was conducted based on the significant bivariate relations detected in the first phase of analysis. Because the presence of a preferred caregiver emerged as a predictor of social withdrawal behavior in this second phase, subsequent analyses examined, first, the potential determinants of social withdrawal so that a path analysis subsequently could be carried out linking the predictors of preferred caregiving and social withdrawal.

### Predicting Social Withdrawal Behavior

No significant bivariate associations emerged between social withdrawal behavior and child or family risk factors and measures of institutional care quality (i.e., caregiver sensitivity responsiveness, resources and routines, relational care, individualized relational care). However, children who had not lived with their biological family prior to institutionalization ($n = 21$; 25.3%) displayed significantly less social withdrawal behaviors than did those who had lived with their families prior to institutionalization ($n = 62$; 74.7%), $r_{pb} = .24$, $p = .03$. In addition, children with a preferred caregiver at the institution ($n = 23$; 37.1%) exhibited less social withdrawal behaviors relative to children who did not have one ($n = 62$; 72.9%), $r_{pb} = -.30$, $p = .005$ (see Table 1).

Based on these bivariate relations, a linear multiple regression was carried out using as predictors of social withdrawal behavior the two aforementioned variables that exhibited significant bivariate associations with it. The overall regression model was statistically significant, $F (2, 82) = 5.77$, $p = .005$, explaining 13% of the variance in social withdrawal behaviors (see Table 2), although only presence/absence of a preferred caregiver significantly predicted social withdrawal behavior, $\beta = -.27$, $t = -2.53$, $p = .01$.

### Predicting Presence/Absence of a Preferred Caregiver

Discovering that absence of a preferred caregiver predicted elevated levels of social withdrawal led to analyses examining the potential determinants of presence versus absence of a preferred caregiver, including child, biological family, and institutional characteristics. As can be seen in Table 3, bivariate associations revealed that children perceived by the caregiver as having more disturbed socioemotional behaviors were less likely to have a preferred caregiver, $\chi^2 (1, n = 85) = 4.86$, $p = .02$, as were children who experienced lower quality of care in the institutional environment, as defined by the measurement of relational and individualized care, $r_{pb} = .26$, $p = .02$, and $r_{pb} = .33$, $p = .002$. Point-biserial correlations also revealed marginal associations indicating that the more sensitive-responsive the caregiver's care, the more likely was the child to have a preferred caregiver, $r_{pb} = .19$, $p = .09$, with the same being true of spending more time in the institution, $r_{pb} = .19$, $p = .08$. No significant relations between the preferred caregiver and early family risk factors were detected.

**TABLE 1.** *Bivariate Associations Between Social Withdrawal Behaviors and Child, Family, and Institutional Context Characteristics (N = 85)*

| | | Social Withdrawal |
|---|---|---|
| Child Characteristics | Age at Assessment[a] | .07 |
| | Cognitive Development[a] | −.03 |
| | Language Development[a] | −.13 |
| | Motor Development[a] | −.07 |
| | Temperament[b] | −.20 |
| | Disturbed Socioemotional Behaviors[b] | .02 |
| Family Characteristics | Early Family Risk Factors | |
| | Prenatal Risk[a] ($n = 79$) | −.03 |
| | Family-Relational risk[a] ($n = 59$) | −.15 |
| | Emotional-Neglect Risk[a] ($n = 60$) | −.09 |
| | Living or Not With the Biological Family[b] ($n = 83$) | .24* |
| Institutional Characteristics | Quality of Institutional Care | |
| | Institutional Resources and Routines[a] | −.07 |
| | Institutional Relational Care[a] | .03 |
| | Individualized Relational Care[a] | −.11 |
| | Preferred Caregiver[b] | −.30** |
| | Caregiver Sensitive Responsiveness[a] | .07 |
| | Age at Admission to the Institution[a] | .13 |
| | Length of Time in Institutional Care[a] | −.12 |

*Note.* Higher Alarm Distress Baby Scale scores are indicative of more signs of social withdrawal.
[a]Pearson coefficient correlation.
[b]Point-biserial coefficient correlation.
*$p < .05$. **$p < .01$.

**TABLE 2.** *Prediction of Social Withdrawal Behavior (N = 83)*

| | $R^2$ (Adjusted $R^2$) | $\beta$ | $t$ |
|---|---|---|---|
| Living or Not With the Biological Family | .13 (.10) | .20 | 1.86† |
| Preferred Caregiver | | −.27 | −2.53* |

†$p < .10$. *$p < .05$.

**TABLE 3.** *Bivariate Associations Between Child, Family, and Institutional Context Characteristics and Preferred Caregiver (N = 85)*

|  |  | Preferred Caregiver |
|---|---|---|
| Child Characteristics | Age at Assessment[a] | .08 |
|  | Cognitive Development[a] | −.08 |
|  | Language Development[a] | .16 |
|  | Motor Development[a] | .07 |
|  | Temperament[b] | .001 |
|  | Disturbed Socioemotional Behaviors[b] | 4.86* |
| Family Characteristics | Early Family Risk Factors |  |
|  | Prenatal Risk[a] (n = 79) | .14 |
|  | Family-Relational Risk[a] (n = 59) | −.18 |
|  | Emotional-Neglect Risk[a] (n = 60) | −.06 |
|  | Living or Not With the Biological Family[b] (n = 83) | 1.94 |
| Institutional Characteristics | Quality of Institutional Care |  |
|  | Institutional Resources and Routines[a] | .09 |
|  | Institutional Relational Care[a] | .26* |
|  | Individualized Relational Care[a] | .33** |
|  | Caregiver Sensitive Responsiveness[a] | .19† |
|  | Age at Admission to the Institution[a] | −.06 |
|  | Length of Time in Institutional Care[a] | .19+ |

*Note.* Lack of a preferred caregiver (0) vs. existence of a preferred caregiver (1).
[a]Point-biserial coefficient correlation.
[b]Chi-square.
†$p < .10$. *$p < .05$. **$p < .01$.

On the basis of these results, a two-stage, logistic regression analysis was undertaken. In the first stage, socioemotional functioning and length of time in institutional care served as predictors of presence/absence of a preferred caregiver. The model proved significant, $\chi^2$ (2, $n = 85$) = 8.79, $p = .05$, although only child socioemotional functioning significantly contributed to the prediction of a preferred caregiver, $p = .04$. Thus, children judged by caregivers to have less disturbed behaviors were more likely to have a preferred caregiver.

In the second stage of the logistic regression, institutional quality of care variables and caregiver sensitive responsiveness were included as predictors of preferred-caregiver status along with child socioemotional functioning. The overall model proved significant, $\chi^2$ (5, $n = 85$) = 27.37, $p = .005$. Table 4 indicates that child socioemotional functioning, individualized relational care,

and caregiver sensitive responsiveness individually and significantly contributed to the prediction of preferred-caregiver status. More specifically, children were more likely to have a preferred caregiver when they presented less social disturbed behaviors, experienced more sensitive-responsive care, and resided in institutions judged to offer higher quality care.

### Path Analysis

The final analysis sought to tie together all significant findings reported through this point in a single model using path analysis, with preferred-caregiving status being predicted by child socioemotional functioning, individualized care, and caregiver sensitive-responsiveness, and itself predicting social withdrawal behavior. Maximum likelihood estimation was used in calculating paths, and all three predictors of preferred-caregiver status were permitted to correlate with each other (see Figure 1). The fit statistics for the model were adequate, with a significant chi-square, $\chi^2$ (10, $n = 85$) = 3.79, $p = .02$, CFI = .98, RMSEA = .06. Results revealed that the better children's socioemotional functioning, the more individualized care, and the more sensitive-responsive were caregivers, the more likely the child was to have a preferred caregiver, which itself decreased the likelihood of the child showing social withdrawal behavior.

## DISCUSSION

The main goal of the current study was to examine the potential influence of the quality of children's institutional experiences on social withdrawal behavior, also taking into account individual child factors and functioning and pre-institutional experiences before attributing effects to the institutional experience itself. A second objective was to explore potential determinants of the predictors of social withdrawal behavior, analyzing, again, the putative influence of individual, pre-institutional, and institutional factors.

### Determinants of Social Withdrawal Behavior

Having a preferred caregiver at the institution was the only pre-institutionalization or institutionalization predictor of children' social withdrawal behavior to emerge in this inquiry. Although

**TABLE 4.** *Prediction of the Existence of a Preferred Caregiver (N = 85)*

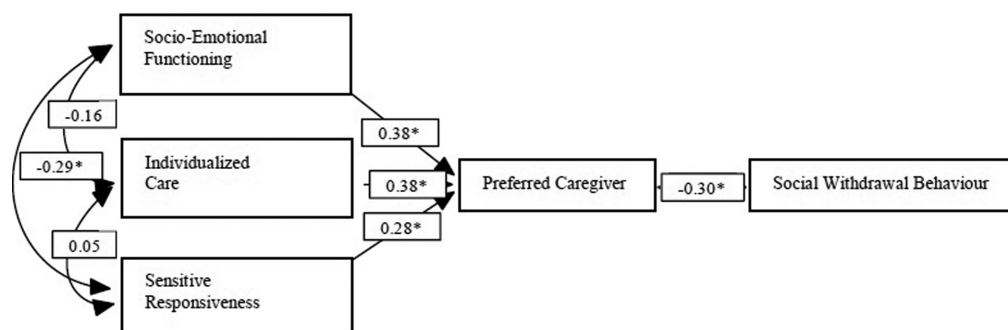| Step |  | β | Wald's | Odds Ratio | Model |
|---|---|---|---|---|---|
| 1 | Disturbed Socioemotional Behaviors | −1.66 | 4.32* | .19 | $\chi^2$ (2) = 8.79* |
|  | Length of Time in Institutional Care | .10 | 2.99† | 1.10 |  |
| 2 | Disturbed Socioemotional Behaviors | −2.75 | 8.27** | .06 | $\chi^2$ (5) = 27.37*** |
|  | Institutional Relational Care | .004 | .003 | 1.00 |  |
|  | Individualized Relational Care | .19 | 7.78** | 1.21 |  |
|  | Caregiver Sensitive Responsiveness | .43 | 4.78* | 1.53 |  |

†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .005$.

FIGURE 1. Path of influence of a child's socioemotional functioning, individualized care, caregiver's sensitive responsiveness, and the presence (vs. absence) of a preferred caregiver on social withdrawal. The path diagram includes the path coefficients. *$p < .05$.

structural and some relational aspects of the quality of institutional care failed to predict social withdrawal behavior, children who had the opportunity to establish a unique affective relationship with their caregiver were less likely than were those without one to be socially withdrawn. According to O'Connor et al. (2000), institutionalized children's atypical behavior results from the lack of a consistent caregiver rather than the absence of physical resources, including adequate nutrition and medical care. In this sense, the existence of an adult with whom the child has a special relationship at the institution seems to act as a protective factor when it comes to being socially withdrawn, reducing the likelihood of such behavior. These findings would seem to be in line, then, with those of Smyke et al. (2007), who found that "microcaregiving environment" (p. 215) predicted child functioning even after controlling for a number of child's characteristics and length of institutional care. Similarly, Ames (1997) found higher developmental ratings in postinstitutionalized children identified as favorites of the caregivers, as compared to those who were not.

How should we understand the meaning of social withdrawal? According to attachment theory, the prolonged absence of a primary caregiver, capable of stimulating and regulating the child's affect-arousal states, may result in the deactivation of the attachment system, characteristic of the avoidant pattern, excluding defensively oneself from events, feelings, and social interactions (Bowlby, 1969/1982). In this sense, sustained social withdrawal may be considered a defensive maneuver, the primary goal of which is to downregulate the attachment system, thereby avoiding the distress caused by the unavailability of a primary caregiver (Leary & Hoyle, 2009). Research on reactive attachment disorder (RAD) seems to have provided evidence that the absence of an attachment figure fosters social withdrawal. In a revision of the *Diagnostic and Statistical Manual for Mental Disorders, fifth edition* (American Psychiatric Association, 2000), Zeanah and Gleason (2010) proposed that the two RAD subtypes (American Psychiatric Association, 2000) should be separated into distinct syndromes: (a) reactive attachment disorder of infancy and early childhood (former inhibited subtype) and (b) disinhibited social engagement disorder (former indiscriminate subtype). Based on an extensive review of research, Zeanah and Gleason contended that while disinhibited social engagement disorder is more about an abnormal

social functioning, the essence of the reactive attachment disorder of infancy and early childhood, characterized by a consistent pattern of emotionally withdrawn behavior, involves the lack of a selected attachment; as a result, it also shared clinical signs with depression (Gleason et al., 2011).

In summary, having an attachment figure in the institution may reduce the likelihood of children's displaying social problems (Smyke et al., 2002), including social withdrawal. This is certainly consistent with classic findings showing that children from institutions where caregivers were discouraged from forming emotional attachments to the children had more behavior problems postinstitutionalization than did children from institutions where this was not the case (Tizard & Tizard, 1971). Such data certainly suggest that relationship experience with a special caregiver in the institution affords opportunities for emotional exchanges and exploration of the environment, experiences that consequently influence child's social and interpersonal competencies.

### Determinants of Presence of a Preferred Caregiver

In view of the data showing that it was the presence/absence of a preferred caregiver that seemed most important in accounting for children's social withdrawal behavior, the question arose as to why some children developed such relationships whereas others did not. Findings pertaining to this issue have underscored the dynamics of the institutional environment, the sensitive-responsiveness of the caregiver, and the characteristics of the child. To our knowledge, this is the first study to explore the etiological factors of the existence of an individual with whom the child has developed a special relationship within the institutional environment.

Recall that the presence of a special caregiver was linked with the provision of higher quality care provided by the staff, as reflected in a caregiving pedagogy involving the provision of individualized care, thereby highlighting the putative influence of the institutional socioemotional environment on the child–caregiver relationship (Muhamedrahimov, 2000). This not-surprising result supports the idea that the way the institution is organized, in terms of its structural characteristics, may have an impact on the quality of care provided to each child and, consequently, on the caregiver–child relationship. Indeed, work by the

St. Petersburg–USA Orphanage Research Team (2008) has rather convincingly demonstrated this. When structural changes were made in Russian institutions to promote the caregiver–child relationship and a family culture, quality of care improved, and so did children's social functioning.

Results of the current study also indicated that children were more likely to have a preferred caregiver when caregivers were more sensitively responsive and when children themselves manifested less disturbed socioemotional behavior. Considering a transactional perspective (Sameroff & Fiese, 1990), children who received better quality of caregiving—in terms of individualized care and sensitive responsiveness—may improve their social and emotional functioning and, in turn, use these competences to establish a special relation with an adult in the institutional setting. Caregiving warmth, emotional support, and contingent responsiveness in the institution may contribute to the development of several skills, including the child's ability to regulate emotions and behavior (Merz & McCall, 2010). Responsive caregiving has long been thought, after all, to support early childhood development—across mental, social, and emotional domains (Ainsworth et al., 1978; Bornstein & Tamis-LeMonda, 1989).

Taken together, the results of this study reveal, in accordance with observations by others (e.g., Bakermans-Kranenburg et al., 2011), that the quality of the caregiving in institutional contexts is important for socioemotional development. Likewise, the results offer support to the notion that different components of the institutional experience, and also caregiver and child characteristics, may act together (van IJzendoorn et al., 2011; Vorria et al., 2003; Zeanah & Fox, 2004), promoting the quality of the institutional environment in terms of stable relationships and leading to better developmental outcomes in terms of less social withdrawal behaviors in institutionalized children.

### Limitations

Results of the current study are generally consistent with empirical data that have chronicled negative social and emotional functioning associated with institutional rearing, as well as the etiological role of the quality of institutional care in undermining social well-being. Nevertheless, there are limitations to this report that should be acknowledged. First, being a cross-sectional study, information regarding children's social withdrawal behavior and institutional quality of care was available for only a single point in time. Thus, the study design limits the interpretation of results regarding the etiological roots of social withdrawal behavior in institutionalized children. Future work should be longitudinal in design, with assessments of the child's social withdrawal behavior at the time of admission to the institution and at subsequent moments, thereby affording the prediction of change over time. Such a design also would make possible the investigation of the development and formation of the preferred child–caregiver relationship.

Another limitation of this inquiry was that information on the families of origin was based on case reports—that routinely have missing information. This is particularly true if a problem was not observed, leaving coders unable to be sure that a given problem was indeed absent. Hence, in future research, a more comprehensive screen for the child's familial experiences prior to coming to the institution would be preferred.

### Clinical Implications

Despite those limitations, the findings of the present study have some important implications. First, this work, by focusing on a relatively neglected aspect of social functioning in recent research on institutionalization, highlights the apparent influence of a special caregiver—or lack thereof—on children's emotional and social development, even when basic physical and health needs appear to be met. Nonetheless, associations between social withdrawal behaviors and inhibited and disinhibited types of reactive attachment disorder as well as other developmental phenomena deserve further exploration, both during and after institutionalization. In addition, further research about the effects of a clinical intervention in sustained withdrawal behavior is essential, contributing to an evidence-based description of the problem.

Second, and regarding the establishment of a special relationship with a caregiver in an institutional setting, results of the current study point to the need of considering the influence of diverse risk and protective factors, within a broader picture in which the mutual influences of individual (child and caregiver) and contextual variables are taken into account. Finally, efforts should be carried out to improve the quality of care provided at the Portuguese institutions, such as the implementation of organized interventions (St. Petersburg–USA Orphanage Research Team, 2008) focused on institutional structure, staff training, and the improvement of the relationship between institutionalized children and their caregivers.

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# CORRELATES OF CHANGE IN POSTINSTITUTIONALIZED INFANTS' SUSTAINED SOCIAL WITHDRAWAL BEHAVIOR FOLLOWING ADOPTION

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ABSTRACT: Infants adopted from institutions experience inadequate care prior to adoption and are therefore expected to show elevated sustained social withdrawal behavior shortly after being adopted. Social withdrawal is expected to decrease as they adapt to their new families. Sustained social withdrawal was assessed 1 month' postadoption (Time 1) and again 6 months later (Time 2) via the Baby Alarm Distress procedure (A. Guedeney & J. Fermanian, 2001). At Time 1, 22.5% of the infants scored within the clinical range for social withdrawal whereas a significant decrease in social withdrawal was indicated at Time 2, with none of the infants scoring above the cutoff score. As predicted, maternal depressive symptoms and insecure attachment were associated with a smaller decrease in infants' social withdrawal. High maternal expectations for efficacy were associated with a smaller decrease in social withdrawal. Infants' temperament, gender, age at adoption, developmental level, and maternal marital status were unrelated to the level of change in social withdrawal. Participating in a preventive intervention was not associated with greater change in social withdrawal. These results highlight the beneficial effect of adoption and the role of maternal depression and attachment security in decreasing sustained social withdrawal among internationally adopted infants.

Abstracts translated in Spanish, French, German, and Japanese can be found on the abstract page of each article on Wiley Online Library at http://wileyonlinelibrary.com/journal/imhj.

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## INFANT SUSTAINED SOCIAL WITHDRAWAL

Infant sustained social withdrawal is a behavioral pattern in which an infant consistently does not display positive (e.g., eye contact, smiling, cooing) or negative responses (e.g., crying) in situations that would normally elicit these kinds of behaviors (Guedeney, Foucault, Bougen, Larroque, & Mentre, 2008). Brief infant withdrawal frequently appears during mother–infant interactions (Beebe, Lachmann, & Jaffe, 1997; Weinberg & Tronick, 1994), playing an important role in their regulation (Brazelton & Cramer, 1990). In contrast, sustained withdrawal behavior is significantly less common and is observed in severe pathological conditions (Guedeney & Fermanian, 2001) such as autism, pervasive developmental disorders, infant depression (Guedeney, 2000), and chronic, severe pain (Gauvain-Piquard, Rodary, Razvani, & Sebouti, 1999). Social withdrawal behavior can be thought of as a continuum ranging from a light tendency to withdraw in specific contexts to a chronic, generalized pattern of response to the social world at large. Light, context-specific presentations of social withdrawal are considered normal and are similar to individual differences associated with temperament variations such as the slow-to- warm-up (Chess & Thomas, 1977) or the inhibited temperament (Kagan, 2012). Extreme and chronic displays of social withdrawal, on the other hand, represent pathology. Longitudinal studies and clinical case studies have reported that infants displaying sustained and chronic social withdrawal behavior often grow up to become withdrawn, depressed, and developmentally inadequate young children, thus implicating that sustained social withdrawal can serve as a marker and a risk factor for future pathology and, as such, requires further clinical and empirical attention (Guedeney, Marchand-Martin, Cote, & Larroque, 2012).

The development of the Baby Alarm Distress Scale (ADBB; Guedeney & Fermanian, 2001), a research and assessment scale designed to asses social withdrawal among 2- to 24-month-old infants, has been useful in advancing this goal. Studies using the ADBB have shown that 3 to 27% of infants in the general population (e.g., Guedeney et al., 2008; Puura et al., 2010) and about 31 to 39% of high-risk infants (HIV positive, mental health referrals) meet criteria for sustained social withdrawal (e.g., Dollberg, Feldman, Keren, & Guedeney, 2006; Hartley et al., 2010). Using the ADBB, associations were found between infant sustained social withdrawal and inadequate caregiving environment characterized by parental depression and anxiety (Mantymaa et al., 2008; Matthey, Guedeney, Starakis, & Barnett, 2005) and disturbed parent–infant relationships (Gerhold, Laucht, Texdorf, Schmidt, & Esser, 2002). In light of these associations, it has been suggested that infants' sustained social withdrawal may be viewed as a defense mechanism against a chronic unavailability of adequate care, leading to a gradual diminution of the attachment system and generalizing into a diminished engagement and lowered reactivity to the social environment at large (Dollberg et al., 2006).

## SUSTAINED SOCIAL WITHDRAWAL AMONG ADOPTED INFANTS

Sustained social withdrawal is expected, almost by definition, to be frequently observed in institutions for babies and toddlers, where significant environmental deprivation and insufficient stimulation are common (Kreppner et al., 2007; van IJzendoorn et al., 2011). For some institutionalized infants, social withdrawal may be a coping strategy and may be associated with autistic-like behaviors observed among these children (Castle et al., 2009) as well as reactive attachment disorder (Zeanah et al., 2004), which is frequently diagnosed in adopted children (Wimmer, Vonk, & Reeves, 2010). In some of the cases, sustained withdrawal may be a symptom of reactive attachment disorder. Because sustained social withdrawal is a behavioral pattern ranging from normal to deviant rather than a discrete diagnosis, it is more common and relatively simple for identification via observation. Therefore, it can serve as a useful construct in the assessment of change when institutionalized infants are placed in a more adequate environment such as with an adoptive family.

It is well-agreed that adoption is a naturally occurring, intensive intervention that improves the life circumstances of institutionalized children by changing the quality of care provided to them and providing the child with normal family life experiences (van IJzendoorn & Juffer, 2006). However, adoption by itself may not be sufficient for overcoming the detrimental effects of early deprivation. In fact, high rates of insecure and especially disorganized attachment, quasi-autistic behaviors, inattention and overactivity, externalizing and internalizing behaviors, and disinhibited attachment are reported among older adopted children, along with significant cognitive and physical growth catch-ups (Castle et al., 2009; Hawk & McCall, 2010; Juffer & van IJzenndoorn, 2005; van

IJznendoorn & Juffer, 2006). Also known are cases of adoption failures (Roberson, 2006). From a clinical standpoint, adoption failure is a catastrophic event in the lives of both adoptive parents and the adopted child. Sustained social withdrawal, as described earlier, may under certain circumstances become a risk factor because of its potentially negative impact on the newly establishing relationship between the infant and the adoptive parents, and may lead to adoption failure. Thus, understanding factors associated with changes in sustained social withdrawal following adoption has both empirical and clinical relevance. To our knowledge, the prevalence of social withdrawal among postinstitutionalized adopted infants and changes in its frequency over time have not been assessed. In this study, we hypothesize that sustained social withdrawal is common among postinstitutionalized adopted infants at the time of adoption and that it decreases as the adopted infant develops attachment relations with his or her adoptive parents.

## INFANT'S CHARACTERISTICS AND SUSTAINED SOCIAL WITHDRAWAL BEHAVIOR: TEMPERAMENT, AGE AT ADOPTION, GENDER AND DEVELOPMENTAL STATUS

Since the tendency to withdraw in novel situations is one of the defining characteristics of inhibited temperament (Kagan, 2012), one may wonder about the link between temperament and social withdrawal. It is argued that social withdrawal is a more generalized behavioral pattern that is not limited to novelty and unfamiliar contexts. Whereas inhibited and temperamentally withdrawn infants are socially engaged with their caregivers, albeit being cautious with strangers, socially withdrawn infants tend to be disengaged both with their caregivers as well as strangers (Guedeney et al., 2012). Empirical data regarding the association between temperamental features and social withdrawal have been inconclusive. For example, withdrawn toddlers were described by their mothers as temperamentally difficult (Costa & Figueiredo, 2011) and unpredictable (Dollberg et al., 2006), suggesting that social withdrawal may, at least partially, reflect the infant's anxious and withdrawn temperament (Puura et al., 2010). Other studies have reported that infant sustained social withdrawal was unrelated to temperament (Matthey et al., 2005; Milne, Greenway, Guedeney, & Larroqued, 2009). Because the current study includes assessments of infants' perceived temperament at the time of adoption, it provides grounds for examining the role of the infant temperament as perceived by the adoptive mother in the rate of change in sustained social withdrawal over time, therefore expanding further understanding of the role of temperament in sustained social withdrawal behavior.

A child's age at adoption has been consistently identified as affecting the quality of postadoption adaptation: Children adopted earlier show better postadoption adaptation compared to those adapted later (Bakermans-Kranenburg et al., 2012; Hawk & McCall, 2010; Merz & McCall, 2010; Zeanah, Gunnar, McCall, Kreppner, & Fox, 2011). Sustained social withdrawal has been shown to be unrelated to age (e.g., Dollberg et al., 2006; Hartley et al., 2010; Mantymaa et al., 2008; Puura et al., 2010); however, it has not been assessed in the context of postinstitutional adaptation.

Finally, Guedeney et al. (2008) found that the combination of being a male and being developmentally delayed increased the risk for social withdrawal. The present study examines whether sustained social withdrawal, and more specifically, a decrease in sustained social withdrawal, is related to adoptees' age of adoption, gender, and developmental status.

## MATERNAL PROTECTIVE AND RISK FACTORS ASSOCIATED WITH CHANGE IN INFANTS' SUSTAINED WITHDRAWAL BEHAVIOR: MATERNAL DEPRESSION, EXPECTATIONS, ATTACHMENT STYLE, AND MARITAL STATUS

While the process of adaptation to motherhood as experienced by birth mothers and adoptive mothers has been described as quite similar, adoptive parents also have reported emotions and concerns that are unique to the adoption process (Fontenot, 2007). These include the hardship and long route to adoption, the need to overcome the trauma of infertility, having to cope with the stigma of adoption, and a fear of not being able to love the adopted child (Daniluk & Hurtig-Mitchell, 2003; Lesens et al., 2012). These unique concerns are reflected in elevated levels of depressive and anxiety symptoms that have been reported among some adoptive parents (Bird, Peterson, & Hotta Miller, 2002). High levels of depressive symptoms have been associated with higher rates of externalizing problems among toddlers who were adopted shortly after birth, suggesting a causal link between adoptive parents' depressive symptoms and toddlers' behavioral problems (Pemberton et al., 2010). Effects of postadoption parental depressive symptoms also have been observed on adopted children's hypothalamic–pituitary–adrenal axis regulation, as measured by their diurnal cortisol levels (Laurent et al., 2013). Elevated postadoption depressive symptoms were attributed to unfulfilled and unrealistic expectations in the domains of self, child, family, and society (Gair, 1999; Rushton & Monck, 2010) as well as to adoptive mothers' personality traits (Foli, South, Lim, & Hebdon, 2012). Taken together, it appears that a high level of depressive and anxiety symptoms and unrealistic expectations regarding the adoption process may be related to an increased risk for unsuccessful postadoption adaptation.

An association between maternal psychopathology, especially maternal depressive symptomatology, also has been reported in the case of infant sustained social withdrawal (Mantymaa et al., 2008; Matthey et al., 2005). It has been suggested that a mother's elevated level of depressive symptomatology may interfere with her ability to accurately read and sensitively respond to her infant's developmentally appropriate need for brief withdrawals and to her failure to "repair" normative mismatched interactions with him or her (Tronick, 2007). Furthermore, sustained social withdrawal may exacerbate preexisting maternal depression among adoptive mothers and further complicate the postadoption adaptation. Less is known about the role of anxiety symptoms in the context of sustained social withdrawal. We suggest that maternal elevated depressive and anxiety symptoms may be risk factors in the context of postadoption adaptation, as they may interfere with the expected natural decrease in

sustained social withdrawal. Therefore, the present study examines the associations between maternal reported depressive and anxiety symptoms and change in infant sustained social withdrawal.

A maternal secure state of mind regarding attachment has been suggested as a protective factor, fostering adopted infants' relational and socioemotional development, whereas an insecure state of mind has been suggested as a risk factor (Pace & Zavattini, 2011; Steele, Hodges, Kaniuk, Hillman, & Henderson, 2003; Verissimo & Salvaterra, 2006). To our knowledge, the role of maternal attachment has not been studied in the context of infant sustained social withdrawal. We hypothesize that adoptive mothers who hold a secure attachment state of mind may be less overwhelmed when facing a socially withdrawn infant. Adoptive mothers who hold an insecure attachment state of mind, on the other hand, are threatened and confused by these behaviors, misinterpreting them as signs of rejection or a lack of need on the part of the adopted infant, and respond with rejection, withdrawal, or intrusiveness. Therefore, we expect that a decrease in infant sustained social withdrawal would be more apparent among infants adopted by secure mothers compared to those adopted by insecure mothers. Finally, in recent years, the rate of single parents among adoptive parents has increased, especially in the context of international adoption (Lansford, Ceballo, Abbey, & Stewart, 2001). Single-handedly coping with the task of parenting a postinstitutionalized infant is different and potentially more challenging as compared to coparenting such a child in the context of a two-parent family (Shireman, 1996). The current study includes both single and married adoptive mothers, thus allowing us to examine the impact of the mother's marital status on change in sustained social withdrawal behavior.

### The Current Study

The goals of the study are to:

- assess rates of sustained social withdrawal among newly adopted infants 1 month' postadoption (Time 1).

- assess changes in sustained social withdrawal behavior from 1 month' (Time 1) to 6 months' postadoption (Time 2).

- explore the risk factors associated with the change in social withdrawal from Time 1 to Time 2. Risk factors to be assessed include age at adoption, perceived temperament, developmental level, and gender for infants and depressive and anxiety symptoms, expectations for efficacy, attachment style, and marital status for mothers. We expect that high levels of reported depressive symptoms and insecure maternal state of mind regarding attachment will be associated with smaller changes in infant sustained social withdrawal.

- examine the impact of a preventive parent–infant intervention (intervention group) on the change in social withdrawal as compared to the treatment-as-usual group (control group).

## METHOD

### Participants

The sample consisted of 40 mother–infant dyads. Infants were all born in Russia, raised in orphanages, and adopted by Israeli parents through international adoption agencies. Sixty-six families who were approved for international adoption were invited to volunteer for the study while waiting for a child. Forty-seven families agreed to participate (29% refusal rate) and were randomly assigned to an attachment-focused home-intervention group (n = 24; 51%) and a "treatment-as usual" control group (n = 23; 49%). To have single and married mothers equally represented in both groups, the random group assignment was done separately for single and married mothers. Attrition rate for the entire sample was 15%, and it was unevenly distributed between the groups: One family (4%) dropped out of the intervention group, and six families (26%) dropped out of the control group. The final sample included 19 boys (47.5%) and 21 girls (52.5%) ranging in age from 5 to 36 (M = 15.10, SD = 7.07) months at the time of adoption. All infants participating were examined by the adoption agencies' pediatricians as part of the routine adoption process and were reported to be medically healthy and with no severe known developmental disorders. Twenty-two of the adopted infants (55%) were reported as full-term whereas 4 (10%) were born prematurely; information was unavailable for the remaining 14 (35%) infants. Mothers' mean age was 37.62 (range = 29–51, SD = 5.25) years. Twenty-one mothers (52.5%) were married, and 19 (47.5%) were single. The majority of mothers (98%) had post-high-school education, 14 of them were working full-time (35%), 3 were working part-time (8%), and 10 were not working (25%); data for the remaining mothers (32%) were missing. All families were of average Israeli or above-average income. Table 1 presents the demographics and the study's measures of the intervention and control groups. As can be seen, the groups did not differ on any of the demographic characteristics.

### Measures and Coding

*The maternal demographic questionnaire.* This questionnaire was designed by the authors for the purpose of the current study and included questions regarding the mothers' age, marital status, education, occupation, family income, and so on.

*The adult attachment interview (AAI; George, Kaplan, & Main, 1985).* The AAI was administered to the mothers to assess their state of mind regarding attachment. The AAI is a semistructured interview in which the interviewee is asked to describe her relationship with her parents during childhood. The mother is asked to recall and describe specific childhood memories, including incidents of distress, to speculate about the reasons behind her parents' behavior, and to reflect on the impact of these experiences on her personality. The interviews were audiotaped, transcribed, and scored using Main and Goldwin's (1998) system. Based on this scoring system, mothers were classified as secure-autonomous; insecure-dismissing or preoccupied with regard to attachment; or

**TABLE 1.** *Demographics and Attachment Security of Intervention and Control Groups*

| | Intervention (n = 23) | Control (n = 17) | |
|---|---|---|---|
| Child Characteristics | | | |
| Gender | | | |
| Girls | 11 (48%) | 10 (59%) | n.s. |
| Child prematurity | 3 (13%) | 1 (6%) | n.s. |
| Age at Adoption (months) | M = 16.35 | M = 13.41 | n.s. |
| | SD = 8.36 | SD = 4.54 | |
| BSID-II MDI score | M = 78.08 | M = 76.56 | n.s. |
| | SD = 16.73 | SD = 11.20 | |
| BSID-II PDI score | M = 84.17 | M = 79.67 | n.s. |
| | SD = 22.53 | SD = 20.50 | |
| Mother Characteristics | M = 38.64 | M = 43.14 | n.s. |
| Age (years) | SD = 5.71 | SD = 4.52 | |
| Maternal Marital Status | | | |
| Single | 11 (48%) | 8 (47%) | n.s. |
| Maternal Employment | | | n.s. |
| Full-time | 8 | 6 | |
| Part-time | 1 | 2 | |
| Unemployed | 6 | 4 | |
| Unknown | 8 | 5 | |
| Attachment Security | | | |
| Secure | 11 (48%) | 6 (35%) | n.s. |

BSID-II MDI = Bayley Scales of Infant Development, Second Edition, Mental Development Index; BSID-II PDI = Bayley Scales of Infant Development, Second Edition, Psychomotor Development Index.

unresolved/disorganized with respect to a loss or a trauma. In the present study, the AAI was administered by a trained social worker and scored blindly by a certified AAI coder (the second author).

*Symptom checklist 90-revised (SCL-90-R; Derogatis, 1977, 1992).* The SCL-90-R Hebrew version (Roskin, 1984) was used to assess maternal psychological symptomatology and depressive symptoms. The scale consists of 90 items, each having 5-point scales from 0 (*no problem*) to 4 (severe). The items are aggregated into nine subscales: Somatization, Obsessive-Compulsive, Interpersonal Sensitivity, Depression, Anxiety, Anger-Hostility, Phobic Anxiety, Paranoid Ideation, and Psychoticism. A total score denoted as the Global Severity Index (GSI) is calculated by summing up all items. The SCL-90-R has been used with both general and psychiatric populations and has been shown to have an adequate validity, internal consistency, and test-retest reliability (Derogatis, 1992). The mean internal reliability score (Cronbach's $\alpha$) of the nine symptom subscales for the current study was .71 (range = .54–.81). Given the current study's research questions, the GSI (Cronbach's $\alpha$ = .89) score and the depression (Cronbach's $\alpha$ = .81) and anxiety (Cronbach's $\alpha$ = .70) subscale scores were used.

*The Infant Demographic Questionnaire* was designed by the authors for the purpose of the current study and was administered to the mothers during the home visit 1 month after the adoption of the child. Mothers were asked what they knew about the adopted

infant's developmental and health histories as well as about the institution in which the adopted infant stayed and his or her experiences prior to adoption.

*The bayley scales of infant development, second edition (BSID-II; Bayley, 1993).* The BSID-II was administered to assess the adopted infants' mental and motor developmental levels. The BSID-II is a standardized, widely used assessment for infants and toddlers aged 1 to 42 months. The BSID-II includes two subscales, a Mental scale yielding an MDI and a Motor scale yielding a PDI. The Mental scale includes developmentally graded tasks assessing the sensory-perceptual, communication and linguistic, concept formation, and problem-solving skills of the child. The Motor scale assesses the child's level of psychomotor development. Each scale score is translated into standardized scores adjusted for the child age ($M = 100$, $SD = 15$). The BSID-II has been validated and normalized on varied populations (see Bayley, 1993) and was used with Israeli infants (e.g., Brandes et al., 1992; Sadan, Malinger, Schwieger, Lev, & Lerman-Sagie, 2007).

*The parental sense of competence scale (PSOC; Gibaud-Wallston & Wandersman, 1978, August; Johnston & Mash, 1989).* The PSOC was administered to the adoptive mothers during the first home visit to assess maternal expectations regarding their coping and competence in dealing with their newly adopted infants. The PSOC is a 17-item, self-report scale assessing the level of the parent's frustration, anxiety, motivation, sense of competence, problem-solving efficacy, and resourcefulness as a parent. Example items include "Being a parent is manageable, and any problems are easily solved," and "My mother/father was better prepared to be a good mother/father than I am." Item scores range from 1 (*strongly disagree*) to 6 (*strongly agree*). Eight items are reversed so that for all items, high scores reflect a high sense of competence. Two factors are yielded: Competence-Efficacy and Satisfaction. The PSOC has been used with parents of infants and toddlers within normal and high-risk populations and has been found to be reliable and valid (Johnston & Mash, 1989). Internal reliability scores for the current study were as follows: Competence-efficacy $\alpha = .77$, Satisfaction $\alpha = .71$, and PSOC Global Score $\alpha = .83$.

*Infant characteristics questionnaire (ICQ; Bates, Freeland, & Lounsbury, 1979).* The ICQ was used to measure maternal perceptions of the adopted infant's temperament. The instrument consists of 24 items rated on a 9-point scale (1 denotes a low level and 9 denotes a high level of the described behavior) and yields four factors: Fussy-Difficult, Unadaptable, Dull, and Unpredictable. For the current study, a ICQ Total Score was computed (Cronbach's $\alpha = .72$).

### Coding

*The alarm distress baby scale (ADBB; Guedeney & Fermanian, 2001).* The ADBB was used to assess the infant's sustained social withdrawal behavior during the two mother–infant free-play inter-

actions. The ADBB is an eight-item scale designed for use with infants aged 2 to 24 months. The scale was originally designed to be utilized by a professional (e.g., well-baby-care pediatrician or nurse) who interacts with the infant during a medical examination in a well-baby clinic. Later, the scale was adapted for use by a trained observer to assess infant social withdrawal from videotaped mother–infant free play interactions (Dollberg et al., 2006). This adaptation was used in the current study because it appeared more adequate for use with newly adopted infants and their adoptive parents. The eight items allow the observer to assess the infant's facial expression, rate and quality (positive vs. negative) of vocalization, general level of activity, self-stimulating gestures, and briskness of response to stimulation. With all items, low scores indicate low rates of withdrawal behavior whereas high scores indicate high rates of withdrawal. A cutoff score of 5 with a sensitivity of 0.82 and a specificity of 0.78 was determined to be optimal for screening purposes by the scale developers (Guedeney & Fermanian, 2001). Coding for the present study was conducted by two psychology graduate students who were trained by a certified ADBB trainer (the first author). Precoding reliability was established on the 20 training tapes distributed by the scale's developers. Precoding interrater reliability was .92, and $\kappa$s averaged .80. A second reliability assessment was conducted during coding on 10 interactions and showed that intraclass $r = .90$, and $\kappa$s ranged from .73 to .82. Coders were blind to the family intervention/control group status and time of assessment. ADBB scores were derived from mother–infant free-play interactions 1 month' postadoption [ADBB Time 1 (T1)] and again at 6 months' postadoption [ADBB Time 2 (T2)].

### Procedures

The study was approved by the Geha Mental Health Center and the Academic College of Tel Aviv-Yaffo Ethics Committees. The adoption agency's social worker called the families who were approved for international adoption and were waiting for their child to arrive from Russia, explained the goal of the study and the random group-assignment procedure, and asked whether they would agree to participate. An appointment was scheduled for those who agreed, during which the parents signed the informed consent form, filled out the demographic questionnaire, were interviewed with the AAI, and completed SCL-90-R (in this order). Families were then randomly assigned to either the treatment-as-usual group or to the home-based attachment-focused intervention group. About 1 month after the arrival of the adopted infant, the Time 1 assessment was carried out. A trained developmental psychologist made a home visit, during which mothers completed the Infant Demographic Questionnaire, the PSOC, and the ICQ questionnaires, the infant was assessed with the BSID-II, and a free mother–infant play interaction was videotaped. After this visit, the home-based attachment-focused intervention began. The intervention plan for each family was individually tailored based on the attachment narratives provided by the parents, with the specific aim of helping the parents to recognize and respond to the infant's attachment

**TABLE 2.** *Social Withdrawal at Time 1 and Time 2 by Group Participation, Maternal Attachment Security, and Marital Status and Child Gender*

| | ADBB T1 | | ADBB T2 | | ADBB Change | |
|---|---|---|---|---|---|---|
| Variable | *M* | *SD* | *M* | *SD* | *M* | *SD* |
| Group Participation | | | | | | |
|   Entire Sample | 3.20 | 3.08 | 1.21 | .93 | 1.93 | 3.45 |
|   Intervention | 3.74 | 3.35 | 1.21 | .93 | 2.78 | 3.87 |
|   Control | 2.47 | 2.60 | 1.16 | 1.11 | .77 | 2.45 |
| Maternal Attachment Security | | | | | | |
|   Secure Attachment | 4.35 | 3.97 | 1.23 | 1.23 | 3.17 | 4.99 |
|   Insecure Attachment | 2.48 | 1.91 | 1.22 | .81 | 1.22 | 1.77 |
| Child Gender | | | | | | |
|   Boys | 3.21 | 3.28 | 1.24 | 1.22 | 2.00 | 3.61 |
|   Girls | 3.19 | 2.98 | 1.15 | .77 | 1.87 | 3.40 |
| Maternal Marital Status | | | | | | |
|   Married | 3.81 | 2.91 | 1.15 | .94 | 2.60 | 3.25 |
|   Single | 2.53 | 3.20 | 1.24 | 1.08 | 1.31 | 3.63 |

ADBB T1 = Baby Alarm Distress Scale Time 1; ADBB T2 = Baby Alarm Distress Scale Time 2.

behaviors that were at times unclear and difficult to identify, and to provide him or her secure-base experiences. The same trained developmental psychologist, supervised by the second author, regularly met with the intervention-group families. Sessions were scheduled once a week during the first 2 months, twice a month during the next 4 months, and then once a month in the second part of the first year. The whole intervention lasted 1 year. The Time 2 assessment was conducted for both groups at home, 6 months after the arrival of the adopted infant, and consisted of a similar videotaped mother–infant play interaction. Whenever additional treatments were needed (e.g., occupational therapy, speech therapy, etc.), the team facilitated the referral to the specific treatment facilities, in either of the two groups.

## RESULTS

### Rates of Sustained Social Withdrawal Among Newly Adopted Infants and Change in Sustained Social Withdrawal 6 Months' Postadoption

Table 2 shows the mean and standard deviations of the ADBB T1, ADBB T2, and ADBB change scores (ADBB T2 scores subtracted from ADBB T1 scores) for the entire sample as well as separately for the intervention and control groups. As can be seen from the table, there was a large within-group variability in the entire sample's ADBB scores at Time 1 (range = 0–14, $SD$ = 3.08). Nine infants (22.5%) scored above the cutoff score of 5 for pathological social withdrawal; 6 (26%) in the intervention group and 3 (18%) in the control group, $\chi^2 = .40$, n.s. At Time 2, none of the infants in the entire sample scored above the cutoff point of 5. The change in ADBB scores from Time 1 to Time 2 was significant, $t(31) = 3.12$, $p < .01$. A closer look at the individ-

ual level of analysis revealed that the average ADBB change rate was 1.93 points (range = 4–13) and that 2 children (5%; both in the intervention group) dramatically decreased their scores of sustained social withdrawal from Time 1 to Time 2 (13 and 12 points, respectively) whereas 5 children (12.5%) slightly increased their level of sustained social withdrawal from Time 1 to Time 2 (Four children, 2 in each group, increased their score from 0 to 1, and 1infant in the control group increased his score from 0 to 4.) The intervention and control groups differed significantly in the likelihood of change, $G^2 = 19.30$, $p < .05$, so that change was more likely to occur in the intervention group.

### Correlates of Change in Social Withdrawal Behavior 6 Months' Postadoption

Pearson correlations were computed between ADBB change, infant age at adoption, perceived temperament (ICQ Total), developmental level [BSID-II, Mental Development Index (MDI), and Psychomotor Developmental Index (PDI)], maternal depressive and anxiety symptoms (SCL-90-R GSI score and SCL-90-R Depression and Anxiety subscales), and parental expectations (PSOC Total Score, PSOC Competence-Efficacy factor and PSOC Satisfaction factor). The independent samples *t*-test procedure was used to assess group differences on ADBB change scores for child gender (boys vs. girls), maternal attachment security (secure/insecure), and mother's marital status (married/single). The results are presented in Tables 2 and 3. No significant association was found between ADBB change and the infant's age of adoption; however, the ADBB T1 score correlated negatively with the infant's age of adoption. ADBB T1 and ADBB change also were not related to the infant's perceived temperament or to the infant's developmental level. However, child perceived temperament was negatively associated with ADBB T2 so that more withdrawn infants were perceived by their mothers as less temperamentally difficult six months post adoption. No gender differences were found in the mean ADBB T1, $t(38) = -1.30$, n.s., ADBB T2, $t(38) = -.16$, n.s., or in the extent of ADBB change, $t(38) = -1.64$, n.s. ADBB at Time 1 was not related to maternal depressive or to anxiety symptoms as measured by the SCL-90-R Depression and Anxiety subscales and the SCL-90-R GSI score. However, the Maternal Depressive Symptoms subscale score (but not the GSI or Anxiety score) was negatively associated with ADBB change, so that mothers who reported high levels of depressive symptoms before the child's arrival showed a smaller decrease in social withdrawal. ADBB T1 was negatively associated with the PSOC Global Score as well as with the Competence-Efficacy factor, but was unrelated to the PSOC Satisfaction factor. In other words, mothers who reported high expectations for competence and efficacy had infants who showed low levels of initial withdrawal behavior. ADBB change was correlated negatively with the Competence-Efficacy factor and tended to correlate negatively with the Global Score, showing that infants who showed a smaller change in withdrawal behavior 6 months' postadoption had mothers who had high initial expectations for parental competence and efficacy. Secure mothers

**TABLE 3.** *Intercorrelations Between Infant Social Withdrawal and Infants' and Mothers' Factors*

| Factor | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. ADBB T1 | – | .03 | .94** | −.21 | −.28* | .33 | .19 | −.14 | −.39* | −.13 | −.48** |
| 2. ADBB T2 | | – | −.29 | −.45* | −.09 | .01 | −.13 | −.02 | −.08 | −.02 | −.18 |
| 3 ADBB Change | | | – | −.03 | −.23 | .21 | .19 | −.42** | −.36 | −.11 | −.41* |
| 4. ICQ Total | | | | – | .32 | −.18 | .21 | .21 | −.30 | −.25 | −.13 |
| 5. Child age at adoption | | | | | – | −.64** | −.12 | −.11 | .025 | .04 | −.01 |
| 6. BSID-II MDI | | | | | | – | .47* | −.07 | .02 | .14 | −.08 |
| 7. BSID-II PDI | | | | | | | – | −.31 | −.04 | .08 | −.13 |
| 8. SCL-90-R Depression Scale | | | | | | | | – | −.14 | −.27 | .00 |
| 9. PSOC Total | | | | | | | | | – | .94** | .92** |
| 10. PSOC Satisfaction | | | | | | | | | | – | .73** |
| 11. PSOC Efficacy | | | | | | | | | | | – |

ADBB T1 = Baby Alarm Distress Scale Time 1; ADBB T2 = Baby Alarm Distress Scale Time 2; ICQ = Infant Characteristics Questionnaire; BSID-II MDI = Bayley Scales of Infant Development, Second Edition, Mental Development Index; BSID-II PDI = Bayley Scales of Infant Development, Second Edition, Psychomotor Development Index; SCL-90-R = Symptom Checklist 90-Revised; PSOC = Parental Sense of Competence Scale.
*$p \leq .05$. **$p < .01$.

had infants who were significantly more withdrawn 1 month after adoption, $t(36) = 1.91$, $p < .05$; yet, these differences disappeared over the 6-month period, and the two groups did not differ on the ADBB T2 assessment, $t(36) = .04$, n.s. Secure and insecure mothers differed on the ADBB change, and this difference was close to significance, $t(36) = 1.53$, $p = .07$. Finally, infants of married and single mothers did not differ on their ADBB T1, $t(38) = −1.33$, n.s., ADBB T2, $t(38) = .285$, n.s., or ADBB change, $t(38) = −1.039$, n.s.

To examine whether infants participating in the intervention group showed a more marked decrease in social withdrawal between Time 1 and Time 2 as compared to infants in the control group, the two groups' ADBB scores for the two assessments and ADBB change scores were first compared using the independent samples $t$-test analysis. These analyses showed that the two groups did not differ significantly in Time 1, $t(38) = −1.30$, n.s., and in Time 2 ADBB scores, $t(38) = −.16$, n.s. A significant difference was found, however, between the two groups on the ADBB change scores, $t(38) = −1.76$, $p < .05$, so that the change was larger in the intervention group. Next, a multivariate analysis of variance with repeated measures analysis was conducted on the ADBB scores, with time as the within-subject measure and group as the between-subject measure. Because ADBB T1 scores were significantly correlated with the infant's age at adoption, this variable was entered as a covariate to control for a possible effect on the change rate. To increase the model's power, missing values were replaced by variables' means. The results showed a significant overall main effect for time, Wilks's $F$ ($df = 1, 38$) $= 14.12$, $p < .01$, partial $\eta^2 = .27$, but no Time × Group effect. In other words, ADBB scores decreased significantly from the T1 assessment to T2; however, the decrease was not related to group (intervention vs. control) participation.

Finally, based on the results reported earlier, a regression model predicting ADBB change from T1 to T2 was tested to assess the combined and unique contributions of group participation (intervention/control), maternal attachment state of mind (secure/insecure), maternal depressive symptoms, and maternal expectations for competence and efficacy. Results showed that the overall model was significant, $F(4, 25) = 4.54$, $p < .01$, and explained 42% of the variance. Maternal reported depressive symptoms significantly predicted ADBB change, $\beta = −.45$, $t = −2.86$, $p < .01$, as did maternal attachment security, $\beta = −.32$, $t = −2.03$, $p = .05$. Group participation and expectations for competence did not contribute to the prediction.

## DISCUSSION

The concept of infant sustained social withdrawal has its roots in the early reports by Spitz (1945) and Robertson and Bowlby (1952), who described behavioral signs of withdrawal, detachment, and depression among youngsters subjected to early parental loss, severe deprivation, and inadequate care. The goals of the present study were to assess the rate of sustained social withdrawal among postinstitutionalized internationally adopted infants, to examine changes in sustained social withdrawal behavior from 1 to 6 months' postadoption, and to identify the factors associated with these changes over and above adoption itself. Specifically, the role of the child's age at adoption, perceived temperament, developmental level, and gender, and the mother's depressive and anxiety symptoms, expectations for efficacy, attachment state of mind, and marital status as well as participation in a preventive intervention program were tested in the context of change in infant postadoption sustained social withdrawal behavior.

As predicted, the rate of infants who scored within the clinical range of sustained social withdrawal shortly after adoption was high (22.5%) and was found to be at the high end of the range reported for normative, low-risk samples (3–27%). In a similarly aged Israeli sample of infants referred to an infant mental health clinic, 11.6% of the nonreferred and 39% of the referred infants scored within the clinical range. This finding is consistent with our hypothesis that postinstitutionalized infants who often experience

inadequate care, characterized by rare age-appropriate stimulation and emotional availability, tend as a group to show frequent sustained social withdrawal behavior as a reaction to the early life adversities to which they have been subjected. However, the rate found in our study also is lower than that reported in high-risk samples (31–39%). We suspect that this relatively high, yet not extreme, rate of clinically significant withdrawal may be due to the fact that the first assessment of sustained social withdrawal was conducted 1 month' postadoption and may represent the first signs of infant recovery from the adversities of the institutional care. Future studies should assess sustained social withdrawal among infants who are still institutionalized or immediately after arrival at the adoptive family. Furthermore, about three fourths of the infants in the current sample scored below the cutoff point for clinically significant social withdrawal, pointing to individual differences in response to adverse environments and in recovery rates.

The most robust finding of the present study was the decrease in sustained social withdrawal presented by almost all of the adopted infants 6 months after arriving to their adoptive families. This suggests that as predicted, changing the social and physical environment in which the adopted child is being raised by placing him or her in a stable and loving family environment and developing an attachment relationship with the adoptive family decreases the infant's tendency to socially withdraw. Given the lack of comparative longitudinal data regarding natural changes in sustained social withdrawal over time, it is impossible to parse apart the impact of adoption from natural maturational processes. Nevertheless, converging data regarding the beneficial impact of adoption on infants' socioemotional development and studies showing that social withdrawal is related, among other things, to the social context in which the child is being raised substantiate the conclusion that being removed from an institution and placed with an adoptive family contributes to the reported decrease in the infants' social withdrawal behavior. Given our assumption that social withdrawal may be a risk factor for postadoption maladaptation and even for adoption failure, the finding regarding a significant postadoption decrease in withdrawal is important. The fact that this change is observed relatively shortly after the adopted child is placed in a new home has empirical and clinical implications. It can serve as a source of encouragement for adoptive families as well as a means for assessing short-term postadoption-adaptation progress.

While the vast majority of adopted infants in our sample showed lower levels of withdrawal behavior on the second assessment, a small subgroup of 5 infants showed an increase in sustained social withdrawal display on the second assessment. Of them, 4 showed a negligible increase that can be attributed to a measurement error. However, 1 infant's score increased by 4 points on the second assessment. Examining this individual's scores revealed that this infant's initial developmental level was in the mental retardation range (MDI = 64) and 1 *SD* below the average MDI for this sample, suggesting that developmental disorders may account for an increase in social withdrawal over time. This finding, if replicated, calls attention to infants with high sustained withdrawal behavior beyond the first months of adoption, as it may

be an early sign of significant difficulties within the infant or the adoptive family.

As predicted, maternal depressive symptomatology and security of attachment were associated with a decrease in infants' sustained social withdrawal behavior. Infants adopted by mothers who reported high levels of depressive symptoms at the waiting time for adoption showed less decrease in sustained social withdrawal behavior as compared to infants adopted by mothers who reported low levels of depressive symptoms. This suggests that maternal depressive symptoms may indeed interfere with the adjustment and recovery of postinstitutionalized, socially withdrawn infants, probably through the same path of transmission of maternal depression between the mother and her biological infant that has been described by Tronick (2007) in the context of postpartum depression. Accordingly, the depressed mother's frequent displays of negative affect during dyadic interaction with the adopted infant may prolong, extend, and expand the low-keyed, remote, and shallow affect displayed by a withdrawn infant. In contrast, nondepressed mothers may be more effective in altering the shallow affect displayed by the withdrawn infant. Thus, the mother's depressive symptoms and the infant's withdrawn behavior may jointly interfere with the natural decrease in social withdrawal behavior following adoption, and therefore increase the risk for continued socioemotional maladaptation on the part of the adopted child as well as the risk for adoption failure. Notably, in the present study, maternal depressive symptoms were assessed before the arrival of the adopted child. This time gap allows us to conclude that social withdrawal was not a contributing factor to the level of depressive symptoms among mothers. However, the time gap also raises the possibility of change in maternal depressive symptoms from the pre-adoption waiting time to the first assessment that occurred after the arrival of the adopted infant. Therefore, future studies are needed in which maternal depressive symptom rates would be assessed prior to and throughout the process of adoption.

As predicted, a maternal secure state of mind regarding attachment predicted a larger reduction in infant sustained social withdrawal whereas an insecure state of mind predicted a smaller reduction in infant withdrawal behavior. This finding supports our hypothesis that a maternal secure state of mind serves as a protective factor, enabling mothers to be empathic and understanding toward the adopted infant's withdrawn behavior and to accommodate their expectations for signs of recovery and attachment to meet the infant's pace and needs. In contrast, mothers who hold an insecure state of mind regarding attachment appear to be more vulnerable to the effects of infant sustained social withdrawal, possibly because they are more sensitive to potential threats of rejection and interpersonal failure and fail to understand the infant's confusing signs of neediness. Steele et al. (2003) similarly suggested that mothers whose state of mind regarding attachment is dominated by unresolved loss or trauma fail to show the emotional availability that is required to establish a secure-base experience for their adopted children. If replicated in future studies, this finding suggests that adoptive mothers who hold an insecure state of mind need support and assistance in understanding their adopted infants' emotional

needs, especially when disguised by overt withdrawal behavior and a lack of interest in the caregiving environment.

Maternal expectations for competence and efficacy, assessed shortly after the arrival of the adopted infant, were negatively associated with change in infant sustained social withdrawal, so that infants of mothers who reported that they were feeling competent 1 month after adoption and expected to be effective as adoptive mothers showed a *smaller* decrease in sustained social withdrawal behavior. Because maternal sense of competence and efficacy was assessed at the beginning of the adoption process, we regard it as parental expectations for competence and efficacy rather than a grounded, experience-based sense of mastery. Thus, the finding points to the negative effect of maternal expectations for efficacy on infants' sustained social withdrawal behavior. To our knowledge, the research regarding the impact of parental expectations on adopted infants' socioemotional adaptation is limited. The few studies that did address this issue have found that parental realistic expectations regarding the child were crucial to adopted children's adjustment. Parental realistic expectations regarding adoption of children with special needs predicted a positive adoption outcome as measured by parental satisfaction, relationship with adopted child, and impact on the adoptive family and marriage (Reilly & Platz, 2003) whereas unrealistic expectations regarding the child, the adoptive parent, and the adoption process were associated with parental postadoption depression (Foli, 2010). Taken together, it is possible to speculate that mothers who hold unrealistic expectations regarding their parental role (e.g., their ability to quickly undo the negative adversities associated with their adopted infant's pre-adoption experiences) may become insensitive and intrusive with their infants, interfering with the natural, gradual decrease in social withdrawal behavior.

Contrary to our hypothesis, participation in the preventive, attachment-based intervention did not predict a significantly greater change in infant sustained social withdrawal, as both intervention and treatment-as-usual infants significantly decreased the level of sustained social withdrawal from 1 to 6 months' postadoption. The rationale for providing postadoption preventive intervention was derived from previous clinical and empirical reports regarding the challenges that adoptive parents encounter and the multiple risks accompanying the postadoption process (e.g., Barth & Miller, 2000; Bird et al., 2002). The intervention protocol included various pre- and posttreatment outcome measures described elsewhere, with sustained social withdrawal being one of them. The fact that our study failed to show a significant impact for the intervention program on sustained social withdrawal behavior decrease may be explained by the small sample size and the high attrition rate from the control group. Accordingly, of the 7 families that dropped out of the study during the intervention period, 6 were from the control group. Three of these families left the study because they were dissatisfied and frustrated with the limited support provided by the adoption agency ("treatment-as-usual" control condition). Other control families told us after the completion of the study that they joined adoptive parents' groups or were helped by various professionals such as occupational thera-

pists, speech therapists, and developmental specialists while participating in the study. This information clearly represents the wish of many adoptive parents to be accompanied and supported by professionals in the postadoption process; yet, it may have interfered with the study's goal of showing that the preventive intervention is effective. Nevertheless, it is of significance that the largest improvements in sustained social withdrawal were evidenced in the intervention group, even though, compared to the impact of time in and of itself, the impact of the group participation was insignificant.

Finally, the present findings indicate that the rate of change in social withdrawal behavior was unrelated to any of the child characteristics measured (i.e., gender, age at adoption, developmental level, or perceived temperament). In contrast, significant associations were found between the rate of change in sustained social withdrawal and the adoptive mothers' characteristics (i.e., their state of mind regarding attachment and the level of depressive symptoms experienced by them). This pattern of results is relevant to the ongoing debate about whether sustained social withdrawal is an inborn, temperament-like characteristic of the individual infant or whether it is the product of environmental influences. The results of the current study cannot resolve this debate because they are based on a relatively small sample of a unique group of postinstitutionalized infants who underwent a dramatic change in their lives by being adopted internationally. Yet, one can conclude based on these results that altering the interpersonal context in which infants grow leads to changes in their tendency to socially withdraw, thus buttressing the view that sustained social withdrawal can be affected, at least partly, by environmental conditions. This finding is encouraging because it suggests that changing the social environment in which withdrawn infants are being raised by either intervening to improve parental functioning or by removing infants from the damaging environment by adoption or foster placement may alter the negative developmental trajectory associated with sustained social withdrawal. Early identification of socially withdrawn infants as well as families who are less effective in meeting withdrawn infants' needs is important for providing them with support and targeting factors for change.

### Limitations and Suggestions for Future Research

The present study is the first to examine observed infants' sustained social withdrawal in the context of postinstitutional infant adoption, and as such, its contribution to the understanding of infants' postinstitutional socioemotional adaptation and recovery is significant. Its strengths include a longitudinal design, use of an observational assessment, and a random group-assignment procedure. The study holds some limitations as well, such as a small sample size and the exclusion of fathers. Fathers were not included in the current analyses because only a few participated in the intervention and cooperated with the study's assessment protocol. Future studies need to enlist adoptive fathers' participation in the intervention and research protocol to assess their role in postadoption adaptation in general and in the area of change in sustained

social withdrawal in particular. Longitudinal studies with larger samples of adopted infants as well as comparative samples of orphan infants remaining in institutions are needed to address issues of stability and change in postadoption sustained social withdrawal behavior over time.

## *Conclusions*

This study of newly arrived postinstitutionalized infants and their adoptive parents shows that sustained social withdrawn behavior is part of the infant's status upon arrival and decreases during the first months following the adoption. Several clinical implications emerge from our findings. First, social withdrawal among postinstitutionalized infants at the time of adoption may serve as a risk factor for continued socioemotional maladaptation, as indicated, for example, by insecure attachment and, in worse cases, by adoption failure. Therefore, it is important to prepare adoptive parents to be aware of infant social withdrawal and assist them in finding ways to encourage the development of more adequate strategies of dealing with the social world in their adopted children. Second, socially withdrawn infants are unlikely to be demanding or to display externalized behavioral difficulties as is evidenced for example by them being perceived by their mothers as less temperamentally difficult six months after adoption. Consequently, their adoptive parents are less likely to seek help from clinicians. Nevertheless, evidence has shown that in some cases sustained social withdrawal may lead to psychopathology. Therefore, clinicians should be sensitive and effective in identifying social withdrawal. It is especially important to detect adopted infants whose sustained social withdrawal does not decrease over the first months of adoption since this may be a warning sign regarding postadoption maladaptation. This can be done as part of ongoing support provided to interested adoptive families. Third, mothers who experience high levels of postadoption depressive symptoms and those identified as holding an insecure state of mind regarding attachment also need to be identified and supported since they are at a greater risk to be overwhelmed by infants who are clinically withdrawn. Finally, parental pre-adoption expectations need to be assessed and modified to help adoptive parents to allow their infants to adapt to their new family at their own individual pace.

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# ASSOCIATIONS BETWEEN MATERNAL INTERACTION BEHAVIOR, MATERNAL PERCEPTION OF INFANT TEMPERAMENT, AND INFANT SOCIAL WITHDRAWAL

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ABSTRACT: Infant social behavior develops in the context of early parent–infant interaction. Persisting withdrawal from social interaction is a sign of infant distress and is linked with the existence of risk factors. Impaired social behavior of the infant not only may be an indicator of pathology in the infant but the first sign of an effect of a psychosocial risk. In this study, we assessed 39 seven-month-old infants in videotaped interaction with their mothers and then compared the total score of the infant social behavior rated with the Alarm Distress Baby Scale (ADBB; A. Guedeney & A. Fermanian, 2001) with variables of mother–infant interaction rated with the Emotional Availability Scales, second edition (EAS 2; Z. Biringen, J. Robinson, & R.N. Emde, 2000). The ADBB total score had a strong negative correlation with maternal sensitivity in the EAS 2 ($r = -0.75$) and with the EAS 2 child variables of child involvement ($r = 0.82$) and child responsiveness ($r = 0.85$), indicating that the infants with more signs of social withdrawal had less sensitive mothers and were less involving and responsive in the interaction. Against our expectations, the ADBB total score had no correlation with maternal structuring. Our results give further support of the ability of the ADBB to screen for early signs of pathology in infant social behavior and problems in parent–infant interaction.

Abstracts translated in Spanish, French, German, and Japanese can be found on the abstract page of each article on Wiley Online Library at http://wileyonlinelibrary.com/journal/imhj.

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Infant social behavior develops in the context of early parent–infant interaction (e.g., Feldman, 2007). Unsatisfying mother–infant interaction has long-term consequences for the child, affecting the quality of attachment (Crittenden, 1995; Teti, Gelfand, Messinger, & Isabella, 1995) and restricting the child's cognitive and socioemotional development, as in the case of maternal depres-

sion (Murray, Fiori-Cowley, Hooper, & Cooper, 1996a; Murray, Hipwell, Hooper, Stein, & Cooper, 1996b; Luoma et al., 2001). Persisting withdrawal from social interaction is now known to be a sign of infant distress and has been linked with the existence of risk factors for infant mental health (Guedeney, Foucault, Bougen, Larroque, & Mentré, 2008; Puura et al., 2010). Impaired social behavior of the infant not only may be an indicator of pathology in the infant but the first sign of the effect of a psychosocial risk such as poor parental mental health (Mäntymaa et al., 2008).

Since the pioneering work done in infant psychiatry in the 1980s in Finland (Tamminen, 1990), the increasing awareness of

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the importance of early interaction for the development and health of an individual through the whole life span has made urgent the need for finding and helping infants at risk. During the next decade, the primary healthcare personnel working in well-baby clinics received much training in infant social and emotional development, and for the first time, some of these were included in the revised schema well-baby clinic checkups. At the end of the1990s, a large, longitudinal early intervention study entitled the European Early Promotion Project (EEPP; Puura et al., 2002) was carried out in five European countries, including Finland. In the research project, a training program for primary healthcare nurses for supporting early parent–infant interaction was developed, and its effects were studied. After the actual research, the training program spread to almost the entire country. The primary healthcare personnel, particularly the nurses, who now had gained more knowledge on infant mental health, felt that they needed tools for better assessing infants in families in which everything seemed to be alright, but somehow the infant's behavior raised concerns.

In connection with the EEPP (Puura et al., 2002), a subsample of the infants in mother–infant dyads from the larger study sample was videotaped in a free-play situation. Having learned of a new, structured, but relatively simple, method for observing infants, the Alarm Distress Baby Scale (ADBB; Guedeney & Fermanian, 2001), we decided to rate the existing videotapes with the measure. The purpose of the study was to see how the simpler ADBB method would correlate with a more detailed and better studied method for rating interaction behavior of young infants, the Global Rating Scale for Mother–Infant Interaction (GRS; Murray et al., 1996a). The hypothesis was that the ADBB would distinguish those infants with "good" interaction behavior from infants with avoiding behavior, very little or no positive engagement in play, and inert or flat behavior according to the GRS infant scales. A sample of 127 eight- to eleven-week-old infants was videotaped in free interaction with their mothers, and infant interaction behavior was rated with both methods by independent researchers (Puura, Guedeney, Mäntymaa, & Tamminen, 2007). The ADBB, scored with videotaped interactions, readily detected 80% of those infants rated as having poor interaction skills on the GRS infant scales. This suggested further applicability of the method, particularly since the number of infants rated as false positives in comparison to GRS infant scales remained small. Mothers of infants with ADBB scores over threshold performed more poorly during interaction with their infants when compared to mothers of infants with normal ADBB scores. As in the study by Guedeney and Fermanian (2001), the suggested cutoff point of 5 or more proved to be optimal, with satisfactory sensitivity and specificity (Puura et al., 2002).

A logical sequel for studying the feasibility of the ADBB in Finland was to design a study for examining the prevalence of withdrawal behavior in infancy, taking advantage of the Finnish well- baby clinics network used by over 90% of the families in Finland (Puura et al., 2010). We also wanted to see whether we could teach general practitioners working in the well-baby clinics and doing the regular health checkups to screen infant social with-

drawal with the ADBB. A random sample of 491 parents with 4-, 8-, or 18-month-old infants was asked to participate in the study; parents of 363 infants (74%) agreed to participate. The infants were examined during routine checkups in well-baby clinics by general practitioners (GPs) trained in the use of the scale, and the infants' withdrawal symptoms were assessed with the ADBB. A score of 5 or more on the ADBB in two subsequent assessments at a 2-week interval was regarded as a sign of clinically significant infant social withdrawal. All but one of the trained GPs acquired sufficient reliability in detecting withdrawn infants from normally behaving infants: The GP who had the lowest reliability achieved a moderate kappa of .5, and all other GPs had good $\kappa$s from .7 to 1 (Altman, 1991). In this study, with a slight majority of families from a middle-class background, approximately 7% of infants were showing social withdrawal as a sign of distress in the first assessment, and 3% on both the first and second assessments did so (Puura et al., 2010).

The current study is the third in a continuum of studies with the ADBB in Finland. The aim of all three studies has been to examine the qualities and feasibility of the ADBB as a tool for screening young children at risk for developing psychopathology. Our previous studies had indicated that the ADBB might be successfully used in primary care services for detecting signs of infant distress and possibly even problems in parent–infant interaction. In the current study, we wanted to examine further how the ADBB total score would correlate with a well-validated measure for assessing dyadic parent–infant interaction, the Emotional Availability Scales, second edition (EAS 2; Biringen, Robinson, & Emde, 2000), since increased social withdrawal in infants has previously been linked with unsatisfying parent–infant interaction (Field, 1992; Murray et al., 1996a; Puura et al., 2007). In the research literature, a temperament type in infancy that involved heightened distress to novel and unfamiliar stimuli has been thought to increase the risk for behavioral problems related to anxiety and social withdrawal (Fox, 2004). The current study made it possible to compare the ADBB rating of infant social withdrawal with a maternal report of infant temperament. Our hypothesis was that maternal behavior would be correlated with infant social behavior, and that infants reported to be more fearful and easily distressed might show signs of social withdrawal and be less responsive in the interaction with their mothers.

## METHOD

The current study was conducted as a part of a larger research project studying the development of social cognition of infants (Leppänen et al., 2011). For the original study, a sample of 60 mothers with a young child (<7 months of age) was recruited from the Tampere region by using the database maintained by the Population Register Center in Finland (Väestörekisterikeskus). The exclusion criteria concerning the mothers were current use of antidepressant medication, diagnosis of mood disorder, mental retardation, visual or auditory impairment, or significant medical illness. The infants in the sample had approximately equal gender

representation. To be eligible for the study, children were required to be born full-term (i.e., 38–42 weeks' gestational age), of normal birth weight, and without history of visual or neurological abnormalities. Of the original 60 dyads, we were able to videotape 42 mothers with their full-term, healthy 7-month-old infants, and they form the sample of the current study.

Mothers filled in the Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden, & Sagovsky, 1987), and mothers' perception of their infant's temperament was measured with the Infant Behavior Questionnaire (IBQ; Rothbart, 1981). The mother–infant dyads were videotaped at their homes in a 15- to 20-min, free-play situation. The questionnaire and videotape data were obtained for 39 mother–infant dyads (65% of the original sample). Those three dyads who had only videotaped data were excluded from this analysis.

For the current study, the first two authors (K.P. and M.M.) rated infants' social behavior from the videotapes, using the ADBB (Guedeney & Fermanian, 2001) and the EAS 2 (Biringen, Robinson, & Emde, 2000) so that for each tape, one author did the EAS 2 rating and the other the ADBB rating on separate occasions, and without disclosing any information of their ratings to the other. Both researchers are experienced child psychiatrists and have been working with infants for more than 10 years. Both have been trained in the use of both methods. Both had separately rated 20 videotapes from a sample of the EEPP study for calculating interrater reliability for the EAS 2 and another 10 videotapes from the current sample for calculating interreliability for the ADBB. For the EAS 2, ratings within 1 point of the same clinical significance (e.g., 7 and 6 for good-enough sensitivity) were considered to be in the same class, and the interrater reliability was $\alpha = 0.9$ for all child and mother variables. The interrater reliability for an ADBB total score of less than 5 (*no social withdrawal*) or 5 or more (*social withdrawal*) had a $\kappa$ of 0.78.

### ADBB

The ADBB (Guedeney & Fermanian, 2001) was designed to be a part of a medical examination in a well-baby clinic. It consists of eight items concerning the behavior and features of the baby (facial expression, eye contact, vocalization, overall level of activity, self-stimulating behavior, briskness of response to stimulation, attraction towards the infant, and relationship between the infant and the observer), which the observer rates on a scale ranging from 0 to 4; for each item, a score of 0 represents the best functioning or normality of the infant, and a score of 4 severe abnormality. A sum score of 5 or more is thought to be deviant and a sign of distress in the infant (Guedeney & Fermanian, 2001; Puura et al., 2007). The rating is done immediately after observation in a live situation or on videotape. Initially, it was recommended that infants scoring 5 or more should be re-rated within 2 weeks to ascertain whether the observed infant social withdrawal behavior would be sustained, but studies with one-time measurement also have been published (see Guedeney et al., 2013).

### EAS 2

The EAS 2 (Biringen et al., 2000) is an observational method to assess the quality of the relationship between a parent and a child. The EAS 2 is a dyadic measure, meaning that parental behavior cannot be assessed independently of child behavior, and vice versa. It is a global assessment of emotional openness and emotional communication between parent and child. The EAS 2 assesses both parental and child behavior, describing three parental scales (Sensitivity, Structuring, and Hostility) and two child scales (Involvement of the Parent and Child Responsiveness). The parental sensitivity is rated on a scale of 1 to 10: A score of 10 describes oversensitive behavior, 9 is an optimal rating of parental sensitivity, 8 indicates little less than optimal parental sensitivity, 7 and 6 represent good-enough sensitivity, and scores of 5 or less denote increasing parental insensitivity. Parental Structuring is rated on a scale of 1 to 9: A score of 9 indicates highly overstructuring and intrusive parental behavior, and scores of 8, 7, and 6 indicate overstructuring and intrusive behavior above the optimal level. In this scale, a score of 5 represents the optimal level of structuring with no intrusive parental behavior, and scores of 4, 3, 2, and 1 indicate increasing lack of structuring. Both child variables are rated from 1 to 9. In the child scales, ratings of 9 and 8 describe overinvolving or overresponsive behavior, 7 denotes optimal child behavior, 6 and 5 indicate good-enough child behavior, and scores 5 or less represent increasingly underinvolving or underresponsive child behavior. In this study, we did not use the scale of Maternal Hostility.

Since the scales of the EAS 2 are not ordinal, their statistical analyses can be complicated. In the current study, none of the mothers scored above the optimal in sensitivity, and none of the children scored above the optimal in child involvement of the parent or in child responsiveness; thus, we were able to analyze those scales as ordinal. In the Parental Structuring scale, none of the mothers received the highest score of 9, but there were several mothers scoring above the optimal rating of 5. To make the statistical analyses of the Parental Structuring scale easier in the current study, the scale for structuring was recoded to an ordinal scale, with scores of 6, 7, and 8 recoded to 4, 3, and 2, respectively.

### EPDS

The EPDS (Cox et al., 1987) is a self-report questionnaire originally designed for screening depression among women during the postpartum period, but it also has been found to have satisfactory validity among nonpostnatal women (Cox, Chapman, Murray, & Jones, 1996). In the EPDS, the mothers are asked to choose from the options those that best describe their feelings during the previous 7 days. The scale consists of 10 items scored on a four-step scale from 0 (no symptom) to 3 (definite symptom), the maximum score of 30 indicating a high level of depressive symptoms. Scores below 13 are considered to be normal while a score of 13 or more is reported to indicate possible depression. The EPDS contains, besides questions concerning the presence of negative affect, items

for positive affect (e.g., being able to laugh and see the funny side of things, looking forward with enjoyment to things).

### *IBQ*

The IBQ (Rothbart, 1981) is a parental report meant to assess temperamental characteristics of 3- to 12-month-old infants, with 90 items scored from 0 (does not apply) to 7 (most definitely applies) and describing infant behavior in everyday situation like diaper change, feeding or dressing the infant. The items form six subscales: Activity Level, Smiling and Laughter, Distress and Latency to Approach Novel Stimuli (Fearfulness), Distress to Limitations, Soothability, and Duration of Orienting. In this study, Positive Affectivity is a calculated mean of the scores of Activity Level, Smiling and Laughter, and Soothability, and Negative Affectivity is the mean of the scores of both distress variables.

### *Statistical Methods*

Means, standard deviations, ranges, and percent distributions were used in describing the variables involved. Pairwise correlations of the continuous variables were examined by Spearman's $\rho$ because EPDS and ADBB total scores were nonnormally distributed. The interdependence of ADBB with selected EAS 2 variables also was examined by curve fitting; linear, quadratic, cubic, logarithmic, and inverse equations were considered, and the best fitting was selected.

To see whether the background factors, adjusted for each other, would have an independent effect on the ADBB total score, all of them were inserted into a regression model. Cox regression was used instead of linear regression because of the nonnormality of the ADBB total score.

### RESULTS

### *Sample Description*

Mean, standard deviation, and range of main background variables and measures used are given in Table 1. Of the 7-month-old infants who were assessed, 19 (48%) were females, and 5 infants (12%) were breastfed for less than 1 month, 6 infants (15%) between 1 and 3 months, and the rest over 3 months. The question concerning maternal education level was missing from 22 mothers (56%). From those who responded, 6% had primary-school education, 29% secondary-level education, 41% college, and 24% university-level education. In the EPDS, only 2 mothers (5%) had a score of 13 or more, indicating possible depression. The mean of Positive Affectivity in this sample was higher than that of Negative Affectivity, indicating that the mothers reported more positive infant behavior than negative. Of the infants, 8 (20%) scored at or above the cutoff point of 5 on the ADBB, indicating infant social withdrawal. As can be seen from the range of the EAS 2 scores, the mothers were not very low in sensitivity, although 5 (12%) of them had a score of 5, indicating some problems. For maternal structuring the range was wider, with 10 mothers (26%) having a

**TABLE 1.** *Mean,* SD, *and Range of Main Background Variables and Measures Used Among Finnish Full-Term, Healthy, 7-Month-Old Infants and Their Mothers (*n = 39*)*

|  | *M* | *SD* | Range |
|---|---|---|---|
| Age, Mother (years) | 30.2 | 5.1 | 20.0–44.0 |
| Age, Infant (days) | 215.2 | 3.7 | 206.9–221.9 |
| Breastfeeding (days) | 80.7 | 30.3 | 0–100 |
| EPDS Total Score | 3.6 | 3.7 | 0–16 |
| IBQ |  |  |  |
|   Positive Affect | 4.3 | 0.7 | 2.9–5.8 |
|   Negative Affect | 2.9 | 0.7 | 1.0–4.3 |
| ADBB Total Score | 2.46 | 2.5 | 0–11 |
| EAS 2 |  |  |  |
|   Maternal Sensitivity | 6.8 | 1.1 | 5–9 |
|   Maternal Structuring | 4.7 | 0.8 | 3–6 |
|   Child Involvement | 5.0 | 1.1 | 3–7 |
|   Child Responsiveness | 5.3 | 1.2 | 3–7 |

EPDS = Edinburgh Postnatal Depression Scale; IBQ = Infant Behavior Questionnaire; ADBB = Alarm Distress Baby Scale; EAS 2 = Emotional Availability Scales, (2nd ed.).

score of 3 or 4, indicating problems. Infant scores of involvement and responsiveness in the EAS 2 also were wider, with 10 infants (26%) scoring 3 or 4 on child involvement, and 9 infants (23%) scoring 3 or 4 on child responsiveness. As expected, a majority of the dyads scored in the normal range for all measures.

### *Correlations Between the ADBB Total Score, Other Measures, and Background Factors*

We used the total score of the ADBB to see how it would correlate with maternal reports on infant behavior, with the quality of observed mother–infant interaction, maternal self-reported symptoms of depression, and other background factors (Table 2). There was a clinically insignificant correlation between the ADBB total score and maternal reports on the Negative or Positive Affectivity on the IBQ. A negative correlation was observed with the ADBB total score and the EAS 2 scores of observed maternal sensitivity ($r = -0.75$), infant involvement ($r = -0.82$), and infant responsiveness ($r = -0.85$), indicating that increased social withdrawal was clinically meaningfully correlated with poorer quality of interaction. Clinically insignificant correlation was observed between EAS 2 scores of observed maternal structuring and the ADBB total score.

Moderate clinically significant positive correlation was observed between the ADBB total score and maternal depressive symptoms ($r = 0.34$) (Table 2), but no clinically significant correlation was observed between the ADBB total score and maternal age, infant age, infant birth weight, or length of breastfeeding.

There was a clinically significant positive correlation between IBQ Negative Affectivity and maternal depressive symptoms on the EPDS ($r = 0.39$). Within the EAS 2 variables, clinically meaningful and expected positive correlation between maternal sensitivity and child responsivity ($r = 0.81$) was observed, and between maternal

**TABLE 2.** *Correlations Between the ADBB Total Score, Maternal Depressive Symptoms in the EPDS, Observed Maternal Sensitivity and Structuring and Child Involvement and Responsivity in the EAS 2, and Maternal Report on Infant Positive and Negative Affectivity in the IBQ Among Finnish Full-term, Healthy, 7-Month-Old Infants and Their Mothers (*n = 36–39)

| | EPDS | IBQ | | EAS 2 | | | |
|---|---|---|---|---|---|---|---|
| | Total Score | Positive Affect | Negative Affect | Maternal Sensitivity | Maternal Structuring | Child Involvement | Child Responsiveness |
| ADBB Total Score | 0.34 | 0.05 | −0.16 | −0.75 | −0.25 | −0.82 | −0.85 |
| EPDS Total Score | | −0.16 | 0.39 | −0.20 | −0.22 | −0.25 | −0.13 |
| IBQ | | | | | | | |
|   Positive Affect | | | −0.27 | −0.04 | −0.22 | −0.04 | 0.01 |
|   Negative Affect | | | | 0.09 | 0.10 | 0.01 | 0.14 |
| EAS 2 | | | | | | | |
|   Maternal Sensitivity | | | | | 0.30 | 0.67 | 0.81 |
|   Maternal Structuring | | | | | | 0.58 | 0.42 |
|   Child Involvement | | | | | | | 0.89 |

ADBB = Alarm Distress Baby Scale; EPDS = Edinburgh Postnatal Depression Scale; IBQ = Infant Behavior Questionnaire; EAS 2 = Emotional Avalability Scales (2nd ed.).

sensitivity and child involvement ($r = 0.67$). As expected, maternal structuring was positively correlated with child involvement ($r = 0.58$) and with child responsivity ($r = 0.42$). (Table 2).

The correlation between maternal sensitivity and the ADBB total score is illustrated in Figure 1, where the ADBB total score is seen to start rising once maternal sensitivity is less than a score of 7, representing the rating of a sensitive-enough parent. The highest rating of 11 in the ADBB is seen when maternal sensitivity is 5, which in the EAS 2 means clear, albeit not serious, problems in parent–infant interaction. All mothers with 7 or more in sensitivity had infants with low scores on the ADBB. Figure 2a and 2b illustrate the correlations between the ADBB total score and EAS 2 child involvement and child responsiveness. The ADBB total score starts to rise once infant involvement gets less than optimal with scores of 6 or lower, and the same is seen in Figure 2b for infant responsiveness, but the association is not as clear-cut as with maternal sensitivity. There are some infants who are in the less optimal area of child involvement or child responsiveness, but score low in the ADBB, and some infants who score high on the ADBB, but have been assessed to be in the good-enough area on the EAS 2 child involvement and child responsiveness.

Cox regression showed that infants' gender, age, birth weight, and length of breastfeeding, and maternal age did not have any statistically significant effect on the ADBB total score.

## DISCUSSION

In this study, we used the ADBB to assess 7-month-old infants in videotaped interaction with their mothers, and then compared the ratings of observed infant social behavior with variables of mother–infant interaction rated with a measure developed for older infants and children (EAS 2) and with maternal reports of infant temperament. We also examined whether maternal depressive symptoms and background factors such as maternal age, infant age, birth weight, or length of breastfeeding would have independent effects on the ADBB total score.

The ADBB total score had a strong negative correlation with maternal sensitivity on the EAS 2. This was an expected finding because low maternal sensitivity is one of the factors most strongly associated with pathological infant development, as has been found in numerous studies on depressed mothers (e.g., Field, 1992; Murray et al., 1996a; Murray et al., 1996b; Tamminen, 1990), and the ADBB was designed to measure signs of infant distress. In the current study, the ADBB total score also seemed to be quite sensitive for less optimal scores of maternal sensitivity, as seen in Figure 1. That the ADBB might be sensitive in detecting parent–infant dyads with interaction problems even though the parents have not mentioned any or before they have become aware of the problems also has been suggested by Matthey, Guedeney, Starakis, and Barnett (2005). Against our expectations, the ADBB total score had no clinically significant correlation with maternal structuring, even though in our previous study (Puura et al., 2007) infants judged as withdrawn had less engaging and more intrusive mothers and mothers with less warm affect. In this sample, none of the mothers scored very high on structuring or intrusiveness, which may explain our result.

The ADBB total score had a negative correlation with the EAS 2 child variables, indicating that infants with more signs of social withdrawal were less responsive and involving in the interaction. In the EAS 2, child involvement is meant to assess the degree to which the child attends to and engages parent with visual, physical, or verbal bids (Biringen et al., 2000). Signs of infant social withdrawal measured by the ADBB include decrease in infant-initiated and responsive social behavior such as actively engaging the other in gaze contact and active vocalization, and even in head and torso movements needed in orienting toward the parent in interaction (Guedeney & Fermanian, 2001). Thus, it is understandable that the EAS 2 child variables would be correlated with the ADBB total score, measuring partly the same aspects of infant behavior. Even though the association between the EAS 2 child scores and the ADBB total score was clear, there were some infants who were not rated as socially withdrawn but rated less than optimal in child
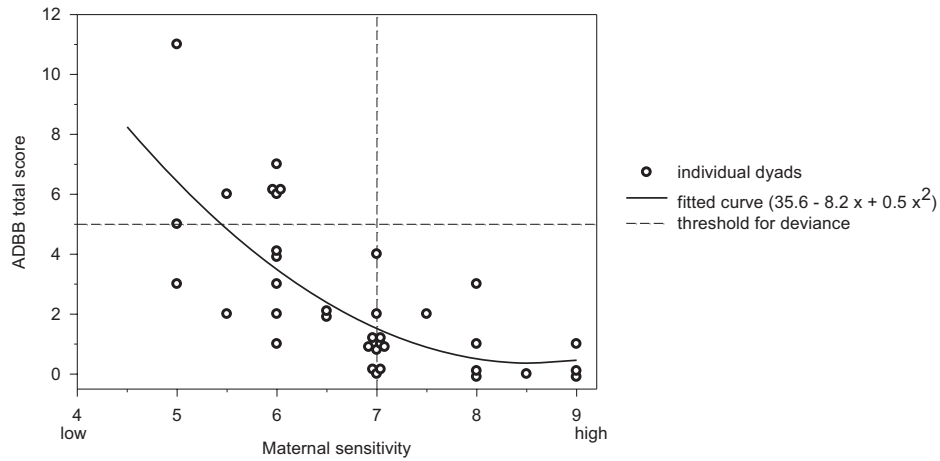
FIGURE 1.    Correlation between maternal sensitivity on the Emotional Availability Scales (2nd ed.) and the Alarm Distress Baby Scale total score among Finnish full-term, healthy, 7-month-old infants and their mothers ($n = 39$).
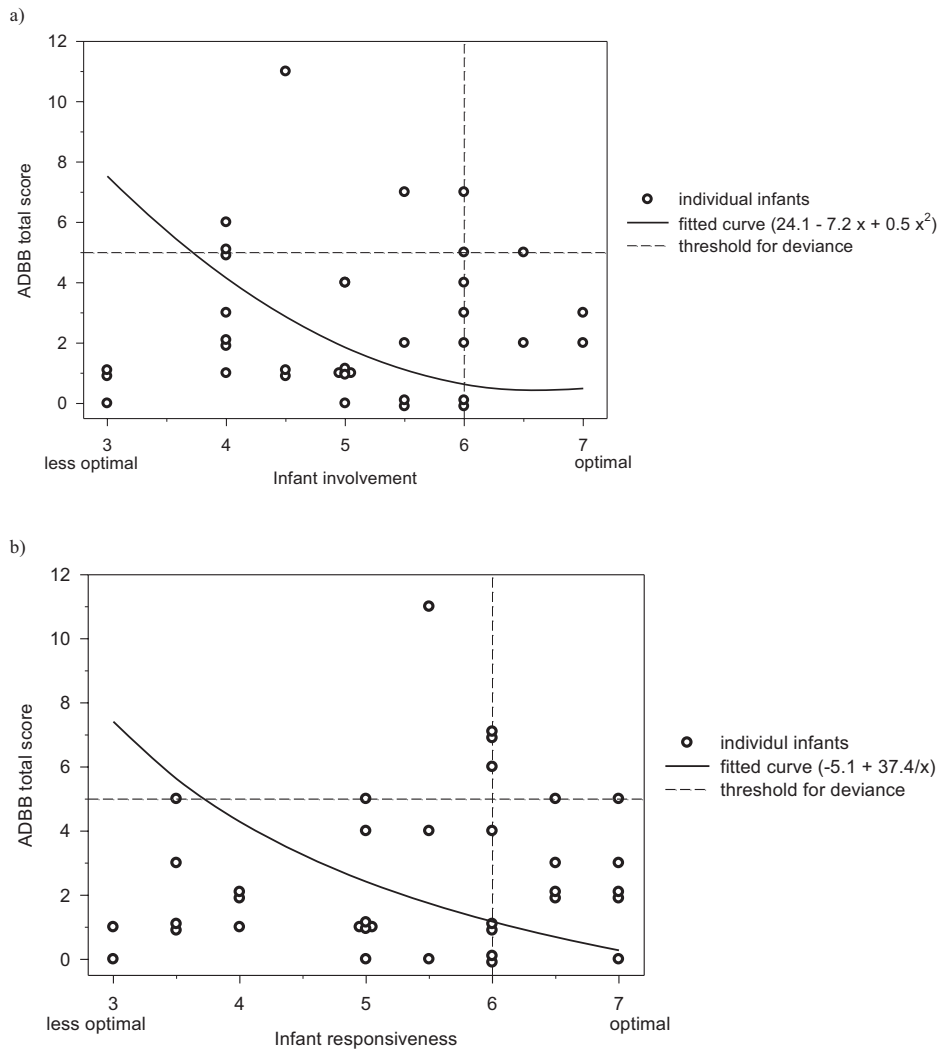


FIGURE 2.    Correlation between infant involvement (a) and infant responsiveness (b) on the Emotional Availability Scales (2nd ed.) and the Alarm Distress Baby Scale total score among Finnish full-term, healthy, 7-month-old infants and their mothers ($n = 39$).

involvement and child responsiveness, and some infants were rated as socially withdrawn, but still moderately responsive and involved in interaction. This discrepancy may stem from the EAS 2 being a dyadic observation method while the ADBB focuses only on infant behavior. Thus, for some infants, being observed with a less optimal parent may have lowered their ratings of involvement or responsiveness in the dyad whereas in the ADBB, all their activity would count for a more positive score, even if it is not a response or bid to the parent. On the other hand, a sensitive and well-structuring mother may succeed in getting the infant to respond to her or even make occasional bids, thus "helping" the infant get a higher EAS 2 score, whereas in the ADBB when the observer looks only at the infant, there also may be signs of withdrawal.

Against our initial hypothesis, no clinically meaningful correlation was found between the ADBB total score and maternal reports of infant negative or positive affectivity, although the latter was positively and clinically significantly correlated with maternal self-reports of symptoms of depression. The IBQ is a caretaker-report of the assessment of infant temperament based on questions on the infant's behavior in various everyday situations (Rothbart, 1981). According to Rothbart and Derryberry (1981), temperament is defined as constitutionally based individual differences in reactivity and self-regulation, with constitutional referring to the relatively enduring biological makeup of the individual, influenced by heredity, maturation, and experience. Normal infant behavior such as engaging in gaze contact and vocalizing is mostly independent on temperament, and regardless of the type of infant temperament, distressed infants will show signs of social withdrawal (Fox, 2004). However, an actively protesting child with lots of display of negative emotion may be rated high on negative affectivity by the caregiver, but not necessarily be assessed as withdrawn by an observer. A passive, silent child without any major negative affective outbursts may not score high on parental report on negative affect but will appear withdrawn in observation. Another possible reason for not finding a correlation between the ADBB and the IBQ is informant bias. Parents with depressive symptoms or depression have been found to rate their children as having more problems, as compared to nondepressed parents (Hayl et al., 1999; Kroes, Veerman, & De Bruyn, 2003; Youngstrom, Izard, & Ackerman, 1999). In our study, some of the parents may have reported the behavior of their infants as more negative than what the observers saw on videotape.

### Limitations

Limitations of the study include the sample size, with only 65% of the original 60 mother–infant dyads with both the observation and questionnaire data available. The mothers were volunteers reached through the population register, but the sample cannot be said to represent Finnish mothers and their 7-months-old children in general, particularly since demographic data were available from only 17 mothers. The scores of mothers and infants on the observation measures indicate that most of the dyads in the sample were doing well, but the sample had more infants rated as withdrawn than in

the normal population (Puura et al., 2010). However, in this study, the main objective was to examine how findings from a relatively simple infant observation method designed for screening infant social withdrawal would compare with a widely used, more detailed observation measure of both parent and infant variables in paren–child interaction. The current sample suits that purpose, as it does have dyads of both good-enough and less optimal interaction. A small sample size can make results somewhat vulnerable to bias caused by outliers, subjects scoring very different from others. In our sample, the values given to participants had no exceptional outliers, indicating less risk for bias. Because the sample was obtained from a larger study with a different aim and it was relatively small, the possible effect of any of the background factors was analyzed only for possible direct effect on the ADBB total score. In this sample, no such effects were found, but it does not rule out the possibility that in another study with a different and larger sample, such effects might be found.

Another source of possible bias is analyzing the same videotape with two different observation methods. To minimize this bias, the researchers separately watched the tapes and were blind to any other information on the dyads so that one researcher did the ADBB rating and the other the EAS 2 ratings. Both researchers rated their shares of ADBB and EAS 2 ratings, but it was not possible to divide the EAS 2 rating so that the parental and child scales would have been rated by different researchers. The method can be used with one rater rating both parent and infant variables (Biringen et al., 2000), but it may have increased the probability of also-unexpected observed interscale correlations in our study. Another cause for unexpected interscale correlations may be due to sample characteristics since the majority of the dyads scored within the normal range on all the EA 2 scales. The interrater reliability for the EAS 2 ratings was calculated from a different sample, which may have increased the possibility for rater bias. In addition, calculating the interrater reliability only for no social withdrawal or social withdrawal on the total score of the ADBB may have allowed for discrepancies in the ratings of the two researchers. However, for a screening tool, the ability to distinguish between normal and deviant ratings is of great importance, and the interrater reliability of the researchers in this aspect was thought to be sufficient and relevant for the study. Both researchers also were experienced in clinical infant observation and, through previous research projects, were trained to use and experienced with both the ADBB and the EAS 2.

### CONCLUSION

Our results seem to support the feasibility of the ADBB as a screening tool for assessing infant distress and early signs of pathology in infant social behavior and in parent–infant interaction. While parental reports are essential in screening and assessing children, *it is important to* note the possible informant bias and also include observational measures as part of the assessment procedure, both in clinical practice and in research. Our results also indicate that it may be important to have a measure for assessing signs

of pathological behavior of the infant, as methods for assessing dyadic interaction may not detect the more subtle signs of infant social withdrawal. Since many of the interaction observation methods are too time-consuming for use in clinical practice and since obtaining and maintaining reliability in their use may be difficult, the ADBB could be an easier and fairly reliable tool for detecting signs of distress in the infant. The strong association between maternal sensitivity and ADBB total score suggests that the ADBB also could be used as a screening tool for detecting problems in parental sensitivity.

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# IMPACT OF A RANDOMIZED HOME-VISITING TRIAL ON INFANT SOCIAL WITHDRAWAL IN THE CAPEDP PREVENTION STUDY

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ABSTRACT: The goal of this study was to measure the effects of a home-based, preventive intervention on children's sustained social withdrawal behavior at 18 months of age. The Compétences parentales et Attachement dans la Petite Enfance: Diminution des risques liés aux troubles de santé mentale et Promotion de la résilience (CAPEDP) (Parental Skills and Attachment in Early Childhood: Reducing Mental Health Risks and Promoting Resilience) study gathered a sample of vulnerable women, replicating (Olds, 2006) Elmira study, but with a more psychologically oriented frame of work. The eight-item Alarm Distress Baby Scale (ADBB; Guedeney & Fermanian, 2001) was used to assess social withdrawal behavior of the child at 18 months, and results were converted into the recent and simpler five-item Modified ADBB (m-ADBB) as well. Results show that the early implementation of a prevention program by specially trained and supervised psychologists might be effective in reducing social withdrawal behavior in 18-month-old infants. Mothers with fewer mood symptoms at recruitment seem to have profited more from the intervention, as their children had lower than expected levels of social withdrawal at 18 months. Because of its simplified coding and scoring scheme, as compared to the original ADBB, the m-ADBB might

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be an instrument that is more user-friendly given the time and resource restrictions that front line mental health and health workers face in their efforts to screen for effects of maternal postnatal depression.

Abstracts translated in Spanish, French, German, and Japanese can be found on the abstract page of each article on Wiley Online Library at http://wileyonlinelibrary.com/journal/imhj.

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Withdrawal can be a normal feature of infant behavior in parent–infant interactions, and a way for the infant to regulate the flow of interaction. However, increased or sustained withdrawal reactions in infants can be observed in inadequate parent–infant interactions such as between a depressed mother and her child. Sustained social withdrawal behavior has been linked with several conditions that negatively affect mother–child relationships and mother–child synchrony (Guedeney, 2013). Withdrawn social behavior, manifested by a lack of either positive (e.g., smiling, eye contact) or negative (e.g., vocal protestations) behavior, should draw the clinician's attention to the possibility that the infant is not displaying age-appropriate emotional/social behavior. Withdrawal from social interaction is a sign of infant distress regardless of its cause and can reflect not only the problems of these infants but also those of their caregivers (Mäntymaa, Puura, Kaukonen, Salmelin, & Tamminen, 2008).

Perinatal depression is a frequently observed condition, as 10 to 15% of mothers present significant postnatal depression (PND) in the months after giving birth (Gavin et al., 2005), and prevalence is even higher in women with a previous history of depression or with psychosocial risk factors such as low income or social isolation (Centers for Disease Control, 2008). The impact of perinatal depression on infant mental health has become a major concern for home-visiting interventions, which often include it as a specific target along with other mediating factors of child mental health.

Perinatal home-visiting programs designed for vulnerable families have developed significantly since the late 1970s, initially in North America and later in Europe. One of the best known and most assessed programs is that of David Olds, implemented in the United States: the Nurse–Family Partnership program (NFP; Olds, 2006; Olds, Kitzman, Cole, & Robinson, 1997) targeting primiparous women under the age of 19 years and with various psychosocial risk factors. Positive results were observed on outcome measures such as better use of contraception, greater interval between pregnancies, less attendance in emergency rooms for infants and toddlers, and less externalized behavioral symptoms in infants under the age of 2 years. However, few prevention programs have demonstrated convincing results with regard to preventing PND (Dugravier et al., 2013). Only intensive interventions targeting high-risk women, beginning from pregnancy and continuing through the postpartum period, seem to have some effect (Chabrol et al., 2002; Zlotnick, Johnson, Miller, Pearlstein, & Howard, 2001).

In France, a national mother–child support and prevention network known as the *Protection Maternelle et Infantile* (Infant and Mother Protective Services, or PMI) has been implemented since 1945. Mothers have access to PMI centers free of charge at any moment during pregnancy and up to the child's third birthday. Home-visiting by a nurse is proposed for vulnerable families, although the vulnerability criteria in question are not well-documented. In Paris, PMI home visits to vulnerable families are limited to a single visit for 60% of such families (Ikounga N'Goma & Brodin, 2001); few families receive more than three home visits. Moreover, nurses do not receive specific training in mental health issues for mothers and children, and have little organized psychological supervision (DASES 75, 2003). Widely used, even by middle-class families, to date this system has yet to be evaluated with regard to cost–benefit issues.

The Compétences parentales et Attachement dans la Petite Enfance: Diminution des risques liés aux troubles de santé mentale et Promotion de la résilience (CAPEDP) (Parental Skills and Attachment in Early Childhood: Reducing Mental Health Risks and Promoting Resilience) study is the first randomized, controlled trial assessing an evidence-based, home-visiting, infant mental health promotion program carried out in France (Tubach et al., 2012). Enrolled mothers were young (<26 years of age) and primiparous, had sufficient fluency in French to be able to understand the informed consent procedure, and had at least one of three additional risk criteria concerning their future child's mental health: planning to raise the child alone, low socioeconomic status (defined as receiving welfare benefits, or being close to the poverty threshold, i.e., with an income of ≤800 euros per month), and having less than 12 years of schooling.

The intervention was conducted by a team of supervised psychologists with specific training on working alliance skills, early child development, attachment issues, and health promotion and prevention during pregnancy. The members of the intervention team participated in recruiting mothers in 10 public hospital maternity wards. All intervention team members were blinded to the results of the assessments. Four additional psychologists, with the same profile, made up the assessment team.

The intervention was manualized and tailored to each family's needs. It consisted of home visits during pregnancy and up to the child's second birthday, with decreasing frequency of visits over time: six visits during the antenatal period, eight in the first 3 months' postpartum, 15 between the 4th and 12th months' postpartum, and another 15 during the child's second year of life, resulting in a total of 44 home visits per family. The frequency of home visits was adjusted to each family's needs. Between visits, telephone calls to the CAPEDP team could be made as often as necessary. Furthermore, all families, whether they were in the intervention group or in the control group, could access usual care:

For example, mothers in the control group who were found to have high levels of depression were systematically referred to adult psychiatric services.

The program had three primary objectives: improving child mental health at the age of 2 years and, regarding two potential mediating variables, reducing PND at 3 months' postpartum and optimizing the quality of the home environment when the child was 12 months old. The present article focuses on one of the secondary goals of the CAPEDP project: to measure the impact of the intervention on children's sustained social withdrawal behavior at 18 months of age.

## METHOD

### Recruitment

Ten maternity wards participated in recruitment for the study, with families living in the Northern Paris and in the surrounding suburbs. Women were recruited before the third trimester of pregnancy by the members of the future home-visiting team. After completing baseline screening and informed consent procedures, participants were randomly and alternatively assigned to either the CAPEDP intervention or the usual care group using a computer-generated randomization sequence, stratified by recruitment center, with random block sizes of 2, 4, or 6 participants. Investigators, psychologists performing the CAPEDP intervention, and participants were blinded to assignment before, but not after, randomization, as per the open-label design. However, in accordance with a prospective randomized open blinded endpoint study methodology, outcome assessors were blinded to assignment, and no investigators, psychologists, or participants had any knowledge of aggregate outcomes at any point during the course of the study. Families in the control group received usual care and assessment visits at their homes across the trial period. The intervention group, in addition to usual care and assessment visits, received the CAPEDP home-visiting program.

### Measures

A team of trained and supervised psychologists conducted independent assessments of the children in both groups during specific home visits from Month 7 of pregnancy to the children's second birthday. Psychologists who assessed the families were not involved in any aspect of care and had no knowledge of whether the family had been assigned to the intervention group or the control group. For each family, six home-based assessment visits were scheduled across the trial period: at Week 27 of pregnancy, and then when the child was 3, 6, 12, 18, and 24 months old. Figure 1 presents the flowchart of the study.

*Full ADBB Scale.* The Alarm Distress Baby Scale (ADBB; Guedeney & Fermanian, 2001) consists of eight items and aims to assess prolonged reactions of social withdrawal in infants. The ADBB has demonstrated good psychometric properties as well as transcultural validity (Guedeney, 2013). Clinical validity and pre-

dictive validity have been shown to be adequate in several studies with large samples at different ages (age range: 2–24 months; Facuri-Lopes, Ricas, & Cotta Mancini, 2008; Guedeney, Foucault, Bougen, Larroque, & Mentré, 2008; Guedeney, Marchand-Martin, Cote, Larroque, & the EDEN Mother-Child Cohort Study Group, 2012).

The ADBB was created to facilitate assessment of social withdrawal in children between 2 and 24 months of age, in the context of routine pediatric examinations or during specific psychological assessments. To enable the observation of the child's behavioral reactions, the clinician engages the child in social interactions through talking, touching, and smiling. The eight items are facial expression, eye contact, general level of activity, self-stimulation gestures, vocalizations, rapidity of response to stimulation, relationship with the observer, and attractiveness to the observer. Each item is rated on a scale of 0 (*no unusual behavior*) to 4 (*very unusual behavior*), resulting in 0 as the minimum and 32 as the maximum ADBB total score; the higher the ADBB score, the greater the signs of social withdrawal shown by the infant. A cutoff point of 5 resulted in optimal sensitivity (0.82) and specificity (0.78) to detect infants at risk (Guedeney & Fermanian, 2001). The eight-item ADBB was used for assessing the effects of the CAPEDP intervention at 18 months' postpartum.

*The Modified ADBB.* Matthey, Črnčec, Hales, and Guedeney (2013) developed a short version of the ADBB, the Modified ADBB (m-ADBB) to be used as a screening tool in Australia. This version has yet to be validated. The m-ADBB includes only five areas of child behavior: (a) facial expression, (b) eye contact, (c) vocalization, (d) activity level, and (e) relationship with the observer. Scoring distinguishes three global levels—"Satisfactory," "Possible problem," or "Definite problem"—for each area. Matthey et al., 2013, are currently conducting studies on training and interrater reliability of the m-ADBB. One Definite problem or two Possible problems on the m-ADBB indicates that further assessment of the infant is needed—ideally conducting a second evaluation over the following weeks—to determine whether the infant's signs of withdrawal were transient or enduring. Matthey et al. found that many infants showing withdrawal signs on an initial assessment were no longer showing these signs just a few weeks later or did not show these signs with their mother. This is in accordance with findings by Puura et al. (2010) in their retesting of infants by the same health professional. A simple algorithm was used to derive total m-ADBB scores from total ADBB scores: For each of the five m-ADBB items, ADBB scores of 0 were scored as 0 on m-ADBB; ADBB scores of 1 would result in a 1 on the m-ADBB same item, and ADBB scores of 2, 3, and 4 were equivalent to m-ADBB 2. Items 6 and 8 in the full ADBB are not taken into account when calculating m-ADBB total scores. Figure 2 summarizes the correspondence between the items of the ADBB and the m-ADBB.

*Training the assessment team to use the ADBB.* All members of the assessment team were trained in the theory and use of the ADBB
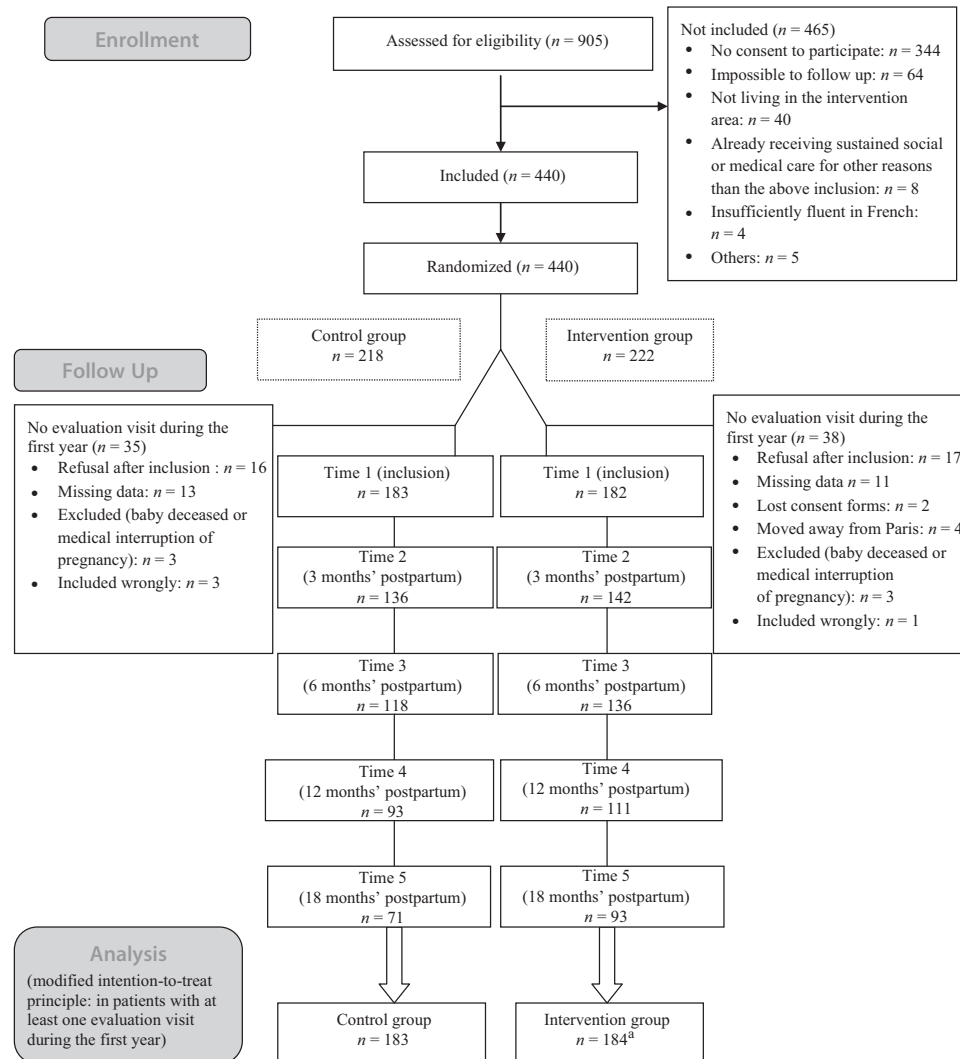
FIGURE 1.    Study flowchart.

by the first author (A.G.), and then independently scored 15 video clips of children around18 months of age (the age group they were then to assess in the CAPEDP study). Training was continued until each member of the assessment team had reached reliability (i.e., was scoring with a $\kappa$ coefficient >0.7 compared with reference scores on a set of five new clips, and made no repeated over- or underrating on any of the items). Assessment took place at home during free play, diaper changes, or a feeding situation. Assessment team members completed the ADBB immediately after the home observation and assessment session. The ADBB scores were then rescored into m-ADBB scores. A cutoff score of $\geq 5$ was used with the ADBB, and a cutoff score of 2 was used for the m-ADBB.

*Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden, & Sagovsky, 1987).* The level of depressive symptoms was measured using the EPDS, a 10-item self-administered questionnaire specifi-

cally developed for use during the postnatal period. The EPDS also has been validated and is conventionally used for assessing prenatal depression. The questions focus on the psychological rather than the somatic aspects of depression. Mothers respond to items on a Likert scale of 0 to 4. Total scores range from 0 to 30; higher scores indicate higher levels of depressive symptoms. The French version of the EPDS has been validated in the French population for both postnatal (Guedeney & Fermanian, 1998) and prenatal use (Audouard, Glangeaud-Freudenthal, & Golse, 2005). Although a high EPDS score does not confirm a diagnosis of depression, per se, scores above cutoff points indicate a probable depressive disorder. A cutoff score of >10 has been found to be optimal for postnatal screening for minor and major depressive disorders in mothers evaluated by nurses in PMI centers. Concerning prenatal depression, a recent French validation study found that a cutoff score of >11 had good sensitivity (0.80) and specificity (0.80) (Audouard et al., 2005).

| ADBB | | m-ADBB |
|---|---|---|
| 1. Face expression | = | I. Face expression |
| 2. Visual contact | = | II. Visual contact |
| 3. Body activity level | → | III. Activity level |
| 4. Self; stimulation | | |
| 5. Vocalization | = | IV. Vocalization |
| 6. Reaction to stimulation | | |
| 7. Relationship | | V Relationship |
| 8. Attractivity | | |

| Each item is rated 0-4 : | Each item is rated 0-2 |
|---|---|
| 0: Normal behavior | 0: Satisfactory |
| 1: Very discreetly abnormal | 1: Possible problem |
| 2: Clearly abnormal | 2: Definite problem |
| 3: Very abnormal | |
| 4: Massive, permanent | |

FIGURE 2. From the eight-item Alarm Distress Baby Scale (ADBB) to the five-item m-ADBB.

### Statistical Analysis Procedures

Continuous variables are expressed as means and SDs and categorical variables as percentages and frequencies. Differences between arms were examined using the $\chi^2$ test for qualitative variables, or Fisher's exact test when theoretical objectives were under 5 or for comparison of means (t test or Student's), or the Wilcoxon test when variables were not normally distributed. All tests were done using an $\alpha$ threshold of 5%. The internal consistency of items of the ADBB and m-ADBB was measured using Cronbach's $\alpha$ coefficient (Cronbach, 1951).

### Participants

Of the 905 families who were eligible to participate in the study, 440 were enrolled and signed the informed consent form. Mothers were recruited by the team of psychologists who provided the at-home intervention. A total of 73 future mothers (16.6% of the initial 440) then proceeded to withdraw their consent or could not be contacted during the first year of the study. These women therefore were not included in the modified intent-to-treat population because no data were available for them apart from initial eligibility criteria.

Of the resulting 367 included families, 278 had an assessment including the EPDS, at 3 months' postpartum, and 153 had ADBB data completed when their child was 18 months old. At this time, the mean number of home visits for the children in the intervention group for whom ADBB scores were available was 24.5 (range = 0–51, SD = 9.8).

### RESULTS

### Sociodemographic Factors

The median age of the 367 mothers at inclusion was 22.3 years. Regarding inclusion-criteria risk factors, 307 (83.9%) had less than 12 years of schooling [and 61 (16.7%) had <9 years], 170 (46.8%) had sufficiently low income to be eligible for government medical aid (Couverture Medicale Universelle [universal medical coverage] or Aide Médicale d'Etat [state provided welfare]) and 99 (27.1%) declared that they were planning to bring up their child without the child's father. A complete sociodemographic description of the initial CAPEDP sample has been published elsewhere (Tubach et al., 2012). No significant differences were found between the initial sample and the remaining sample at 18 months: Of the baseline population, 118 (34.9%) mothers considered themselves to be poor; 161 (44.2%) were living alone and were single; 138 (37.9%) had not planned their current pregnancy; 149 (40.9%) had been pregnant at least once before, but their previous pregnancies had been terminated; and 190 (52.1%) were first-generation immigrants. The sample therefore presented high levels of psychosocial vulnerability.

### Prenatal Depression

The mean prenatal EPDS score was 11.1 (SD = 5.6) in the control group and 10.5 (SD = 5.6) in the intervention group, $p = .28$. At baseline, 164 (44.7%) women had a prepartum EPDS score >11.9. Table 1 presents ADBB and m-ADBB scores at 18 months' postpartum comparing children who had mothers with prenatal depression scores above and below the threshold EPDS score of 11.

### PND

At 3 months' postpartum, EPDS mean scores were 9.4 (SD = 5.4) for the control group and 8.6 (SD = 5.4) for the intervention group (crude t test: $p = .18$; t test adjusted for prenatal EPDS score: $p = .33$). At 3 months' postpartum, 69 mothers in the control group (37.7%) and 65 in the intervention group (35.3%) had a postpartum score >10, $p = .64$.

**TABLE 1.** *Alarm Distress Baby Scale (ADBB) and Modified ADBB (m-ADBB) Scores at 18 Months' Postpartum Comparing Children With Mothers With Prenatal Edinburgh Postnatal Depression Scale (EPDS) Scores >11 and ≤11*

|  |  | Total (n = 362) | EPDS>11 (n = 160) | EPDS≤11 (n = 202) | p |
|---|---|---|---|---|---|
| ADBB Score | n | 362 | 160 | 202 | (S) p = .4897 |
|  | Missing Data | 210 (58.0%) | 95 (59.4%) | 115 (56.9%) |  |
|  | Available Data | 152 | 65 | 87 |  |
|  | Minimum/Maximum | 0.0/21.0 | 0.0/18.0 | 0.0/21.0 |  |
|  | Mdn [IQR] | 2.0 [0.0–5.0] | 2.0 [0.0–5.0] | 1.0 [0.0–5.0] |  |
|  | M (SD) | 3.0 (3.9) | 3.3 (4.1) | 2.9 (3.7) |  |
| m-ADBB Score | n | 362 | 160 | 202 | (S) p = .5323 |
|  | Missing Data | 210 (58.0%) | 95 (59.4%) | 115 (56.9%) |  |
|  | Available Data | 152 | 65 | 87 |  |
|  | Minimum/Maximum | 0.0/10.0 | 0.0/9.0 | 0.0/10.0 |  |
|  | Mdn [IQR] | 1.0 [0.0–3.0] | 1.0 [0.0–3.0] | 1.0 [0.0–3.0] |  |
|  | M (SD) | 1.8 (2.3) | 2.0 (2.4) | 1.7 (2.2) |  |

IQR = interquartile range.

**TABLE 2.** *Alarm Distress Baby Scale (ADBB) and Modified ADBB Scores in the Four Subgroups: Intervention Versus Control, With Edinburgh Postnatal Depression Scale Score >11or ≤11*

|  |  | Total (n = 367) | Intervention Group/EPDS>11 (n = 76) | Intervention Group/EPDS≤11 (n = 105) | Control Group/EPDS>11 (n = 84) | Control Group/EPDS≤11 (n = 97) | p |
|---|---|---|---|---|---|---|---|
| ADBB | n | 367 | 76 | 105 | 84 | 97 | (S) p = .1041 |
|  | Missing Data | 214 (58.3%) | 38 (50.0%) | 53 (50.5%) | 57 (67.9%) | 62 (63.9%) |  |
|  | Available Data | 153 | 38 | 52 | 27 | 35 |  |
|  | Minimum/Maximum | 0.0/21.0 | 0.0/18.0 | 0.0/11.0 | 0.0/14.0 | 0.0/21.0 |  |
|  | Mdn [IQR] | 2.0 [0.0–5.0] | 2.0 [0.0–5.0] | 1.0 [0.0–3.5] | 1.0 [0.0–5.0] | 2.0 [1.0–5.0] |  |
|  | M (SD) | 3.1 (3.9) | 3.3 (3.9) | 2.0 (2.6) | 3.3 (4.5) | 4.1 (4.7) |  |
| m-ADBB | n | 367 | 76 | 105 | 84 | 97 | (KW) p = .0468 |
|  | Missing Data | 214 (58.3%) | 38 (50.0%) | 53 (50.5%) | 57 (67.9%) | 62 (63.9%) |  |
|  | Available Data | 153 | 38 | 52 | 27 | 35 |  |
|  | Minimum/Maximum | 0.0/10.0 | 0.0/9.0 | 0.0/5.0 | 0.0/8.0 | 0.0/10.0 |  |
|  | Mdn [IQR] | 1.0 [0.0–3.0] | 1.0 [0.0–3.0] | 0.0 [0.0–2.0] | 1.0 [0.0–4.0] | 2.0 [0.0–4.0] |  |
|  | M (SD) | 1.9 (2.3) | 1.9 (2.1) | 1.2 (1.7) | 2.1 (2.8) | 2.6 (2.7) |  |

IQR = interquartile range.

### Infant Withdrawal

Table 2 compares mean ADBB and m-ADBB scores in control and intervention groups for children whose mothers had prenatal EPDS scores >11 and ≤11. Table 3 describes the difference between these groups with a linear analysis, depending on depressive symptoms, and with the interaction between groups and depressive symptoms.

The mean ADBB score was 3.1 (SD = 3.9), with a median interquartile range [IQR] = 2.0 [0.0–5.0], range = 0–21. The mean m-ADBB score was 1.9 (SD = 2.3), with a median [IQR] = 1.0 [0.0–3.0], range = 0–10. No significant difference was found in the distribution of ADBB total scores between the two groups, Wilcoxon test, p = .15. The comparison of the distribution of m-ADBB scores was at the limit of statistical significance, p = .055, with higher scores in the care-as-usual group. In the subgroup of

**TABLE 3.** *Difference Between Groups (Intervention vs. Control, Prenatal Maternal Depression vs. No Depression, and Group × Depressive State) for Alarm Distress Baby Scale (ADBB) and Modified ADBB (m-ADBB) Scores*

| Variables | p |
|---|---|
| **ADBB** |  |
| Intervention Group vs. Usual Care Group | .1277 |
| With or Without Prenatal Maternal Depression | .7088 |
| Group × Prenatal Maternal Depression | .1074 |
| **m-ADBB** |  |
| Intervention Group vs. Usual Care Group | .0448 |
| With or Without Prenatal Maternal Depression | .7603 |
| Group × Prenatal Maternal Depression | .1075 |

nondepressed women at baseline (EPDS ≤ 11), ADBB total scores were significantly higher in the care-as-usual group, $p = .02$. A similar and reinforced pattern was observed using the m-ADBB, $p = .006$.

In the control group ($n = 183$), 23.8% of the infants had an ADBB total score of ≥5, as compared to 16.7% in the intervention group ($n = 184$), $p = .27$.

Using the m-ADBB, 34.9% of the infants had an m-ADBB total score >2 in the control group, as compared to 28.9% in the intervention group, $p = .43$.

The Cronbach $\alpha$ coefficient (Cronbach, 1951) was similar for both scales: 0.81 for the m-ADBB and 0.83 for the ADBB.

## DISCUSSION

The difference between the two groups in social withdrawal behavior at 18 months was not statistically significant when assessed using the full ADBB, but there was a trend to significance when using the m-ADBB. The absence of the self-stimulation gesture item in the shorter scale may reduce variability in the scoring of the scale. The Cronbach's $\alpha$ coefficient (Cronbach, 1951) remains high for the shorter five-item version of the scale. Thus, the CAPEDP intervention did not show any efficacy in preventing social withdrawal behavior in 18-month-old infants from very vulnerable, multirisk families. However, this home-based intervention conducted by psychologists does seem to have had a significant effect in the subgroup of infants whose mothers were not depressed prenatally. These findings are in line with the results of the CAPEDP intervention on PND (Dugravier et al., 2013), with a clear effect on the less vulnerable women within this high-risk group. Moreover, there is a large array of literature on the negative effects of PND on the unfolding of intervention programs (attrition, frequency of visiting) and on their efficacy (Ammerman, Putnam, Bosse, Teeters, & Van Ginkel, 2010).

The level of withdrawal behavior at 18 months in the care-as-usual group is relatively high (23.8%), as compared to the 13% rate found in the Paris cross-sectional study with infants aged 14 to 18 months (Guedeney, Foucault, Bougen, Larroque, & Mentré, 2006), but is in line with the higher level psychosocial risk of the current sample.

### Limitations

In the present study, attrition at 3 months' postpartum, 6 months into the program, was high (36.8%). No individual risk factor, including prenatal depression, and no socioeconomic factor were associated with dropout. However, the fact that future mothers who presented a greater number of risk factors for later infant mental health problems were significantly more likely to drop out of the program, with comparable dropout rates in the control and the intervention groups, cannot be neglected.

The significance of the results is limited by these high rates of missing data. However, high dropout rates are frequently encountered in such samples (Von Klitzing, Doyle, Saïas, Greacen,

Sierau et al., 2011). Attrition is common in long-term prevention programs in general, and this remains true for home-visiting programs. In the Healthy Families New York Home Visiting Program (HFNY), 1 year after baseline, 50% of the mothers who were assigned to the intervention group had dropped out of the program. At the children's second birthday, only 1 in 3 HFNY participants remained in the program (DuMont et al., 2008). Similar results were found in the Healthy Start Program in Hawaii (Ammerman et al., 2010).

Further limitations of the present study include the fact that social withdrawal in the child was assessed at 18 months, during a home visit, but without using a standardized setting. Furthermore, sustained withdrawal behavior was assessed only at one time point. Earlier and repeated measures (e.g., at 6, 9, and 12 months) would have been ideal, as new onset of maternal depression is frequent during the initial months of postpartum. Two assessments at 6 and 9 months, or at 9 and 12 months, would have yielded a more reliable assessment of withdrawal behavior. In addition, the m-ADBB scores were deducted from the full ADBB and not obtained through direct observation. The cutoff score of 2 or more for the m-ADBB was empirical and has not been validated in the French context. Finally, with regard to maternal depression, assessment relied on parental report, not on a psychiatric diagnostic interview.

## CONCLUSION

These results show that the early implementation of a prevention program by specifically trained and supervised psychologists may well be effective in reducing social withdrawal behavior in 18-month-old infants. This finding is significant because social withdrawal behavior has been shown to be linked with language and communication delays in later childhood (Guedeney et al., 2012; Milne, Greenway, Guedeney, & Larroque, 2009) and may be an important mediating factor in maladaptive developmental pathways (Costa & Figuereido, 2012). Mothers with fewer mood symptoms at recruitment seem to have profited most from the CAPEDP intervention, with their children having lower levels of social withdrawal at 18 months as compared to the children in the control group. Because of its simplified coding and scoring scheme, as compared to the original ADBB, the m-ADBB may well prove to be a more practical solution for evaluating withdrawal behavior in vulnerable populations, given the time and resource restrictions that frontline health workers face in their efforts to screen for the effects of maternal PND.

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# A DESCRIPTION OF THE MODIFIED ALARM DISTRESS BABY SCALE (m-ADBB):
# AN INSTRUMENT TO ASSESS FOR INFANT SOCIAL WITHDRAWAL

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ABSTRACT: This article introduces the *m-ADBB*, a modified version of the Alarm Distress Baby Scale (ADBB; A. Guedeney & J. Fermanian, 2001) used to screen for infant social withdrawal. Social withdrawal can be an indicator of several factors, including infant depression. A brief description is given of various studies that have shown that infants' behavior, as rated on the ADBB, is associated with poor maternal and paternal mental health as well as with later cognitive development. The original ADBB comprised eight items that clinicians rated on a 5-point scale. Following work in Australia, this scale was modified to a five-item checklist, with each item being rated on a 3-category scale to improve interrater reliability. The m-ADBB is described, together with data relating to psychometric properties, available training programs, and current studies.

Abstracts translated in Spanish, French, German, and Japanese can be found on the abstract page of each article on Wiley Online Library at http://wileyonlinelibrary.com/journal/imhj.

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The purpose of this article is to introduce a modified version of a previously developed instrument, the Alarm Distress Baby Scale (ADBB; Guedeney & Fermanian, 2001), to assess for social withdrawal in infants. The modified version (m-ADBB) was developed in Australia, and clinicians in several Australian states and overseas have been trained in its use.

## INFANT WITHDRAWAL: BACKGROUND

Brief infant social withdrawal is a normal part of development, and is used by infants to regulate their emotions (Feldman, 2007). Thus, during an interaction with their parents (carer/adult) they may look away, go quiet, or cease being active to reduce their level

of arousal (Beebe, Lachmann, & Jaffe, 1997; Brazelton & Cramer, 1990; Feldman, 2007; Weinberg & Tronick, 1994). However, if the adult is continually too intrusive or unresponsive, infants may learn that they have to consistently withdraw for the majority of the interaction to reduce their arousal level (Tronick & Weinberg, 1997).

Evidence that infants react in such a manner comes from a variety of study paradigms. The still-face procedure (cf. Adamson & Frick, 2003; Tronick, Als, Adamson, Wise, & Brazelton, 1978) is a method to show the infant's behavior to an unresponsive parent (most studies have actually used the infant's mother.) In this paradigm, the infant's parent, after reacting normally with him or her by smiling, mirroring his or her behavior, and talking, is instructed to remain passive and without any expression regardless of the infant's response. What is typically observed is the infant initially increasingly trying to engage his or her parent, then becoming distressed by the parent's lack of responsiveness. The infant squirms, grizzles, and looks away, and if the procedure continues for long enough, will become socially withdrawn. He or

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she will no longer look at the parent or vocalize and will appear expressively flat.

Another paradigm that shows that infants can experience this social withdrawal in an everyday context rather than in a laboratory setting is investigating infant's behavior to adults with depression. Many studies have now been conducted, using a variety of interactional measures, that show that infants of depressed mothers are more withdrawn in their interactions (Field, 1995; Murray & Cooper, 1997) and that this behavior can generalize to the infant's interactions with other adults apart from his or her mother (Albertsson-Karlgren, Graff, & Nettelbladt, 2001; Righetti-Veltema, Conne-Perreard, Bousquet, & Manzano, 2002).

In addition, sustained withdrawal behavior in infancy can be associated with several pathological conditions of both organic and nonorganic origin (Guedeney & Fermanian, 2001). Organic causes include fever, dehydration, seizure, intoxication, diseases of the central nervous system, and visual and auditory sensory impairment (Behrman, Vaughan, & Nelson, 1983). Sustained withdrawal is also a feature of many psychological and relationship disorders of infancy. The most obvious of these are pervasive developmental disorders including autism, where withdrawal is constant and is a key element of the diagnosis (Guedeney & Fermanian, 2001). However, withdrawal is also a principal symptom of infant depression (Guedeney, 1997, 2000; Herzog & Rathbun, 1982; Spitz, 1951), and is observed in infants with anxiety disorders and post traumatic stress disorders (Zeanah, 1999). Withdrawal features in most attachment disorders (Zeanah, Boris, Bakshi, & Lieberman, 2000) and is an important symptom of nonorganic failure to thrive (Powell & Bettes, 1992).

Given the wide range of potential underlying causes, social withdrawal therefore presents an important behavior for screening in infancy.

### Measures Assessing Infant Withdrawal

A variety of measures are available to assess infant interactional behavior, and most also assess parent social behavior with his or her infant. These include the Global Rating Scale (GRS: Murray, Fiori-Cowley, Hooper, & Cooper, 1996); Chatoor's Feeding and Play scales (Chatoor, Egan, Getson, Menvielle, & O'Donnell, 1987; Chatoor et al., 1997); the CARE Index (Crittenden, 1988), and the Emotional Availability Scales (Biringen, Robinson, & Emde, 1998). Each of these requires either special apparatus (e.g., a mirror and an infant seat for the GRS) or can be rated only from viewing videotapes because the number of items to be rated exceeds the capacity of an in-vivo rating (e.g., Chatoor's Play scale, 21 items).

*ADBB.* Partly due to the limitations just noted, Guedeney and Fermanian (2001) developed a brief scale, the ADBB, which can be used within a routine clinical setting to screen for infant withdrawal without the need for special apparatus. Consisting of only eight items, it is possible for a clinician to assess these while he or she is conducting the routine assessment of the infant, such as that which occurs at well-baby visits; thus, this brief scale has great clinical utility. It is suitable for assessing infants aged 2 to 18 months old, with the requirement that the clinician attempt to socially engage the infant by talking and smiling at him or her during the routine examination, which should be for at least 10 min. However, unlike the previously mentioned measures, this scale does not include items about the parent's interactional style; it only focuses on the infant and assesses whether he or she is socially withdrawn.

The eight items assessed on the ADBB are: (a) facial expression, (b) eye contact with the clinician, (c) activity level, (d) self-stimulating gestures, (e) vocalization, (f) response to stimulation, (g) relationship with the examiner, and (h) examiner's overall impression of interest in the infant.

Each item is rated on a scale from 0 to 4 (0: No unusual behaviour; 1: Doubt as to the presence of unusual behaviour; 2: Mild unusual behaviour; 3: Clear unusual behaviour; 4: Severe unusual behaviour), with higher scores indicating more of a problem. The total score thus can range from 0 to 32. Studies have indicated that a score of 5 or more is indicative of significant withdrawn behavior in the infant (Guedeney & Fermanian, 2001; Puura, Guedeney, Mäntymaa, & Tamminen, 2007).

### STUDIES USING THE ADBB

Many studies have been conducted using the ADBB, and Guedeney et al. (2013) described 17 reports across nine countries from Europe: France (Guedeney, Foucault, Bougen, Larroque, & Mentré, 2008; Guedeney, Marchand-Martin, Cote, Larroque, & The EDEN Mother–Child Cohort Study Group, 2012; Guedeney, Grasso, & Starakis, 2004; Rochette & Mellier, 2007; Wendland, Gautier, Wolff, Brisson, & Adrien, 2010), Italy (De Rosa et al., 2010), Finland (Puura, Guedeney, Mäntymaa, & Tamminnen, 2007; Puura et al., 2010; Mäntymaa et al., 2008), Portugal (Costa & Figueiredo, 2011), South America: Brazil (Lopes, Ricas, & Mancini, 2008), Argentina (Oliver, 2011; Oliver et al., 2009), South Africa (Molteno, Jacobson, Carter, Dodge, & Jacobson, 2013), Australia (Matthey, Guedeney, Starakis, & Barnett, 2005; Milne, Greenway, Guedeney, & Larroque, 2009; Re et al., 2006), and Israel (Dollberg, Feldman, Keren & Guedeney, 2006). In summary, these studies have been conducted on infants ranging in age from 2 to 24 months, in various settings such as community and hospital well-baby clinics, clinics for emotional difficulties in children, childcare settings, and a clinic for possible fetal alcohol syndrome infants. Sample sizes have ranged from 23 to 1,586, and some studies have conducted repeat assessments over a brief interval (a few weeks) while others have been longitudinal studies looking at the effects of social withdrawal as the infant gets older (up to 10 years of age).

Studies examining the psychometric properties of the ADBB have consistently shown a score of 5 or more to be optimal for detecting infants with possible problems in this domain, although one study (Oliver, 2011) found a score of 4 or more to be optimal in their population. These studies have used independent psychiatric diagnoses (using the DC:0–3 system, e.g., Parent–Infant Relationship Global Assessment Scale; ZERO TO THREE, 2005) or have validated the ADBB against a mother–infant relationship

measure (e.g., the Global Rating Scale; Murray et al., 1996). Sensitivity has ranged from .62 to .82, and specificity from .73 to .85. Positive predictive value is low at .35 or .36, although this is comparable to instruments such as the Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden, & Sagovsky, 1987), and negative predictive values are, as is usual with such instruments, much higher (usually .95–.97.).

Associations have been found between an infant's withdrawal status and the mother's and/or father's mood, with depressed parents more likely to have infants showing signs of withdrawal (Mäntymaa et al., 2008). In addition, withdrawn infants have been found to have poorer cognitive and behavioral development some 2 years later (Milne et al., 2009). High risk infants, such as those with cardiac problems at birth, those exposed to high levels of prenatal alcohol, or those living with adoptive parents or whose parents have joint custody are more likely to show signs of withdrawal on the ADBB (Guedeney et al., 2008; Molteno et al., 2013). Prevalence of infants scoring at or above the ADBB threshold within normative community sample studies is around 10 to 15%, although some studies have reported higher rates (Guedeney & Fermanian, 2001; Guedeney et al., 2008).

### Modification of the ADBB: The m-ADBB

One of the aforementioned studies on the ADBB was conducted in Australia by Matthey (the first author) et al. (2005). Following this project and inspection of the data it generated, the first author revised the scoring method of the ADBB to better fit within the Australian context and also to remove items that were either very difficult on which to obtain sufficient interrater agreement or were highly correlated with other items to suggest they were measuring similar behavior (discussed later). This revision was finalized in collaboration with the primary author of the ADBB (Guedeney) and is known as the m-ADBB (modified ADBB). As with the full ADBB, it is used within routine clinical practice and also requires at least a 10-min interaction with the infant for an assessment to be made.

*Item modifications.* Analyses of the data collected on the ADBB (from Matthey et al., 2005) showed that Item 4 (Self-stimulating gestures) was too difficult on which to obtain sufficient interrater agreement with raters experienced at working with infants. This suggests that this item could potentially be rated inaccurately too frequently to allow for robust psychometric properties of the scale.

Item 8 (Examiner's overall impression of interest in the infant) was highly correlated ($>.61$) with six of the other items (e.g., Facial expression: $+.71$; Relationship: $+.77$), indicating that it was not contributing sufficient unique information to the scale. Infants who smile (facial expression) and talk (vocalization) will almost always cause the clinician to be interested in them. The opposite also may be true. Thus, this item was removed.

Similarly, Items 3 and 6 (Response to stimulation and Activity level, respectively) were quite highly correlated ($+.63$); thus, these two items were combined into one item titled "Activity."

*Scoring modification.* Another modification made in the m-ADBB is in the scoring of each item. Within New South Wales (Australia), Child and Family Health Nurses (CFHNs) routinely screen for developmental milestones. For each milestone (e.g., crawling, hearing, etc.) the nurse, at the time of the development of the m-ADBB, rated the infant on a scale of (*Satisfactory*), (*Possible Problem*), or (*Definite Problem*). Therefore, it was decided to use this scoring format for the m-ADBB so that it could be easily incorporated into the routine clinical checkups that are most often conducted by CFHNs. While the rating options of developmental milestones by CFHNs have possibly changed over time, we have maintained this straightforward and easily comprehendible 3-category scoring system.

Ratings of over 100 infants by the first two authors has led to continuing refinement of the descriptions for each of these response options to result in clear descriptors enabling good interrater reliability to be obtained (An intraclass correlation coefficient across three raters of 0.87 was achieved in one of our current studies.) The operationalization of the scoring criteria was also revised in the m-ADBB, such that each item only measured behavior along a single dimension (see the Appendix for rating descriptions for one of the m-ADBB items).

Observation of these infants revealed some instances where infant vocalization was absent for all of the appointment except for the final few minutes, if the appointment was long enough (e.g., over 15 min). This highlighted that silence may be due not only to appropriate wariness on the part of the infant but also that given sufficient time, some infants would eventually start to vocalize. This late appearance of the social behavior was not apparent for the other behaviors. Thus, for vocalization, we chose to have only two response options: Satisfactory or Possible Problem. The Definite Problem option, which would be the complete absence of vocalization (rated on the ADBB with a score of 4), was excluded.

*Additional section.* We have added a section in the m-ADBB on infant's and clinician's characteristics during the examination. While the former is most applicable in research studies in which video recordings are used, it also can serve as a reminder to the clinician when she or he is using the m-ADBB in vivo.

- *Clinician's characteristics:* The clinician is to be rated on the degree to which he or she attempted to engage the infant. Our view is that if an infant appears to be withdrawn (i.e., few facial expressions, little activity, little relationship with the clinician, etc.), but the clinician has not tried to engage him or her (e.g., if much of the appointment is spent talking with the parent and with very little social interaction with the infant), then it would be unwise to conclude the infant may have social difficulties or be withdrawn. Rather, it would suggest a reassessment is required, where the clinician spends time trying to socially engage the infant. If the infant is still withdrawn after this, then there may be cause for concern. This variable also can be self-rated by a clinician using the m-ADBB in vivo, and would serve

as a reminder to consider if he or she had in fact engaged sufficiently with the infant to be able to make a reasonable assessment of the infant's social behavior.

- *Infant's characteristics:* The infant is rated on whether he or she spends much of the interaction distressed (e.g., crying) or appears to be ill or tired. The presence of any of these variables would negate the validity of ratings on the m-ADBB, as such variables clearly would impact the infant's social behavior. We recommend in such instances that the clinician note this, and reassess the infant on the next visit.

*Age suitability.* As previously stated, the ADBB can be used from 2 months of age. Our experience, however, has led us to recommend the use of the m-ADBB from 3 months of age due to the difficulty of being confident that a lack of facial expression in a 2-month-old infant is due to his or her showing signs of withdrawal, rather than not having some expressions (e.g., smiling) developed yet. This accords with Feldman's position (2007) that "At around 3 months, infants begin to engage in face-to-face interactions and to display visual, facial, and vocal behaviors in response to social cues" (p. 341).

## m-ADBB: DESCRIPTION

Thus, the m-ADBB has just five items:

- Facial expression (*to anyone*)
- Eye Contact (*with clinician*)
- Vocalization (*to anyone*)
- Activity (*to anyone*)
- Relationship (*with clinician*).

They conveniently form the acronym "FEVAR" (a slight misspelling of a common infant illness!), which assists the clinician to keep each item in mind when examining the infant.

Response options for four of the m-ADBB items (Facial Expression, Eye Contact, Activity, Relationship to the Examiner) are: "Satisfactory," "Possible Problem," or "Definite Problem." For the fifth item (Vocalization), the response options are just "Satisfactory" or "Possible Problem." We have chosen not to give numerical scores to each response option because we believe this would only confuse reports between the two versions, as the ADBB receives a numerical score for which clinical cutoff scores have been calculated.

## INITIAL RESEARCH WITH THE m-ADBB

One study to date conducted in South Africa used the m-ADBB (Hartley et al., 2010), while in this article we report on data from our study. The South African study investigated the relationship of postpartum depression, using the EPDS, and infant social withdrawal in a sample of 83 dyads in which the mother was HIV positive and had an infant 10 to 12 months old. As with the find-

ings by Matthey et al. (2005) using the full ADBB, no relationship was found between the two measures despite almost one third of their infants being classified as withdrawn. They concluded that current maternal mood, as measured by the EPDS, may not be the factor that impacts on infant social withdrawal but rather her ongoing mood since birth, which was what Matthey et al. found.

### Psychometric Properties

*Validity and cutoff score.* Solely for the purpose of ascertaining the concordance between the m-ADBB and the full ADBB, we converted the qualitative m-ADBB descriptors (Satisfactory, Possible Problem, Definite Problem) into numerical scores (0, 1, 2, respectively). We then calculated the correlation between the two scales, in a pilot study within our unit of 22 video clips, which produced an *r* of 0.72 (blind ratings), suggesting that despite the revisions contained in the m-ADBB, both scales are measuring similar constructs.

Comparing performance of this m-ADBB with that of the full ADBB indicates that one definite problem or two possible problems on the m-ADBB approximates the validated clinical full ADBB cutoff score of 5 or more. This was ascertained by assessing the 22 infants on the m-ADBB blind to their previous ratings using the full ADBB, which had been conducted independently by separate researchers.

*Reliability.* The South African study (Hartley et al., 2010) reported a Cronbach's $\alpha$ of 0.8 in their sample of 83 infants of HIV-infected mothers. To determine the stability of the infant's behavior across time and across people, the first three authors of this article conducted a study (Hales, Matthey & Črnceč, 2010) on 34 mother–infant dyads (15 males, 19 females). Participants were attending early childhood and parenting services for routine physical assessments of their infants in Sydney. The mean infant age was 6.1 months ($SD = 2.5$ months, range = 3.0–14.4 months), and all were described by their mothers as having been in good health since the birth. The infant was videotaped at the first assessment with the nurse. Then, 2 to 5 weeks later ($M = 24.5$ days, range =12–37 days, $SD = 8.2$ days), a second assessment was conducted with the same nurse and videotaped. Both assessments consisted of a routine physical examination of the infant by the nurse, with the mother present. In addition, at this second visit, the mother also was videotaped for approximately 10 min interacting with her infant on her own. She was initially instructed to do "what she normally does at home" with her infant. If she engaged in little or no talk or play with her infant, she was then asked to do so. The order of the nurse assessment and the mother–infant interaction was counterbalanced at this second assessment.

Good levels of interrater agreement were reached by the three raters of the video clips, with intraclass correlation coefficients ranging from 0.87 at the start of the study to 0.90 at the midway point, thus indicating that rater drift over the duration of the study was not an issue.

**TABLE 1.** *Classification of the Infants as "Withdrawn" or "Not Withdrawn" at the Two Assessments With the Nurse*

|  | Time 1 | |
|---|---|---|
| Time 2 | Not Withdrawn | Withdrawn |
| Not Withdrawn | 21 | 7 |
| Withdrawn | 1 | 4 |
|  | 22 | 11 |

**TABLE 2.** *Number of Infants Withdrawn/Not Withdrawn at the First and Second Nurse Assessments, Compared With the Mother–Infant Interaction*

|  | Mother–Infant Interaction | | |
|---|---|---|---|
| Nurse Assessments | Not Withdrawn | Withdrawn | Total |
| Not Withdrawn at Either Nurse Assessment | 16 | 5 | 21 |
| Withdrawn at Only One Nurse Assessment | 8 | 0 | 8 |
| Withdrawn at Both Nurse Assessments | 3 | 1 | 4 |
|  | 27 | 6 | 33 |

Table 1 shows that of the 33 infants with valid data (One infant was too drowsy to have the data included.), only 4 of the 11 withdrawn infants from the first assessment continued to be withdrawn at the second assessment. Table 2 shows that of these 4 infants, only 1 was also withdrawn with his or her mother.

Note, however, that for infants assessed as withdrawn with their mother ($n = 6$), the mothers were assessed as being less socially engaged during the mother–infant interaction. These mothers had clinically significantly higher EDS scores (although not statistically significant, given the small *n*: 7.8 vs. 4.3; $p = .07$, $d = 0.83$), even though the scores are still below the clinical range on this scale.

These findings highlight the importance of not overpathologizing an infant who is assessed on the m-ADBB as "withdrawn" based upon just a single assessment. Any infant who screens as withdrawn with a health professional should not only be reassessed some 2 weeks later to determine if this behavior is stable over time, but also should be observed with his or her parent to ascertain if the withdrawal behavior is stable across people. Others have shown that the rate of "withdrawn" infants drops dramatically if this clinically sensible approach is used. Puura et al. (2010) found that approximately half of their sample of infants who were initially categorized as "withdrawn" on the full ADBB no longer was withdrawn on a second testing occasion some 2 weeks later. An infant who is withdrawn with a relative stranger (e.g., a nurse) who is doing unusual things with him or her (e.g., stretching infant's legs, lifting infant by the arms, etc.) may simply be appropriately "wary." Displaying social behavior at a different occasion (i.e., 2 weeks later) or with someone more familiar to him or her (e.g., his mother) would indicate that the infant is social and not suffering from ongoing withdrawal. We would recommend that it is usually only in ongoing withdrawal with different people that clinical intervention is warranted, unless the parent requests assistance.

### Training

Two training packages have been developed by the first two authors (Contact the first author for details.): a 1-day, face-to-face workshop and a distance education package. Accreditation in the use of the instrument is achieved by demonstrating high concordance with the developers of the m-ADBB on specific infant video clips. To date, training has been conducted in Australia in various states (Victoria, South Australia, Queensland, and New South Wales) and also in the United States and South Africa. All participants who have completed their ratings have received accreditation (either on the first or second attempt), thus demonstrating that the scoring procedure and training are comprehendible and attainable.

While the five behaviors may seem straightforward to clinicians, we have found that training on the use of the m-ADBB is important to ensure that infants are assessed accurately. Inspection of our training data shows that 7 of the 15 trainees to date who have undertaken the accreditation ratings did not pass on the first attempt but did so after further trainer feedback. This demonstrates that training is essential before clinicians use the m-ADBB, and thus any publications using the scale should report that they have been accredited in its use.

### Research Required Investigating Additional Psychometric Properties

We believe that an important consideration for measures that involve some element of rater observation is the extent to which raters, once trained, "drift" over time in their classification of the different behaviors. This information then informs the developers of an instrument on whether periodic, ongoing training of accredited raters is required to ensure that interrater reliability remains high. We believe that this aspect therefore needs to be explored in both the m-ADBB and the full ADBB.

Another aspect that needs investigation is whether in-vivo ratings on the m-ADBB are indeed concordant with ratings made from video. While there is some evidence that this is the case for the full ADBB, conflicting evidence is also available: Some studies have reported low interclass correlation coefficients (range = 0.42–0.88; Guedeney & Fermanian, 2001; Lopes et al., 2008; Matthey et al., 2005).

A third aspect that is required and currently being investigated by our team in conjunction with data provided by a team of researchers from Argentina exploring the properties of the full ADBB (Oliver et al., 2009) is the concurrent validity of the m-ADBB with an independent assessment of the infant's withdrawal

status. This assessment uses both clinician-rated and parent-report scales of the infant's development.

Although studies on the full ADBB have now been conducted in a number of different countries, the issue of whether there are cultural differences in the social behavior of infants has not been directly explored. Clearly if there are cultural differences, the results of an assessment using the m-ADBB must take this into consideration.

### *Clinical Usefulness*

As previously discussed, infant social withdrawal can be due to a number of reasons, and the m-ADBB and full ADBB do not provide information on why an infant is withdrawn, just that he or she appears so. One possibility that could hold promise for future research is whether these instruments will prove helpful in the earlier identification of infants with autistic spectrum features. Toddlers and children with such disorders are characterized by their impaired social relationship behaviors (cf. Goin & Myers, 2004), and clearly, the m-ADBB assesses social behaviors. If this tool proves useful in identifying infants with a high likelihood of having, or developing, autistic-like difficulties, then earlier, effective intervention may be possible. To date, the earliest that autism spectrum difficulties can be screened for is around 18 months using instruments such as the M-CHAT (Robins, Fein, Barton, & Green, 2001), whereas the m-ADBB is useful from 3 months of age. Indeed, a recent study using the ADBB has indicated that this eight-item instrument is useful in screening for autism in young infants (Wendland, Gautier, Wolff, Brisson, & Adrien, 2010). It is probable, therefore, that the m-ADBB also will prove to be a valuable addition to the early detection of possible autism.

### CONCLUSION

The five-item m-ADBB is a clinically useful behavioral checklist that screens for withdrawal in infants aged 3 to 18 months. Evidence from a number of studies using the original eight-item ADBB has shown that withdrawal is related to maternal and paternal mood, poorer developmental or socioemotional status, and is predictive of poorer cognitive and behavioral outcomes at 2 years of age. Results from the one study that has used the m-ADBB have suggested that current maternal mood may not be related to infant social withdrawal, and findings from a full ADBB study also found this same result, suggesting that it may be ongoing maternal mood since birth that is related to infant social withdrawal.

Importantly, our work indicates that within a screening context, clinicians should not overpathologize infants that appear to be withdrawn on just one assessment. Repeat testing is required if an infant initially appears to be withdrawn to ensure that clinicians more accurately separate infants who show transient withdrawal, possibly due to appropriate social wariness on the first testing occasion, from those who evidence more enduring withdrawal (i.e., being "withdrawn" on two testing occasions).

## APPENDIX: RATING DESCRIPTIONS FOR ONE OF THE m-ADBB ITEMS (FACIAL EXPRESSION)

**1. FACIAL EXPRESSION: TOWARDS ANYONE**

*Assess the extent of facial expressiveness throughout the examination. Do <u>not</u> include crying or reactions to aversive/painful procedures (e.g., oral examination) as a sign of facial expressiveness.*

| | |
|---|---|
| ☐ Satisfactory: | Facial expressiveness is clearly observed on several occasions, and is either all positive (e.g., smiling) or there is a reasonable range of positive and negative (e.g., grimacing) expressiveness. |
| ☐ Possible problem: | Expressiveness is less clear, although there is a reasonable suggestion of this (positive or negative), or expressiveness is exclusively negative. |
| ☐ Definite problem: | There are only hints of expressiveness, expressiveness is ambiguous or absent; face appears fixed, frozen, or "sad" for the whole period. |

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