ASSESSING THE SOCIAL BEHAVIOR OF INFANTS: USE OF THE ADBB SCALE AND RELATIONSHIP TO MOTHER'S MOOD

STEPHEN MATTHEY
Sydney South West Area Health Service

ANTOINE GUEDENEY
Hopital Bichat-Claude Bernard

NAFSICA STARAKIS
Department of Social Action, Infancy and Health, Paris

BRYANNE BARNETT
Sydney South West Area Health Service and University of New South Wales

ABSTRACT: Infants can show a range of social behavior when interacting with their main caregiver. Previous work has demonstrated that when the caregiver is depressed, the infant may demonstrate withdrawn behavior not only to this person but also to others. This pilot study used a relatively new assessment tool, the Alarme Distress de Bebe Scale (ADBB; Guedeney and Fermanian, 2001), to assess the social behavior of 44 infants during a routine physical checkup. Results indicated that withdrawn infant social behavior to the clinician was related to the mother's report of whether she had felt more irritable, sad, anxious, or depressed since the birth, but not to her current mood as rated by her score on the Edinburgh Postnatal Depression Scale (Cox, Holden & Sagovsky, 1987). The psychometric properties of the ADBB also were explored. The findings are further evidence for the need to screen for mood difficulties in women with infants not just by focusing on a woman's current mood but also her mood since the infant's birth.

RESUMEN: Los infantes pueden mostrar diversas conductas sociales cuando interactúan con la persona que principalmente les cuida. El trabajo investigativo anterior ha demostrado que cuando esa persona está deprimida, el infante pudiera demostrar un bajón en la conducta, no sólo hacia esa persona, sino también hacia otros. Este estudio experimental usó una herramienta relativamente nueva, conocida como 'ADBB,' para evaluar el comportamiento social de 44 infantes durante un examen físico de rutina. Los resultados indicaron que la conducta social de los infantes decaídos hacia el examinador clínico estaba relacionada con el reporte de la madre de si ella se había sentido más irritable, triste, ansiosa o deprimida a partir del nacimiento, pero no a su estado de ánimo presente tal como fue evaluado por medio de su

puntaje en la Escala de la Depresión Postnatal de Edinburgh. También se exploran las propiedades sicométricas de ADBB. Los resultados son una prueba adicional de la necesidad de examinar las dificultades del estado de ánimo en las mujeres con infantes, no sólo enfocándose en el presente estado de ánimo de la mujer, sino también su estado de ánimo desde el nacimiento del infante.

RÉSUMÉ: Les nourrissons peuvent faire état d'un éventail de comportement social quand ils communiquent avec le mode de soin principal. Des travaux précédents ont démontré que lorsque le mode de soin est déprimé, le nourrisson peut faire état d'un comportement de repli, non seulement vis-à-vis de cette personne, mais aussi vis-à-vis des atures. Cette étude pilote a utilisé un outil d'évaluation relativement nouveau, le ADBB, afin d'évaluer le comportement social de 44 nourrissons durant une visite d'examen physique de routine. Les résultats ont indiqué que le comportement social de l'enfant replié sur lui-même, vis-à-vis du docteur, était lié au compte-rendu que la mère avait fait sur le fait qu'elle se sentait irritable, triste, anxieuse ou déprimée depuis la naissance, mais n'était pas lié à son humeur du moment telle qu'elle avait été évaluée par son score à l'Echelle de Dépression Post-natale d'Edinburgh. Les propriétés psychométriques de l'ADBB ont aussi été explorées. Les résultats prouvent qu'il est nécessaire de dépister les difficultés d'humeur chez les femmes ayant des nourrissons, non seulement en se concentrant sur l'humeur du moment de la femme, mais aussi sur son humeur au moment de la naissance du bébé.

ZUSAMMENFASSUNG: Kleinkinder können eine Vielzahl von sozialen Verhaltensweisen in der Interaktion mit ihrer wesentlichen Betreuungsperson zeigen. Vorangegangene Arbeiten haben gezeigt, dass bei Depressivität der Betreuungsperson das Kleinkind zurückgezogenes Verhalten, nicht nur mit der Betreuungsperson, sondern auch mit anderen Personen zeigen kann. Diese Pilotstudie benutzt ein relativ neues Untersuchungsinstrument, den „ADBB", um das soziale Verhalten von 44 Kleinkindern während einer Routineuntersuchung zu bestimmen. Die Ergebnisse weisen darauf hin, dass ein zurückgezogenes Verhalten des Kleinkinds gegenüber dem Untersucher mit den Berichten der Mütter ob sie irritierbarer, traurig, ängstlich, oder depressiv seit der Geburt waren in Zusammenhang stand, aber nicht mit ihrer derzeitigen Stimmung, wie sie mittels der Edinburgher Nachgeburtsdepressionsskala erhoben wurde. Die psychometrischen Fähigkeiten des ADBB wurden auch untersucht. Diese Ergebnisse sind eine weitere Bestätigung für die Notwendigkeit nach Schwierigkeiten bei Müttern mit Kleinkindern zu suchen, nicht nur in dem man auf die derzeitige Stimmung achtet, sondern in dem man die Stimmung seit der Geburt berücksichtigt.

抄録：乳幼児は、主な養育者と相互交流する時、さまざまな社会的行動を見せることができる。先行研究では、養育者が抑うつ的な時は、乳幼児はその養育者に対してだけではなく、他の人に対しても引きこもる行動を示すだろうということが、明らかにされた。この予備的研究では、日常の健康診断の間に、44 人の乳幼児の社会的行動を評価するために、比較的新しい評価ツール、`ADBB'を使用した。結果から、臨床家に対して引きこもる乳幼児の社会的行動は、母親が出産以来、より苛々している、悲しい、不安、あるいは落ち込んでいると感じたことがあるかどうかについての母親の報告と関係していたが、エジンバラ産後抑うつ尺度 the Edinburgh Postnatal Depression Scale の点数によって評価された母親の現在の気分とは関係していなかった。ADBB の心理検査としての特性も調査された。この所見は、乳児のいる母親の気分の障害を、単に女性の現在の気分だけでなく、乳児の誕生以来の母親の気分にも焦点づけることによって、スクリーニングする必要性の、さらなる根拠となる。

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INTRODUCTION

It has been well documented that infants, from just a few hours old, demonstrate the ability to socially interact with adults (Zeedyk, 1998). From a few months of age, infants' social behavior can be observed in a variety of ways including vocalizing, eye contact with the observer, imitating physical gestures, showing a range of facial expressions, and responding to the adult. Using facial expressions and vocalizations as indicators of feeling states, most infants show three emotions by 2 months of age (interest, contentment, and distress) and eight emotions by 7 months (joy, contentment, anger, disgust, surprise, interest, distress, and sadness) (Izard, Huebner, Risser, McGinness, & Dougherty, 1980). Smiling in response to a person's voice and face occurs by 8 weeks old (Snow, 1998) while anxiety towards strangers is generally considered to be evident by around 9 months of age (Snow, 1998). Such anxiety when held by a stranger will usually produce active behavior, such as vocal protestations and squirming, in an attempt to get closer to the infant's parent. Withdrawn social behavior from just 2 months of age, indicated by a lack of either positive (e.g., smiling, eye contact) or negative (e.g., vocal protestations) behaviors, is more akin to a state of learned helplessness and should alert the clinician to the possibility that the infant is not displaying age-appropriate emotional/social behavior.

Such low infant sociability can be due to many factors, including both organic and nonorganic disorders (Guedeney & Fermanian, 2001). In 70% of infants with nonorganic failure to thrive, where there has been considerable emotional or social understimulation, Powell and Low (1983) found that such infants had poor eye contact, diminished vocalization, and a lack of response to an adult. Tronick and Weinberg (1997) reviewed how maternal depression, which can result in either an intrusive or withdrawn parenting style, also can affect the social behavior of the infant. Such infants have less eye contact and more self-comforting behaviors (self-stimulating gestures). This connection between depressed mood in the caretaker (usually the mother) and either withdrawn behavior in the infant or impaired mother–infant interaction has been found in a number of studies (e.g., Field, 1984; cf. Luby, 2000). Such withdrawn infant behavior has been found to be associated with decreased frontal EEG activity, which is present when the infant is interacting with his or her mother as well as with other adults (Dawson et al., 1999). This would suggest that there is some carryover effect—that the infant, exposed to prolonged periods of interacting with an unresponsive caregiver, has become "depressed" and continues to exhibit withdrawn behavior even when someone else interacts in a positive way with him or her. The diagnostic classificatory system for infants and toddlers, DC: 0–3 (Zero to Three, 1994), has recognized the importance of impaired affect in infants by including a category of "Depression in Infancy and Early Childhood."

Field (1995) stated that "Infants who interact with depressed mothers (particularly chronically depressed mothers) are at risk for later social interaction problems" (p. 1); however, note that depression in the postpartum period does not necessarily mean the mother–infant interaction will be impaired (Campbell & Cohn, 1997; Chabrol, Bron, & LeCamus, 1996) nor should one presume that all impaired interactions will necessarily lead to withdrawn infant behavior. Undoubtedly, there will be buffers to such effects such as the role of fathers and other caregivers (e.g., Albertsson-Karlgren, Graff, & Nettelbladt, 2001) and possibly the temperament of the infant.

Given these caveats, there is an increasing realization that assessing an infant's social behavior is important. While diminished social behavior in the infant may not necessarily be an indicator of pathology, it should alert the clinician to undertake further assessment of both the infant and the environment. In some cases, it may reveal that the mother is experiencing psychosocial difficulties (e.g., postnatal depression, anxiety, or bonding difficulties) which she may have been reluctant to disclose (Small, Brown, Lumley, & Astbury, 1994).

ASSESSMENT OF THE INFANT'S SOCIAL BEHAVIOR

While measurement of the infant's temperament may have some overlap with his or her 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 and heat as well as social stimuli) whereas social behavior in infancy refers to degree and style of responsiveness just to social stimuli. Thus, while an infant may, within temperament measures, be considered "shy" or "slow to warm up to others," he or she will still be responsive to the adult. A socially withdrawn infant, however, will lack many of the features of responsiveness to others.

Most studies that have investigated infant social behavior have been done within an experimental setting directing the mother to interact with her child (e.g., Murray, Fiori-Cowley, Hooper, & Cooper, 1996; Tronick & Cohn, 1989). These experimental settings have sometimes required a special apparatus (e.g., Murray's use of an infant chair and mirror placed on a table) while the mother and child are videotaped. Trained assessors then rate these videotaped interactions, with part of the rating giving an indication of the social behavior of the infant towards the mother. A different approach was taken by Rosenn, Loeb, and Jura (1980), who described an assessment measure that can be used within a clinical setting, investigating the social behavior of the infant to a relative stranger—the examiner (e.g., child health nurse or pediatrician). They used a semistructured social interaction, consisting of the examiner approaching the infant, showing him a toy, picking up the infant, holding him, and putting him down again. The infant's overall social behavior during this interaction is then rated on a 7-point scale, from 1 (*extremely negative: screaming, flailing, self-stimulation*) to 7 (*extremely positive: laughing, cooing, showing interest*). In their article, they discussed the interrater reliability of this measure across samples of failure-to-thrive and control infants.

One advantage of assessing an infant's social behavior with a comparative stranger rather than with his parent is that it does not put the parent under any perceived pressure. Within a clinical setting, such as a hospital or early childhood clinic, to ask parents to "play with their infant" and for the clinician to assess the resultant infant social behavior would undoubtedly make parents feel anxious and possibly unwilling to visit such centers if they felt their competence was being assessed. A scale that therefore neither requires special apparatus nor a special sequence of prescribed interactions and which does not require the parent's active interaction with the infant could be considered by clinicians interested in assessing the infant's social behavior as being more desirable. Such a scale is the Alarme Distress de Bebe Scale (ADBB; Guedeney and Fermanian, 2001), constructed to assess infant social behavior during routine physical examinations given by a range of health professionals.

ADBB Scale

This French scale (see Appendix 1) consists of eight items related to the infant's social behavior and is used during the clinician's routine physical examination of the infant. It requires the clinician to engage the infant in social behavior—by talking, touching, and smiling at him or her, which are practices normally undertaken during such examinations. The eight items, each rated from 0 to 4 (with low scores being optimal social behavior), are 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 clinician keeps in mind the eight items while conducting the routine physical assessment and then spends approximately 2 to 3 min completing the scale.

Recently, high scores on the ADBB (indicative of withdrawn behavior) have been shown

to be associated with less optimal interactive behaviors by both the mother and her infant in a Finnish study on 127 two-month-old infants (Puura, 2004) and in an Israeli study on 97 seven-to eighteen-month-old infants (Dollberg, 2004).

The original article (Guedeney & Fermanian, 2001) showed the ADBB scale to have good psychometric properties on a sample of 60 infants in France, aged between 2 to 24 months. Good interrater reliability was found between raters using it during live (as opposed to viewing the videotape) assessments and an expert's rating. Interrater reliability as well as acceptable test-retest reliability ($r_s = 0.91$, 1-month interval) also were demonstrated in a Brazilian study (Lopes, 2004). A total ADBB cutoff score of 5 or more was found to be optimal in detecting those infants considered to have unusually low social behavior. This optimum cutoff score has recently been replicated in both a Finnish study (Puura, 2004) and a Brazilian study (Lopes, 2004). Thus, a score of 1 on only five of the eight items is sufficient to indicate possible suboptimal social behavior. Factor analysis, using the criterion of factor loadings of 0.5 or more, identified two factors accounting for 63.6% of the variance—an interpersonal factor (five items: eye contact, level of activity, self-stimulating gestures, relationship, attractiveness) and a noninterpersonal factor (three items: facial expression, vocalization, response to stimulation), with one complex item (response to stimulation) loading greater than 0.5 on both factors (but with the authors deciding to put it under the noninterpersonal factor).

The authors of the scale recommended that further studies investigate this factor structure. This has been done in a Brazilian study on 90 infants aged between 0 and 2 years (Assumpcao, Kuczynski, Da Silva Rego, & Castanho de Almeida Rocca, 2002). This study found four factors accounting for 63.5% of the variance. While the authors specified the factor loading criterion of 0.5, examination of the data revealed that all nonincluded items had loadings of less than 0.3, which is the usual criterion used in factor analysis (Child, 1990). Factor 1 consisted of facial expression and level of activity, Factor 2 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.

Apart from the continued exploration of the scale's psychometric properties, it would seem important to explore what factors may be associated with withdrawn infant behavior when using the ADBB. As mentioned earlier, maternal depression has been linked to impaired mother–infant interaction and subsequent social withdrawal in infants; therefore, it would be interesting to determine whether women who report feeling depressed since the birth are more likely to have infants who score high on the ADBB scale when interacting with a community nurse or a pediatrician during routine physical checkups.

METHOD

Aims

There were two aims to the study. The first was to examine whether there was a relationship between the social behavior of the infant with a clinician, as assessed using the ADBB scale during a routine physical checkup of the infant, and the mother's mood. The second aim was to further investigate the psychometric properties of the scale.

Considerations

To explore the relationship between ADBB scores and maternal mood and to investigate the factor structure of the scale required sufficient variance on these variables. Two types of sites

were therefore chosen: one where many participants were likely to have coped reasonably well since the birth (Early Childhood Clinics) and one where many participants were likely to have experienced significant levels of distress since the birth (a residential unit for families with substantial infant sleep or feeding problems). As this is a pilot study, data from the participants from both types of sites were combined. It is realized that a larger study would be required to determine whether there may be other differences between women at these two types of sites that also could contribute to differences in ADBB scores.

Participants

Mothers ($N = 47$) with infants attending either their local early childhood clinic for a routine infant checkup or a residential unit for parents with baby care issues (e.g., sleeping or feeding difficulties) participated in the study. All units were located in South West Sydney, Australia. The mothers' mean age was 28.5 years ($SD = 3.9$, range $= 17 - 36$ years), and the fathers' mean age was 31.3 years ($SD = 5.7$, range $= 22 - 44$). All mothers were in a relationship.

The infants ranged in age from 13 to 52 weeks old ($M = 30.1$ weeks, $SD = 12.1$ weeks). Seventeen of the 44 mothers included in the final data analyses had at least one other child. Fifty percent of couples described themselves as being of Australian ethnic background; of the rest, 24% of mothers had an Australian background with a partner from a different background (mainly European), and two mothers were from Southeast Asia. All spoke English either as their sole language or as well as another language. A total of 31.8% of mothers and 15.9% of fathers had tertiary-level education while 18.5% of mothers and 43.3% of fathers did not complete high school. Regarding employment, 21.1% of mothers were working either full-time or part-time at the time of the study. Nearly one fourth (23.7%) of the mothers reported that they had had no previous experience with infants.

A previous fetal loss (e.g., miscarriage) was reported by 41% of the mothers, which is similar to the approximated rate of miscarriages in all pregnancies (Burt & Stein, 2002).

Premature birth occurred for 10.5% of the infants (<37 weeks gestation), and 29% had spent time in the neonatal intensive care unit (NICU) at birth, with only 1 infant spending more than 10 days in the unit (72 days). None of the infants were described by their mothers as having poor health either since the birth (including, surprisingly, all those who had spent time in the NICU) or at the time of the study. Three fourths of the infants were cared for full-time by their mother; the remainder also were cared for by family members up to a maximum of 2 days per week.

Procedure

Mothers attending two early childhood clinics or the residential unit, with infants between 3 and 12 months old, were invited to participate in the study. At all three locations, the routine physical examination of the infant was undertaken (either by a female clinic nurse or a male residential unit pediatrician). This examination was videotaped by a research assistant (RA). During the examination, the health professional tried to socially engage the infants by talking and smiling to them in the usual manner as well as handling them in the usual way to conduct the physical checkup. The infant's mother was present during this examination.

At this visit, the mothers completed two forms: the study consent form and the Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden & Sagovsky, 1987). She also was asked whether her baby had behaved as he or she normally did during such visits. The clinic nurse or unit pediatrician also completed a developmental milestones checklist, and rated their impression of the infant's social behavior towards the mother and towards herself/himself. A

home visit by the RA was arranged within a few days of the clinic visit or within a few days of discharge from the residential unit (stay at the unit was a maximum of 7 days). At this home visit, the mother completed a background questionnaire, which included a question about how she had been feeling since the birth. Subsequently, the videotape of the infant's behavior during the visit was rated, using the ADBB scale, by up to three raters (discussed next) who were blind to information about the mother's mood.

Measures

ADBB Scale (Guedeney & Fermanian, 2001). This is an eight-item, observer-rated scale (see Appendix 1). Each item is rated from 0 to 4, with total scores therefore ranging from 0 to 32. High scores indicate less social behavior on each item, with a cutoff total score of 5 or more being suggestive of poor social behavior. The items as well as the scale's psychometric properties were described earlier.

Edinburgh Postnatal Depression Scale (EPDS; Cox et al., 1987). This 10-item self-report questionnaire was specifically constructed to measure mood in postpartum women. Good maternal postpartum sensitivity and specificity have been reported for the scale in both the United Kingdom (Cox et al., 1987) and Australia (Boyce, Stubbs & Todd, 1993), with a cutoff score of 13 or more indicating the likely presence of major depression and 10 or more the likely presence of minor or major depression. Acceptable reliability has been reported (split-half reliability = 0.88, standardized alpha coefficient = 0.87; Cox et al., 1987).

Clinician rating of infant social behavior. This was developed for the study. A 5-point Likert scale was devised, with the end and middle points being 1 (*very social for age*), 3 (*average for age*), and 5 (*not at all social for age*).

Mood since the birth. A single question on the background questionnaire asked: "Have you felt more irritable, anxious, sad, down or depressed since the birth?"

Usual behavior with strangers. The mother was asked how her baby usually reacted to strangers, with the options being *very clingy, slow to warm up, smiles easily if remains with his mother,* or *easily held by others.*

Additional questions. When the mother was recruited, just prior to seeing the nurse or pediatrician, she was asked a few questions about her infant's current state with regards to whether he or she was "out of sorts" or sleepy. After the videotaping, she was asked whether her infant had behaved as he or she normally did during such visits.

RESULTS

ADBB Reliability Ratings

Reliability was calculated across three raters (first three authors) on a sample of the videotapes and across two raters on the remainder. Prior discussion among the raters set the interrater agreement criterion as being the Total ADBB score within 3 points of each other. There were 47 tapes in the study. Of these, 20 were initially independently rated by all three raters and 27 by just two raters (one in Australia, one in France). Of these latter tapes, 10 were then rated

by the third rater due to too large a discrepancy between the first two raters. For three of these tapes, the agreed criterion was still not reached using this method of independent ratings. The usual method to resolve such a discrepancy is for the raters to then view the videotape together and reach a consensus opinion. Due to the practical difficulty of having the raters in two continents, this was not possible in this study—and arguably, it is important information that the scoring on the ADBB for a small sample of infants (in this case, 6%) could not be agreed upon. These infants were therefore discarded from further analyses.

In summary, of 47 tapes, criterion-level agreement (total ratings within 3 points) was reached on the ADBB score by at least two of three raters on 43 tapes (91%). For three tapes (6%), the raters did not score the infant's behavior as similar. These three tapes were therefore excluded from the analyses. For the other tape, the three raters were within 4 points of each other, and so this tape was included in the analyses.

Each of the eight ADBB items was then assigned an agreed score. When there were three raters, this score was either the score given by all three or by at least two of the raters (92% of items). The mean score was assigned when none of the three raters agreed (8% of items: all but one within 1 point of each other). When there were two raters, the score was either that given by both (88% of items) or the average of the two (12% of items).

All correlations (Pearson's) between the raters' total ADBB scores were statistically significant ($p < .01$), with values ranging from 0.52 to 0.66.

When calculating the interrater reliability using the dichotomous variable of withdrawn/not withdrawn (Cohen's κ), consideration should be given to the standard error of measurement (*SEM*) for each rater's total score. Lopes (2004) found a high test-retest correlation (0.91) by the same rater over a 1-month period. The standard deviation of the agreed total ADBB scores from our study was 3.9, which is similar to that reported in Guedeney and Fermanian (2001; $\sigma = 3.8$). Thus, the *SEM,* using the formula $\sigma_{SEM} = \sigma_x \sqrt{1 - r_{xx}}$ (Ley, 1972), is 1.2 points (68% confidence level) or 2.3 points (95% confidence level). At a minimum, therefore, a margin of 1 point should be allowed when dichotomizing the score into withdrawn/not withdrawn. Thus, scores of 4 or 5 should be categorized as being either withdrawn or not withdrawn. Allowing for this *SEM* results in kappas of between 0.60 and 0.66, which are in the moderate-to-good range (Robson, 1993).

Total ADBB Scores

For the sample, 34.1% (15 of 44 infants) scored above the threshold of 5 or more on the ADBB, which is a similar rate to the French sample of 60 infants (30% above the 5 or more cutoff score). No significant relationships were found between the ADBB score and whether the pregnancy was planned or whether the woman had experienced fetal losses, or whether the infant had spent time in the NICU. There also was no difference in mean ADBB scores between infants assessed at the three sites, and thus the gender of the clinician was not related to the infant's social behavior.

Infant Social Temperament and Age

The behavior of the infant during the routine examination could be related to either how the mother described his of her usual social behavior with strangers (this would be expected) or may have been induced by the unfamiliar situation in the clinic or unit. These factors can loosely be termed the social temperament of the infant. The hope would be that the mother's description of her infant should match his or her behavior in the clinic—otherwise, it may not be particularly representative of the infant's everyday behavior. Initially, however, we need to

determine whether behavior to strangers is related to age—again, this is a developmental behavior, which we would expect. Those less than 6 months old might be expected to show more social behavior to strangers than those over 6 months.

There were only 2 infants described by their mothers as "very clingy" when around strangers, and 1 was described as "slow to warm up" to strangers. Only 1 of the very clingy infants scored above the cutoff score on the ADBB (score of 5), and the "slow to warm up" infant also scored in the clinical range (score of 15). There was no significant difference on the total ADBB score between infants described by their mothers as "smiles easily but prefers to stay with the mother" ($n = 16$) or those described as "easily held by others" ($n = 19$), $t = 0.26$, $df = 33$, n.s. (missing data on 6 infants).

Only 2 mothers stated that their infant had seemed more withdrawn than usual during the examination. One of these received a high ADBB score (13) while the other received a low ADBB score (0.5). Two were considered to have been "cranky" during the examination, and both of these had ADBB scores in the normal range (scores of 1 and 0).

Inspection of the relationships between the infants' age and ADBB scores showed that these two variables were not related. Infants less than 6 months old were equally likely to score high on the ADBB as the older infants.

The overall impression from these analyses is that ADBB scores are not related to the infant's reported "social temperament" with strangers or to whether the infant was considered "out of sorts" during the routine examination. These findings lend support to the validity of using the ADBB to make an assessment of the social behavior of the infant in this type of setting, as the scale is measuring behavior that is not akin to the mother's report of her infant's social temperament. Therefore, it is possible that some infants who show withdrawn behavior do appear to be content to be held by strangers simply because they do not protest, due to their withdrawn behavior.

Relationship of Social Withdrawal to Mother's Mood

No significant relationship was found between the ADBB score and mothers' current mood as measured by her EPDS score; however, a two-way ANOVA indicated that the mothers' report of her mood since her child's birth was significantly associated with the total ADBB score, $F(1, 34) = 5.61$, $p < .05$, $\eta^2 = 0.12$, but that there was no main effect for the baby's age. Follow-up analyses indicated that mothers reporting that they had felt more irritable, anxious, sad, down, or depressed since the birth had infants with significantly higher ADBB scores than those saying they had not felt like this since the birth ($M = 5.6$ & 1.6, respectively), $t(29.47$ (variances unequal) $= 3.79$, $p = .001$, $r_{pb} = 0.57$). The r_{pb} value of 0.57 shows that this statistical significance also is clinically significant (cf. Matthey, 1998). This clinically significant association between the mother's self-reported mood since her child's birth and the infant's social behavior during the routine clinic examination can be understood best by categorical analyses: Twelve of the 22 women (55%) who had felt more sad or anxious since the birth had infants rated in the withdrawn range on the ADBB compared to just 1 of the 16 (6%) who said they had felt this way since the birth.

Clinicians' Impressions

The correlation between the clinicians' ratings of sociability towards herself/himself and the total ADBB score was significant, $r_p = 0.34$, $p < .05$; however, when the ratings were compared in a 2 × 2 classification, a different interpretation of the data is evident. The two-way classification was "sociable" versus "not sociable." On the ADBB, this is a split at 4/5 (4 or less =

TABLE 1. *Factor Analysis (Oblique Rotation) of the ADBB Scale* (N = 44 Infants)

Item No.	Factor 1	Factor 2
2 (eye contact)	.886	
7 (relationship to observer)	.814	
1 (facial expression)	.775	
8 (attractiveness to observer)	.674	
6 (response to stimulation)		−.914
3 (level of activity)		−.465
5 (vocalizations)		−.434
4 (self-stimulating gestures)		

Note. Loadings of 0.3 or more shown.

sociable; 5 or more = not sociable); for the clinician's rating, those rated as average to very sociable for their age were classified as sociable; those rated as not very social or not at all social for their age were classified as not sociable. The results indicate that there is concordance between their impressions and the ADBB raters' scores on 68% of infants; however, the accuracy is best for those scored as sociable on the ADBB—96% of these get a similar rating by the clinician. For those rated on the ADBB scale as not social (i.e., a score of 5 or more), the concordance by the clinicians dropped to just 9%.

Factor Analysis

Both varimax and oblique rotations initially produced two factors with eigenvalues greater that 1. Item 4 (self-stimulating gestures) did not load on either factor in both methods. The varimax rotation produced a more complex solution (four items loading on both the first factor and a second minor factor by 0.4 or more) compared with the oblique factor rotation, the pattern matrix of which produced no complex items. Thus, this oblique rotation solution will be described.

Table 1 shows the item loadings on the two factors which accounted for 58.4% of the variance. . The first, and major, factor (accounting for 52.7% of the variance) consists 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) consists of general level of activity, vocalizations, and briskness of response to stimulation. These factors make intuitive sense, in that the perceived sociability of a baby to an observer is often conveyed by facial appearance—a baby who smiles and looks at the observer is more appealing than one who has limited facial expression or looks away from the observer. The level of activity and, to a lesser extent, vocalizations (which on the ADBB can be any type of vocalization—from cooing and babbling to crying) are less likely to determine the sociability of the baby to the individual. As noted, Item 4 (self-stimulating gestures) did not load on either factor. Cronbach's alpha for the scale was 0.80. If Item 4 was removed, this would increase to 0.87.

DISCUSSION

This pilot study adds to the work of others on the use and development of the ADBB scale and the relationship between maternal mood and infant social behavior. While this is only a pilot study, the main findings are that (a) the infant's social behavior towards a comparative stranger during the routine physical checkup is related to the mother's report of her mood since the birth; (b) the clinicians in this study (early childhood nurses and pediatrician) did not identify most of

the withdrawn infants as classified by their score on the ADBB, (c) factor analysis indicates that there are two factors on the ADBB—one a nonverbal social factor and the other a verbal and motoric social factor, and (d) the *SEM* for the scale is between 1 and 2 points.

Maternal Mood and Infant Social Behavior

The finding that the mother's current mood (EPDS score) is not related to the infant's social behavior, but that her mood since the birth is related to the ADBB score, is important, though clearly the asking of just one mood question limits our knowledge of this finding. Additional questions about the onset and duration of mood difficulties will improve our understanding of the possible impact of this on infant's social behavior. However, it is interesting that another recent Australian study has obtained a similar finding, in that the ADBB score was not related to current mood but was to the women's mood in pregnancy (Bookless, 2004). These findings indicate that for some dyads, assessment of just the mother's current mood will miss infants who may have been affected, in their social behavior, by a period of depression or sadness/anxiety in their mother. This highlights the need to ask all women postnatally about how they have been coping since the birth, and not just inquire about their current mood. For those women who report that they have had substantial periods feeling distressed, careful observation of how the infant behaves with the clinician may therefore alert the practitioner to consider whether a more formal assessment of the infant's social behavior is warranted, which may then have intervention implications. Our findings also confirm the work of experimental studies that have demonstrated a link between the infant's mood and the mother's mood in contrived settings.

While we found no relationship between the ADBB score and the mother's description of her infant's "social temperament," note that this was assessed with just one question to the mother rather than using an infant temperament scale. In addition, we unfortunately did not record how many visits the mother and infant had previously made to the Early Childhood Clinic. While such visits are on average rarely more than 2 weeks to monthly after the first few months, the issue of the infant's "familiarity" with the nurse was not controlled; however, it is unlikely that this variable had an impact on the study's findings, given that there was no difference in total ADBB scores between the clinic infants and those assessed through the residential unit (to which they had only been once).

The variable concordance between the clinicians' ratings of the infant's sociability and that by the raters scoring the videotapes is interesting. Examination of the rating data as continuous variables indicates that there is a small-to-moderate relationship between clinicians' and observers' ratings ($r_p = 0.34$). If, however, the variables are treated as categorical (sociable or not sociable), the reason for this small-to-moderate correlation is revealed—it is the strong agreement on the sociable infants producing a significant correlation, but the weak agreement for the nonsociable infants, that prevents the agreement being higher. Clearly, this analysis assumes that the ADBB scores and their split into sociable and not sociable are valid, which has some support in the consistency of this cutoff score being obtained across three studies with different investigators; however, we suggest that further work needs to be done in this area.

In addition, it also is important to emphasis that any infant with withdrawn behavior would require further assessment to elucidate the possible cause(s) of such behavior and the likely treatment options. It would be wrong, at this stage, to always presume that such behavior is as a result of the depression a mother may have experienced, and that such a mood has resulted in understimulation of the infant. This study did not explore other variables that could be contributing to the infants' observed behaviors, such as paternal mood and behavior, and impact

of life events or stressors on the family. But the possibility of maternal depressed mood should be kept in mind and explored. While we do not yet know if there are long-term negative implications of withdrawn behavior in infancy, if such behavior is related to a form of depression in the infant, the provision of some intervention to address either the mother's mood, the infant's withdrawn behavior, or both may be warranted (Luby, 2000). Any such interventions would need to be evaluated with respect to both of these variables.

Another important issue is why there was substantial disagreement on some infants between the three raters. Clearly, the criterion of having a total ADBB score within 3 points is quite strict—there only needs to be a slight (1-point) difference on half the items for the raters to fail to meet this criterion. This can happen because of the degree of specificity of the items. For example, with respect to level of activity—the view that the infant has a "reduced general level of activity—few head and limb movements" has a score of 1, but another rater could rate the same behavior as "Low level of activity in response to stimulation," which gets a score of 3 on this item. In addition, there is likely to be greater agreement between raters if they spend considerable time working together when assessing infants, as with all interaction-type scales, subjective interpretation plays a part.

We are currently working on a modified ADBB scale (fewer items and simpler scoring system) that should increase the reliability of trained raters. We also are developing a training package that may enable this research tool to be introduced into routine clinical practice with acceptable reliability and minimal rater drift following training. Until research is undertaken as to the effectiveness of such training and the viability of clinicians using the ADBB scale in routine clinical practice, we would recommend that the instrument be viewed as useful for research purposes only.

Psychometric Properties

The results of the factor analysis were in contrast to Guedeney and Fermanian's (2001) and Assumpcao et al.'s (2002) findings; however, further examination of the raw data in the French study (data provided by Guedeney, personal communication, September 2003) reveals that the varimax rotation resulted in three items with loadings greater than 0.3 on both factors. It may be that a different rotation method could be used to simplify the derived factor solution.

Another issue to consider when interpreting the factor analysis is the likely lack of independence between some items. The first six items on the ADBB scale all refer to the infant's behavior. The last two, those of the ability of the baby to form a relationship with the observer and the attractiveness of the baby to the observer, are in a sense derivatives of the first six items. A baby who smiles and looks at the observer will most probably be rated as being attractive and able to form a relationship—indeed, examination of the inter-item correlation matrix shows that these latter two items have medium-to-high correlations (≥ 0.5) with most of the other items. Thus, it makes more clinical sense to consider the factor analysis without these two items. If this is done, our study reveals the first factor is comprised of just the facial expression and eye contact items (see Table 1).

Cronbach's alpha for the scale is acceptably high. The slight increase in this value if the self-stimulating gestures item was removed (from 0.80–0.87), together with the lack of loading of this item on either factor, could suggest that the removal of the item from the scale is possible; however, at this stage, we would not recommend this. Self-stimulation is an important behavior that indicates emotional regulation by an infant, and is therefore a sign of possible emotional distress. The original study found it loaded on one of the factors, and until further studies have been conducted to produce a definite and consistent factor pattern, removal of any item is not advised.

We found that there was an acceptable level of interrater reliability when viewing the videotapes among three trained raters, although not to the extent that only two raters could be employed. For 3 of 47 tapes in this study, no agreement could be reached, and consider this to be important. Such information is often lacking in studies, or resolution of different ratings is reported as being achieved by further collaboration. Because of geographical restrictions, joint viewing and discussion of our videotapes to resolve discrepancies in our ratings were not possible (as the chief investigator was in Australia and the other raters in France). We also believe that where three raters give very different ratings independently of each other, it may be more valid to discard those videotapes, for research purposes, than to try to "force" the raters to agree. The impression gained from studies where agreement is reached for all interactions is that the scale, with high interrater reliability, can be used validly on all cases. We believe this is rare, and would not be surprised if this rate of approximately 6% of "unratable infants" could be the case in other studies. Therefore, we would encourage the use of two trained raters (training videotapes are available from the first two authors), with a third as a backup where discrepancies are detected, when the scale is being used for research purposes.

Many of our analyses have used the original ADBB cutoff score of 5 or more determined for the French sample (Guedeney & Fermanian, 2001). While we believe it is important that investigators do not assume that cutoff scores will be consistent across different cultures, it is interesting that in two other cultures, Finland and Brazil, this same cutoff score was found to be optimal (Lopes, 2004; Puura, 2004). These findings lend some support to our use of this score of 5 or more as the cutoff, though we believe further work is needed comparing ADBB scores with an independent criterion of infant social behavior. We also would advocate that users of the scale are trained in understanding the error band inherent in any score on this measure. From our calculations of the *SEM,* we would recommend that scores of 4 *or* 5 be viewed as indicative of possible withdrawn behavior, and further checks using the ADBB scale should be conducted to monitor the infant's social progress.

The issue of whether scores on such measures should be analyzed as a dichotomy or as a continuous variable is always interesting. Our view would be that the dichotomy, providing the *SEM* is incorporated in the interpretation, allows for screening of infants. Any intervention work should then use both methods of analyzing scores for change, in a similar way as described for the EPDS scale by Matthey (2004).

CONCLUSION

Further data have been reported on the use of the emerging ADBB scale. The association between withdrawn infant social behavior and a mother's report of mood difficulties since the birth, as opposed to her current mood status, is important in the context of what we know about possible impacts of postnatal mood disorders on the infant. This finding strengthens the argument for exploring these issues with new parents and, where a mother's mood difficulty is being treated, to possibly incorporate the infant's social behavior as an outcome variable. The psychometric properties of the ADBB scale were found to be reasonably strong, and it is possible that with further research into its use within clinical settings, it can become a useful tool to assist clinicians in considering the infant's social behavior as well as his or her physical development.

APPENDIX 1

ADBB Scale

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

0: No unusual behaviour
1: Doubt as to unusual behaviour
2: Mild unusual behaviour
3: Clear unusual behaviour
4: Severe unusual behaviour

This scale is best rated by the observer on the basis of her/his observations, immediately following the clinical interview. Initially, spontaneous behaviour 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 between two ratings, return to the definition above.

1—FACIAL EXPRESSION: Observer assesses any reduction of facial expressiveness:
0: Face is spontaneously mobile, expressive, animated.
1: Face is mobile, expressive, but limited in range.
2: Little spontaneous facial mobility.
3: Face is fixed, sad.
4: Face is fixed, frozen, absent.

2—EYE CONTACT: Observer assesses the reduction of eye contact:
0: Eye contact is spontaneous, easy and sustained.
1: Brief spontaneous eye contact.
2: Eye contact is possible only when initiated by observer.
3: Eye contact is fleeting, vague, elusive.
4: Total avoidance of eye contact.

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: Frequent and well coordinated, spontaneous head, torso and limb motions.
1: Reduced general level of activity, few head and limbs movements.
2: No spontaneous activity, but reasonable level in response to stimulation.
3: Very low level of activity in response to stimulation.
4: Immobile, rigid, stiff, whatever the stimulation.

4—SELF-STIMULATING GESTURES: Observer assesses the frequency with which the child plays with his/her own body: fingers, hand, hair, thumb sucking, repetitive rubbing etc., in relation to the general level of activity:
0: Absence of self-stimulation; auto-exploration is appropriate to the level of general activity.
1: Self-stimulation occurs fleetingly.
2: Self-stimulation is rare but obvious.
3: Frequent self-stimulation.
4: Constant self-stimulation.

5—VOCALIZATIONS: Observer assesses the lack of vocalization expressing pleasure (cooing, laughing, babbling, babbling with consonant sounds, squealing with pleasure), but also lack of vocalization expressing displeasure or pain (screaming or crying):
0: Frequent, cheerful, modulated spontaneous vocalizations; brief crying or screaming in response to an unpleasant stimulation or sensation.

1: Brief spontaneous vocalizations, frequent screaming or crying (even if only in response to stimulation).
2: Infant is constantly crying.
3: Whimpering only in response to stimulation.
4: Absence of vocalization.

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 the delay in response:
0: Appropriate, brisk and swift response to stimulation.
1: Slightly delayed and sluggish response to stimulation.
2: Sluggish, delayed response to stimulation.
3: Markedly sluggish response to even unpleasant stimulation.
4: Very delayed response to stimulation, or absence of any response to stimulation.

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. Relationship is assessed through attitude, visual contact, reaction to stimulation:
0: Relationship clearly and quickly established, rather positive (after a possible initial phase of anxiety) and sustained.
1: Relationship identifiable, positive or negative, but less sustained.
2: Relationship mildly evident, delayed, positive or negative.
3: Doubt as to the existence of a relationship.
4: Absence of identifiable relationship to others.

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:
0: The child attracts attention through his/her initiative and contact, generating a feeling of interest and enjoyment.
1: There is interest towards the child, but with less pleasure than as described in 0.
2: Neutral feelings towards the child, possibly with a tendency to forget to focus on the child.
3: Uneasy feeling towards the child, feeling of being maintained at a distance.
4: Disturbing feeling with the child, impression of a child beyond reach.

LAST NAME:

FIRST NAME:

TOTAL:

DATE:

AGE:

MONTHS:

EXAMINER:

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