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MATERNAL MIND-MINDEDNESS: RELATIONS WITH MATERNAL–FETAL ATTACHMENT AND STABILITY IN THE FIRST TWO YEARS OF LIFE: FINDINGS FROM AN AUSTRALIAN PROSPECTIVE STUDY

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ABSTRACT: Mind-mindedness captures a caregiver's attunement to his or her infant's mental states, and the tendency to interpret behavior as resulting from these mental states. The construct is assessed through analysis of maternal language during interaction or from mothers' use of mental state words when invited to describe their child. This study examined whether maternal–fetal attachment predicted maternal mind-mindedness, whether there was continuity in mind-mindedness over the first 2 postnatal years, and concordance for the two approaches to measurement. One hundred fifty women completed a questionnaire measure of maternal–fetal attachment in the third trimester of pregnancy and participated in home visits to assess maternal mind-mindedness when their infants were 7 months and 19 months of age. Path analysis showed that maternal–fetal attachment predicted indices of maternal mind-mindedness at 7 and 19 months; mothers who made more mind-related comments during play at 7 months also did so at 19 months, and mothers who made more mind-related comments during play at 19 months also used more mental state words when describing their child. Results suggest that a proclivity to mind-mindedness may be a caregiver characteristic that is present prior to birth and stable over time.

Keywords: maternal mind-mindedness, maternal–fetal attachment

RESUMEN: La mentalidad orientada hacia el pensamiento mental capta la sintonía de quien presta cuidado para con los estados mentales de su infante. El diseño es evaluado a través de análisis del lenguaje materno durante la interacción o a partir del uso materno de palabras sobre estado mental cuando se le invita a describir a su niño. Este estudio examina si la afectividad materna hacia el feto predijo la mentalidad de la madre orientada hacia el pensamiento mental, si hubo continuidad en tal mentalidad durante los dos primeros años postnatales, y concordancia para los dos acercamientos a la medición.

Ciento cincuenta mujeres completaron un cuestionario para medir la afectividad de la madre hacia el feto en el tercer trimestre del embarazo y participaron en visitas a casa para evaluar la mentalidad de la madre orientada al pensamiento mental cuando sus infantes tenían 7 y 19 meses de nacidos. Los análisis de trayectoria mostraron que la afectividad de la madre hacia el feto predijo índices de la mentalidad materna orientada al pensamiento mental a los 7 y 19 meses; las madres que hicieron comentarios más relacionados con la mente durante el juego a los 7 meses también lo hicieron a los 19 meses y las madres que hicieron comentarios más relacionados con la mente durante el juego a los 19 meses también usaron más palabras sobre el estado mental cuando describían a sus hijos. Los resultados sugieren que una propensión a la mentalidad orientada hacia el pensamiento mental pudiera ser una característica de quien presta cuidado que está presente antes del nacimiento y se mantiene firme a través del tiempo.

Palabras claves: mentalidad materna hacia el pensamiento mental, afectividad materna hacia el feto

RÉSUMÉ: La préoccupation pour les pensées de l'autre, en anglais *mind-mindedness*, capture l'harmonisation du parent avec les états mentaux de son bébé, et la tendance à interpréter le comportement comme résultant de ces états mentaux. Le concept est évalué à travers une analyse du langage maternel durant l'intereaction ou à partir de l'utilisation que font les mères de mots d'état mental lorsqu'on les a invitées à décrire leur enfant. Cette étude a examiné si l'attachement foetal maternel prédisait la préoccupation maternelle pour les pensées de son bébé, s'il existait ou non une continuité dans la préoccupation les deux premières années après la naissance et si une concordance pour les deux approches à la mesure pouvait être trouvée. Cent cinquante femmes ont rempli un questionnaire de mesure de l'attachement foetal maternel dans le troisième trimestre de la grossesse et participé à des visites à domicile destinées à évaluer la préoccupation pour les pensées du bébé lorsque les bébé avaient 7 et 19 mois. La trajectoire d'analyse

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a démontré que l'attachement foetal maternel prédisait les indices de préoccupation maternelle à 7 et 19 mois. Les mères ayant fait état de plus de commentaires de préoccupation durant le jeu à 7 mois le faisaient également à 19 mois et les mères ayant fait plus de commentaires de préoccupation durant le jeu à 19 mois ont aussi utilisé plus de mots d'état mental en décrivant leur enfant. Les résultats suggèrent qu'une tendance à la préoccupation pour les pensées peut s'avérer être une caractéristique qui est présente avant la naissance et stable avec le temps.

Mots clés: préoccupation maternelle pour les pensées de l'enfant, attachement maternel foetal

ZUSAMMENFASSUNG: Unter "Mind-Mindedness" versteht man, die Einstimmung der Bezugsperson auf die mentalen Zustände seines/ihres Kindes und die Absicht, das Verhalten als Folge dieser mentalen Zustände zu interpretieren. Das Konstrukt wird durch die Analyse der mütterlichen Sprache während der Interaktion oder anhand der Anzahl von genannten mentalen Zustands-Wörtern erfasst, wenn Mütter aufgefordert werden, ihr Kind zu beschreiben. Diese Studie untersuchte, ob mütterliche pränatale Bindung mütterliche Mind-Mindedness vorhersagt, ob in den ersten beiden Jahren nach der Geburt Kontinuität in der Mind-Mindedness vorlag und ob Konkordanz im Hinblick auf die beiden Erfassungsansätze besteht.

Einhundertfünfzig Frauen füllten im dritten Trimester der Schwangerschaft einen Fragebogen zu mütterlicher pränataler Bindung aus und wurden 7 und 19 Monate nach der Geburt zu Hause zur Beurteilung der mütterlichen Mind-Mindedness besucht. Eine Pfadeanalyse zeigte, dass die mütterliche pränatale Bindung Indizes der mütterlichen Mind-Mindedness 7 und 19 Monate nach der Geburt vorhersagte. Mütter, die 7 Monate nach der Geburt mehr Kommentare bezüglich mentaler Zustände während des Spiels äußerten, taten dies auch 19 Monate nach der Geburt. Zudem verwendeten Mütter, die 19 Monate nach der Geburt mehr Kommentare bezüglich mentaler Zustände während des Spiels äußerten bei der Beschreibung ihres Kindes auch mehr Wörter, die mentale Zustände beschreiben. Die Ergebnisse legen nahe, dass es sich bei der Neigung zur Mind-Mindedness um eine Eigenschaft der Bezugsperson handelt, die vor der Geburt vorhanden und zeitlich stabil ist.

Keywords: mütterliche Mind-Mindedness, mütterliche pränatale Bindung

抄録: マインド・マインデッドネスMind-Mindednessは、養育者が自分の乳児の心的状態に調律することattunement、そして行動がそれらの心的状態からもたらされると解釈することをとらえている。構成概念は、相互交流の間の母親の言語を通して、あるいは自分の子どもを描写するように頼まれた時に、母親が使う心的状態の言葉mental state wordsから評価される。この研究では、母親の胎児との愛着が母親のマインド・マインデッドネスを予測するかどうか、マインド・マインデッドネスには生後 2 年間にわたって連続性があるかどうか、そして 2 つの測定アプローチの一致度を調査した。

150人の女性が妊娠後期に母親の胎児への愛着を測定する質問紙を終え、乳児が月齢7ヶ月と19ヶ月時に母親のマインド・マインデッドネスを評価するための家庭訪問に参加した。パス分析から、母親の胎児への愛着は、7ヶ月と19ヶ月時の母親のマインド・マインデッドネスの指標を予測した; 7ヶ月時にプレイの間にこころに関連したmind-relatedコメントをより多くした母親は、19ヶ月時にも同じようにし、19ヶ月時のプレイの間にこころに関連したコメントをより多くした母親は、自分の子どもを描写するときにも心的状態の言葉をより多く使った。結果から、マインド・マインデッドネスの傾向は、出産前から存在し長期にわたって安定している養育者の特徴characteristicであるだろうと示唆される。

キーワード: 母親のマインド・マインデッドネス, 母親の胎児への愛着

摘要: 思維意識的構念捕捉了護理者和他/她的嬰兒的心理狀態的協調, 和用這些心理狀態來解釋嬰兒行為的傾向。我們通過產婦的語言分析過程中的相互作用, 或從母親當被邀請來形容她們的孩子時, 使用心理狀態的話, 去評估這個構念。本研究探討母親胎兒依附是否預測產婦的思維意識, 產後頭兩年思維意識是否有持續性, 以及這兩種測量方法是否一致。一百五十名女子在他們嬰兒分別為7和19個月大時完成妊娠晚期母親胎兒依附的問卷調查, 並參加了家訪, 評估母親的思維意識。路徑分析表明, 母親胎兒依附預測嬰兒7至19個月時母親思維意識的指數;在7個月時使用較多心理狀態的話的母親, 於19個月時也多採用心理狀態的話。在嬰兒19個月玩耍時多採用心理狀態的話的母親, 也多用精神狀態的話去來描述她們的孩子。結果表明, 思維意識的傾向可能是一個照顧者的特點, 這傾向是出生前已存在, 並隨著時間的推移而穩定。

關鍵詞: 母親的思維意識, 母親胎兒依附

ملخص: التوحد الذهني يعبر عن لحظات تفاعل الأم مع الحالات العقلية للرضيع والاتجاه نحو تفسير سلوكه كنتاج لهذه التغيرات الذهنية . ويتم قياس هذه الظاهرة من خلال تحليل اللغة الأمومية أثناء التفاعل مع الطفل أو من خلال استخدام الام لمصطلحات متعلقة بالحالة العقلية أو الذهنية عند وصفها للطفل . تناولت هذه الدراسة ماإذا كان التعلق الأمومي بالجنين ينبئ بظاهرة التوحد الذهني واستمرارها على مدى أول سنتين في عمر الطفل .

استكمل 150 امرأة استبيانا عن التعلق الأمومي بالجنين في الفترة الأخيرة من الحمل وكذلك خضعوا لزيارات منزلية لتقييم حالة التوحد الذهني في عمر 7 شهور و19 شهر . أظهر تحليل المسار أن التعلق الأمومي بالجنين ينبئ بمؤشرات التوحد الذهني لدى الأم عند عمر 7 شهور و19 شهر . الأمهات اللواتي استخدمن مصطلحات ذهنية أكثر أثناء اللعب في عمر 7 شهور قاموا بذلك أيضا في عمر 19 شهر والأمهات اللواتي أبدين تعليقات ذهنية أكثر في عمر 19 شهر استخدموا مصطلحات ذهنية أكثر عند وصفهم للطفل . النتائج تشير إلى أن الميل نحو التوحد الذهني ربما يكون خصوصية لدى مقدم الرعاية أو الأم موجودة قبل الولادة وتستمر مع الوقت .

كلمات مفتاحية : *التوحد الذهني الأمومي – التعلق الأمومي بالجنين*

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The capacity of a caregiver to keep the infant in mind and to see the infant as an intentional individual with his or her own feelings and desires is a crucial component of the caregiving system (George & Solomon, 2008; Slade, 2005). This capacity has been defined and measured in different ways (Sharp & Fonagy, 2008), including the ability to interpret and predict the behavior of self and others in terms of mental processes (reflective functioning; Fonagy, Steele, Moran, Steele, & Higgitt, 1991), mental representations of the self as parent and of the child in the current parent–child relationship (Aber, Slade, Berger, Bresgi, & Kaplan, 1985; Zeanah, Benoit, Hirshberg, Barton, & Regan, 1994), and approaches that have a more specific focus on caregiver representations of the child's mental states and intentionality, such as insightfulness (Koren-Karie, Oppenheim, Dolev, Sher, & Etzion-Carasso, 2002) and maternal mind-mindedness (Meins, 1997).

Mind-mindedness, the focus of the current research, has been defined as a parents' tendency to view their child as an intentional agent with his or her own thoughts, perspectives, and mental life (Meins, 1997, 2013). This parental capacity has been inferred from analysis of parent language in two different ways: appropriate or nonattuned comments that parents make about their infant's mental states and feelings during live interaction, "observational measure" (Meins, Fernyhough, Fradley, & Tuckey, 2001), and the use of mental state words when asked to describe their (generally) preschool-aged child, "interview measure" (Meins, Fernyhough, Russell, & Clark-Carter, 1998). A growing body of research has shown that mind-mindedness assessed using the observational measure is associated with more sensitive parenting (e.g., Demers, Bernier, Tarabulsy, & Provost, 2010a; Meins et al., 2001), secure attachment (e.g., Laranjo, Bernier, & Meins, 2008; Meins et al., 2012; Meins et al., 2001), child social cognitive development including theory of mind (Laranjo, Bernier, Meins, & Carlson, 2014; Meins, Fernyhough, Arnott, Leekam, & de Rosnay, 2013), and executive functioning (Bernier, Carlson, & Whipple, 2010).

Meins, Fernyhough, Arnott, Leekam, and Turner (2011) Meins et al. (2012) proposed that mind-mindedness was a stable cognitive behavioral trait likely to be independent of child characteristics and general social circumstances, and one that may predate the birth of the infant. Subsequently, this view was qualified to suggest that while mind-mindedness may indeed be a stable orientation to mental states, it may be specific to representations of people with whom one has close relationships (Meins, Fernyhough, & Harris-Waller, 2014). There remain a number of unanswered questions about the construct of mind-mindedness that we sought to address in this article. Relatively little is known about the origins of individual differences and whether the construct is stable over time in relation to a particular child. There also is limited information regarding whether the two different approaches to measurement (observational and interview) are tapping the same construct.

PRENATAL ORIGINS OF MIND-MINDEDNESS

One of the key developmental tasks of pregnancy is that the expectant mother engages in a process of psychological reorganization, whereby she develops mental representations of herself as a mother and of the expected child, and an imagined future relationship with that child (Cranley, 1981; Slade, Cohen, Sadler, & Miller, 2009; Zeanah & Barton, 1989). These representations become more differentiated toward the end of pregnancy and include schemas of the unborn baby as a unique person with stable temperamental characteristics (Ammaniti et al., 1992).

Maternal–fetal attachment is an empirical construct that embodies these maternal cognitions and emotional responses to the pregnancy and developing fetus (Cranley, 1981; van den Bergh & Simons, 2009). It is assumed that prenatal representations of the infant will influence how mothers feel about and interact with their infant after birth, but there is limited evidence to support this, particularly when self-report questionnaires are used to assess prenatal representations. Several reviews of the correlates and predictive validity of individual differences in maternal–fetal attachment have yielded equivocal and inconsistent findings (Cannella, 2005; van den Bergh & Simons, 2009; Walsh, Hepper, Bagge, Wadephul, & Jomeen, 2013), partly due to the fact that the construct is multifaceted and measured in many different ways.

Two prospective studies have demonstrated that adolescent mothers who reported a more positive relationship during pregnancy (higher levels of warmth, interest, and connection with the unborn baby) showed more affectionate caretaking during the first postpartum week (Bloom, 1995) and more positive affect and involvement in face-to-face play 3 months after birth (Siddiqui & Hagglof, 2000). Individual differences in maternal–fetal attachment also have been associated with secure attachment styles in the mother and with more optimal child developmental outcomes (Alhusen, Hayat, & Gross, 2013).

To our knowledge, there are just two reports from a small sample that have examined the prenatal origins of maternal mind-mindedness. Contrary to prediction, an autonomous state of mind regarding attachment, assessed in pregnancy, did not predict mind-mindedness 6 months after birth in a small sample (Arnott & Meins, 2007). However, mothers who were more willing to engage in conjecture about what their unborn child would be like in the third trimester of pregnancy used proportionally more appropriate mind-minded comments during free play with their infants 6 months after birth, suggesting that mind-mindedness may have its origins in a parent's willingness to represent the fetus as a potential child with likes, dislikes, and emotional interests (Arnott & Meins, 2008). Feelings of attachment to the unborn child also were assessed using the self-report Antenatal Attachment Scale (Condon, 1993), but were not related to later mind-mindedness.

Building on the idea that mind-mindedness evolves over the transition to parenthood, Meins et al. (2011) subsequently reported in a larger sample that mothers who made more appropriate mind-related comments during interaction with their infants

had more positive recollections about the child's fetal development, birth, and early life. However, the retrospective design was a substantial limitation since mothers' perceptions may have been revised in response to experiences with the infant in the intervening months. The current study prospectively examines relations between feelings toward the unborn baby in pregnancy and later mind-mindedness.

IS MIND-MINDEDNESS STABLE?

Our second objective was to examine the stability of mind-mindedness over time and whether the two different approaches to measurement are congruent. Evidence to date has been limited. Meins et al. (2011) reported significant correlations for mothers' appropriate and nonattuned mind-related comments when their infants were 3 and 7 months old. The frequency of both types of mind-related comments increased as the baby got older, and the researchers posited that continuity in proclivity to mind-minded discourse applied regardless of developmental change in the infant. The current study provides a more rigorous test by examining stability from infancy to toddlerhood, a period spanning significant developmental and cognitive change.

There is even less information about concordance for the two different measures: whether what mothers say to their infants relates to how they talk about them. Meins et al. (2003) showed that mothers who made more appropriate mind-related comments during interaction with their 6-month-old infants used more mental state words when asked to describe their child at age 4 years. More recently, Lundy (2013) reported concordance in a small sample between mothers' mental state words in descriptions of their 4-year-olds and their use of mind-related comments during an observed interaction. This is the only study that has used the observational approach to measurement in older children, and the measure developed for the study bears little resemblance to the infant measure.

There are no clear developmental guidelines regarding the validity of the different measures at different developmental stages. Researchers generally have used the observational measure for infants under 12 months and the interview approach for older (preschool-aged) children, and most studies have assessed mind-mindedness in infants 12 months or younger, with limited data on parents and infants in the second year of life. One group of researchers used both the interview and observational measures to assess mind-mindedness in a sample comprised of adolescent and adult mothers of 18-month-old infants. Modest concurrent relations between mental state descriptors of the child and sensitivity have been reported, but only when the valence of the descriptors was considered (Demers et al., 2010a). In a second report from this sample, the frequency of observed mind-related comments during a free-play interaction was associated with maternal sensitivity, but only for the adult mothers (Demers, Bernier, Tarabulsy, & Provost, 2010b). Concordance between the different measures of mind-mindedness was not reported. Arnott and Meins (2007) suggested that a unique property of mind-mindedness is that it is a construct at the interface between representation and behavior; thus, in this study, we wanted to examine whether the representations of the child accessed by the interview question related to observed maternal discourse about the child's mental states during real-time interaction.

In summary, this prospective study aims to add to understanding of the origins and stability of individual differences in maternal mind-mindedness. We use path analysis to examine (a) whether the quality of the maternal–fetal relationship in the third trimester of pregnancy predicts a mothers' tendency to label mental states of her child in both the first and second year of life; (b) whether a mother's tendency to explicitly label her child's mental states at 7 months of age predicts her tendency to do so at 19 months, and (c) whether there is concordance between mind-mindedness scores inferred from observed maternal language during interaction and the mother's use of mental state words in spontaneous descriptions of her 19-month-old child.

METHOD

Participants

Participants were a subsample from a larger prospective study, Parental Age and Transition to Parenthood Australia (PATPA). Inclusion criteria were as follows: nulliparous pregnant women, English-speaking, aged 20 years or older. Due to the study focus on older maternal age, the sampling strategy involved overrepresentation relative to the population of older mothers and mothers using assisted conception. Three hundred seventeen women in Sydney, New South Wales consented to participate in the larger PATPA study, with 266 (84%) subsequently completing all measures in pregnancy and at 4 months' postpartum. Mothers of singleton infants ($n = 253$) were invited to participate in additional home visits in the first and second postnatal year. At 7 months, 150 women participated in the home visit, and 132 participated at 19 months. Due to technical difficulties with video data from the 19-month home visit, observational data were missing for three cases. Those who declined a home visit and/or completed only one visit were more likely to speak a language other than English at home, $\chi^2(1, N = 253) = 5.20$, $p < .05$, but did not differ on other demographic or pregnancy variables.

Mean age at birth of participant mothers was 33.5 ($SD = 4.6$, range = 25–43) years. Approximately 41% ($n = 67$) of women conceived using medical assistance (in vitro fertilization, ovulation induction, or intrauterine insemination). The majority of participants had a partner ($n = 98\%$) and had completed tertiary education (69%, $n = 113$). All infants were firstborn, and there were 92 boys and 72 girls.

Procedure

The study protocol was approved by all relevant institutional ethics committees. Nulliparous pregnant women were recruited from antenatal classes at metropolitan hospitals and from infertility clinics located near the hospitals in two large cities in Australia. Women

who consented participated in a structured telephone interview and completed questionnaires in the third trimester of pregnancy ($M^{\text{gestation}} = 31.69$ weeks, $SD = 1.12$ weeks) and also at 4 months' postpartum (not reported here). Mothers and infants were visited at home when infants were approximately 7 months ($M = 7.22$ months, $SD = .80$ weeks) and 19 months old ($M = 19.07$ months, $SD = .96$ weeks). On both occasions, mothers completed some questionnaires on the researcher's laptop, answered questions to update demographic information, and participated in a free-play interaction (15 min, videotaped) using a set of developmentally appropriate toys provided by the researchers. At the 19-month visit, prior to other activities, mothers were asked to "describe their child," and their response was recorded. Mothers' language during play and in response to the request to describe their child was transcribed verbatim.

Measures

The maternal–fetal relationship. The Maternal–Fetal Attachment Scale (MFAS; Cranley, 1981) was completed in the third trimester of pregnancy to assess the extent to which the participants engaged in behaviors and thoughts that represent an affiliation with their unborn child (e.g., I can almost sense my baby's personality from the way he or she moves around; I wonder if the baby thinks and feels inside of me). Items are scored on a Likert Scale ranging from 0 (*definitely no*) to 4 (*definitely yes*), with higher scores (range = 0–92) indicating more intense attachment. One item ("I keep wondering what sex the baby is.") was not included, as most contemporary mothers know the sex of the baby. Following a recommendation by van den Bergh and Simons (2009), we used the total scale score that has been found to be reliable in several studies. Cronbach's α was .81 for the current sample.

Assessment of maternal mind-mindedness. At both home visits, mind-mindedness was assessed through observing and analyzing maternal interaction during a free-play interaction (Meins et al., 2001). Participants were presented with a set of toys and told to "Play as you normally would with [name of child]." Subsequently, maternal language during the interaction was transcribed verbatim. The transcripts were coded while reviewing the recorded interaction using criteria outlined in the coding manual (Version 2.0, Meins & Fernyhough, 2010). Any comment made by the mother that included an explicit reference to what the infant may be thinking, feeling, experiencing (e.g., "You like the way that toy squeaks") or involved speaking for the infant (e.g., "I don't want to play with that anymore") was classified as mind-minded (mental). Comments also were dichotomously coded as either appropriate or nonattuned. Mind-Related comments were coded as *appropriate* when the researcher agreed with the caregiver's reading of the infant's current internal state (e.g., if the mother said to the infant, "You want the ball" as the toddler looked at or reached for the ball) or coded as *nonattuned* when the researcher disagreed with the mother's reading of the toddler's internal state (e.g., "You're tired" when the infant showed no sign of tiredness or "You want the truck" when the infant was busily engaged with the ball). Two scores were derived for both appropriate and nonattuned comments: a frequency (total) score and a proportional score expressed as a percent (mental state comments/total number of comments) to account for participant verbosity. At both follow-ups, 30% of all transcripts were coded by a second trained coder who was blind to study hypotheses. Intraclass correlations for agreement between the two coders for appropriate comments at 7 and 19 months were .99 and .95, respectively; and .90 for nonattuned comments.

Mind-mindedness also was assessed at 19 months by coding maternal language in response to the interview question "Please describe your child, [child's name]" (Meins et al., 1998). Responses were coded as follows: Each descriptor of the child was placed into one of four mutually exclusive categories: mental, behavioral, physical, or general. Mental attributes were descriptors related to the child's mental life, interests, will or intention, knowledge, intellect, likes, and emotions (Meins & Fernyhough, 2010). Examples included "He knows how to make me laugh, and "She loves reading new books." Behavioral attributes included comments that referred to the child's behavior, such as games or activities in which the child was involved (e.g., "He is always on the move" or "She is very talkative"). Physical attributes included any statements regarding the child's appearance, age, or position in the family (e.g.,"She's very big for her age"). General attributes included comments that did not fit into one of the other three categories (e.g., "We think he's great"). Frequency scores were calculated for each category as was a proportional score (to control for participant verbosity) for the mental state attributes/total number of comments across all four categories. One third of all transcripts were coded by a second trained coder. Intraclass correlations were .90 for mental descriptors, .92 for behavioral descriptors, .89 for physical descriptors, and .91 for general descriptors.

Preliminary analyses were undertaken to identify missing data and test for normality of continuous variables. Bivariate relations among study variables were examined using zero-order and point biserial correlations, and potential covariates were identified from demographic variables. Path analyses were conducted using AMOS with full information maximum likelihood estimation (Version 22; Arbuckle, 2010). Criteria used to assess the adequacy of model fit were as follows: a nonsignificant chi-squared goodness-of-fit index, χ^2/df with a value less than 2, a comparative fit index (CFI) value of around .95 or greater, and root mean square error of approximation (RMSEA) with a value less than .06 (Hu & Bentler, 1999).

RESULTS

Preliminary Analyses and Bivariate Associations

All variables met assumptions of normality, with the exception of nonattuned mind-related comments at both 7 and 19 months, which were positively skewed. Transformation did not improve the normality of the distributions. Two outliers were detected for maternal–fetal attachment, and their scores were changed to scores within 3 *SD*s of the mean (winsorized).

TABLE 1. *Correlations and Means and SDs of Study Variables*

Variable	1	2	3	4	5	6	7	8	9	10	11	*M* (*SD*)	Range
1. Maternal–Fetal Attachment	–											68.93 (9.23)	35–84
2. Appropriate MRC 7 Months (F)	−.10	–										17.75 (9.39)	0–56
3. Appropriate MRC 7 Months (%)	−.12	**81****	–									8.05 (3.82)	0–19.55
4. Nonattuned MRC 7 Months$^{\beta}$ (F)	−**.20****	.17*	.05	–								.65 (1.30)	0–6
5. Nonattuned MRC 7 Months$^{\beta}$ (%)	−**.21****	**.16***	.09	**.99*****	–							.27 (.52)	0–2.15
6. Appropriate MRC 19 Months (F)	**.19***	**.31****	.17†	.00	.01	–						7.23 (3.31)	0–29
7. Appropriate MRC 19 Months (%)	.15	**.26****	**.23****	−.03	−.03	**.86****	–					3.71 (2.50)	0–13.48
8. Nonattuned MRC 19 Months$^{\beta}$ (F)	−.02	**.22***	.10	.07	.05	.12	.10	–				2.74 (2.79)	0–13
9. Nonattuned MRC 19 Months$^{\beta}$ (%)	−.08	.17†	.13	.07	.06	.02	.15	**.96*****	–			1.49 (1.59)	0–8.67
10. Interview MSD 19 Months (F)	.11	**.20***	.13	.12	.11	**.23****	.17†	.13	.09	–		3.45 (2.83)	0–16
11. Interview MSD 19 Months (%)	.15†	.03	.02	.06	.06	**.18***	.16†	.03	.01	**.72****	–	36.08 (22.39)	0–100

Note. MRC = mind-related comments; MSD = mental state descriptors; F = frequency score; % = proportional score expressed as a percentage; $^{\beta}$Spearman's ρ reported due to skewed distribution of non-attuned comments. †$p < .10$. *$p \leq .05$. **$p \leq .01$. ***$p \leq .001$.

Means, *SD*s, and ranges of study variables are shown in Table 1. The mean proportion of appropriate mind-minded comments at 7 months was comparable with, but a little lower than, that reported by Meins et al. (2011) in a community sample of mothers of 7-month-old infants. Mean scores at 19 months were somewhat higher for both mind-mindedness measures (observation, interview) than were those previously reported by Demers et al. (2010a, 2010b) in a French-speaking Canadian population. At 7 months, 70% of mothers ($n = 105$) made no nonattuned mind-related comments (range = 0–6); at 19 months, nonattuned comments were more common, with only 18% ($n = 22$) of mothers making no nonattuned comments (range = 0–13). While the manual recommends using proportional mind-mindedness scores corrected for verbosity, some researchers (e.g., Demers et al., 2010a, 2010b) have reported on frequency scores; therefore, in the current study, we considered both.

T tests examined differences in the mean number of mind-related comments (both frequency and proportional scores) made by mothers at the 7-month and 19-month assessments. Mothers made significantly fewer appropriate mind-related comments at 19 months than they did at 7 months for both frequency scores, $t(115) = 12.15$, $p < .001$, and proportional scores, $t(115) = 11.64$, $p < .001$. Conversely, mothers made significantly more nonattuned mind-related comments at 19 months than they did at 7 months for both frequency, $t(115) = -7.76$, $p < .001$, and proportional scores, $t(115) = -7.55$, $p < .001$.

Bivariate associations among study variables and potentially confounding demographic variables were examined. Pearson's *r* was calculated for continuous variables, Spearman's ρ for skewed variables (nonattuned mind-related comments), and point-biserial correlations for categorical demographic variables (maternal education, mode of conception, and child gender).

Maternal–fetal attachment was significantly positively related to frequency of appropriate mind-related comments at 19 months, and negatively related to both frequency and proportional nonattuned mind-related comments at 7 months. Frequency and proportional scores for mind-mindedness variables were highly correlated at each assessment time. Appropriate mind-related comments at 7 months and 19 months were significantly positively correlated. Frequency scores for appropriate mind-related comments from both assessment points were associated with frequency of interview mental state descriptors at 19 months. However, proportional appropriate mind-related scores were not significantly associated (or only marginally associated) with 19-month comments and interview mental state descriptors. Given the patterns of significant associations, only frequency scores for mind-mindedness variables were used in subsequent path analyses (see Table 1).

Of the demographic variables (not shown in Table 1), maternal age at birth was positively correlated with both frequency and proportion of appropriate mind-related comments at 7 months, *r*s $(150) = .19$, $p < .05$. Mothers with tertiary education and mothers of boys used more mind-related descriptors when describing their child at 19 months, $r(132) = .18$, $p < .05$, $r(132) = .21$, $p < .05$, respectively. Mode of conception (spontaneous vs. assisted conception) was not related to any mind-mindedness variables, *p*s $> .10$. Therefore, maternal age and education as well as child gender were controlled in subsequent path analyses.

Path Analyses

Due to the nonnormality of the nonattuned mind-mindedness variables, two models were examined. The first model considered appropriate mind-related variables only and used maximum likelihood estimation. The second model included both appropriate and nonattuned mind-mindedness variables and utilized the Bollen–Stine bootstrapped *p* value of goodness-of-fit to ensure that the skewed, nonattuned variables did not affect results (Bollen & Stine, 1992).

The initial model examined whether maternal–fetal attachment in pregnancy predicted appropriate mind-related comments (observed) at both 7 and 19 months and mental state descriptors (interview) at 19 months, whether appropriate mind-related comments at 7 months predicted appropriate mind-related comments and mental state descriptors at 19 months, and whether

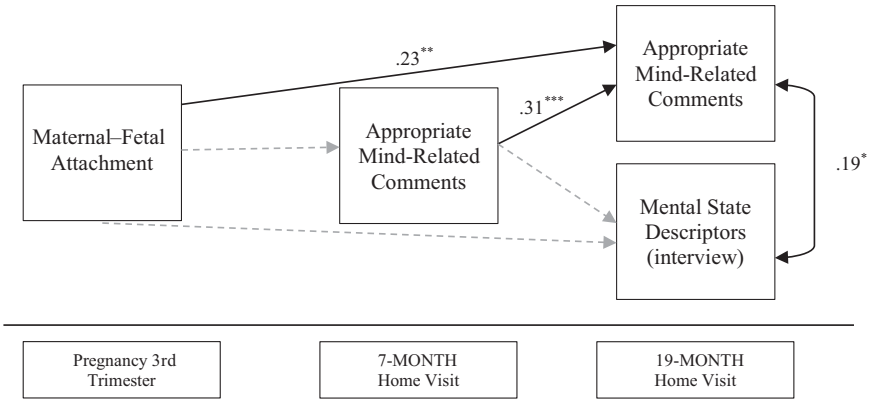

FIGURE 1. Path analysis showing longitudinal associations among maternal–fetal attachment and indices of appropriate maternal mind-mindedness, with standardized coefficients for significant paths (controlling for maternal age at birth of child, maternal education, and child gender) and nonsignificant paths shown in dashed gray lines. Fit indices: $\chi^2(3) = 1.59$, $p = .66$, $\chi^2/df = .53$, CFI = 1.00, RMSEA = .00, , 90% CI = .00, .10. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

19-month mind-related comments and mental stated descriptors were associated. Results indicated that higher levels of maternal–fetal attachment in pregnancy were significantly associated with more appropriate mind-related comments at 19 months, $\beta = .23$, $p < .01$, but not with appropriate mind-related comments at 7 months, $\beta = -.07$, $p = .38$, or mental state descriptors at 19 months, $\beta = .12$, $p = .16$. Appropriate mind-related comments at 7 months predicted appropriate mind-related comments at 19 months, $\beta = .31$, $p < .001$, but did not predict mental state descriptors at 19 months, $\beta = .12$, $p = .18$. At 19 months, appropriate mind-related comments and mental state descriptors were significantly related, $\beta = .19$, $p < .05$. In addition, maternal age at birth was associated with more appropriate mind-related comments at 7 months, $\beta = .18$, $p < .05$, and mothers of boys used more mental state descriptors to describe their child at 19 months, $\beta = .22$, $p < .01$. The fit indices for this model were acceptable, $\chi^2(3) = 1.59$, $p = .66$; $\chi^2/df = .53$, CFI = 1.00, RMSEA = .00, 90% CI (.00, .10). Figure 1 shows this model with standardized coefficients for significant paths (control variables not shown).

In addition to the associations among the variables examined in the initial model, the second model also assessed relations among maternal–fetal attachment and nonattuned mind-related comments at 7 and 19 months as well as associations among nonattuned and appropriate mind-related comments and longitudinal relations between nonattuned variables at both time points. Maternal age at birth, maternal education, and child gender were controlled. To calculate a Bollen–Stine bootstrap p value, missing data were imputed in AMOS using model-based Bayesian multiple imputation. To ensure that data imputation did not alter results, bootstrapping also was undertaken, cases with missing data were omitted. Significant results corresponded across both the imputed and the omitted missing-data-cases samples, with one exception (where significance became marginal), and fit indices were acceptable in both cases. Therefore, imputed data estimates are reported for this model.

The significant associations with respect to appropriate mind-mindedness examined in the earlier model remained significant, with standardized estimates largely unchanged. In addition, higher levels of maternal–fetal attachment in pregnancy were associated with fewer nonattuned mind-related comments at 7 months, $\beta = -.23$, $p = .001$, but not at 19 months, $\beta = .12$, $p = .14$. Nonattuned mind-related comments at 7 months were marginally associated with nonattuned mind-related comments at 19 months, $\beta = .15$, $p = .06$. Appropriate and nonattuned variables were significantly associated at 7 months, $\beta = .18$, $p < .05$, but not at 19 months, $\beta = .08$, $p = .33$. In addition, older maternal age at birth was associated with fewer nonattuned mind-related comments at 7 months, $\beta = -.19$, $p = .01$, and mothers of boys made more nonattuned mind-related comments at 7 months, $\beta = .15$, $p < .05$. Fit indices were acceptable, $\chi^2(7) = 7.58$, $p = .44$, $\chi^2/df = 1.08$, CFI = 0.99, RMSEA = .02, 90% CI (.00, .10). Figure 2 shows the results of this model, with standardized coefficients for the significant paths.

DISCUSSION

This study sought to further explore the origins of maternal mind-mindedness in pregnancy and examine whether mind-mindedness is a stable caregiver characteristic across the first 2 years of a child's life. There was modest support for continuity of mind-related discourse. In a novel contribution, we also found some congruence between mothers' use of mind-related words during real-time interaction with their 19-month-old infants and the proclivity to use mental state words when asked to describe their child. These associations were significant after controlling for maternal age and education and for child gender.

Maternal–Fetal Attachment and Mind-Mindedness

Maternal–fetal attachment was associated with mind-mindedness at both follow-up contacts, albeit with small effect sizes and in somewhat different ways. Mothers with higher fetal attachment scores in pregnancy made fewer nonattuned comments during play with their 7-month-old infants. At 19 months, however, mothers

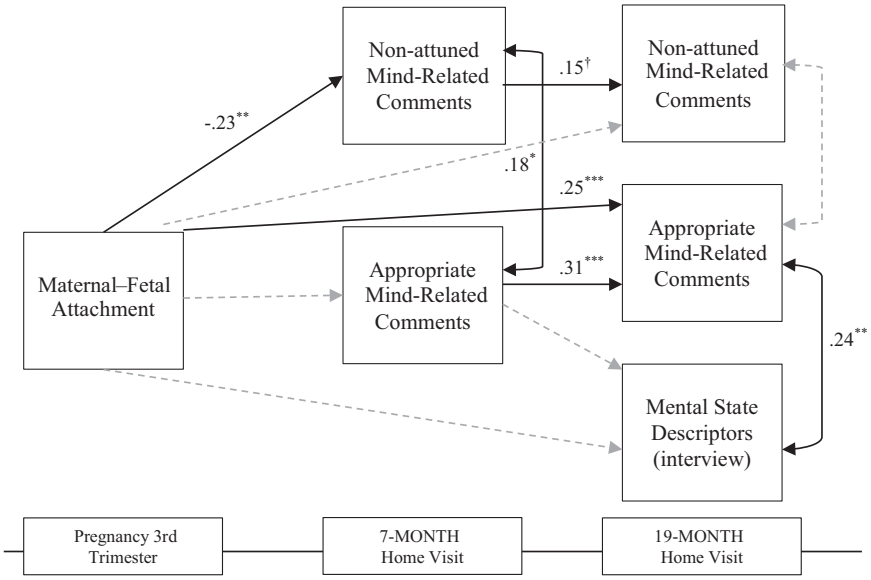

FIGURE 2. Path analysis showing longitudinal associations among maternal–fetal attachment and indices of appropriate and nonattuned maternal mind-mindedness, with standardized coefficients for significant paths (controlling for maternal age at birth of child, maternal education, and child gender) and nonsignificant paths shown in dashed gray lines. Fit indices: $\chi^2(7) = 7.58$, $p = .44$, $\chi^2/df = 1.08$, CFI = .99, RMSEA = .02, 90% CI = .00, .10. †$p \leq .06$. *$p < .05$. **$p < .01$. ***$p < .001$.

who had reported more optimal fetal attachment made more appropriate mental state comments. Maternal–fetal attachment scores were not associated with the number of mind-related descriptors that mothers provided when describing their toddler (interview).

There has been limited evidence regarding the predictive validity of maternal–fetal attachment in relation to maternal behavior (Cannella, 2005; van den Bergh & Simons, 2009), and just one study has examined associations with mind-mindedness. Our results indicate that mothers who engaged to a greater extent in speculation about themselves as a mother and about their unborn infant and who engaged more in behaviors indicating affiliation with the unborn child made fewer nonattuned comments about their infant's feelings and interests in the first year of life. Further, they used more mind-related comments when playing with their infants in the second year of life, suggesting that they were more accurately attuned to their toddler's mental states. These findings are partly consistent with the earlier report by Arnott and Meins (2008); however, that study used a different measure of maternal–fetal attachment (Condon, 1993) and found no association between scores on that questionnaire and mind-mindedness. Mothers who were more willing to engage in conjecture about the baby in response to an open-ended invitation to describe their child (similar to the interview measure of mind-mindedness) made more appropriate mind-minded comments during play with their 6-month-old infants, but there was no association with nonattuned comments. Our findings that higher fetal attachment scores predicted fewer nonattuned comments are intriguing. Nonattuned comments are relatively low frequency, and have generally been found to be unrelated to maternal sensitivity. However, Meins et al. (2012) suggested that they may be salient predictors of parent–child attachment insecurity, particularly ambivalent attachment and disorganization.

These findings add to limited evidence linking self-reports of a more positive maternal–fetal relationship with more optimal parenting after birth (Bloom, 1995; Siddiqui & Hagglof, 2000). Researchers using more complex interview measures that allow the coherence and quality of mental representations of the unborn child to be assessed have provided more convincing evidence. Women with more balanced representations of their unborn child and the caregiving relationship during pregnancy have been shown to demonstrate more positive parenting 12 months after birth (Dayton, Levendosky, Davidson, & Bogat, 2010) and a greater likelihood of secure attachment to their child (Huth-Bocks, Levendosky, Bogat, & von Eye, 2004; Madigan, Hawkins, Plamondon, Moran, & Benoit, 2015). Madigan, Hawkins, Plamondon, Moran, and Benoit (2015) also showed that mothers with an autonomous state of mind regarding attachment are more likely to have balanced prenatal representations of their child, that these representations are stable across the transition to parenthood, and that they mediate associations between state of mind about early attachment experiences and secure mother child attachment. Future research needs to explore associations between maternal–fetal attachment, mind-mindedness, and representational measures of attachment to the child.

Stability of Mind-Mindedness

Taken together, findings linking the maternal–fetal relationship with later mind-mindedness, and the concordance between mind-minded comments during observed play in the first and second years of life as well as between observed mind-related comments and mental state descriptors of the child, support arguments that mind-mindedness taps a stable orientation to mental states, albeit

one that may be specific to close relationships (Hill & McMahon, 2015; Meins et al., 2011; Meins et al., 2014). Supporting this interpretation, Hill and McMahon (2015) found that mothers who scored higher on a trait measure of psychological mindedness, a desire to understand the meaning and causes of the behaviors, thoughts, and feelings of self and others (Applebaum, 1973; Conte, Buckley, Picard, & Karasu, 1995), used more mental state words when invited to describe their preschool aged child.

While these recent studies have shown a consistent tendency to focus on mental states when describing different relationship partners, current findings add to scant data on continuity of mind-related discourse with a particular child over time (Meins et al., 2011; Meins et al., 2003) and concordance across the two measures (Lundy, 2013; Meins et al., 2003). Meins et al. (2011) reported that mothers who made more mind-related comments when their infants were 3 months of age also did so at 7 months, with larger effect sizes than those obtained in the current study. To our knowledge, this study is the first to show that a tendency to make mind-minded comments in the first year of life predicts the tendency to do so later in the second year, and adds to limited data on the validity of the observational measure in the second year of life.

Interestingly, and in contrast to the earlier report by Meins et al. (2011), our mothers in the current study made fewer appropriate mind-related comments with older versus younger children, but the very different developmental stages (range = 3–19 months) limit comparability of findings. On the other hand, and somewhat surprisingly, considering that toddlers might be expected to indicate their preferences and interests more clearly than might infants, nonattuned comments were more frequent at 19 months, as compared with the earlier observation. More work is needed to ascertain the developmental trajectory of mind-related comments in relation to children's language and cognitive development and the applicability of the observational measure for children over 12 months of age.

Currently, there are no developmental guidelines regarding the use of the two measures; however, the observational measure was developed for use with infants under 12 months of age, and most published data concern this age group. The toddler stage is characterized by increases in both autonomy-seeking behavior and negative emotional displays (Brownell & Kopp, 2007). Mothers' talk about beliefs, desires, and feelings also increases, and individual differences in maternal mental state talk may become more pronounced (Brown & Dunn, 1991). Given this, our findings of fewer mind-related comments in this age group are somewhat puzzling. Toddlers also demonstrate great strides in their own capacity to use rudimentary internal state language, with a rapidly increasing verbal and gestural capacity enabling them to express preferences and feelings. Given these more emphatic and clear communications, maternal language may become more focused on providing structure and guiding and teaching rather than making inferences and comments about the infant's mental states. It also is possible that mental state talk is more complex and increasingly references others rather than being focused on the child's own mental states.

Our findings provide some support for the validity of both measures in the second year of life, as have recent findings that mind-mindedness scores (observed) at 18 months predict child mentalizing capacities in the preschool years (Laranjo et al., 2014). The interview measure has been the subject of less empirical evaluation and was originally developed for preschool children. Questions have been raised about the validity for mothers of younger children (Arnott & Meins, 2007; Bernier & Dozier, 2003), with the suggestion that a high frequency of mind-related descriptors for mothers of very young infants might be developmentally inappropriate and indicate less attunement to the child. Another important limitation of the interview measure is that the appropriateness and accuracy of the descriptors cannot be ascertained (Meins, 2013), and recent research has highlighted the importance of considering the differential predictive validity of appropriate and nonattuned comments (Meins, 2013; Meins et al., 2012).

One recent study, however, elected to use the interview measure with mothers of young infants to avoid shared method variance when examining relations with maternal sensitivity and positive feeding behaviors. Farrow and Blisset (2014) found that mothers who used more mind-related descriptors when interviewed about their 6-month-old infants were more sensitive in free-play and feeding contexts. They noted that the frequency of mental state descriptors was lower than that previously reported with preschoolers; however, it was directly comparable to scores in our current study when mothers of 19-month-old infants were asked to describe their child. More research is needed regarding the applicability of the interview measure of mind-mindedness for parents of younger children to determine whether the behavioral and descriptive indices capture the same construct and at what ages they are appropriate and valid.

Finally, some associations between mind-mindedness and demographic variables, and findings in relation to frequency and proportion of mind-related comments, are worthy of comment. Consistent with several previous studies (Meins et al., 2013; Meins et al., 2012; Meins et al., 1998), mind-mindedness was for the most part not related to maternal education. The exception was that mothers with a tertiary education used more mental state descriptors of their 19-month-old toddlers. Interestingly, mothers of boys made more nonattuned comments while playing with their infant at 7 months and also provided more mind-related descriptors of their sons at 19 months, in contrast with previous research that has reported no association with infant gender (e.g., McMahon & Meins, 2012; Meins et al., 2011). Future research could investigate gender-related differences in representations of toddlers in the context of a broader analysis of parent language and gender role socialization.

Findings related to maternal age contribute to a small evidence base suggesting that older mothers may be more mind-minded (Meins et al., 2013). Similarly, Demers et al. (2010b) reported that adult mothers used more mind-related comments than did teenage mothers during interaction with their infants. Older mothers may be more psychologically mature, and this maturity may in turn be

associated with a greater capacity to take the child's perspective and more adaptive parenting cognitions (Camberis, McMahon, Gibson, & Boivin, 2015). Interestingly, this association had attenuated by 19 months, further supporting the need for more research on mind-related discourse with toddlers.

Finally, studies vary regarding whether they take account of maternal verbosity or report frequencies of mind-related comments. In the current study, significant correlations were apparent only for frequency scores. Meins et al. (2013; Meins et al., 2003) reported that findings were similar irrespective of which score was used, and other researchers have reported theoretically meaningful associations for frequency scores (Demers et al., 2010b; Laranjo et al., 2008; Laranjo et al., 2014). Although the rationale that mind-mindedness scores should be adjusted for verbosity is reasonable from an empirical perspective, children whose mothers make many mind-related comments receive these comments, validating their mental states irrespective of how many other types of comments their mothers make. Thus, at least with respect to the observational measure, frequency of mind-minded comments may be meaningful.

Limitations, Conclusions, and Future Directions

Several limitations need to be acknowledged. The sample characteristics (highly educated, older, culturally homogeneous) limit generalizability. Strengths include the prospective design and multimethod approach (questionnaires, interviews, observations).

Little is known about the origins of mind-mindedness, the continuity of mind-related discourse, and the validity of the two different approaches to measurement at different developmental stages. The current findings suggest modest continuity across the first and second years of life and that the two different measures are, at least to some extent, accessing the same construct. The association with maternal–fetal attachment provides some support for the proposition that the proclivity to focus on mental states and agency in the infant may be present before birth and that mind-mindedness can be conceptualized as a caregiver characteristic; however, more research is needed. If this were the case, one would expect associations between mind-mindedness and other measures that tap a parent's capacity to treat the child as a psychological agent, such as reflective functioning (Slade, 2005) and insightfulness (Koren-Karie et al., 2002).

Further research also is needed regarding the origins of individual differences in both maternal representations of the unborn baby and maternal mind-mindedness, particularly with respect to maternal state of mind regarding attachment. The extent to which mind-mindedness is relationship-specific also needs to be established. While some research has shown associations for mind-related descriptors for different close-relationship partners, future studies could examine concordance in mind-mindedness for mothers across siblings, including twins and with unrelated infants. Another direction for future research concerns the cross-cultural applicability of mind-mindedness. It is possible that the attribution of mental states to the child and valuing child agency may be more characteristic of individualistic cultures while in more collectivist cultures, maternal language may be less focused on child individuation and autonomy.

Clinically, it has been suggested that screening for maternal–fetal attachment may provide a cost-effective approach to identifying mothers at risk for relationship difficulties with their infant (Alhusen et al., 2013), although some caution is required due to a lack of conceptual clarity and limited evidence for predictive validity of self-report measures of the maternal–fetal relationship (Walsh et al., 2013). While screening for problematic maternal–fetal relationships using these instruments may be premature, given the current state of knowledge, psycho-education that promotes an orientation to and understanding of the child's mental states can be readily incorporated into antenatal classes, particularly in relaxation and mindfulness sessions, and this may encourage prospective mothers to be more aware of their unborn infants' behaviors and to imagine their infant as a person with a mind and meaningful behavior.

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