Le non verbal des parents : un élément gagnant pour le développement de l'enfant

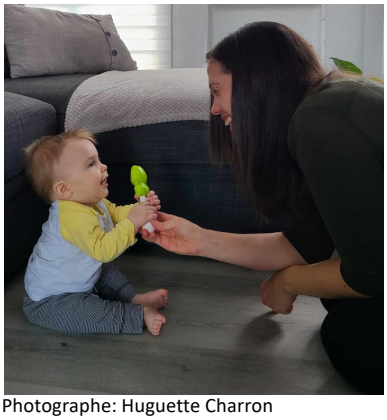
Saviez-vous que notre capacité à affronter les moments difficiles est influencée par notre sécurité d'attachement qui se construit entre 0 et 2 ans? En effet, dès les premiers mois de vie, l'être humain a certains besoins affectifs, dont celui de s'attacher à une figure parentale. Une façon d'aider le bébé à s'attacher à son parent consiste à s'intéresser aux pensées et émotions du petit en donnant un sens à ses comportements, puis en le lui reflétant verbalement (ex. « tu as un grand sourire, tu es content de voir papa? »). Ce phénomène s'appelle la **mentalisation parentale**. Elle permet au bébé de comprendre ses états mentaux, c'est-à-dire ses propres pensées et émotions, ainsi que leurs raisons d'être. La mentalisation parentale augmente également la confiance de l'enfant envers son parent. Cette confiance permettra éventuellement à l'enfant d'explorer le monde qui l'entoure avec assurance, un peu comme s'il détenait une boussole lui permettant de s'aventurer vers l'inconnu, convaincu de retrouver le chemin vers sa base de sécurité. Finalement, la mentalisation parentale influence la sécurité d'attachement qui revêt d'une grande importance pour le bébé, car elle influence son estime de soi, son autonomie, sa confiance en soi et envers les autres, ses relations sociales ainsi que sa résilience, et ce, pour le reste de sa vie.

Les gestes valent-ils autant que les mots ?

Récemment, des chercheurs nous ont appris que la mentalisation parentale peut également s'effectuer de façon non verbale. C'est ce qu'ils appellent la **mentalisation parentale incarnée** (MPI). La capacité du parent à interpréter les états mentaux de son bébé s'exprime donc à la fois par les mots (verbalement) et par la *manière* dont il s'ajuste (non verbalement) aux états mentaux de l'enfant. Telle une danse entre le parent et son enfant, la MPI capture les échanges non verbaux en portant une attention particulière à la qualité des mouvements et des gestes. Par exemple, si un parent secoue brusquement un jouet près du

visage de son bébé et que ce dernier se cambre, tourne la tête ou pleure, le parent peut détecter l'état de l'enfant et s'ajuster en secouant le jouet plus doucement ou plus loin du visage.

À travers ses recherches doctorales en psychoéducation à l'Université de Sherbrooke, Karine Gagné et son équipe ont tenté de voir si cette façon non verbale de s'intéresser aux états mentaux des bébés était liée à leur sécurité d'attachement. L'équipe de recherche ont analysé 110 interactions mères-enfants en contexte de jeu en appliquant la procédure d'observation conçue pour évaluer ce phénomène. Par le biais de son étude, cette équipe est la première à démontrer qu'effectivement, la *manière* dont les mères adaptent leurs gestes aux états mentaux de leur enfant à 8 mois influence la sécurité d'attachement à 15 mois, et ce, au-delà des mots. La MPI est donc un outil précieux pour les parents.


Photographe: Huguette Charron

Intervenir tôt afin d'outiller les parents

Depuis longtemps, les professionnels et les parents accordent beaucoup d'importance aux paroles pour soutenir le développement socioaffectif des tout-petits. Or, cette étude démontre que les bébés captent également le langage non verbal et qu'il est aussi important que les mots dans leur développement socioaffectif.

Ces résultats sont également utiles pour les intervenants qui accompagnent les parents. Ils soulèvent que pour saisir pleinement les éléments qui influencent la sécurité d'attachement des tout-petits, l'évaluation doit inclure des micro-observations du non verbal.

Reste plus qu'à voir comment cet outil si précieux qu'est la MPI peut être connu des parents et des intervenants afin de favoriser le développement optimal des tout-petits.

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Non-verbal and verbal parental mentalization as predictors of infant attachment security: Contributions of parental embodied mentalizing and mind-mindedness and the mediating role of maternal sensitivity

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ABSTRACT

Interest in studying the relative contributions of verbal (e.g., maternal mind-mindedness [MM]) and non-verbal dimensions (i.e., parental embodied mentalizing [PEM]) of parental mentalization to child socio-emotional development is relatively recent. To date, only one study has addressed this issue in relation to child attachment security, suggesting a complementary and unique contribution of each one. The purpose of the present study was to further examine the specific contribution of PEM to infant attachment security by considering MM. In addition, this study aimed to explore the mediating role of maternal sensitivity linking PEM, MM to infant attachment security within 110 mother-infant dyads at moderate psychosocial risk. The two dimensions of parental mentalization (PEM and MM) were assessed on the basis of observations made during a videorecorded sequence of mother-child interactions in a context of free play with and without toys when the infants were 8 months old. The Maternal Behavior Q-Sort was used to measure the mothers' sensitivity in a natural setting based on observations of daily mother-child interactions, also when the infants were about 8 months old. Attachment security was measured using The Strange Situation Procedure at infant age 16 months. The results showed positive correlations between maternal sensitivity and both verbal and non-verbal measures of parental mentalization. The mediation analyses first revealed that PEM had a significant indirect effect on attachment security, with sensitivity being identified as a mediator in this association. No indirect effect linking MM and attachment security via sensitivity was observed. These results highlight the contribution of PEM to maternal sensitivity and show maternal sensitivity to be a factor that partly explains the influence of PEM on attachment security in children.

1. Introduction

Maternal sensitivity has long been considered to be the main driver in the development of infant attachment security. However, the

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relative importance of maternal sensitivity was challenged following the results of different meta-analyses (see De Wolff & Van Ijzendoorn, 1997; Van IJzendoorn, 1995; Verhage et al., 2016) demonstrating a substantially weaker association with attachment than that identified by Ainsworth, Blehar, Waters, and Wall (1978) in her original research. In view of such a moderate association and consistently with one of the central postulates of attachment theory underlying the role of internal working models in the organization of attachment (Bowlby, 1982), several researchers have proposed that parental mentalization may be another factor that contributes to emerging infant attachment security (Fonagy, Steele, Steele, Moran, & Higgitt, 1991; Koren-Karie, Oppenheim, Dolev, Sher, & Etzion-Carasso, 2002; Koren-Karie & Oppenheim, 2018; Meins, Fernyhough, Fradley, & Tuckey, 2001, 2012; Slade, 2005; Slade, Grienenberger, Bernbach, Levy, & Locker, 2005a; Suchman, DeCoste, Rosenberger, & McMahon, 2012). By invoking the concept of parental mentalization, researchers underscored the importance of distinguishing between parents' sensitive responses to infant physical and behavioral signals (e.g., predictability, affective warmth; Pederson & Moran, 1995) and parental capacity to show interest in and attribute meaning to infant mental states (e.g., thoughts, emotions, motivations), defining features of the parental mentalization construct (Meins et al., 2001).

Parental mentalization is considered to be a process that underlies maternal sensitivity: parents who present high levels of parental mentalization are more inclined to adopt sensitive behaviors toward their child (Fonagy et al., 1991; Koren-Karie & Oppenheim, 2018; Koren-Karie et al., 2002; Slade et al., 2005a; Slade, 2005). In this context, parental mentalization acts as an interface between parents' mental representations and their sensitivity in the context of daily interactions, which would subsequently affect infant attachment security and socio-emotional development (Fonagy et al., 1991; Koren-Karie & Oppenheim, 2018; Meins, 2013; Sharp & Fonagy, 2008; Slade, 2005).

1.1. Parental mentalization, maternal sensitivity, and infant attachment security

Research conducted over the last 20 years has tended to demonstrate that parental mentalization and sensitivity play important and complementary roles in the development of infant attachment security (see, among others, reviews by Camoirano, 2017; McMahon & Bernier, 2017; Zeegers, Colonnesi, Stams, & Meins, 2017). In a recent meta-analysis examining the links between parental mentalization, maternal sensitivity and infant attachment security, Zeegers et al. (2017) obtained four major findings: 1) parental mentalization has a direct and an indirect effect on infant attachment security, 2) maternal sensitivity plays a partial mediating role in this association, 3) parental mentalization and sensitivity each explain part of the variance of children's attachment security, and 4) parental mentalization is positively and moderately related to maternal sensitivity. These authors thus underscored the importance of incorporating parental mentalization as a predictor of sensitivity and of infant attachment security in current models (Zeegers et al., 2017).

However, although this research has emphasized that both parental mentalization and sensitivity appear to contribute to the development of infant attachment security, two issues have emerged. The first is conceptual and concerns the operationalization of parental mentalization. The second pertains to the relatively limited research on the parental mentalization mechanisms that are involved in the development of infant attachment security.

1.2. Studying parental mentalization as a function of the verbal and non-verbal dimensions

Interest in studying the verbal and non-verbal dimensions of parental mentalization simultaneously is relatively recent (Shai & Meins, 2018; Shai, Dollberg, & Szepsenwol, 2017). It was sparked by theoretical articles published by Shai and Belsky (2011a, 2011b) pointing to a conceptual limitation in the way to study mentalization in a parenting context : existing constructs for operationalizing parental mentalization (i.e., parental mind-mindedness [MM], parental reflective functioning, and parental insightfulness) were focused on the explicit and verbal dimension and omitted the implicit and non-verbal processes that are part of the conceptualization of the construct. This limitation was shared by other researchers in the field, who stressed the need to adapt current methods to evaluate the implicit and non-verbal processes associated with mentalizing in a way that might complement the verbal dimensions that are usually assessed (Luyten, Malcorps, Fonagy, & Ensink, 2019; Shai & Belsky, 2011a; Shai & Belsky, 2011b; Zeegers et al., 2017).

Shai thus introduced a new construct, parental embodied mentalizing (PEM), in which the non-verbal dimension could be considered (Shai & Belsky, 2011a,2011b; Shai et al., 2017). Contrary to the verbal dimension of parental mentalization, which rests mainly on the parent's narration and verbal expression (e.g., the frequency, consistency and appropriate nature of mentalizing comments; Koren-Karie et al., 2002; Meins et al., 2001; Sharp & Fonagy, 2008; Slade et al., 2005a), PEM pertains rather to *how* parents adapt kinesthetically (e.g., tempo, pacing, etc.) to their child's mental states. Specifically, PEM refers to the parents' non-verbal capacity to understand the child's bodily manifested mental state and adjust their own movements accordingly (Shai & Belsky, 2011a; Shai & Belsky, 2011b; Shai & Belsky, 2017).

The process of non-verbal mentalizing is illustrated by: 1) the quality of movements and of non-verbal communication between parents and their infant; and 2) parental capacity to repair the ruptures occurring in interactions (Shai & Belsky, 2017). Thus, the focus of observations is on the coherence with which parents adapt their actions and movements to their child's mental states, and not on what parents do or not do in their behaviors (Shai & Belsky, 2011b).

To date, there have been two published studies where the links between the two dimensions of parental mentalization were examined (Shai & Meins, 2018; Shai et al., 2017). Both studies indicated that PEM is positively and moderately associated with parental MM ($r = 0.28$; Shai & Meins, 2018) or with parental reflective functioning ($r = 0.29$; Shai et al., 2017), suggesting that each dimension of parental mentalization may contribute to parenting behaviors and child socio-emotional development (Shai & Meins, 2018; Shai et al., 2017).

1.3. PEM, maternal sensitivity, and relative contributions of the two dimensions of parental mentalization to infant attachment security

Only two studies have addressed the links between PEM, maternal sensitivity, and infant attachment security (Shai & Belsky, 2017; Shai & Meins, 2018). Consistent with previous research on verbal parental mentalization (Camoirano, 2017; McMahon & Bernier, 2017; Zeegers et al., 2017), both studies confirmed the existence of positive and moderate links between PEM and maternal sensitivity in 3- or 8-month-old children ($r = 0.39$, Shai & Belsky, 2017; $r = 0.36$, Shai & Meins, 2018). These studies also indicated a unique contribution of PEM to infant attachment security. They both showed that when children are 6- or 8-months-old, PEM predicted attachment security variance at 15 and 36 months, beyond maternal sensitivity (Shai & Belsky, 2017; Shai & Meins, 2018).

To date, only one study has examined and confirmed the relative contributions of the verbal and non-verbal dimensions of parental mentalization to infant attachment security at 15 months. Shai and Meins (2018) obtained results showing that the two indicators of MM (appropriate and non-attuned mind-related comments) and PEM are factors that help distinguish children with a secure profile from those presenting avoidant attachment. In that study, the verbal and non-verbal dimensions of parental mentalization were found to predict infant attachment security over and above maternal sensitivity and socioeconomic status. Those results led to two conclusions: 1) it is important to consider the verbal and non-verbal dimensions of parental mentalization; and 2) their relative contributions are both complementary and distinct as a function of attachment, which supports the hypothesis of a unique contribution by each of the two dimensions of parental mentalization.

In spite of documenting associations between the two dimensions of parental mentalization, maternal sensitivity, and attachment security, those studies provided little information on the mechanisms favoring children's attachment security that involve non-verbal parental mentalization (Shai & Belsky, 2017; Shai & Meins, 2018). Specifically, those studies did not test the proposal by Zeegers and colleagues (2017) that parental sensitivity plays a mediating role in the relationship between verbal parental mentalization and children's attachment security. Indeed, to our knowledge, the mediating role of maternal sensitivity in the relationship between the two dimensions of parental mentalization and children's attachment security has not yet been explored.

1.4. Limitations of previous studies and current issues

Despite the promising nature of those results, certain questions and limitations raised by these studies require attention (Shai & Belsky, 2017; Shai & Meins, 2018). A first element concerns the results of the study by Shai and Meins (2018), where, contrary to expectations, no bivariate relation was found between maternal sensitivity and infant attachment security (Atkinson et al., 2000; De Wolff & Van Ijzendoorn, 1997; Van IJzendoorn, 1995; Verhage et al., 2016). In this study, maternal sensitivity contributes to infant attachment security only when MM and PEM were considered simultaneously. The absence of this link limits the exploration of certain key hypotheses, most notably that of a mediating role for sensitivity in the relation between parental mentalization and infant attachment security.

A second limitation specific to Shai and Meins' (2018) study concerns the evaluation of parental sensitivity and mentalization, which were based on the same mother-infant free-play interaction. The use of the same interaction sequence to operationalize two different constructs may have increased shared method variance. It is methodologically more appropriate to address the relations between constructs in distinct mother-infant interaction segments, as is proposed in the current study.

Finally, it is noteworthy that both studies, which rely on low-risk samples and findings, may not easily generalize to clinical or psychosocial risk contexts. Given that previous studies concerning mother-infant dyads at greater psychosocial risk have suggested differences in the relations between the quality of mother-infant interactions and infant attachment (Booth, Macdonald, & Youssef, 2018; De Falco et al., 2014; Easterbrooks, Bureau, & Lyons-Ruth, 2012; Landi, Giannotti, Venuti, & Falco, 2020), it is conceivable that associations between verbal and non-verbal dimensions of parental mentalization, maternal sensitivity and infant attachment may vary in a context of psychosocial risk where the clinical issues could be greater.

2. The current study

The main objective of this study was to better grasp the specific contribution of the non-verbal dimension of parental mentalization to infant attachment security by considering the verbal dimension (MM), as well as to explore the mediating role of maternal sensitivity, within a sample of mother-infant dyads considered to be at moderate psychosocial risk. First, bivariate associations between PEM, MM, and maternal sensitivity and those between these three factors and infant attachment security are anticipated, as shown in previous studies by Shai and colleagues (see Shai & Belsky, 2017 and Shai & Meins, 2018). The second objective was to examine the mediating effect of maternal sensitivity in the relationships between the verbal and non-verbal dimensions of parental mentalization and children's attachment security, by first considering each dimension separately, and then simultaneously. In line with proposals by Zeegers and colleagues (2017), we expected to document that maternal sensitivity mediated the association between PEM, MM and infant attachment security. Consistent with previous studies that controlled for socioeconomic status (SES; see Shai & Meins, 2018), a score of SES based on the average family income and the number of years of schooling will be considered as a control variable.

3. Method

3.1. Sample

This study was part of a broader longitudinal study conducted with 150 mother-child dyads who were at moderate psychosocial

risk, given the oversampling of younger mothers (mothers could not be more than 25 years old at the expected birth of their child), low levels of education (mothers could not have more than 14 years of education), and low average family income. To participate in this study, only mothers for whom data was available for parental mentalization or sensitivity at T2 (8-months) were selected. Therefore, the current sample consisted of 110 mother-child dyads. At the beginning of the study, the mothers' mean age was 21.8 years (SD = 1.87, range 15–25) with almost two-thirds reporting fewer than 12 years of schooling (65.4 %). Slightly more than a third (36.8 %) had an average family income of under CAN$30,000, representing the poverty threshold established by Statistics Canada in 2009–10, whereas 41.5 % had an average family income above CAN$50,000. The vast majority of the mothers reported cohabiting with or being married to the biological father (93.5 %) and all were White and French Canadian at the beginning of the study. Boys (n = 61) comprised 55.5 % of the sample.

3.2. Procedure and attrition

This study was approved by a university research ethics committee (#108.05.11). Mothers were recruited between 2008 and 2013 through a large hospital located in an average-size Canadian City. The mothers were invited to take part in the study during an ultrasound visit that took place between the 20th and 24th week of pregnancy. The inclusion criteria for mothers were the following: 1) aged less than 25 years at expected birth of the child; 2) have fewer than 14 years of schooling; 3) expect to remain in the general vicinity of the study for the coming 24 months; and 4) absence of major maternal health complications attributable to the pregnancy. The inclusion criteria for infants at birth were the following: 1) birth following 36 weeks of pregnancy; 2) absence of congenital anomalies; and 3) absence of major perinatal complications that require hospitalization or invasive medical procedures.

Data was collected during a home visit conducted at the seventh month of pregnancy (T1) and when the child was approximately 8- (T2) and 16-months-old (T3). Two trained research assistants conducted home visits at T1 and T2. The purpose of the first meeting was to obtain the mothers' free and informed consent for their participation in the study as well as to collect sociodemographic information. At T2, mothers participated with their child in a videorecorded free play sequence of 8 min (5 min with toys and 3 min without toys) that was used to evaluate PEM and MM. The assessment of maternal sensitivity was based on observations made during this 2 -h home visit at T2. The T3 meeting took place in the laboratory to assess attachment.

The attrition rate was 12.7 % (n = 14). The number of participants varied depending on the missing data (min n = 96). Mother-infant dyads who remained in the study did not differ in age (t(107) = -0.08, $p = 0.94$), average family income (t(106) = -0.18, $p = 0.86$), civil status ($\chi^2(1) = 1.13$, $p = 0.23$), or the child's sex ($\chi^2(1) = 0.28$, $p = 0.59$). However, distinctions were observed in the number of years of schooling (t(107) = -2.35, $p = 0.02$), with mothers who remained in the study reporting greater years of education (approximatively 11–12 years of schooling compared to 10 years for those who dropped out).

4. Measures

4.1. Parental embodied mentalizing

To evaluate PEM, we used the procedure developed by Shai (PEM Coding System Manual – version 2.2, Shai, 2017; Shai & Belsky, 2017). This observational strategy focuses exclusively on dynamic communicative body movements, which we applied to an 8-minute mother-infant dyadic free-play interaction when the child was 8-months-old. PEM was coded with the sound off. First, the Embodied Circles of Communication (ECC), representing non-verbal communicational exchanges between mothers and infants as they relate to infant mental states, were identified. Each ECC was classified under one of five themes and under one of the three sub-themes related to body ownership: a) embodied holding – the parent's ability to use his or her own body as a supportive environment for the infant's mental state; b) body ownership – the parent's treatment of the infant as owning its own body, and the appreciation of separateness between the infant's and the parent's bodies and minds. This theme includes three sub-themes: investigation (i.e., when the infant explores the body of its parent by touching the latter's face), manipulation (i.e., the parent creates movement with the infant's legs as an attempts to play), and stimulation (i.e., the parent tickles or kisses the infant's body); c) transitions – the parent moves the infant's entire body in space; d) promoting exploration – generally involving objects likes books or toys, i.e., when the parent and infant engage in kinesthetic interactions; or e) connectivity – the parent attempts to connect with the infant's mental states (i.e., peekaboo games). The predominant kinesthetic qualities in the interaction (ECC) were defined as a function of six criteria: directionality (movement going toward or away from body center), pacing (abrupt vs gradual), pathways (shape of the movement in space, i.e., linear vs rounded), tension flow (bound vs free), tempo (fast vs slow), and space (near vs far). For each kinesthetic quality identified in the ECC, the coder evaluated the quality of the movements between mother and infant on a Likert scale ranging from 1 to 5 (e.g., pacing: abrupt [1] versus gradual [5]). An overall PEM score ranging from 1 (very low) to 7 (very high) based on the kinesthetic qualities was assigned for each ECC and all dyadic interactions. An overall PEM score based on the impression of a mother's general PEM capacity throughout the whole interaction with her infant was assigned using a 7-point Likert scale (from 1 = poor mentalizing to 7 = recognition and appreciation of the infant's mental states). Further details concerning this observation scheme can be found in Shai and Belsky (2017) and Shai and Meins (2018).

The first author was certified in coding PEM and was the primary PEM coder. A second coder, not involved in the other observational measures and unaware of the hypotheses of this study, coded a random sample of approximately 20 % of the total sample (n = 21) to calculate reliability. The intraclass correlation for the global mean PEM score was found to be $r_i = 0.95$. Disagreements were settled by consensus coding between the two observers.

4.2. Maternal mind-mindedness

We evaluated MM according to the procedure described by Meins and Fernyhough (2015). Mind-related comments made by mothers were identified during a filmed free-play interaction with their infant at T2. The video segment of mother-infant interactions is the same as that used for PEM. Interactions were transcribed verbatim, analyzed, and classified according to the two indicators of MM: 1) appropriate mind-related comments (AMRC) and 2) non-attuned mind-related comments (NAMRC).

If the mother made a comment to clarify or describe her infant's mental state in a way that was consistent with the infant's behaviors, the comment was considered to be appropriate. A comment relating to the child's mental states was qualified as appropriate if it referred to an event having occurred during the interaction or if it was associated with a past or future event that was relevant to the context (e.g., "You remember seeing this truck at Grandma's house"). Another type of comment considered appropriate was when the mother spoke in the first person to illustrate what the infant might say had it been able to speak (e.g., "You're saying to Mommy you're happy"). Non-attuned comments referred to misinterpretations of infant mental states. For example, a non-attuned comment would be coded if the mother suggested that the infant modify its activity even though it had shown interest in its current activity. A comment would also be coded as non-attuned if the mother referred to a past or future event that was unrelated to the activity underway or to the infant's mental state.

Observer XT software was used to enter maternal verbalizations in real time. A coder not involved in the coding of other variables and unaware of research hypotheses coded the entire set of data associated with MM. Frequency scores for the number of appropriate and non-attuned mind-related comments were calculated. To control for the mother's verbosity, a total number of verbalizations unrelated to MM was also calculated. The inter-rater agreement was based on a random sample of 20 % of participants ($n = 22$). Intraclass correlations were 0.97 and 0.84, for appropriate and non-attuned comments respectively, and 0.97 for verbalizations unrelated to MM. Disagreements were settled through discussion.

4.3. Maternal sensitivity

Maternal sensitivity was evaluated with the Maternal Behavior Q-Sort (MBQS; Pederson & Moran, 1995). The evaluation was based on all observations made by home visitors at T2. Following the home visit, evaluators completed the 90-item MBQS based on their observations. This instrument provides a total sensitivity score ranging from -1.0 (less sensitive mother) to 1.0 (perfectly sensitive mother).

The evaluators' training in the application of the MBQS consisted of the following components: 1) seminars on the attachment theory and mother-child interactions, which included theoretical elements as well as screenings of video footage of mother-child interactions involving adult mothers and adolescent mothers; 2) the description of videorecorded interactions using the MBQS; and 3) approximately 10 pre-experiment visits followed by "post-visit" interviews with an experienced evaluator. In total, the evaluators' training took about two months.

Several studies have shown that this instrument has excellent validity and reliability (Pederson & Moran, 1995; Pederson, Gleason, Moran, & Bento, 1998; Tarabulsy, Avgoustis, Phillips, Pederson, & Moran, 1997). In our study, the inter-rater agreement established for 24 dyads was 0.83.

4.4. Attachment security

The Strange Situation Procedure (Ainsworth et al., 1978) was used to evaluate the children's attachment security at T3. This mother-infant separation – reunion procedure is used to classify infants into four attachment categories: secure (B), avoidant (A), ambivalent-resistant (C; Ainsworth et al., 1978), and disoriented-disorganized (D; Main & Solomon, 1986). Infants were classified by coders previously trained by Elizabeth Carlson. Thirty dyads were coded separately by two observers, with an 86.67 % agreement for the main classification (26/30). The four dyads for which there was a disagreement were classified by consensus.

4.5. Socioeconomic status

SES characteristics were collected via an in-house questionnaire at T1. Maternal education was evaluated with a Likert scale ranging from 1 (no schooling) to 11 (more than 13 years). The average family income was established on a Likert scale ranging from 1 (under CAN$10,000) to 8 (over CAN$70,000). An SES score was calculated through a factor analysis based on the average family income and the number of years of schooling. The SES score was considered as a control variable in the main analyses.

5. Data analysis

Three sets of analyses were conducted. First, descriptive analyses were conducted, and t-tests carried out as a preliminary analysis. Second, to address Objective 1, bivariate and point-biserial correlations were conducted between PEM, MM, maternal sensitivity and secure/insecure infant attachment. We dichotomize the attachment pattern given the small number of children in some attachment classifications. The first two sets of analyses were conducted with IBM SPSS Statistics version 25.0. Finally, to test the mediating effect of maternal sensitivity in the relationships between PEM and MM and infant attachment security (Objective 2), mediation analyses were conducted using Mplus 8.1 (Muthén & Muthén, 1998-2018). Missing data was managed using full information maximum likelihood, with which missing data can be estimated. We applied the Monte-Carlo method, since it allows for the modeling of

dichotomous variables (Feingold, MacKinnon & Capaldi, 2019; Thoemmes, MacKinnon, & Reiser, 2010), to test three mediation models: one for PEM, a second one for MM, and a third that included the two dimensions of parental mentalization simultaneously.

6. Results

6.1. Preliminary analyses

The child's sex ($\chi^2(1) = 0.16$, $p = 0.69$), maternal age (t(98)=-0.65, $p = 0.52$), maternal education (t(98)=-0.99, $p = 0.33$), and mean family income (t(97)=1.34, $p = 0.18$) did not differ between children with secure and insecure attachments.

6.2. Associations between PEM, MM, and maternal sensitivity

Table 1 presents means and correlations between PEM, the two maternal MM scores (AMRC and NAMRC), maternal sensitivity and infant attachment security. Low to moderate relations were observed between sensitivity and PEM ($r = 0.47$) and between sensitivity and AMRC ($r = 0.21$). No link was found between NAMRC and sensitivity ($r = 0.09$).

6.3. Associations between PEM, MM, maternal sensitivity, and infant attachment security

Table 2 presents descriptive statistics for the different variables as a function of attachment categories (avoidant, secure, ambivalent, and disorganized) and secure/insecure profile. The results indicated a positive and significant correlation between maternal sensitivity and infant attachment security ($r_{pb} = 0.31$). No other significant associations were observed.

6.4. Mediating role of maternal sensitivity in the relationship between PEM, MM, and attachment security

Fig. 1 illustrates the first PEM-only mediation model tested. In this model, PEM was directly linked to maternal sensitivity (B = 0.25, $p = 0.00$, OR=1.28) and maternal sensitivity presented a significant direct effect on attachment security (B=2.41, $p = 0.00$, OR=11.13). An indirect association between PEM and infant attachment security is also documented through maternal sensitivity (B=0.60, $p = 0.02$; OR=1.82). The mediating role of sensitivity is partial, as the direct association between PEM and attachment security remained significant.

Fig. 2 presents the second mediation model, this time using only the AMRC indicator. This model showed a marginally significant direct effect of AMRC on maternal sensitivity (B = 0.01, $p = 0.07$, OR = 1.01) and, as in the previous analysis, a direct effect of maternal sensitivity on attachment security (B=1.75, $p = 0.01$, OR=5.75). The indirect effect of AMRC on attachment security through maternal sensitivity (B=0.02, $p = 0.15$, OR=1.02) was not significant, which indicates the absence of a mediation effect.

Fig. 3 summarizes the third model, which included the two dimensions of parental mentalization. The results indicated a direct association between PEM and maternal sensitivity (B = 0.23, $p = 0.00$, OR = 1.26) and, as in the first model, the indirect association between PEM and attachment security was significant (B = 0.57, $p = 0.02$, OR = 1.77). In this model, the results showed a complete mediation by maternal sensitivity. The indirect effect of MM on attachment security through sensitivity was not significant (B = 0.02, $p = 0.26$, OR = 1.02). This model explained 20.4 % of the variance of infant attachment security.

7. Discussion

The purpose of this study was to examine the specific contribution of PEM in predicting infant attachment security by considering the verbal dimension (MM) within a sample of mother-infant dyads at moderate psychosocial risk. In addition, this study aimed to explore the mediating role of maternal sensitivity in the relationship between the verbal and non-verbal dimensions of parental mentalization and infant attachment security.

The results obtained were as expected, with positive links between maternal sensitivity, PEM, and AMRC being documented, as in

Table 1
Means, Standard Deviations, and Correlations of the Variables Under Study.

Measures	Means	SD	Range	1	2	3	4
(1) PEM	3.53	0.57	1.95–4.94				
(2) AMRC	9.25	4.99	0–22	**0.25*** (103)[e]			
(3) NAMRC	3.18	2.98	0–16	−0.01 (103)	**0.24*** (107)		
(4) Maternal sensitivity	0.44	0.39	−0.73–0.91	**0.47**** (101)	**0.21*** (105)	0.09 (105)	
(5) Infant attachment security (0–1)	–	–	–	−0.02 (91)	−0.02 (94)	0.03 (94)	**0.31**** (96)

Note. **$p < 0.01$; *$p < 0.05$. [a]PEM = parental embodied mentalizing; [b]AMRC = appropriate mind-related comments; NAMRC = non-attuned mind-related comments; [c]SD = standard deviations; [d]Infant attachment security: 0 = insecure/1 = secure; [e] = number of dyads.

Table 2
Descriptive Statistics According to the Four Attachment Profiles and the Secure/Insecure.

	A[d] (n = 13)	B[d] (n = 47)	C[d] (n = 8)	D[d] (n = 23)	Insecure (n = 44)	Secure (n = 47)
PEM[a]	3.59[e] (0.47)[f]	3.53 (0.54)	3.76 (0.59)	3.47 (0.75)	3.55 (0.65)	3.53 (0.53)
	A (n = 13)	B (n = 48)	C (n = 9)	D (n = 24)	Insecure (n = 46)	Secure (n = 48)
AMRC[b]	7.31 (3.90)	8.85 (4.80)	8.11 (3.41)	10.38 (4.75)	9.07 (4.74)	8.85 (4.80)
NAMRC[c]	2.77 (2.74)	3.48 (3.38)	2.22 (2.33)	3.96 (2.82)	3.28 (2.75)	3.48 (3.38)
	A (n = 14)	B (n = 48)	C (n = 9)	D (n = 25)	Insecure (n = 48)	Secure (n = 48)
Maternal sensitivity	0.26 (0.47)	0.56 (0.26)	0.36 (0.42)	0.31 (0.50)	0.31 (0.47)	0.56 (0.26)

Note. [a]PEM = parental embodied mentalizing; [b]AMRC = appropriate mind-related comments; [c]NAMRC = non-attuned mind-related comments; [d]A = avoidant, B = secure, C = resistant, D = disorganized; [e]Means; [f]Standard deviations.

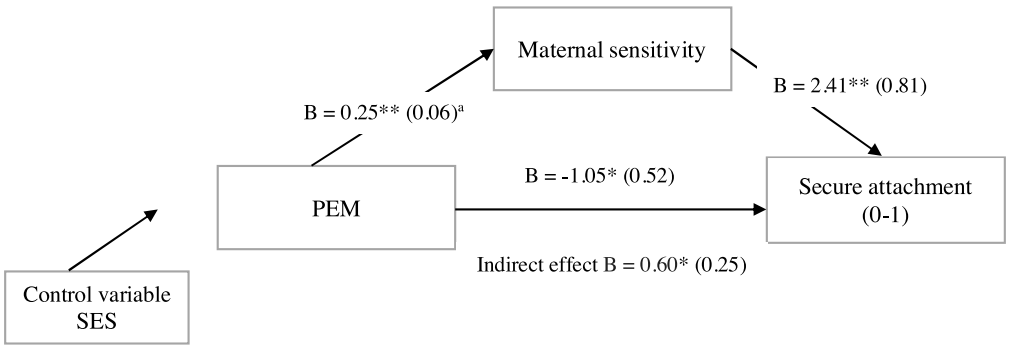

Fig. 1. Direct and Indirect Effects of PEM and Maternal Sensitivity on Attachment Security.
Note. $^{**}p < 0.001$; $^{*}p < 0.05$; $^{\dagger}p < 0.10$; n = 99; $R^2 = 0.20$; [a]Standard deviations; [b]SES = socioeconomic status; [c]Secure attachment: 0 = insecure, 1 = secure.

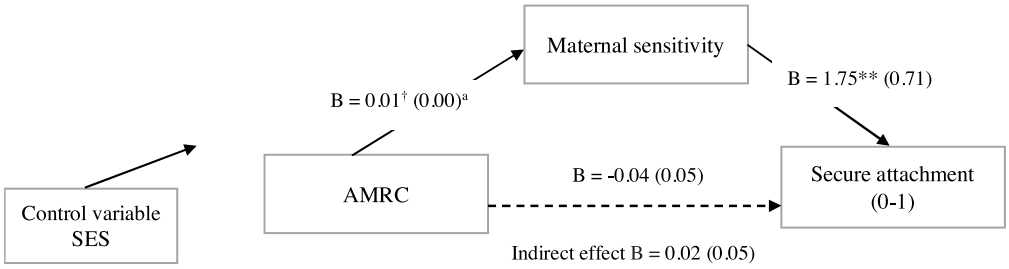

Fig. 2. Direct and Indirect Effects of AMRC and Maternal Sensitivity on Attachment Security.
Note. $^{**}p < 0.001$; $^{*}p < 0.05$; n = 103; $R^2 = 0.13$; [a]Standard deviations; [b]SES = socioeconomic status; [c]AMRC = appropriate mind-related comments; [d]Secure attachment: 0 = insecure, 1 = secure; ⟶ significant association, – · ▶ non-significant association.

previous research (Shai & Belsky, 2017; Shai & Meins, 2018). Whereas the relation between sensitivity and MM is very close to observed meta-analytic effect sizes ($r = 0.21$ vs $r = 0.25$ in Zeegers et al., 2017), the present results show a somewhat greater link between PEM and maternal sensitivity than that obtained in Shai's previous research ($r = 0.47$ vs $r = 0.36$ or $r = 0.39$, see Shai & Meins, 2018 and Shai & Belsky, 2017). This finding may be attributed to the home visiting procedure from which sensitivity observations were made (Pederson & Moran, 1995). This procedure has been viewed as one of the most reliable methods of conducting home observations to draw out attachment processes and can serve to amplify links with non-verbal parental mentalization. Conceptually, this result also suggests that non-verbal parental mentalization involves behaviors that are closer in appearance to sensitivity than verbal parental mentalization. In terms of similarities, PEM and sensitivity share the conceptual characteristic that they are based on parental behaviors in relation to those of the infant and, as such, it is possible that their assessments may be based on similar observations. For example, a parent who shows highly insensitive behavior, such as punitive or hostile behavior, could also be viewed as showing deficits in PEM. It is thus possible that these conceptual similarities stand out more in our study due to the moderate-risk nature of the sample. In this context, it seems plausible, when psychosocial risk is involved, that mothers may experience greater difficulty in mentalization and in sensitivity, an observation that has been regularly made (Berthelot et al., 2015; Ensink et al.,

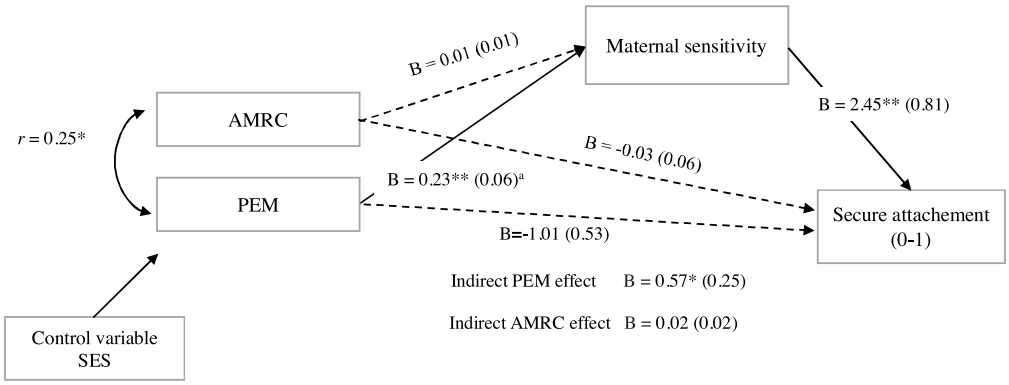

Fig. 3. Direct and Indirect Effects of PEM, AMRC, and Maternal Sensitivity on Attachment Security.
Note. $^{**}p < 0.001$; $^{*}p < 0.05$; n = 99; $R^2 = 0.204$; [a]Standard deviations; [b]SES = socioeconomic status; [c]AMRC = appropriate mind-related comments; [d]Secure attachment: 0 = insecure, 1 = secure; ⟶ significant association, - · ▶ non-significant association.

2015; Kolomeyer, Renk, Cunningham, Lowell, & Khan, 2016; Stacks et al., 2014). A common effect of risk on both variables may serve to increase their association. Further study where different populations are involved could shed greater light on this question.

Nevertheless, the overarching theme of the bivariate findings is the convergence with previous work, emphasizing the associations between parental mentalization variables and maternal sensitivity in the context of daily mother-infant interactions. Accordingly, beyond their respective association, PEM and maternal sensitivity appear to capture different elements of parent-infant interactions. Our results thus highlighted the importance of considering PEM more systematically when studying maternal sensitivity, to better understand the similarities and differences between these two constructs.

Our results also indicated an association between maternal sensitivity and infant attachment security. These results differed from those obtained by Shai and Meins (2018), who, instead, observed differences between the groups based on attachment security for the two indicators of MM (AMRC and NAMRC) and PEM only. Considering the current limited knowledge, it remains difficult to explain why the bivariate links between PEM and infant attachment security established in the study by Shai and Meins (2018) could not be replicated in this study. However, when maternal sensitivity and socioeconomic status are considered simultaneously, PEM contributes to the infant attachment security, which is in line with previous research (Shai & Belsky, 2017; Shai & Meins, 2018). Other studies on these issues will surely be needed to better clarify the complex links involved in these constructs.

The second objective focused on the mediating role of maternal sensitivity in the relation between verbal and non-verbal parental mentalization and infant attachment security. Our results indicated 1) a positive indirect link from PEM to children's attachment security through sensitivity, over and above MM and socioeconomic status, and 2) the absence of an indirect link from maternal MM to children's attachment security. This study thus confirmed the mediating role played by maternal sensitivity in the relationship between PEM and children's attachment security, shedding light on the processes that are involved in the development of infant attachment. This is the major finding of this study. It suggests that the quality of non-verbal exchanges, expressed by mothers' capacity to adapt kinesthetically and non-verbally to their child's mental states and also to repair ruptures occurring in interactions, influences maternal sensitivity and, subsequently, infant attachment security. In other words, this highlights the importance of PEM, which captures more subtle interactive moments by focusing on *how* the mother adjusts her movements to the child's mind, on what is performed to eventually affect infant attachment. Moreover, in spite of the need for replication, the demonstration of PEM's contribution to attachment security through maternal sensitivity highlights its potential relevance as a target of intervention strategies that emphasize parental mentalization and sensitivity with parent-infant dyads.

However, the absence of a mediating effect of maternal sensitivity in the relationship between verbal parental mentalization and infant attachment security is not consistent with the results obtained in Zeegers's meta-analysis (Zeegers et al., 2017) and those of empirical studies focusing exclusively on MM (Bérubé-Beaulieu, Ensink, & Normandin, 2016; Laranjo, Bernier, & Meins, 2008). The hypothesis of an independent contribution to attachment security by the two dimensions of parental mentalization could not therefore be replicated by our results, whereas they suggested a unique contribution of PEM. To our knowledge, this is the second study where PEM and MM were examined simultaneously in connection with maternal sensitivity and attachment security, and the first where the authors explored the mediating role of sensitivity. Replication of these results will thus be necessary to draw more robust conclusions.

Unlike the studies that included both indicators of MM which generally reported no link between attuned and non-attuned comments (Larkin et al., 2021; McMahon & Bernier, 2017; Meins et al., 2012), this study indicated a positive association between these two indicators. In this study, mothers who made more attuned mind-related comments also provided the most non-attuned comments. This counterintuitive result may be explained by the sample's at-risk nature. It therefore seems that in contrast to mothers who are not at psychosocial risk, mothers considered to be at risk could be more inclined to utter more verbalizations about their infant, which increases the probability of misinterpreting the infant's mind. Despite this possibility, less is known regarding mind-mindedness in risk samples, and the findings are inconsistent (McMahon & Bernier, 2017). Furthermore, as pointed out in the systematic review by McMahon and Bernier (2017), non-attuned mind-related comments appeared to be used infrequently and rarely discussed. This result therefore highlights the relevance of focusing more specifically on the relation between attuned and non-attuned mind-related comments in high-risk or clinical dyads.

7.1. Limitations, strengths, and future directions

Some limitations must be considered in the interpretation of this study's results. A first limitation concerns the sample size, which was relatively modest. Furthermore, attrition and differences observed in the number of years of schooling between the group of mother-infant dyads who remained in the study and those who withdrew represent a second limitation. Mothers who remained in the study had higher education level, which may limit representativeness within the participants. However, this limitation was lessened by controlling for education and family income through a score of SES in the analyses. Moreover, the sample consisting exclusively of mother-child dyads at moderate psychosocial risk limits generalization of the results to high-risk populations or to father-child dyads. Nonetheless, this study circumvents certain limitations of the field by: 1) evaluating sensitivity and parental mentalization based on distinct mother-infant interaction segments and 2) furthering the study of these issues with mother-infant dyads at moderate psychosocial risk.

Future studies would do well to replicate these results with parent-infant dyads at high psychosocial risk. Observation of the parents' capacity to mentalize verbally and non-verbally, the mothers' sensitivity, and their links to infant attachment security in this population would thus help provide a deeper understanding of the mechanisms that are involved. Furthermore, studying these processes with father-child dyads would also be essential for obtaining a clearer portrait of the differences and similarities between fathers and mothers.

7.2. Conclusion and implications for research and practice

To our knowledge, this is the first study where the authors integrated the verbal and non-verbal dimensions of parental mentalization when examining the mechanisms involved in the development of infant attachment security. In this regard, the results of this study contributed to the advancement of knowledge in the field of parenting and attachment by: 1) highlighting the importance of including PEM more systematically when studying maternal sensitivity, notably to provide a better understanding of the unique and shared elements of these two constructs, and 2) demonstrating an effect of PEM on attachment security through maternal sensitivity leading to a more refined understanding of the mechanisms involved in the development of infant attachment security. In parallel, another contribution of this study concerns the examination of these associations in a population at moderate psychosocial risk where clinical issues are often greater.

From a clinical standpoint, the demonstration of the effect of PEM on both maternal sensitivity and infant attachment security suggests that PEM should be included more systematically in psychosocial evaluations and interventions. To date, no published study appears to have explicitly included the non-verbal dimension of parental mentalization, which suggests that interventions focused on parental mentalization are centered exclusively on the verbal aspect. Regarding our results, it thus seems advisable to consider PEM in interventions centered on parental mentalization or the parent-infant relationship using video feedback (e.g., Minding the Baby, Slade et al., 2005b; Slade et al., 2020; Mothering Inside Out, Suchman, DeCoste, Castiglioni, Legow, & Mayes, 2008; Suchman, DeCoste, Borelli, & McMahon, 2018).

Author statement

Karine Gagné: Conceptualization, methodology, validation, formal analysis, data curation, visualization, writing original draft, writing- review and editing, project administration.

Jean-Pascal Lemelin: methodology, validation, resources, writing- review and editing, supervision, project administration, funding acquisition.

George M. Tarabulsy: methodology, investigation, validation, resources, writing- review and editing, supervision, project administration, funding acquisition.

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Declaration of Competing Interest

The authors report no declarations of interest.

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