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Parent cognitions and parent–infant interaction
The relationship with development in the first 12 months

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THIS STUDY EXAMINED PARENT cognitions and parent–infant interaction in terms of their contribution to infant development in the first 12 months. With a sample of 95 mother–infant dyads, results using structural equation modelling confirmed the expected finding that parent–infant interaction mediates the association between parent cognitions and infant development. An unexpected finding was that the direct association between parent cognitions and infant development was stronger than the direct association between parent–infant interaction and infant development. These findings are discussed with regard to the implications for preventative and early intervention models.

COGNITION-BASED MODELS OF parenting behaviour suggest that parent cognitions are predictive variables that shape the specific practices undertaken by a parent for the emotional, social, cognitive and physical care of a child (Bugental & Johnston, 2000; McGillivray-deLisi & Sigel, 1995; Murphey, 1992). Parent cognitions are active when parents are behaving deliberately and with forethought, but they also contribute to how parents react spontaneously. In this way, parent cognitions are ubiquitous and it is likely that they have an important, albeit indirect, effect on child development. What underpins parenting behaviour and seems to have a direct effect on child development is the interactional relationship between the parent and the child.

To our knowledge, the research described here brings together for the first time the contribution of parent cognitions and parent–infant interaction to infant development in the first 12 months of life. According to Murphey (1992), parent cognitions can be regarded as those which are either ‘global’ in nature (cognitions that can be acquired vicariously, even by non-parents), or ‘particular’ in nature (cognitions associated with the specific parenting role and usually about a particular child). In line with this, we examined ‘global’ cognitions relating to children in general attitudes and attributional styles and two types of ‘particular’ cognitions relating to infant characteristics (temperament) and parental functioning (wellbeing, social support and role relationship).

Research has frequently found that attitudes are predictive of child outcomes but not necessarily parenting behaviour or aspects of the parent–child relationship (Murphey, 1992). In contrast, low parental attributional style, operationalised as parental perception of reduced control or power compared with the child, has not only been found to reflect a poor parent–child relationship, but also less-than-optimal developmental outcomes (Bugental, Lyon, Lin, McGrath & Bimbele, 1999; Bugental, Lyon, Krantz & Cortez, 1997; Nix et al., 1999). Research findings also reveal that parents who perceive their infant as having a difficult temperament are less satisfied with the parent–child relationship (Sacco & Murray, 1997) and show less sensitive responsiveness during parent–infant interaction (Mertesacker, Bade, Haverkock & Pauli-Pott, 2004). Moreover, parent perceptions of infant temperamental characteristics may influence the infant’s actual development of these characteristics over time (Pauli-Pott, Mertesacker, Bade, Haverkock & Beckmann, 2003).

In terms of “particular” cognitions relating to parental functioning, the literature is vast. However, key areas that have important implications for the parent–child
relationship and child development include parental perceptions of their own wellbeing, social support and relationship to the role of being a parent.

Empirical evidence suggests that maternal depression impacts negatively on infant functioning, particularly via parental negative affect expressed verbally and non-verbally, and reduced parental sensitive responsiveness to infant verbal and non-verbal signals (Cohn, Campbell-Matias & Hopkins, 1990; Field, 1982; Field et al., 2004; Murray, Fiori-Cowley & Hooper, 1996; Stanley, Murray & Stein, 2004). Additionally, a lack of social support from one’s spouse and/or social networks impacts negatively on parenting behaviour (Simons, Lorenz, Wu & Conger, 1993), including the parent–child relationship (Cric, Greenberg, Reznikov, Robinson & Bazelam, 1983). In terms of cognitions relating to the role of being a parent, when parents lack a sense of perceived competence they may not put their parenting knowledge into action (Teti & Gelfand, 1991). Several studies have also revealed a relationship between low parenting self-efficacy and compromised developmental outcomes in older children, such as socio-emotional development (Swick & Hassell, 1990) and school achievement (Bandura, Barbaranelli, Caprara & Pastorelli, 2001).

While thus far we have been concerned with parent cognitions and how they impact upon parent-infant interaction and/or infant development, the direct link between parent–infant interaction and infant development is also important to consider. Bowlby’s (1969) work was prescient, not only in its emphasis on the enduring influence of the infant’s first attachment to another human being, but also with regard to Bowlby’s thoughts on how the early environment interacts with the unique genetic endowment of the maturing organism in order to shape developmental processes. More recently, Schore (1994, 2003) has reconceptualised attachment as a regulatory theory involving a parent who is capable of regulating the infant’s shifting arousal levels, and therefore internal emotional state, but also capable of navigating the infant from stress to stress-recovery when misattunements occur. In line with this, the context of playful parent–infant interaction has been put forward as a unique opportunity for the experience and successful integration of complex, and therefore arousing, socio-emotional interactions. These have been argued to assist in the development and expansion of an independent regulatory system necessary for exploration of the emotional, social, cognitive and physical domains (Glaser, 2000; Penke, 1998, 2001; Schore, 1994, 2003).

There are numerous parent–infant interactional characteristics that are salient during the play. In order to explore parent-infant interaction, we organised six parent–infant interactional characteristics known to occur in the context of play into three constructs. The first of these constructs was ‘Affect: Within the Dyad’, inclusive of mutual attentiveness (Allman & Brothers, 1994; Kaye & Fogel, 1980; Schore, 1994) and pleasurable engagement (Field, 2000; Papouske & Papouske, 1987; Papouske, Papouske & Symmes, 1991). The second construct was ‘Activity Within the Dyad’ inclusive of turn-taking (Fogel, Nelson-Goor, Hsu & Shapiro, 2000; Hsu, Fogel & Messinger, 2001; Scherer, 1994) and parental pausing (Fogel et al., 2000; Scherer, 1994). The final construct was ‘Communication Within the Dyad’ inclusive of infant use of signals and parental sensitive responsiveness (Clausen & Cattenden, 2000).

In summary, the first aim in this study was to develop a full measurement model from a series of separate measurement models that would explain the causal relationships between the underlying latent constructs of parent cognitions, parent-infant interaction, and infant development. These three latent constructs comprised three composite variables (i.e. Parent Cognitions: Children in General, Infant Characteristics and Parental Functioning; Parent-infant Interaction: Affect Within the Dyad, Activity Within the Dyad and Communication Within the Dyad; and Infant Development: Mental Skills, Psychomotor Skills and Quality of Behaviour). It was hypothesised that parent cognitions would predict parent-infant interaction and, in turn, parent-infant interaction would predict infant development. In line with the view that an association between parent cognitions and infant development is mediated by the parent-infant/child relationship, it was expected that a direct association between parent–infant interaction and infant development would be stronger than a direct association between parent cognitions and infant development.

Method

Participants

The sample included 95 mother–infant dyads recruited from 108 Maternal and Child Health Centres located in metropolitan Melbourne and surrounding regional areas. The mothers’ ages ranged from 21 to 43 years (M = 32.33 years, SD = 4.69), and the infants were aged from 1.37 to 12.50 months (M = 6.85 months, SD = 3.13). Mothers were predominantly Caucasian in ethnicity (93.6%) and born in Australia (85.3%). They were also predominately married (69.4%) or in a de facto relationship (24.2%), and 41.1 per cent had at least two children, including the participating infant. The majority of mothers had a minimum of final year secondary (high) school education (81.1%) and, at the time of testing, were not in paid work (70.5%). Regarding annual household income, 42.1 per cent of mothers nominated a family income of up to $50,000 and 57.9 per cent nominated a family income of $61,000 or more.
There were 44 male infants (M = 6.45 months, SD = 3.19) (age corrected: M = 6.39 months, SD = 3.06) and 51 female infants (M = 7.19 months, SD = 3.21) (age corrected: M = 7.10 months, SD = 3.08). Infants’ mean birth weight was 3.36 kilograms (SD = .68). Ninety-five percent of infants were born full-term with no major birth complications or special medical treatment required. Five infants were born prematurely. These five infants were included in the analyses because their development was well within normal limits, or close to being within normal limits, once their ages were corrected in line with administration of the Bayley Scales of Infant Development (Bayley, 1993) (age corrected: M = 6.77 months, SD = 3.11). Most importantly, none of the five mother-infant dyads was found to be outliers when univariate and multivariate normality were assessed at the stage of data treatment.

Measures

Parent Cognitions. Two separate measures were used to assess parent cognitions relating to Children in General: (1) Adult-Adolescent Parenting Inventory – 2 (AAPI – 2) (Bavolek & Keene, 2001); and (2) Parent Attribution Test (PAT) (Bugental & Shennurn, 1984). The subscales on the AAPI – 2 and the PAT were found to have adequate internal consistency (α = .75) and, together, were used to represent parent cognitions relating to Children in General (Attitudes and Attributions, respectively).

The AAPI – 2 was used to assess parenting and child-rearing attitudes relating to Inappropriate Expectations, Empathy, Corporal Punishment, Role Reversal and Power Independence. Bavolek and Keene (2001) have reported high internal reliability for each of the five constructs in addition to high criterion-related validity with regard to discrimination between known abusive/neglectful and non-abusive/non-neglectful parents.

The PAT (Bugental & Shennurn, 1984) was used to assess parenting attributions relating to perceived causes of caregiving success and failure (Adult Control over Success and Adult Control over Failure versus Child Control over Failure). Bugental et al. (1997) have reported high internal consistency for this scale, and Bugental et al. (1999) have reported adequate test–retest reliability.

The Child Domain of the Parenting Stress Index – Third Edition (PSI – 3) (Abidin, 1995) was used to assess parent cognitions relating to Infant Characteristics, and the Parent Domain of the PSI was used to assess parent cognitions relating to Parental Functioning. The Child Domain on the PSI – 3 consists of temperament-related subscales (Adaptable, Demandingness, Mood, Distractibility, Hyperactivity, Child Acceptability, and Reinforces Parent) that were found to have adequate internal consistency (α = .81) and, together, were used to represent parent cognitions relating to Infant Characteristics (Temperament). The Parent Domain on the PSI – 3 consists of personality and pathology subscales (Depression, Competence, Parental Attachment, Spouse, Isolation, Health, and Role Restriction). These personality, pathology and situational subscales were found to have adequate internal consistency (α = .84) and, together, were used to represent parent cognitions relating to Parental Functioning (Wellbeing, Social Support, and Role Relationship). The subscales for parental functioning were grouped in the following way: Health and Depression (variables reflective of wellbeing); Spouse and Isolation (variables reflective of social support); and Competence, Parental Attachment, and Role Restriction (variables reflective of the relationship to the role of being a parent).

Parent–infant Interaction. A modified version of Consullo’s (1991) Dyadic Mutuality Code (DMC), the DMC – M (Smith & Ferrier-Lynn, 2002) was developed to assess the three domains of parent–infant interaction of interest in this study: Affect Within the Dyad, Activity Within the Dyad, and Communication Within the Dyad. The assessment of parent–infant interaction occurred during a five-minute videotaped task that was playful in nature. As with Consullo’s instructions, mothers were asked to begin by positioning their child in an infant seat so that each could fully view the other’s face. They were then asked to ‘interact with your baby as you normally would (at home) without using any toys’. The parent–infant interaction was then videotaped for five minutes, using a standard video recorder fixed to a tripod.

Although the original code (Consullo, 1991) contains six items (Mutual Attention, Positive Affect, Turn-Taking, Maternal Pauses, Infant Clarity of Cues, and Maternal Sensitive Responsiveness), some of these items were modified. According to the modified version, six items fell into three constructs and were referred to as: (1) Affect Within the Dyad: Mutual Attentiveness and Pleasurable Engagement; (2) Activity Within the Dyad: Turn-Taking and Parental Pausing; and (3) Communication Within the Dyad: Infant Use of Signals and Parental Sensitive Responsiveness.

Each item was coded as either 1 (less than optimal parent–infant interaction), 1½ (optimal parent–infant interaction) or 2 (highly optimal parent–infant interaction) according to a modified scoring criterion. Parent and/or infant scores were given for each item as well as an average score for items that have both parent and infant scores. For items that have both parent and infant scores, the average score was used in the total score. The total score was obtained by summing the scores on all items. Scores ranged from 6 to 12, with higher scores indicating more optimal parent–infant interaction. A blind rater was trained using a purpose-written coding manual, and inter-rater reliability for the
total score of the DMC - M was calculated. The single measure intraclass correlation coefficient was found to be \( r = .79, F (15) = 8.37, p = .00. \) The six interactional characteristics were found to have adequate internal consistency (alpha = .83).

**Infant Development:** The Bayley Scales of Infant Development – Second Edition (BSID – II) (Bayley, 1993) was used to assess infant development in three domains: Mental Skills, Psychomotor Skills, and Quality of Behaviour. For Mental Skills and Psychomotor Skills, the total score was based on an index whereby the mean is 100 and standard deviation is 15. For Quality of Behaviour, the total score was achieved by converting the raw score to a percentile between 1 and 100.

Higher scores represent more optimal infant development. Bayley (1993) has reported high internal reliability for each scale and argued for stability of the scores over time based on test-retest reliability with a 1–16 day interval, and a median retest interval of four days. Bayley has also reported high construct validity for each of the scales.

**Procedure**

Twenty-seven parent-infant dyads were assessed at the Child Development Unit in the School of Psychological Science, La Trobe University. The remaining parent-infant dyads were assessed in their home because distance prevented them from coming to the university. The testing session involved three components: (a) participation by the parent and infant in the five-minute videotaped parent-infant interaction task using the DMC – M (Smith & Ferrier-Lynn, 2002); (b) completion by the parent of the battery of self-report questionnaires including a general demographic questionnaire, the AAPI – 2 (Bevrole & Keene, 2001), PAT (Bugental & Shennan, 1984) and the PSI – 3 (Abidin, 1995); (c) assessment of infant development using the BSID – II (Bayley, 1993).

**Results**

The means and standard deviations for Parent Cognitions are shown in Table 1. Mean Parent–Infant Interaction scores were: Affect Within the Dyad, 3.17 (.41) – Mutual Atteniveness and Pleasurable Engagement, 1.64 (.20) and 1.53 (.30), respectively; Activity Within the Dyad, 3.27 (.59) – Turn-Taking and Parental Pausing, 1.64 (.34) and 1.63 (.37), respectively; and Communication Within the Dyad, 3.27 (.64) – Infant Use of Signals and Parental Sensitive Responsiveness, 1.67 (.36) and 1.60 (.36), respectively. Mean Infant Development scores were: Mental Skills, 100.15 (7.25); Psychomotor Skills, 96.20 (6.81); and Quality of Behaviour, 65.12 (24.84).

<table>
<thead>
<tr>
<th>Table 1. Means and Standard Deviations: Parent Cognitions</th>
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<tbody>
<tr>
<td><strong>Observed Variable</strong></td>
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<tr>
<td>Children in General:</td>
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<tr>
<td>Inappropriate Expectations</td>
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<tr>
<td>Empathy</td>
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<td>Corporal Punishment</td>
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<td>Role Reversal</td>
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<td>Power Independence</td>
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<td>Balance of Control Over</td>
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<td>Caregiving Success</td>
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<td>Infant Characteristics</td>
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<td>Adaptable-ability</td>
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<td>Demandinglyness</td>
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<td>Mood</td>
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<td>Distractibility/Hyperactivity</td>
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<td>Child Acceptability</td>
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<td>Reinforces Parent</td>
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<td>Parental Functioning</td>
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<td>Health</td>
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<td>Depression</td>
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<td>Spouse</td>
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<td>Isolation</td>
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<td>Competence</td>
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<td>Parental Attachment</td>
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<td>Role Restriction</td>
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</tbody>
</table>

Note. Higher scores represent more optimal cognitions. AAPI – 2. Scoring out of 10. PAT (Success: Scale). Scoring out of 42. **PAT (Failure: Scale). Scoring calculated by subtracting control attributed to child (scoring out of 42) from control attributed to self (scoring out of 42). PSI – 3: Child Domain. Raw score converted to a percentile between 1 and 100. PSI – 3: Parent Domain. Raw score converted to a percentile between 1 and 100.

The analysis used Structural Equation Modelling (SEM) to examine the major research question of whether parent–infant interaction mediates the association between parent cognitions and infant development. SEM is a modelling technique that consists of sequential regression equations in a two-step process:
the development of a series of ‘measurement models’ followed by the development of a ‘structural model’. It has been argued that a ratio of five cases per parameter estimate is acceptable if the data is normalised (Bentler & Chou, 1987). This ruling was used as a guideline in the current study.

Separate measurement models were developed using a number of variables deemed to reflect latent constructs relating to the ‘theoretical’ domains of Parent Cognitions, Parent–infant Interaction and Infant Development. Given that all separate measurement models were adequate, a full measurement model (Confirmatory Factor Analysis; CFA) was developed including three observed variables relating to Parent Cognitions (Children in General, Infant Characteristics and Parental Functioning); three observed variables relating to Parent-infant Interaction (Affect Within the Dyad, Activity Within the Dyad and Communication Within the Dyad); and three observed variables relating to Infant Development (Mental Skills, Psychomotor Skills and Quality of Behaviour). The purpose of this measurement model was to confirm that the various observed variables had been constructed in a meaningful way and to eliminate any causes of misfit in the model before developing the structural model.

Based on modification indices, the model required re-specification so that it would better represent the sample data. With the inclusion of a covariance between the error terms of Mental Skills and Psychomotor Skills (τ29), the CFA revealed satisfactory fit and non-significance, χ² (23, N = 95) = 34.64, p = .06, with most goodness-of-fit indices (i.e. Comparative Fit Index: CFI, see Bentler, 1990, 1992; Tucker-Lewis Index: TLI, see Hu & Bentler, 1999; Root Mean Square Error of Approximation: RMSEA, see Browne & Cudeck, 1993) at acceptable levels. A summary of goodness-of-fit indices is presented in Table 2 and the full measurement model is presented in Figure 1. Bivariate correlations among all variables to appear in the structural model are presented in Table 3.

### Table 2: Goodness-Of-Fit Summary for the Full Measurement Model, Structural Model 1 and Structural Model 2

<table>
<thead>
<tr>
<th>Model Type</th>
<th>χ²</th>
<th>df</th>
<th>χ²/df</th>
<th>CFI</th>
<th>TLI</th>
<th>AGFI</th>
<th>RMSEA</th>
<th>SRMR</th>
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<tr>
<td>CFA Model</td>
<td>34.64</td>
<td>23</td>
<td>1.51</td>
<td>.96</td>
<td>.93</td>
<td>.85</td>
<td>.07</td>
<td>.06</td>
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<tr>
<td>Structural Model 1</td>
<td>13.25</td>
<td>7</td>
<td>1.89</td>
<td>.94</td>
<td>.87</td>
<td>.87</td>
<td>.10</td>
<td>.06</td>
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<tr>
<td>Structural Model 2</td>
<td>34.64</td>
<td>23</td>
<td>1.51</td>
<td>.96</td>
<td>.93</td>
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</table>

*Notes: N = 95.*

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*Latent constructs are theoretical because there is no complete measure for ‘Parent Cognitions’, ‘Parent–Infant Interaction’ or ‘Infant Development’. Theoricians endeavour to find variables that can be tested to best represent a notion of these theoretical constructs. These are known as observed variables.*
<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
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<th>6</th>
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<td>Parent Cognitions:</td>
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<tr>
<td>1. Children in General</td>
<td>.32**</td>
<td>.36**</td>
<td>.26</td>
<td>.20</td>
<td>.22*</td>
<td>-11</td>
<td>.05</td>
<td>.21*</td>
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<td>2. Infant Characteristics</td>
<td>.06**</td>
<td>.14</td>
<td>.18</td>
<td>.23*</td>
<td>.20*</td>
<td>.07</td>
<td>.33**</td>
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<td>3. Parental Functioning</td>
<td></td>
<td>.17</td>
<td>.14</td>
<td>.30**</td>
<td>.24*</td>
<td>.05</td>
<td>.40**</td>
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<td>Parent-infant Interaction:</td>
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<td>4. Affect</td>
<td></td>
<td>.60**</td>
<td>.71**</td>
<td>.02</td>
<td>.07</td>
<td>.18</td>
<td></td>
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<td>5. Activity</td>
<td></td>
<td></td>
<td>.72**</td>
<td>.21*</td>
<td>.06</td>
<td>.34**</td>
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<td>6. Communication</td>
<td></td>
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<td>.26*</td>
<td>.21*</td>
<td>.39**</td>
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<td>Infant Development:</td>
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<td>7. Mental Skills</td>
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<td>.37**</td>
<td>.42**</td>
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<td>8. Psychomotor Skills</td>
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<td>.23*</td>
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<td>9. Quality of Behaviour</td>
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Note. N = 95, * p < .05, ** p < .01.

The process of testing a structural model with parent-infant interaction mediating the association between parent cognitions and infant development involved two steps. The first step involved the development of a structural model to examine whether parent cognitions predict infant development, and the second step involved the development of a structural model that included parent-infant interaction mediating the association between parent cognitions and infant development. It was expected that the inclusion of parent-infant interaction would improve the fit of the model and move adequately explain the variance in infant development than parent cognitions alone.

As with the measurement model, the first structural model examining whether parent cognitions predict infant development required re-specification. Consistent with the measurement model, this involved the inclusion of a covariance between the error terms of Mental Skills and Psychomotor Skills (.31). The first structural model was non-significant, x² (7, N = 95) = 12.25, p = .07, and the unsatisfactory fit and most goodness-of-fit indices (i.e., TLI, AGFI, RMSEA, SRMR) were not at an acceptable level. Further modifications could not improve the overall fit of the model. Overall, the structural model revealed that parent cognitions predicted infant development (β = .51, p = <.05), with the model explaining 26 per cent of the variance in infant development. A summary of fit indices is presented in Table 2 and the model is presented in Figure 2.

The second structural model examining parent-infant interaction mediating the association between parent cognitions and infant development also required re-specification; this involved the inclusion of a covariance between the error terms of Mental Skills and Psychomotor Skills (.29). With this modification, the second structural model revealed satisfactory fit and non-significance, x² (23, N = 95) = 34.64, p = .08, and most goodness-of-fit indices (i.e., CFI, TLI, RMSEA) were at an acceptable level. A summary of fit indices is presented in Table 2 and the model is presented in Figure 3.

This structural model revealed that parent cognitions predicted parent-infant interaction (β = .36, p = <.01) and, in turn, that parent-infant interaction predicted infant development (β = .31, p = <.05). Indeed, the inclusion of parent-infant interaction improved the model. Regarding the direct association between parent cognitions and infant development, there was a decrease in the regression coefficient from β = .51, p = <.05 (see Figure 2) to β = .43, p = <.05 (see Figure 3), with the second structural model explaining a further 12 per cent of the variance in infant development. Overall, this finding suggests that parent-infant interaction mediated the significant positive association between parent cognitions and infant development. However, the structural model also revealed that parent cognitions predicted infant development directly (β = .43, p = <.05).

**Discussion**

The aim of this study was to examine parent cognitions and parent-infant interaction in terms of their contribution to infant development in the first 12 months. The finding that parent cognitions and parent-infant interaction were positively associated makes sense. Adaptive cognitions are likely to be associated with positive parent-child interactions and vice versa. For example, parents who think of children in general and who see their infant's
characteristics in a positive light are likely to seek out and nurture an interactional relationship. Likewise, when parents think of themselves as functioning well, this is likely to provide an environment in which the parent-infant interactional relationship can thrive.

At the heart of this research project was the idea that parent-infant interaction is pivotal in the infant's early life in that it underlies the development of the first 'attachment' relationship (Schore, 1994, 2003). Given that attachment is regarded as a theory of arousal regulation, play provides an ideal context for the experience and interaction of arousal regulatory information. The finding of a significant positive association between parent-infant interaction and infant development offers indirect support for the idea of ontogenesis—that self-regulation, particularly that learned in the context of playful face-to-face interaction, is a key driving force in the development of self (Gleser, 2000; Panksepp, 1998, 2001).

In relation to the finding that parent-infant interaction mediated the significant positive association between parent cognitions and infant development, it is possible...
that parent cognitions that disturb parents' self-regulatory capacities also disturb their ability to engage in an optimal interactional relationship with their infant. As argued extensively by Schore (1994, 2003), parents' abilities to engage in arousal regulatory interaction with their infants are dependent, to some extent, on their own abilities in that area. In searching for parent cognitions that disturb their self-regulatory capacities, an important starting point is to examine the types of parent cognitions that are capable of arousing strong feelings. Murphey (1992) noted that parent cognitions associated with the specific parenting role, and usually about a particular child (i.e. 'particular' cognitions), are more emotionally 'loaded'. Consequently, they are different from parent cognitions that can be acquired vicariously, even by non-parents (i.e. 'global' cognitions).

In addition, Murphey (1992) argued that particular cognitions were found to be distinct from global cognitions and were more potent in their effects on parent-infant interaction and, in turn, infant development. Certainly these findings suggest that clinical attention should be paid to parents who see their infant's characteristics in an unfavourable light but, particularly, if they regard their parental functioning as poor. It may be that the combination of these two domains of parent cognitions represents a 'cumulative' risk and, consequently, has the greatest potential to disturb a parent's self-regulatory capacities and impinge upon infant developmental capacities.

An unexpected finding here was that the direct association between parent cognitions and infant development was stronger than the direct association between parent-infant interaction and infant development. The literature suggests that some parent cognitions (e.g. attitudes) predict child outcomes even though they have not always been found to predict parenting behaviour (Murphey, 1992). Hence, a direct association between parent cognitions and infant development may not be surprising. However, parent cognitions being a stronger predictor of infant development than parent-infant interaction was surprising.

It is likely that, while parent cognitions affect infant development via parent-infant interaction, there are aspects of parent-infant interaction that have not been accounted for by our model. Indeed, there are many ways that parents influence their infant's development other than during the immediacy of playful face-to-face parent-infant interaction, and it would be impossible for any single measure to capture this. For example, the method of face-to-face parent-infant interaction during feed time, bath time, or using toys may have gleaned different results, as may have a change of emphasis from mother-infant to father-infant or mother-father-infant (triadic) interaction.

Another related explanation is that, while parent cognitions affect infant development via parent-infant interaction, the nature of parent-infant interaction, as observed by a third party (the researcher), does not necessarily match how it is perceived by the infant. Certainly, parents are capable of putting up a good front (Murphey, 1992). In this research, the mother may have been capable of masking her cognitive state during parent-infant interaction, thus appearing to the researcher as if she were interacting in an optimal manner. However, it is possible that parents are not entirely capable of masking their cognitive state from their infant, who has a sophisticated system for reading, and storing in memory, biologically relevant facial and bodily signals without conscious awareness (Fernald, 1992; Nakamura et al., 1998; Schore, 2003).

Of course, the opposite might also be true—that the parent appeared as if she were interacting in a less-than-optimal way, but the infant's prior interactional history with the parent was actually optimal. It is possible, therefore, that despite adequate inter-rater reliability, the parent-infant interaction was not coded correctly. Perhaps improvements to the methodology, such as a warm-up period for mother and infant, could be considered for increased reliability of the mother and infant's most usual playful interaction. Additionally, increased detail of parent and infant facial responses might assist with more accurate interpretation of extremely subtle interactional material.

Given that attachment has been reconceptualised as a theory of arousal regulation (Schore, 1994, 2003), it is important to note that another limitation of this study relates to the use of the DMC-M (Smith & Ferrier-Lynn, 2002). In particular, the DMC-M lacks a distinction between profiles of arousal regulation during less-than-optimal parent-infant interaction—that is, parental and infant under-arousal and over-arousal. Although the profiles of arousal regulation during less-than-optimal parent-infant interaction are acknowledged in the DMC-M, they are classified in an equivalent way. In this way, the DMC-M can be used to describe the quality of the interaction (i.e. ranging from less-than-optimal to highly optimal), but the scoring does not reflect the actual pattern of less-than-optimal interaction that is used (see Cohn et al., 1990; Currings & Ciccheti, 1990 and Field et al., 2001 for details of maternal profiles of arousal regulation in depressed mothers and their infants). There are more complex methods for measuring the quality and nature of parent-infant interaction—for example, Crittenden's (2001) CARE-index—but these require extensive training and are less accessible to clinicians than is the DMC-M (Smith & Ferrier-Lynn, 2002).

A further point to consider is the relatively large age range of infants from 1.37 months to 12.50 months. Initially, we were not concerned with age-related
variations. However, through the use of the DMC-M (Smith & Ferrier-Lynn, 2002), it became clear that age was indeed relevant when assessing parent–infant interaction, most obviously in relation to Mutual Attentiveness. Specifically, we noticed that infant gaze patterns were quite different as a function of age. For example, infants aged up to around eight months appeared to enjoy unbroken mutual eye contact, whereas infants older than eight months appeared to prefer visual and physical exploration of the surrounding environment interspersed with mutual eye contact.

Importantly, we found explanations for these patterns in the literature with regard to critical periods of brain development relating to the onset of the primary visual cortex (at around two months of age), and increased maturity of the orbital frontal cortex (at around 10 months of age) (Schor, 1994, 2003). Future research or clinical work interested in mutual attentiveness as an indicator of parent–infant interaction should be aware that the meaning of optimal mutual attentiveness varies across the 12 month age-range. Furthermore, variations in mutual attentiveness are a consequence of differing biological functions across the 12 month age-range. For example, mutual attentiveness in a two-month-old infant is related to encoding biologically relevant facial signals (Fernald, 1992; Nakamura et al., 1999; Schor, 2003), while in a 10-month-old infant it is more related to using those previously-learned facial signals for social referencing. It is also likely that there are developmental differences for the other parent–infant interaction variables used.

In conclusion, we found that infants’ development was affected by playful parent–infant interaction. Furthermore, in terms of the mediating role of parent–infant interaction, parent cognitions reflecting a component of intrinsic self-regulation appeared to have particularly potent effects on developmental outcomes. Indeed, our findings suggest, for the first time, that interventions aimed at changing parent cognitions may be even more effective than interventions focused solely on changing the parent–infant interactional relationship. Given the importance of early and preventative intervention for good infant mental health, further research is needed to explore the efficacy of our findings.

References


