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## Mother's affection at 8 months predicts emotional distress in adulthood

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### Abstract

**Background**—Long-standing theory suggests that quality of the mother's (or primary caregiver's) interaction with a child is a key determinant of the child's subsequent resilience or vulnerability and has implications for health in adulthood. However, there is a dearth of longitudinal data with both objective assessments of nurturing behaviour during infancy and sustained follow-up ascertaining the quality of adult functioning.

**Methods**—We used data from the Providence, Rhode Island birth cohort of the National Collaborative Perinatal Project (mean age 34 at follow-up, final N=482) to conduct a prospective study of the association between objectively measured affective quality of the mother–infant interaction and adult mental health. Infant–mother interaction quality was rated by an observer when infants were 8 months old, and adult emotional functioning was assessed from the Symptom Checklist-90, capturing both specific and general types of distress.

**Results**—High levels of maternal affection at 8 months were associated with significantly lower levels of distress in adult offspring (1/2 standard deviation;  $b=-4.76$ ,  $se=1.7$ ,  $p<0.01$ ). The strongest association was with the anxiety subscale. Mother's affection did not seem to be on the pathway between lower parental SES and offspring distress.

**Conclusion**—These findings suggest that early nurturing and warmth have long-lasting positive effects on mental health well into adulthood.

A growing emphasis on life-course epidemiology has led researchers to examine the link between early life experiences and subsequent adult mental health. In fact, a recent JAMA article advocates for a new framework of health promotion that aims to understand how early experiences and exposures are biologically embedded to have lifelong consequences.<sup>1</sup> Growing out of attachment theory and the notion that close loving bonds are necessary and provide a secure base from which to explore and navigate the world,<sup>2</sup> investigators have focused on whether high levels of nurturing may promote physical and mental health well into adulthood. There is growing consensus that levels of *warmth and affection* (especially between mother and child) seem to moderate the stress response and make children more resilient to frustration, distress and other difficulties.<sup>3–6</sup> Additionally, although the

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association between socioeconomic status (SES) and health varies somewhat depending on the population, in developed countries, warmth and affection have been linked with higher SES, thus suggesting that this could be one potential pathway through which early lifetime SES is linked to adult health outcomes.<sup>78</sup>

Animal research on nurturing and social bonding suggests that the neurohypophyseal hormone oxytocin may serve a crucial function in creating a powerful bond between mother and child,<sup>910</sup> while disruptions in this bond can lead to dysregulation of brain chemistry and, specifically, the baby's stress response.<sup>11</sup> For example, rat pups observed with higher quality grooming and nursing behaviours by their mothers exhibit lower adult stress reactivity as evidenced by lower ACTH and corticosterone plasma levels.<sup>12</sup> Lower stress reactivity, related to both lower levels of sustained sympathetic nervous system activation and HPA axis dysregulation, has been linked with better health outcomes in both animals and humans.<sup>13–17</sup> While factors such as HPA reactivity appear to be moderately heritable, purely genetic factors alone do not seem to account for an intergenerational transfer of these neuronal differences.<sup>1218</sup> Based on such findings, Meaney *et al*<sup>19</sup> have proposed a model of environmental programming where early experiences alter gene expression and, as a result, HPA stress reactivity. In this view, nurturing behaviour may directly stimulate important developmental processes critical for future stress regulatory capacity.

While the relatively short lifespan of research animals allows researchers to link mother–pup interactions to adult rat functioning, similar studies linking nurturing behaviours during infancy to adult outcomes in humans are almost non-existent. Most studies of adult health outcomes have relied, largely by necessity, on retrospective reports of the family environment during childhood.<sup>2021</sup> For example, Russek and Schwarz found that those who reported feeling greater warmth and closeness with their parents during childhood were less likely to develop coronary artery disease, hypertension, duodenal ulcer and alcoholism 35 years later.<sup>22</sup> Warmth and affection also appears to be independent of parental involvement, which exhibits a curvilinear association with mental health such that both under- and over-involvement is linked with worse mental health.<sup>23</sup> While suggestive, such retrospective assessments can be subject to recall bias and also do not allow for the examination of family environment features that cannot be easily remembered, such as infant experience. Objective assessments of maternal interactions during infancy provide a unique opportunity to examine the relation between the earliest of life experiences and adult outcomes.

The present study takes advantage of longitudinal data in a prenatal cohort to examine the association between objective assessments of mother–infant nurturing at 8 months and symptoms of distress in middle adulthood. We tested the hypothesis that greater warmth and affection exhibited by a mother towards her child is associated with less distress in the adult offspring. We also explored potential links between parental SES, affection and distress.

## METHODS

### Sample

The analysis relies on the adult offspring of participants in the National Collaborative Perinatal Project (NCPP). The NCPP was designed as a multi-site, community-based, observational cohort of pregnant women and their children.<sup>24</sup> Major findings have been summarised previously.<sup>2526</sup> Reflecting the larger proportion of minority participants in the study, SES in the original NCPP was somewhat lower than census-based estimates of a comparably aged population, but other socioeconomic groups are reasonably well-represented.<sup>2728</sup> In 1996, 1062 of the offspring (mean age 34) were sampled to participate in a study examining health outcomes associated with childhood learning disabilities,<sup>29</sup> and 720 were successfully interviewed. Those who were followed up were comparable to the

original NCPP study sample in terms of race, but more women participated in the follow-up than men (78% vs 66%). Similar to the original NCPP sample, current study participants are slightly less educated and report lower incomes when compared to their counterparts from the census. Of those interviewed, 127 had missing values for mother's affection at 8 months and another 95 had incomplete adult distress scores. An additional 16 respondents did not have valid parental SES values resulting in a final sample of 482 respondents used in the analyses. Women were more likely to have complete distress data as compared to men (87% vs 83%), and there were no differences in mean distress scores between those with and without mother's affection data.

## Measures

**Mother–infant nurturing**—At the 8-month evaluation, mothers and children came to the test site, and observations of the mother–child interaction were made by the examining NCPP psychologist during cognitive and developmental testing of the children. At the end of each interview, the psychologist completed an assessment of how the mother managed the testing situation, her level of affection and attention towards her infant and her reaction to the test performance. Each of these items had a set of five unique pre-determined categories (roughly ranging from low to high) that the psychologist was asked to endorse. Because trained psychologists rated the behaviours while administering a standard assessment battery, the situational context was specific and standardised. Further efforts were made to standardise assessments across the raters through rigorous training, and quality control procedures were regularly implemented between sites.<sup>28</sup>

The present analysis focuses on assessment of the mothers' expression of affection towards her infant. Study psychologists were asked to report levels of affection using the following categories: “negative” (0.6% of sample), “occasionally negative” (8.9%), “warm” (84.9%), “caressing” (4.2%) and “extravagant” (1.5%). To maximise statistical power, while still being able to detect non-linear associations, we created three categories of mother's affection: low (combining negative and occasionally negative), normal (warm) and high (caressing and extravagant). Results from preliminary analyses suggested a threshold effect with the “high” group reporting lower distress levels; thus, for the majority of analyses reported, the low and normal groups were combined and compared with high maternal affection.

**Perception of parental bonding**—Items from the Parental Bonding Instrument (PBI) were used to help establish the validity of the mother–infant nurturing variables. The PBI is a measure administered during the adult follow-up interview to assess perceptions about being parented through to the age of 16.<sup>30</sup> We use the specific item which asked the respondent whether they agreed that the primary female caregiver was affectionate towards them. Responses were on a four-point Likert scale, ranging from “strongly agree” to “strongly disagree”.

**Emotional functioning**—Emotional functioning was assessed during the adult follow-up interview using four subscales from the Symptom Checklist-90 (SCL-90). The SCL-90 assesses a person's recent experience of various types of distress and has demonstrated reliability and validity.<sup>31</sup> The NCPP follow-up included four of the subscales of the SCL-90 that measured common types of distress, including distress due to somatisation (12 items), interpersonal sensitivity (9 items), anxiety (10 items) and hostility/anger (6 items). Each symptom is measured on a Likert scale ranging from 1 (not at all distressed by the symptom) to 5 (extremely distressed), and responses are summed. A general distress score was also created by combining the four subscales. Final symptom scores are presented as t scores

(standardisation based on non-clinical adult male and female norms<sup>32</sup>); the mean score in the reference population was 50, with a normal range of 40–60.

**Additional covariates**—Additional covariates used in the analyses include parental SES, parental history of mental illness (parental self-report of prior hospitalisation, out-patient treatment or problems with drugs or alcohol: yes/no), as well as participant race (white/non-white), high school completion and marital status (currently married vs other). Parental SES and parental history of mental illness were assessed directly from the parents during the original NCPP study, while all other covariates were measured during the adult interview. Parental SES is a measure ranging from 0 to 10 based on the scale derived by the US Census Bureau based on the education and occupation of the head of household together with family income.<sup>27</sup> Finally, since persons with childhood evidence of a learning disability were over-sampled for this study, we also adjusted for this factor.<sup>29</sup>

## Analysis

ANOVAs and t tests were used to compare the PBI affection scores and SCL-90 scores across levels of mother's affection. Ordinary least squares regression modelling was the main method of analysis to examine the prospective association between mother's expression of affection and level of adult offspring emotional distress. Multivariable regression models adjust for parental SES and the respondent's adult age, sex, race, education level, marital status, maternal mental illness and study design.

## RESULTS

Demographic characteristics of the sample are presented in table 1. At the 8-month assessment, 10% of the sample (N=46) were characterised by a low level of mother's affection towards the infant, 85% (N=409) were characterised as having a normal amount of affection and the remaining 6% (N=27) had mothers who were highly affectionate. Parental SES was correlated with maternal affection levels. For example, among those in the bottom quartile of the sample SES distribution, only 2% of mothers exhibited high affection levels versus 11% among those in the top quartile (p value for trend <0.001).

### Predictors of distress

The mean general distress score was 55.16 (SD=8.55), with somatisation M=55.1 (SD=9.8); interpersonal sensitivity M=56.5 (SD=10.0); anxiety M=53.5 (SD=11.8); hostility M=55.5 (SD=10.5). There were no sex differences in any individual subscale or general distress scores.

After adjusting for relevant covariates, each point on the parental SES scale was associated with 0.68 point lower somatisation score (SE=0.23, p<0.01) and a 0.35 lower overall distress score (SE=0.20, p=0.08). Parental SES was not significantly associated with any of the other distress measures. Offspring who had not completed high school reported higher levels of distress on all SCL-90 subscales, as did those who were not currently married, with the exception of the hostility scale.

### Comparison of mother's affection variable with retrospectively reported affection

Overall, 81% of respondents agreed or strongly agreed that their mothers were affectionate towards them when interviewed as adults. Among those whose mothers were observed to be highly affectionate, 88% also agreed or strongly agreed that their mothers were affectionate; 81% of those observed with normal levels of affection also agreed and 73% of those observed with low levels of maternal affection also reported their mothers to be affectionate (p value for trend=0.05). In other words, a higher proportion of individuals recollected their

mothers to be affectionate overall during childhood than was observed at the 8-month assessment.

### Affection and distress

Participants whose mothers exhibited a high level of affection reported lower scores on each of the SCL-90 subscales as compared to those whose interactions were characterised as normal or low (figure 1). Of the four SCL-90 subscales, differences in anxiety were the largest in magnitude, with 7.15 point difference between the low/normal and high affection offspring (53.86 vs 46.70,  $t(34) = 4.46$ ,  $p < 0.001$ ). The hostility subscale showed the smallest difference of 3.29 points (55.70 vs 52.40,  $t(480) = 1.59$ ,  $p = 0.07$ ). The general distress scores differed by almost 5 points between the two groups (55.38 vs 50.39,  $t(35) = 4.52$ ,  $p < 0.001$ ).

Table 2 presents linear regression results of mother's affection predicting each SCL subscale as well as the mean SCL score from age and sex-only adjusted models (model 1) and the fully adjusted models (model 2). High levels of mother's affection were independently associated with a 4.22-point reduction on the overall general distress score (model 2). Across all the symptom subscales, the direction of association was highly consistent; more warmth was associated with less distress.

We did not find evidence that mother's affection lies on the path between parental SES and higher offspring distress scores. For example, using the distress subscale most strongly linked with parental SES, somatisation, as the outcome, the strength of the association between SES and somatisation was not altered through the inclusion of the mother's affection variable.

Finally, all results were largely comparable when using the retrospectively reported maternal affection levels as the main independent variable, although fewer of the associations reached statistical significance. For example, retrospectively reported high levels of maternal affection were associated with somatisation ( $\beta = -1.99$ ,  $p = 0.04$ ) in age and sex-only adjusted regression model (akin to model 1 in table 2) but failed to reach significance in the fully adjusted model. No statistically significant association was found with overall distress even in the minimally adjusted model ( $\beta = -1.02$ ,  $p = 0.17$ ).

## DISCUSSION

In this study, we found that objectively observed high levels of affection between mothers and their 8-month infants are associated with fewer symptoms of distress 30 years later among the offspring, as compared to offspring whose mothers exhibited low or normal levels of affection. Furthermore, although we found that lower parental SES was linked with lower levels of maternal affection, there was no evidence of mediation of SES-distress association. These results extend previous findings showing either a relationship between early childhood experiences and childhood outcomes<sup>33</sup> and those finding an association between adult health outcomes and retrospective reports of parental relationship quality.<sup>34–36</sup> Findings presented here thus provide strong support to the assertion that even very early life experiences can influence adult health and emphasise the importance of having a strong nurturing relationship.<sup>1237–39</sup>

### Hypothesised pathways

High levels of maternal affection are likely to facilitate secure levels of attachment and bonding, which then translate to lower distress levels in both childhood and adulthood. Secure attachment in infancy may either facilitate, or serve as an indicator of, other environmental conditions that foster children's ability to learn effective strategies of emotional regulation, appropriate social skills, a stronger sense of self and effective

behavioural or cognitive responses to stress.<sup>34</sup> Previous research has found that parental bonding during childhood (reported retrospectively) is linked with fewer depressive symptoms in young adults, higher self-esteem and perceived social support and more adaptive coping styles.<sup>34</sup> Children who report more secure attachments to their mothers also have better peer interactions which in turn have been linked to better functioning in middle adulthood.<sup>40</sup> Thus, resilience factors laid down early in childhood may extend into adulthood and protect an individual from psychological distress.<sup>41–43</sup>

High levels of warmth and affection are also related to positive affect. Positive maternal affect is likely to engender reciprocating positive affect in her offspring.<sup>17</sup> According to the “broaden and build” theory, positive emotions promote more adaptive functioning by expanding one’s cognitive repertoire and facilitating effective coping.<sup>44,45</sup> Recent work has identified oxytocin as a neurobiological mechanism produced on receipt of nurturing, which promotes social, psychological and physical well-being.<sup>10,46,47</sup> Together, positive affection and strong attachment may become a source of resilience that buffers deleterious effects of future stressors.<sup>3</sup>

Somewhat surprisingly, we did not find a significant relationship between *low* levels of mothers’ affection during infancy and adult offspring distress. This may be related to the overall high level of affection in the sample and potential lack of truly negative, deleterious interactions observed. Additionally, the relatively low levels of distress exhibited by the sample are similar to those found in other studies of non-patient comparably aged individuals.<sup>48</sup> The low prevalence of highly distressed individuals (comparable to a non-patient sample) together with high levels of affection may have resulted in a “floor effect” where it is more difficult to observe any adverse effects of a low-nurturing environment. Alternatively, the fact that significant associations with distress were observed primarily among individuals whose mothers exhibited “high” levels of affection, with few differences observed between the “low” and “normal” affection groups may suggest that the presence of ample affection matters as much as levels of conflict and other aspects of adverse environments. Presence of high levels of warmth and affection may be an independent source of resilience and act as a protective factor regardless of other characteristics of the family environment.<sup>41</sup>

Findings from this unique prospective study must be considered preliminary for several reasons. First, the single item measure of mother’s affection is clearly limited, and we had no additional objective information on either attachment or the nurturing nature of the mother–child bond. Subjectivity by the observing psychologist may have introduced bias and the normative meaning of terms such as “caressing” or “extravagant” might also have been different during the early 1960s when the original study was conducted compared with what they are understood to mean today. Our finding of concordance between the observed affection variable and the subjective recollection of maternal affection offers some support for the validity of the observed assessment. Furthermore, variation on the observed mother’s affection variable was constrained, and the “normal” category by which the majority of the sample was classified likely encompassed significant variation in actual affection levels. Combining of low and normal groups for analyses presented here is not meant to imply that these groups are not meaningfully different. We were, however, underpowered to examine more detailed gradations of the affection–distress relationship. We also had limited opportunity to examine other aspects of the early social environment. The nature of this relationship is likely closely linked with the overall family environment and interacts with other factors that may foster resilience and positive outcomes. There might also be a common prior cause of both mother’s affection and offspring’s distress, such as genetic factors<sup>49</sup> or personality factors, as well as the mother’s own emotional well-being during pregnancy and during her child’s infancy.



Major strengths of this study are the long follow-up, measures of key aspects of the early childhood environment (e.g. SES) and observational measures of maternal affection, which have been shown to be more predictive of outcomes than self-report measures.<sup>50</sup> Much of the work on maternal nurturing and later life emotional reactivity in the offspring has been conducted either in animals or using retrospective reports of maternal–child interactions in humans. Few studies have data for humans on maternal–child interaction in early childhood with follow-up through adulthood, making this study a unique and important contribution to the literature in spite of this somewhat limited and unusual measure of maternal warmth.

In conclusion, it is striking that a brief observation of level of maternal warmth in infancy is associated with distress in adult offspring 30 years later. These provocative findings add to the growing evidence that early childhood helps set the stage for later life experiences and provide support for the notion that biological “memories” laid down early may alter psychological and physiological systems and produce latent vulnerabilities or resilience to problems emerging later in adulthood.<sup>1</sup> Thus, the quality of early socio-emotional development may have more far-reaching effects than previously believed. Additionally, it may be that focussing on early life assets rather than solely on deficits or what is considered minimally sufficient may increase our capacity to promote more resilient trajectories.

These findings have implications for the detection of risk early in life and point to avenues for individual- and policy-level interventions. For example, to be most effective, psychosocial and behavioural interventions might need to be targeted at much younger ages than is currently the norm and would need to focus on preventing the “imprinting” of negative experiences. Greater appreciation of the broad importance of the quality of children’s relationship with their early caregivers (likely both in and out of the home) may also alter policy priorities. For example, it may lead to increased support for policies related to oversight and regulation of organisations that provide caregiving and related services. Ultimately, should findings from this study be replicated, they suggest that a combination of strategies, which empower families, improve access to high-quality child-care and provide targeted interventions to those at risk, is needed to improve overall population mental health.

Each  $\beta$  coefficient represents the absolute point difference in the given SCL scale associated with a high level of mother’s affection at 8 months.

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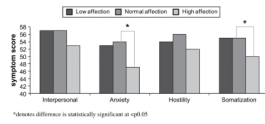
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**Figure 1.**  
 Observed level of mother’s affection at 8 months and SCL-90 scores at mean age 34.  
 \*denotes difference is statistically significant at  $p < 0.05$ .

**Table 1**

Demographic characteristics of NCPP offspring included in the analysis according to observed levels of maternal affection during infancy (at 8 months of age)

	Low affection % (n)	Normal affection % (n)	High affection % (n)
Men	52.2% (24)	61.6% (252)	59.3% (16)
White race	58.7% (27) <sup>a</sup>	77.8% (318) <sup>b</sup>	81.5% (22) <sup>b</sup>
Completed high school	80.4% (37)	82.4% (337)	88.9% (24)
Currently married	32.6% (15) <sup>a</sup>	46.5% (190)	59.3% (16) <sup>b</sup>
	Mean (SD)	Mean (SD)	Mean (SD)
Age	33.83 (1.66)	33.53 (1.73)	34.63 (1.93)
Parental SES	3.27 (1.57) <sup>a</sup>	4.41 (1.99) <sup>b</sup>	5.54 (2.01) <sup>c</sup>

Different letters (a, b, c) denote difference between affection levels that are statistically significant at  $p < 0.05$ .

**Table 2**

Linear regression model results of high levels of mother's affection during infancy predicting SCL scores in adult men and women

	Model 1 (age and sex only) <sup>§</sup> $\beta$ (se)	Model 2 (full multivariate model) <sup>§</sup> $\beta$ (se)
Interpersonal	-4.12 (2.0) <sup>‡</sup>	-3.81 (2.0) <sup>*</sup>
Anxiety	-6.86 (2.3) <sup>‡</sup>	-6.57 (2.4) <sup>‡</sup>
Hostility	-2.83 (2.1)	-2.11 (2.1)
Somatization	-5.23 (1.9) <sup>‡</sup>	-4.39 (1.9) <sup>‡</sup>
Mean SCL Score	-4.76 (1.7) <sup>‡</sup>	-4.22 (1.7) <sup>‡</sup>

\* p<0.10.

<sup>‡</sup> p<0.05.

<sup>‡</sup> p<0.01.

<sup>§</sup> Model 1 adjusts for age and sex only; model 2 adjusts for parental SES, age, sex, race, completion of high school education, marital status, maternal mental illness and study design variable.