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Contributions of maternal and infant factors to infant responding to the Still Face paradigm: A longitudinal study

Melanie Gunning[a], Sarah L. Halligan[b,*], Lynne Murray[c,d]

[a] CAMHS, NHS Lothian, UK
[b] Department of Psychology, University of Bath, Bath, UK BA2 7AY
[c] University of Reading, UK
[d] Stellenbosch University, South Africa

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ABSTRACT

Early mother–infant interactions are characterised by periods of synchronous interaction that are interrupted by periods of mismatch; the experience of such mismatches and their subsequent repair is held to facilitate the development of infant self-regulatory capacities (Tronick, Als, Adamson, Wise, & Brazelton, 1978). Infant responding to such interactive challenge is assumed to be a function of both maternal behaviour and pre-existing infant characteristics. However, the latter has received relatively little attention. In a prospective longitudinal study of a sample comprising high and low adversity dyads ($n = 122$), we examined the contributions of both maternal sensitivity and neonatal irritability to infant behavioural and physiological responding to the interactive challenge of the Still Face paradigm. Results indicated that higher levels of maternal sensitivity were associated with more regulated infant behaviour during the Still Face paradigm. Neonatal irritability also predicted poorer behavioural and heart rate recovery following the Still Face challenge. Furthermore, there was an interaction such that irritable infants with insensitive mothers showed the worst behavioural outcomes. The findings highlight the importance of the interplay between maternal and infant characteristics in determining dyadic responding.

1. Introduction

The development of the infant's capacity to regulate behavioural and physiological responses to the environment, and particularly to challenges, is hypothesised to be fundamental to subsequent satisfactory emotional and behavioural development (Cole, Michel, & Teti, 1994; Eisenberg et al., 1996; Kochanska, Murray, & Harlan, 2000; Rothbart, Ziaie, & O'Boyle, 1992). The extent to which this capacity is a function of the infant's own early response style, the caregiver's behaviour, or some combination of infant and maternal characteristics is therefore an important topic for research. For example, it has been proposed that caregiver sensitivity may mitigate the negative effects of difficult infant temperament, whereas insensitive parenting, particularly in the context of an already difficult infant, may be important in the development of later child emotional-behavioural difficulties (Belsky, 1997; Belsky & Pluess, 2009; Pluess & Belsky, 2010). Nevertheless, so far, knowledge about the contributions of infant and parenting factors, both separately and in combination, to the early development of infant regulatory capacities is limited.

* Corresponding author at: Department of Psychology, University of Bath, Bath, UK BA2 7AY. Tel.: +44 1225 386636; fax: +44 1225 386752.
E-mail address: s.l.halligan@bath.ac.uk (S.L. Halligan).

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'Temperament' has been described by Kagan (2005) as a set of biases in behaviour and/or emotional responsiveness which are thought to be biological in origin and appear early in development. The degree to which infants are highly reactive or irritable in their responses to changes and challenges in their environments, and how easily the infant regulates and returns to a calm state, are thought to be key components of a 'difficult' or 'negative' temperamental bias (Rothbart & Derryberry, 1981). It has been suggested that early individual differences in this domain may have long term consequences, including differences in adult brain structure (Schwartz et al., 2010, 2012). However, little is known of the developmental mechanisms by which individual differences in infant emotional responding and regulation arise.

Mother–infant interactions provide one of the earliest external sources of both potential challenge and support in relation to the young infant's regulatory capacities. Investigation of face-to-face interactions has shown that, rather than being characterised by perfect contingency and synchrony between mother and infant, cycles of well-matched behaviours are often followed by periods of mismatch and repair. Thus, Tronick and Gianino (1986), in the Mutual Regulation Model (MRM), note that breaks in contingency commonly occur which are followed by the recovery of smooth, matched interaction, facilitated by maternal sensitive support of the infant (Beebe & Lachmann, 1998; Cohn & Tronick, 1987; Weinberg, Tronick, Cohn, & Olson, 1999). Recovery following mismatch has been considered particularly important to the infant's acquisition of regulatory skills, since it involves the experience of transition from dysregulated to regulated behaviour.

While the study of factors that reduce maternal sensitivity and thereby increase the frequency of mismatch (e.g. high levels of adversity) is well represented in the literature (e.g. Murray, Fiori-Cowley, Hooper, & Cooper, 1996; Murray, Stanley, Hooper, King, & Fiori-Cowley, 1996), the role of infant characteristics, particularly temperamental differences, has received surprisingly little attention. In particular, individual differences in the developing infant's reactivity profile may be particularly important in determining infant responses to periods of interaction mismatch. An interaction between infant and maternal characteristics also seems likely. In particular, an infant who experiences many episodes of mismatch due to compromised maternal responding, and who has a higher reactivity to these episodes may become overwhelmed, unable to reduce negative responding, and consequently may be less available for further episodes of good interaction. Although these moment-to-moment adjustments may be of a relatively brief duration, their frequency and their cumulative effects may have long term consequences.

The Face-to-Face-Still-Face procedure (FFSF) is a well-established paradigm which involves a perturbation in maternal communication that has been found to be behaviourally and physiologically stressful for the infant (Tronick, Als, Adamson, Wise, & Brazelton, 1978); the infant is confronted first with a two-minute period of normal mother–infant play, followed by two minutes of the mother's neutral, silent face (the Still Face episode; SF), before infant and mother finally resume normal play (the reunion or recovery episode). The infant's response to the SF episode has been extensively described in the literature. A recent meta-analysis (Mesman, van IJzendoorn, & Bakermans-Kranenburg, 2009) confirmed the robustness of the classic SF effect of a decrease in infant positive affect and gaze to mother coupled with an increase in negative affect. In the recovery episode, while infants show an increase in positive bids, they nevertheless maintain a raised level of negative affect (the 'carry-over' effect). Individual differences in infant responding have been noted (e.g. Braungart-Rieker, Garwood, Powers, & Notaro, 1998; Braungart-Rieker, Garwood, Powers, & Wang, 2001; Cohn, Campbell, & Ross, 1992), and behavioural responses to the SF episode have been related to other measures of emotionality (Forman et al., 2003). Some studies have also investigated physiological responses, including heart rate (Haley, Handmaker, & Lowe, 2006; Haley & Stansbury, 2003; Ham & Tronick, 2006) and respiratory sinus arrhythmia (Bazhenova, Plonskaia, & Porges, 2001; Ham & Tronick, 2006; Moore et al., 2009; Weinberg & Tronick, 1996). The combined evidence suggests that the SF episode elicits increased heart rate, reflecting increased physiological arousal, and a decrease in respiratory sinus arrhythmia, a response which is presumed to facilitate self-regulation in response to environmental challenge (Mesman et al., 2009).

Although Weinberg and Tronick (1996) stated that the recovery episode is a critical component FFSF responding, until relatively recently most research has focused on infant responses to the SF episode itself, and studies that have looked at the recovery episode have typically concentrated on *parental* contributions (Mesman et al., 2009). Nevertheless, infant responses during the recovery episode may be of fundamental significance for the development of self-regulation capacities since they are thought to reflect attempts to return to homeostasis following the disruption to behavioural and physiological functioning associated with the SF episode. Further, since disruptions to infant behavioural and physiological responses during the SF phase of the procedure are typically pronounced across infants, individual differences in the capacity for emotional regulation may be swamped during this phase, and it is possible that they will be better elucidated in the recovery episode. Indeed, one previous study that examined recovery responses (Bendersky & Lewis, 1998) suggested that they may be particularly useful in characterising high-risk (cocaine exposed) infants. However, this issue has not been widely examined; moreover, the *determinants* of the infant's capacity to regulate his state following psychosocial challenge remain to be fully clarified.

Observations deriving from the FSSF paradigm are significant, as they index infant responding in the context of the social interactions that are held to be key to the development of infant self-regulation. However, to date, studies utilising the FFSF paradigm have typically focused on maternal behaviour as a predictor of infant responding, with the possible contribution of infant temperament being largely ignored. Prior studies that have examined infant responding in the FFSF in relation to measures of infant temperament (maternal report) have yielded mixed findings (Braungart-Rieker et al., 1998; Conradt & Ablow, 2010; Tarabulsy et al., 2003). While Braungart-Rieker et al. (1998) reported that difficult infant temperament was associated with less optimal responding to the still face, Tarabulsy et al. (2003) found no main effect of infant difficultness on FFSF responding, but they identified an interaction, such that less difficult infants seemed to benefit more from positive maternal behaviour. Finally, Conradt and Ablow (2010) did not find an association between parental