A contingency-based approach to the etiology of ‘disorganized’ attachment: The ‘flickering switch’ hypothesis

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The authors present a new approach to the etiology of disorganized attachment based on contingency detection theory. According to this view, the relevant common factor in parental maltreatment and unresolved loss that leads to disorganized attachment has to do with the type of “deviant contingency environment” that both of these conditions generate. In such environments, infants experience periods of being in control followed by periods of sudden loss of control over the caregiver’s behavior. The authors hypothesize that this adversely affects the developmental unfolding of the infant’s innate “contingency detection module” (Gergely & Watson, 1999), which normally involves a maturational shift around 3 months from an initial attention bias for perfectly contingent stimulation to an emerging preference for less-than-perfect social contingencies. The periodically changing controllability of abusive and dissociating “unresolved” attachment figures is hypothesized to block this process and to lead to the defensive fixation of a dysfunctional “flickering contingency switch” mechanism with two dominant and competing target positions (self-oriented vs. other-oriented). This results in the dissociative style of attention and behavioral organization characteristic of disorganized infant attachment. The authors summarize the preliminary results of an empirical study that provides support for this model in 6.5-month-old infants using a modified Still-Face situation (the Mirror Interaction Situation). The study demonstrates differential emotional and behavioral reactions to sudden loss of maternal contingency and a specific interest in

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exploring the perfectly contingent self-image in the mirror in infants who at 12 months become categorized as “disorganized” in the Strange Situation. (Bulletin of the Menninger Clinic, 65[3], 397–410)

During the past decade, disorganized attachment in infancy and its relationship to later dissociative disorders (Carlson, 1998), controlling, externalizing, and aggressive behavior (Lyons-Ruth & Jacobvitz, 1999), and borderline personality disorder (Fonagy, Target, & Gergely, 2000) became central topics of theorizing and research in developmental psychopathology (Solomon & George, 1999). In this article, we shall present a new model of the etiology of attachment disorganization based on contingency detection theory (Gergely, Koós, & Watson, in press) and some preliminary supporting evidence for this model from an ongoing longitudinal study (Koós, Gergely, Gervai, & Tóth, 2000).

Disorganized/disoriented attachment and family risk factors

Infants classified as Disorganized/Disoriented (D) at 12 months exhibit a variety of atypical behaviors in relation to an attachment figure in the Strange Situation test (Ainsworth, Blehar, Waters, & Wall, 1978), which involves brief separations from the caregiver. Such infants proved to be unclassifiable within the standard categories of secure (B), insecure-avoidant (A), and insecure-resistant (C) attachment. According to Main and Solomon (1986), unlike the other three attachment groups, disorganized infants lack a coherent, organized behavioral strategy to cope with separation-induced stress. These authors developed a new coding system for disorganized/disoriented attachment based on the ethological model of “conflict behaviors” (which result from simultaneous activation of incompatible response systems).

The frequency of disorganized attachment in middle-class, non-clinical groups in North America is about 15%, while in low-socioeconomic samples it is 24% (van IJzendoorn, Schuengel, & Bakermans-Kranenburg, 1999). Notably, disorganization is especially frequent (over 80%) in maltreated infants and in infants of parents who experience unresolved loss or trauma (George, Kaplan, & Main, 1985). In contrast, infant temperamental variables were found to be unrelated to disorganized attachment (see van IJzendoorn et al., 1999). Several studies demonstrated a link between infant disorganization and later dissociative disorders (Carlson, 1998), as well as
controlling, externalizing, and aggressive behavior (Lyons-Ruth & Jacobvitz, 1999; van IJzendoorn et al., 1999).

Disorganized infants exhibit a variety of behaviors that imply a temporary collapse of the organized adaptive behavioral strategies characteristic of the other attachment types (Main & Hesse, 1990; Main & Solomon, 1986). These include sequential or simultaneous displays of contradictory behavior involving both approach and avoidance; undirected or misdirected movements; incomplete or interrupted movements; temporal freezing, stilling, or slowed down movements or expressions; displays of apprehension regarding the parent; and disorganized or disoriented activities such as wandering, confused or dazed expressions, or multiple rapid changes of affect. These behavioral episodes are characterized by a temporary disruption of attentional and behavioral organization, often involving minor dissociative states and the production of repetitive, stereotypic body movements (such as rocking, ear pulling, or hair twisting) (Main & Solomon, 1986).

Frightened and/or frightening parental behavior and disorganized infant attachment: The Main and Hesse hypothesis

Main and Hesse (1990) proposed that disorganized attachment arises from the infant's experience of the attachment figure as frightening. This represents an inherent conflict for the infant. The experience of fear activates the attachment system, compelling the baby to seek proximity. However, the ensuing proximity to the caregiver, who is, in fact, the source of fear, leads to increased alarm that, in turn, activates avoidance tendencies. This inherent paradox results in the collapse of the infant's behavioral and attentional strategies.

Main and Hesse (1990) also hypothesized that due to unresolved loss or trauma, the caregiver experiences dissociative periods of painful, loss-related thought intrusions. During such periods, he or she may display unmodulated frightening or frightened behaviors that are unpredictable to the infant. Such inexplicable frightening parental displays are, like experiences of abuse, seriously alarming to the infant and result in the simultaneous activation of approach and avoidance tendencies. This, then, suggests a unifying explanation for why disorganization is associated both with parental abuse and with unresolved loss or trauma in the parent.

However, recent studies that tested the hypothesis that the association between unresolved loss and disorganized attachment is mediated by frightening parental behavior provided only weak and somewhat equivocal support for the theory (for a review, see Lyons-Ruth
Koós and Gergely & Jacobvitz, 1999). Furthermore, several studies found additional maternal behavioral categories (e.g., affective communication errors, role confusion, negative/intrusive behaviors, disorientation, and withdrawal) that predicted infant disorganization equally well or even more strongly, although these categories did not involve explicitly frightening and/or frightened behaviors (Lyons-Ruth & Jacobvitz, 1999).

The available evidence, therefore, suggests that frightening and/or frightened parental behavior may not be the only or, indeed, the most central aspect of the type of parental environment that leads to the development of disorganized attachment in infancy. In this article, we shall consider an alternative approach to the etiology of disorganization (Gergely, Koós, & Watson, in press) based on the role of contingency detection in the development of attachment security (Gergely & Watson, 1996, 1999; Watson, 1994, 2001). Before doing so, however, let us briefly review some relevant facts about the central role of contingency detection in early socioemotional development.

The role of contingency detection in early socioemotional development

Numerous studies have demonstrated that young infants are highly sensitive to the contingent relationships between their motor responses and consequent stimulus events (Bahrick & Watson, 1985; Field, 1979; Lewis, Alessandri, & Sullivan, 1990; Papousek & Papousek, 1974; Rochat & Morgan, 1995; Watson, 1972, 1994). For example, Watson (1972) has shown that 2-month-olds increase their rate of leg kicking when it results in a contingent stimulus event (the movement of a mobile), but not when they experience a similar, but noncontingent, event. In fact, the detection of causal control over the mobile’s movement proved positively arousing for these infants. After some experience with the contingency, they started to smile and coo at the contingent mobile. In a similar paradigm, Lewis et al. (1990) also demonstrated that when 2-month-olds detect that their previously experienced contingent control over a stimulus event no longer holds, they express frustration and distress.

What are the developmental functions of this early sensitivity to contingency? Watson (1994) hypothesized that contingency detection plays a central role in the differentiation of the self from the environment and in the establishment of the primary representation of the body schema (cf. Gergely, 2000). In an ingenious study, Bahrick and Watson (1985; see also Rochat & Morgan, 1995; Schmuckler, 1996) demonstrated that the perception of perfect contingency between the
pattern of efferent motor activation and consequent proprioceptive and visual feedback can be used for self-detection and self-orientation as early as 3 months. Three- and 5-month-olds were seated in front of two monitors, so that they could freely move their legs. One monitor presented the video-recorded live image of the subject’s moving legs, providing a visual stimulus that was perfectly contingent with the infant’s responses. The other monitor presented a previously recorded and therefore noncontingent image of the infant’s moving legs. Five-month-olds and a subgroup of the 3-month-olds differentiated between the two displays, looking significantly more at the noncontingent image. This finding is in line with a number of other studies (Papousek & Papousek, 1974; Rochat & Morgan, 1995, Schmuckler, 1996) indicating that after 3 months infants differentiate self from nonself on the basis of response-stimulus contingencies and prefer to fixate away from the self. Interestingly, Bahrick and Watson (1985) found that while the other subgroup of 3-month-olds also differentiated between self and nonself, they showed the opposite preference for the perfectly contingent self-image (cf. Field, 1979).

How do young infants detect different degrees of contingency, and what is the nature of the demonstrated change in contingency preference around 3 months of age? Gergely and Watson (1999) proposed that early sensitivity to contingency is mediated by an innate “contingency detection module” that analyzes the conditional probability structure of the contingent relations between responses and stimuli over time. Based on Watson’s (1994) “contingency switch” hypothesis, they argue that during the first 2–3 months, the initial target of the module is genetically set to seek out and explore perfectly response-contingent stimulation. This initial orientation toward perfect contingencies accounts for the preference for live feedback of the self’s image in one subgroup of Bahrick and Watson’s 3-month-olds. The hypothesized evolutionary function of this initial attention bias is to develop a primary representation of the bodily self. This is done by identifying and representing those stimuli that are the necessary sensory consequences of the body’s motor actions, over which the infant exercises perfect control.

Watson (1994) further hypothesized that around 3 months, due to maturational factors, the preferred target value of the contingency detection mechanism is switched to high-but-imperfect degrees of contingencies typically provided by the reactions of attachment figures attuned to the infants’ affective-communicative displays. In support of this hypothesis, in further studies Watson (1979, 1985) demonstrated that when tested on a range of different degrees of contingencies, 4- to 6-month-olds were most motivated to engage moder-
ately high contingencies, while failing with very low or near-perfect contingency magnitudes. The hypothesized switch at 3 months, resulting in an attention bias toward high-but-imperfect contingencies, also accounts for the avoidance of the perfectly contingent self-image after 3 months in Bahrick and Watson’s (1985) older group of 5-month-olds and in the other subgroup of 3-month-olds (whose contingency switch has already been reset). This maturational change functions to orient the infant after 3 months of age away from self-exploration (perfect contingencies) and toward the exploration and representation of the social world as presented by the (necessarily less than perfectly response-contingent) parental environment.

Deviant parental contingency and disorganized attachment: The ‘flickering switch’ hypothesis

According to our contingency-based hypothesis, the etiologically relevant common factor in parental maltreatment and unresolved loss that leads to disorganized infant attachment has to do with the particular type of “deviant contingency environment” that both of these conditions generate. In such environments, infants repeatedly experience periods of being in contingent control followed by periods of sudden loss of contingent control over the caregiver’s behavior. This occurs when the caregiver becomes abusive or when, due to intrusive, loss-related ideation, the parent dissociates and becomes unresponsive or noncontingent to the infant’s affective-communicative behaviors.

We propose that the dissociative attentional and behavioral tendencies that are so characteristic of disorganized attachment arise as a result of the effect that such deviant parental contingency environments exert on the early development of the contingency detection mechanism. As noted, there is evidence that at around 3 months, the target value of the contingency analyzer is switched from a preference for perfectly response-contingent stimulation to high-but-imperfect social contingencies. We now hypothesize that the availability of a sufficiently controllable and predictable attachment figure who provides the infant with high-but-imperfect social contingencies may be necessary during this critical period in order for the new target setting of the contingency detection module to become consolidated as its dominant steady state. By switching to the exploration of less-than-perfect contingencies, the infant for the first time achieves a degree of predictability and control over his or her social environment, if that environment provides sufficiently high and stable contingent reactivity. The ensuing experience of contingent control generates
positive arousal and feelings of social efficacy in the infant that may contribute to bonding and the development of secure attachment. The process of shifting preferential attention toward moderately high social contingencies may also involve the establishment of an active inhibition of the initial target setting of the contingency detection mechanism at perfect contingencies. This results in the avoidance of self-orientation and self-stimulation when detectable and controllable levels of less-than-perfect social contingencies are available.

What would be the consequences for this developmental process if during the critical period of resetting the target value of the contingency detection module (somewhere between 2 and 4 months) the infant were exposed to the type of deviant contingency environments associated with disorganized attachment? We make three hypotheses: (1) During periods of normal (i.e., nondissociative and sufficiently contingent) functioning of the abusive or unresolved caregiver, the infant will experience sufficient amounts of contingent control for the new target position of the contingency detection mechanism to become established at lower-than-perfect (social) contingencies. (2) However, during repeated periods when the caregiver becomes abusive or dissociates, the infant experiences a drastic loss in the control power of the very same responses that had previously been efficient in influencing the attachment figure’s reactions. During such periods of loss of contingent control, the ensuing feelings of helplessness and anxiety may trigger a (defensive) switching back of the contingency detection module to its original target setting of exploring perfect contingencies. As a result, the attention system becomes disengaged from its social target and is turned toward self-related perfect contingencies again to generate affect-regulative experiences of causal control. (3) Repeated experiences of this kind, involving periodic drastic loss of contingent control over an attachment figure, may result in an insufficient establishment of the active inhibition of the initial target value of the contingency detection mechanism. Therefore, during such periods of helplessness, the original self-oriented setting of the attention system to explore perfect contingencies may be expected to become dominant again.

We hypothesize, therefore, that the types of deviant parental contingency environment provided by abusive or dissociating unresolved parents result in a fixation of a dysfunctional loose or flickering switch of the contingency detection device with two dominant and competing target positions (one perfectly contingent and self-oriented, and one less-than-perfectly contingent and other-oriented), leading to a dissociative style of attention organization. Distress and helplessness associated with the attachment figure with whom peri-
ods of significant contingency loss are repeatedly experienced become triggering stimuli for disengagement and dissociation, leading to the temporary collapse of the other-oriented organization of the attention system. We predict that during such periods of disorganization, sources of perfectly contingent stimulation will become attractive again and may gain temporary dominance over the attention system. This is so because by throwing the contingency detection switch back to its initial target position, the infant can generate self-soothing positive arousal through perfectly contingent self-stimulation and repetitive bodily activities that compensate for the loss of control in the social world.

The fact that one of the indicative signs of disorganized attachment is the production of repetitive, stereotypic body movements (e.g., rocking, ear pulling, or hair twisting) in the presence of the caregiver (Main & Solomon, 1986) seems to support the preceding prediction. Furthermore, the susceptibility to dissociation that results from the early fixation of a dysfunctional loose or flickering contingency switch with two dominant and competing target positions may also help explain the long-term association between disorganized attachment in infancy and dissociative symptoms in adulthood (Carlson, 1998; Liotti, 1992).

An empirical study of the ‘flickering switch’ hypothesis of disorganized attachment

In addition to providing a plausible account for several central characteristics of disorganized attachment, the flickering switch hypothesis generates some testable novel predictions as well. For example, we hypothesized that as a result of distress evoked by the temporal loss of contingent control over the caregiver’s behavior, disorganized infants will become specifically attracted to sources of perfectly response-contingent stimulation. Furthermore, this predicted effect should be demonstrable significantly earlier than 12 months (when disorganized attachment is diagnosed in the Strange Situation), because the flickering contingency switch is hypothesized to become established during the early critical period (around 2 to 4 months) when the target value of the contingency detection module is normally reset. We shall now report some preliminary results from an ongoing study that allowed us to test these predictions.*

*This study is being carried out with 100 mothers and their first-born infants at the Institute for Psychology of the Hungarian Academy of Sciences in Budapest by Judit Gervai, György Gergely, Júlia Frigyes, Örsolya Koós, Krisztina Lakatos, Krisztina
The three-phase Mirror Interaction Situation

In the Mirror Interaction Situation (MIS) paradigm, the caregiver and the infant are seated next to each other, but they are separated by an occlusion screen that makes it impossible for them to touch or see each other directly. Both are facing a one-way mirror, which enables them to interact through facial and vocal gestures (see Figure 1). Two video cameras on the other side of the one-way mirror (thus invisible to the subjects) record their facial and vocal behaviors. These video records are fed into a mixer that creates a synchronized, time-coded, split-screen record of their interactive behavior for off-line analysis.

The situation consists of three 2-minute episodes. Phase 1 is a free interaction period, when the mother is instructed to interact freely with the baby. Phase 2 is the still-face period, when the parent is instructed to put on a motionless, neutral still-face while fixating the infant’s image (similar to the standard still-face procedure; see Tronick, Als, Adamson, Wise, & Brazelton, 1978). Phase 3 is the recovery period, when the mother is instructed to become “alive” again and to interact freely with the infant. In relation to the proposed hypotheses, the MIS procedure allows us (1) to observe caregiver-infant interactive patterns and emotional reactions as a function of sudden loss of parental contingency (still-face procedure); (2) to examine preferential engagement of attention in a preferential choice situation where the infant is free either to engage the less-than-perfect parental contingency or to explore in the mirror the perfectly contingent sensory consequences of his or her own motor activity; and (3) to investigate the affect-regulative role of engaging different degrees of contingent stimulation during distress independently of other forms of parental emotion regulation (e.g., direct physical comforting).

The preliminary results we are reporting here are based on a sample of 60 mothers and their first-born infants tested at 6.5 months in the MIS (Koós et al., 2000). Infant security of attachment was measured later in the Strange Situation at 12 months. In this sample, there were 13 disorganized (D) infants, 31 secure (B) infants, 10 insecure-avoidant (A) infants, and 6 insecure-resistant (C) infants. Here we shall discuss only the relevant findings for the disorganized and the secure infants. We have developed a coding system for the MIS that

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codes a variety of maternal and infant behavioral categories, including frequency and duration of affect, gaze direction, infant- versus mother-initiated interactive episodes, contingent and mirroring reactions, different types of maternal vocalizations and verbalizations, and “testing of self-movement in the mirror” (TSM). Here we shall focus only on two of these measures: infant affect and TSM. The latter was defined as the relative frequency or duration of time that an infant spent looking at the perfectly response-contingent visual consequences of his or her motor activity in the mirror. Simply looking at the self-image (staring) without engaging in any visible motor activity was not included in this category. To fit the category, the infant needed to move in some way as well.
For secure infants, TSM changed significantly across the three phases of the MIS. During Phases 1 and 3, when the mother was available, the secure babies engaged in relatively small amounts of TSM. In contrast, they showed a significant increase in TSM during the still-face period (Phase 2), when the mother became non-contingent.

Unlike secure babies, disorganized infants showed relatively high degrees of TSM throughout the three phases. Furthermore, in Phase 3, after having experienced a period of loss of contingent control over their mother during the preceding still-face period, disorganized infants exhibited significantly more TSM than did secure babies. (This pattern of TSM was unique to disorganized infants. Insecure-avoidant and insecure-resistant babies did not differ from secure infants in this regard.)

At the same time, secure and disorganized infants showed a similar (negative) emotional reaction to the sudden loss of contingent control during the still-face period. Negative affect increased in both groups from Phase 1 to Phase 2. Furthermore, the amount of time they spent looking at their mother’s image decreased in both cases during the still-face period. It seems that the secure and the disorganized infants were equally frustrated and distressed by the still-face intervention and avoided the mother’s noncontingent image. Furthermore, in Phase 3, when the mother became reactive again, both groups looked significantly more at her image again.

Interestingly, however, the secure and the disorganized groups showed a different pattern of change in affective state between Phases 2 and 3. Secure infants showed more negative affect during Phase 3 (when the mother became reactive again) than during the still-face period. In contrast, disorganized infants expressed more positive affect in Phase 3 than in Phase 2. A measure of overall hedonic state (combining the changes in positive vs. negative affect) also indicated a significant difference between the two groups: From the still-face to Phase 3, disorganized infants increased their hedonic state in the positive direction, while the hedonic state of secure infants actually decreased from Phase 2 to Phase 3.

We interpret this intriguing pattern of results as follows. In line with the flickering switch hypothesis, the fact that, unlike the other attachment groups, disorganized infants engaged in high degrees of TSM throughout the three periods indicates that sources of perfectly contingent stimulation are differentially attractive to them. This finding is not a simple by-product of looking more at the self’s image overall (i.e., including passive staring) or of looking less at the mother than did the other attachment groups, because disorganized
Koós and Gergely

infants did not differ in these measures from the other groups. It
seems, therefore, that it was their special attraction to sources of
stimulation over which they exercised perfect contingent motor con-
trol that differentiated the disorganized infants from the other attach-
ment groups at 6.5 months of age.

These results are also in line with the hypothesis that the explo-
ration of perfect contingencies is positively arousing for infants and
as such can be used as a means of self-regulation. For example, se-
cure infants reacted to the unavailability of the mother during the
still-face period by increased exploration of self-generated perfect
contingencies in the mirror. They most probably did so in an at-
tempt to deal with their distress by generating positive arousal.
However, the secure babies turned to this kind of self-regulatory ac-
tivity only when they had no access to their reactive mother. During
Phases 1 and 3, when the mother was available, they engaged in sig-
ificantly less TSM than during the still-face period. This is in line
with our contingency switch hypothesis, according to which by 6
months in normal development, the dominant target position of the
contingency detection module has already been set at lower-than-
perfect (social) contingencies. This predicts that when a reactive at-
tachment figure is available, secure infants will be less likely to pre-
ferentially engage their perfectly contingent self-image. In fact, even
though during Phase 3 they continued to experience frustration due
to the preceding still-face intervention (as evidenced by their in-
creased negative affect), secure infants actually decreased their
amount of TSM in this period.

In contrast, for disorganized infants, the flickering switch hypo-
thesis predicts that after experiencing temporal loss of contingent con-
trol over the attachment figure during the still-face period, their at-
tention will be more easily drawn to sources of perfectly response-contingent stimulation. This prediction was borne out, as
during Phase 3 disorganized infants engaged in significantly more
TSM than did secure babies.

Because the experience of contingent control is positively arousing
to infants (Watson, 1972), the fact that disorganized babies showed
more positive affect during Phase 3 than secure infants may be attrib-
uted to the positive arousal generated by their higher amount of TSM
during this phase. In other words, even though (similar to secure ba-
bies) disorganized infants were distressed by the loss of maternal con-
tingency during the still-face period (as shown by their increased neg-
ative affect during Phase 2), it seems that by engaging in more TSM
during Phase 3, they managed to achieve some measure of successful
self-regulation.
Etiology of ‘disorganized’ attachment

Summary

These findings provide preliminary support for the flickering switch hypothesis of disorganized attachment. The MIS study has demonstrated a behavioral reaction specific to disorganized infants as early as 6.5 months of age that was predicted by the flickering switch model: These infants are differentially attracted to sources of perfectly contingent stimulation in a situation that induces stress as a result of loss of contingent control over the caregiver’s behavior. This early differentiating feature predicts attachment disorganization at 12 months and suggests that the formation of disorganized attachment is well on its way by the time the baby is 6 months old. This in turn is consistent with our hypothesis that at the heart of the etiology of disorganized attachment lies the dysfunctional influence of a deviant parental contingency environment during the early critical period (around 2–4 months), when the genetically determined tendency for resetting the target value of the contingency detection module toward social contingencies is activated.

References
Koós and Gergely


