Patterns of instability and change: Observations on regression periods in typically developing infants

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Development is characterized by change; change that might come about so gradually that we as parents hardly notices it until afterwards. Currently, the dominating trends in developmental psychology have primarily honed in on biology and continuity (Kagan, 2008). Findings over the past decades have revealed that many cognitive and social skills/capabilities (e.g.: imitation, eye gaze, face recognition) can be observed at birth or very early after; findings that suggest continuity from early abilities to later fully mature versions. However, the existence of an early capacity does not automatically imply that this capacity is carried out by similar networks as the mature version (e.g.; Hall & Oppenheim, 1987; Heimann, 1991) and current theories rarely try to clarify exactly how these early abilities unfold into later mature versions (Johnson, 2005; Johnson, Grossman & Cohen Kadosh, 2009; Kagan, 2008).

The idea put forward in this chapter does not argue against a strong biological influence or the possibility of our nervous system being organized in such a way that certain perceptual features are more likely to be acted upon than others. However, this chapter presents observations suggesting that early development is a more discontinuous process than mostly assumed. It will be argued that eight distinct periods can be observed during the first year of life and that these periods reflect biological reorganizations and change that introduce instability into the fragile parent-child relationship. Behaviorally it might look as if the infant becomes less competent, that he or she "moves backwards". Thus, these periods are named regression periods (RP) (Plooij & Rijt-Plooij, 1989).

There have been many previous suggestions that such periods of change exist, but no consensus exist as to how many periods are to be expected or of the underlying function(s) (e.g.: Bever, 1982; Campos et al., 2008; Fischer, 1987; Plooij, 2003). The standard psychological literature usually reports only three or four periods during the first year of life

(Plooij & Rijt-Plooij, 1989) whereas the findings presented in this chapter suggest up to ten regression periods during the first 18 months of life (centered around week(s) 5, 8, 12, 17, 26, 36, 44. 51-53, 61-62, and 72-73). These findings, based on detailed observations of both free living chimpanzees and human infants, questions some of our basic notions of early infant development. The field has for the most part not uncritically embraced these findings although the clinically grounded concept "touchpoints" introduced by Brazelton constitutes one important exception (Brazelton & Sparrow, 2006). However, independent replications are needed in order to provide a more solid scientific foundation which is also the primary aim of the chapter: To present and summarize studies that have investigated the existence of regression periods in three different countries: Spain, Great Britain, and Sweden.

The RP concept used here corresponds to weeks when an infant temporarily looses his or her stability due to hypothesized intrinsic reorganizations. Such periods are defined through observable behaviors within the cognitive, emotional or social domains (Zeanah, Neil & Larrieu, 1997). The infants' regressive behavior signals change, a shift to a new emergent phase (Tronick, 2006). These behavioral changes destabilize the parent-infant relationship and introduce new stressors for the parent to handle. Thus, the parent and the child must renegotiate their relationship and develop new dyadic regulatory capacities. If unsuccessful, the dyad will encounter an increase in stress that might lead to recurrent failures to achieve affectively rewarding interactions. Such failures might have "a profound effect on the development of coping and individual differences in resilience in the face of stress" (Tronick, 2006, p. 98).

Various ideas have been put forward regarding the mechanism that might explain regression or nonlinearity in development, e.g., biobehavioral, cognitive, perceptual, connectionist or complex dynamic processes (e.g.: Bates, 1976; Elman, 2003; Fischer & Rose, 1994; Kozulin, 1990; Rijt-Plooij & Plooij, 1992; Smith & Breazeal, 2007; Trevarthen

1982; Trevarthen & Aitken, 2003; Munakata & McClelland, 2003). As one example, van Geert (1991) proposed a dynamic systems model of competitive growth in which regression is found in the intermediary stage whereas Plooij (1990, 2003) has promoted the idea that the perceptual control theory developed by Powers (1973) better explain regressions within early infancy. According to this theory, infants are born with few and limited levels of control, but with age develop a hierarchy of perceptual control. Each change in perception is the result of important changes within the nervous system and each change also signals the development of a new skill or strategy, and causes regression. These changes momentarily destabilize the infant's inner world and thus affect the mother-infant relationship. The reaction of the infant changes and the mother (parent) has to understand those new responses and re-negotiate the relationship. The underlying brain changes also mean that, at the end of a period, the infant's understanding of the world will have changed to some degree.

The remaining part of this chapter summarizes the results from a European project that, during the 90's, brought together research groups from Spain, Sweden, and Great Britain to test if indicators of regression could be found at the ages proposed in the original studies (Plooij & Rijt-Plooij, 1989; Rijt-Plooij & Plooij, 1992).

Observations from Spain

Sadurni and Rostan (2002, 2003) studied regression periods among eighteen Catalan children in Spain. The children were between three weeks and 14 months and each child was followed longitudinally for about five months within one of four cohorts. Data were collected through questionnaires, semi-structured interviews and direct observations; the protocol followed Rijt-Plooij and Plooij's (1992) original suggestions. A regression period was coded if three behavioral indices were co-occurring: (1) An increase in bodily contact, (2) an increase in crying/irritability, and (3) one of several possible distortions; e.g.: a shift in the child's sleep-

wake cycle, a change in the child's activity level or drowsiness. The agreement between coders for specifying a regression period was around 80 percent.

The findings from the Spanish study show a close fit with the regression periods proposed by Rijt-Plooij and Ploij (1992) (see Figure 1). Sadurni and Rostan report peaks at 5, 8, 12-13, 18, 26-27, 35, 43 and 52 weeks, observations that matched almost perfectly the expected weeks.

Insert Figure 1 About here

The original Dutch study never reported fewer than 80 percent of the children as regressive within any RP while the level of reported regression in the Spanish study varied from 42 to 100 percent. The highest percentages were observed for RP 2 (100%), RP 5 (85%) and RP 1 (80%) while lowest figure was noted for RP 3 (42%). For the other four RPs, the reported percentages varied from 50 to 62 %.

Each regression period lasted on average for two weeks with a range from one to four weeks. It was obvious that some children had quite concentrated RPs while for others the regression periods were prolonged over several weeks. Possible reasons for this variability can, according to Sadurni and Rostan, be attributed to either individual (e.g. temperamental differences between children) or relational factors influencing both members of the dyad.

Observations from Great Britain

Based on weekly phone interviews with thirty mothers from 10 to 26 weeks postpartum, a study from Great Britain found clear support for three regression periods (Woolmore & Richer, 2003). Beside the obvious aim to replicate the Dutch findings, Woolmore and Richer also made a point of developing a rigorous protocol for detecting regression periods. A computerized algorithm was used for deciding if any specific week should be categorized as regressive or not. They underscore that it is difficult to decide if a regression period exists or

not due to the high level of "noise" in the system under observation (= the mother-infant dyad). The information indicating regression is seen as a "weak signal" in a noisy environment.

The computer algorithm developed by Woolmore and Richer (see Figure 2) analyzed the information and classified any particular week as either a regression week or a non-regression week. To be classified as a regression week the score had to be one or two in category A (Fractious or changeable mood) and B (Attachment related behavior) and two or more in category C (Additional regression items). The categorizations made with the computer program were checked for reliability by having an independent rater evaluating twelve infants who were selected randomly. The achieved reliability was excellent (Kappa = .82).

Insert Figure 2 About Here

The final analysis revealed a pattern that fitted well with the expected weeks (see Figure 1), clear support was found for the three expected peaks, at 12, 17 and 24 weeks ($p < .01$; z test of proportions). In addition two additional peaks were initially found around week 14 and 20. Of these two, the peak around 14 weeks disappeared when a correction for age was instigated so that a deviance of +/- one week was accepted. The regression peak at week 20 did however not disappear and represents a regression week not previously reported by Rijt-Ploij and Ploij (1992). This week has previously been linked to an increase in conflicts within the mother-infant dyad by Rijt-Plooij and Ploij (1993) and Woolmore and Richer suggest that this regressive peak signifies something else than a pure regression period. In addition, they claim that this peak disappears for dyads in which the mother is depressed (Ploij & Rijt-Plooij, 2003).

In sum, the British study highlights the importance of adopting a rigorous methodology when studying regression during the infancy period. This is important in order

to reduce the possibility of reporting chance findings. It is, however, as important to be aware of the opposite risk, to not see regression when it is actually there.

Observations from Sweden

As for the studies carried out in Spain and Great Britain, the main goal of the Swedish project (Lindahl, 1998; Lindahl, Heimann & Ullstadius, 2003) was to replicate van de Rijt-Plooij and Plooij's (1992) findings. A definition of regression that closely matched the one used in the original studies was chosen, a definition that emphasizes regression as an interpersonal phenomenon:

> *"The regressive phenomenon we are dealing with…belongs to the emotional domain. It consists mainly of the temporary decrease/disappearance of the growing independence of the baby as measured through mother-infant body contact, combined with an increase in crying"*
>
> (Rijt-Plooij & Plooij, 1992, p. 131)

Seventeen infants (9 girls) and their mothers were followed from birth to 15 months and data on regression was collected through both questionnaires and observations. A significant correlation was observed between the numbers of observed and expected regression weeks ($r = .90$), which suggests a connection stronger than could be expected by chance. Overall a cyclical pattern matching the original findings was found although these periods did not always coincide perfectly with the expected RP's (about 70% of the observed regressive weeks matched the expected weeks). The percentage of infants judged as regressive during the expected weeks revealed support for six of the hypothesized periods (see Figure 1): Fifty percent or more of the children were identified as regressive during RP 1 (54%), RP 3 (50%), RP 4 (70+), RP 5 (53%), RP 6 (80+), and RP 7 (80+) weeks. In contrast, no or weak support were found for RP 2 (29%), RP 8 (44%) and RP 9 (36%).

The lack of support for RP 2 in the Swedish study is somewhat surprising since this period around two months of age is one of the more accepted periods of change or transition in the literature (e.g. Fischer, 1987; Trevarthen & Aitken, 2003). Moreover, both the original study by Rijt-Plooij and Plooij (1992) and the Spanish replication study (this chapter) found clear indications of regression during this period. A re-analysis of the Swedish data did not resolve the issue but did hint to a possible explanation: Five additional infants had been judged as "close-to-be-regressive" by their mothers but not strong enough to indicate a RP. A similar pattern of "borderline regression" was not found for any of the other expected regression periods and should these five infants have been included together with the four previously identified infants, support for RP 2 would have been evident (69% displayed regression or borderline regression). Moreover, the low number of regressive infants for RP 9 might have been masked by illness since four children (= 29%) were reported ill and not regressive during this regression period.

The role of the primary caregiver changed when the infants' were between 8 to 12 months old and might explain why no support for RP 8 was found. For about half the sample, the mother went back to work and the father stepped in as caregiver, a change that might have had an impact on the parental-infant relationship and also on how behavioral changes were reported back to the research team.

Conclusions

The combined findings from Spain, Sweden and Great Britain are in concert with the overall picture presented by Rijt-Plooij and Plooij (1992, 1993), the phenomenon of regression periods in early infancy seems to be real and warrants the attention of both clinicians and researchers. It is notable that the regression periods investigated in the research presented in

this chapter to a large degree overlap with the touchpoints in development as suggested from clinical experience by Brazelton (Brazelton & Sparrow, 2006).

Campos et al. (2008) recently suggested that regressive phenomena have been neglected in contemporary research. Much of current research has, for good reasons, focused on finding links between early and late versions of early competencies resulting in a better understanding of the capacities the infant has and of early starting points for important social and cognitive skills. However, the overwhelming support for early competencies might also overshadow the fact that similarly identical behaviors might be governed by different neural structures. Thus there is a risk that we overinterpret early competencies and early changes in the development.

This means that for understanding the regression phenomena described here we need to focus on the detailed behavioral and neurological development of the infant. Social and cognitive functions emerge as the result of interactions between different brain regions as well as of interactions between the brain and the psychosocial environment (Johnson et al., 2009). Moreover, Johnson et al. also argue that "the same behavior could be supported by different neural substrates at different ages during development" (p. 152) which might affect how we understand the changes taking place at each regression period. Plooij (2003) presents a list of possible perceptual changes underlying each regression period. Understanding of events is, for instance, highlighted at RP 4, relationships at RP 5 and categories at RP 6. These are possible links that need to be coupled with direct behavioral evidence. It is however also possible, if we follow the line of argument put forward by Johnson et al. that each RP does not represent a completely new competence but instead a further development of skills already to some degree within the child's repertoire.

Finally, it must be stressed that more research is needed. We lack knowledge on how individual differences might influence how regressive behaviors are expressed and

interpreted, we lack a deeper understanding on how culture exerts its influence, and we lack knowledge on possible consequences on the development of attachment by how the parent-infant dyad handles the stress induced by regression. We do, however, have good grounds to suspect that how parents react to or understand their infant will impact development. Thus, a parent with less knowledge, with less social support or with mental health problems (e.g. depression) increases the risk of a non-optimal outcome of recurrent stressful conflicts between the parent and the infant induced by repeated regressions. The one time smooth interaction might instead become characterized by an increase in crying, fewer moments of positive interactions and maybe even sustained withdrawal on the infant's part (Guedeney, 2007).

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Figure legends

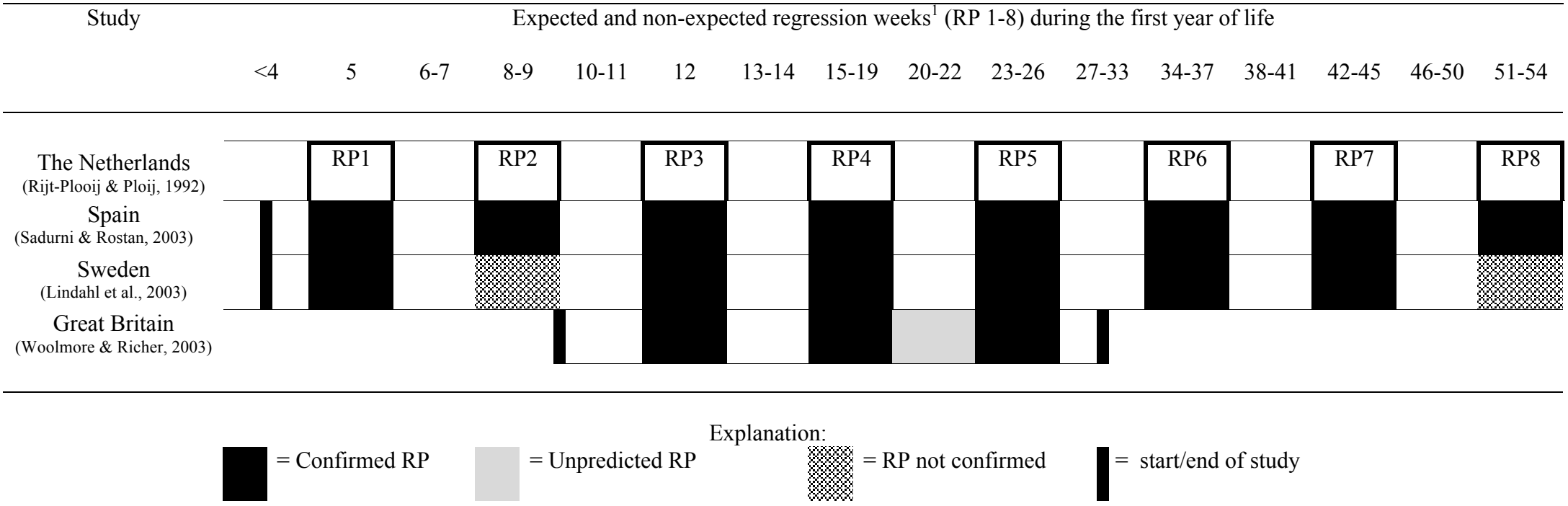
Figure 1

Regressive periods (RP) replicated in Spain, Sweden and Great Britain using findings from the Netherlands as gold standard. For each study a hit is counted if one or more regressive weeks is overlapping completely or in part with the Dutch report. A miss is counted if a RP lies completely outside expected periods (thus, a hit would be noted for RP 4 if a study identifies regression for weeks 14-17). An unconfirmed RP indicates that less than 50% of the children in a study are judged as regressive.

Figure 2

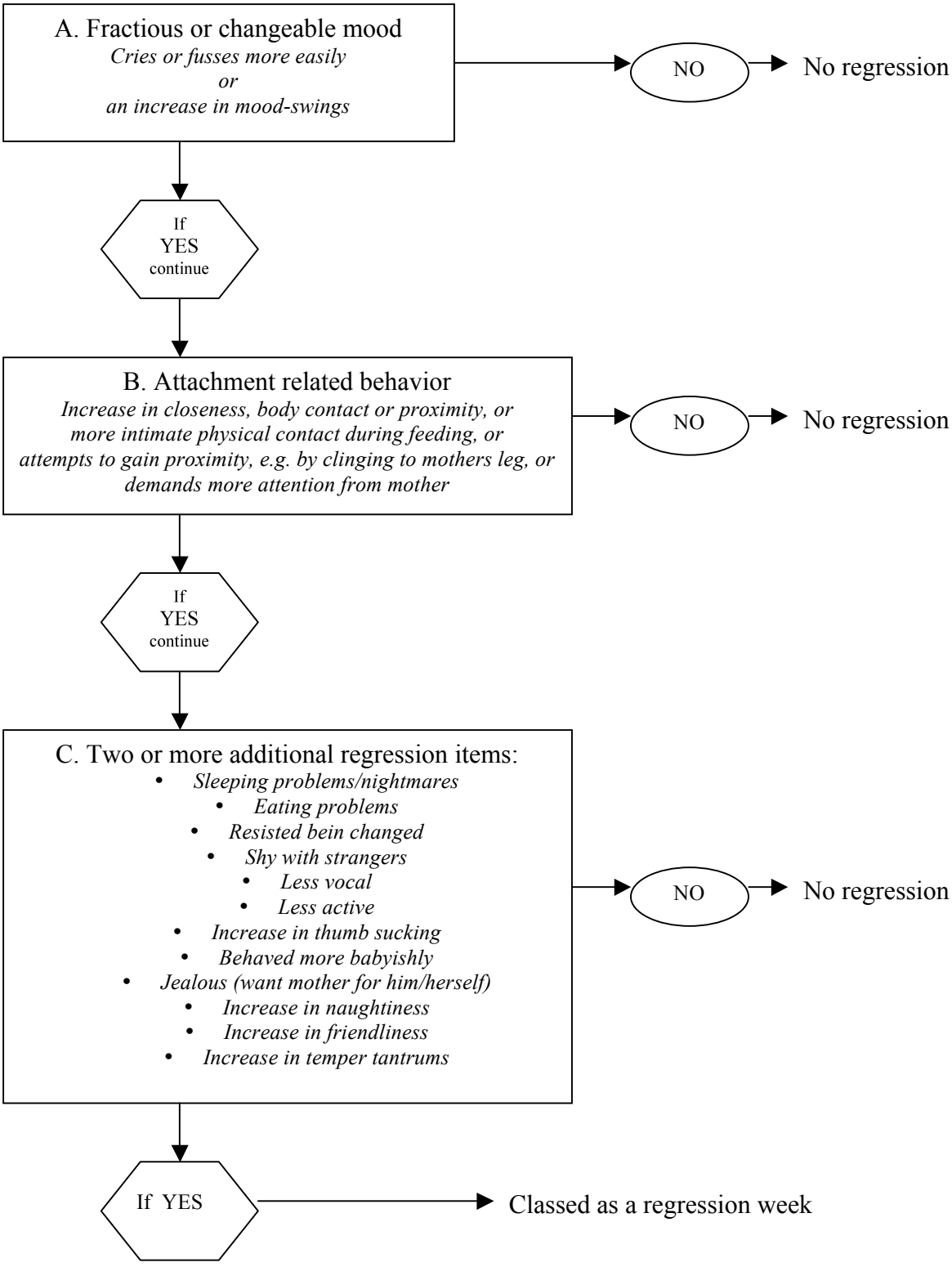
The Plooij algorithm for determining regression weeks. Adopted from Woolmore and Richer (2003, p. 25).

Figure 1



[1] Each regressive week has been estimated based on data presented by Rijt-Plooij and Ploij (1992) using 50+ as criterion. Thus, over 50 % of the children participating in a study must be judged as regressive for a regressive week to be declared. Exceptions: (1) In RP1 in Lindahl et al's study the number of regressive children is exactly 50%. (2) Woolmore and Richer used a different statistical procedure when identifying regression (z test of proportions).

Figure 2


A. Fractious or changeable mood
Cries or fusses more easily
or
an increase in mood-swings
NO
No regression
If
YES
continue
B. Attachment related behavior
Increase in closeness, body contact or proximity, or
more intimate physical contact during feeding, or
attempts to gain proximity, e.g. by clinging to mothers leg, or
demands more attention from mother
NO
No regression
If
YES
continue
C. Two or more additional regression items:
Sleeping problems/nightmares
Eating problems
Resisted bein changed
Shy with strangers
Less vocal
Less active
Increase in thumb sucking
Behaved more babyishly
Jealous (want mother for him/herself)
Increase in naughtiness
Increase in friendliness
Increase in temper tantrums
NO
No regression
If YES
Classed as a regression week