Early maternal separation, nightmares, and bad dreams: Results from the Hungarostudy Epidemiological Panel

Szilvia Csóka\textsuperscript{a,b,*}, Péter Simor\textsuperscript{c,d}, Gábor Szabó\textsuperscript{a}, Mária S. Kopp\textsuperscript{a,b} and Róbert Bódizs\textsuperscript{c,a}

\textsuperscript{a}Institute of Behavioural Sciences, Semmelweis University Budapest, Hungary; \textsuperscript{b}HAS-SU Mental Health Sciences Research Group of the Hungarian Academy of Sciences, Budapest, Hungary; \textsuperscript{c}Department of Cognitive Sciences, Budapest University of Technology and Economics, Budapest, Hungary; \textsuperscript{d}Nyírő Gyula Hospital, Department of Addictology, Budapest, Hungary; \textsuperscript{e}HAS-BME Cognitive Science Research Group of the Hungarian Academy of Sciences, Budapest, Hungary

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Early maternal separation is a particularly stressful experience. Current models of nightmare production emphasize negative emotionality as having a central role in determining dream affect. Our aim is to test the hypothesis that persons who experienced early maternal separation (before one year of age and lasting at least one month) report more frequent nightmare experiences and bad dreams as adults. In the frame of the Hungarostudy Epidemiological Panel, 5020 subjects were interviewed. Significant associations were found between early maternal separation and both frequent nightmare experience in adulthood and increased frequency of oppressive and bad dreams. Current depression scores fully mediated the association between early separation and nightmares, but not the association between early separation and negative dream affect. We interpret these findings as a trait-like enhancement of negative emotionality in adults who experienced early maternal separation. This enhancement influences the content of dreams and, when it takes the form of depression, also influences the frequency of nightmares.

Keywords: dreaming; maternal deprivation; nightmares; sleep disorders; attachment; depression

Introduction

Although contemporary attachment theory does not deem early separation per se an irreversibly harmful experience, because subsequent experiences in relationships also have effects on outcomes (Main, Kaplan, & Cassidy, 1985; Steele & Steele, 2008a), the theory was strongly influenced from the beginning by observations related to maternal separation. Maternal separation is known to be one of the most stressful events in the lives of non-human mammals (Harlow, 1969; Harlow, Dodsworth, & Harlow, 1965; Kuhn, Paul, & Schanberg, 1990; Pihoker, Owens, Kuhn, Schanberg, & Nemeroff, 1993; Suomi, 1997). Short-term consequences of hospitalization requiring maternal separation in humans have also been well documented (Bowlby,
Children placed in hospital or residential nurseries commonly show a predictable sequence of behaviors: protest, despair, and detachment (Bowlby, 1969). Since René Spitz published his classic studies on the dramatic effects of hospitalization, it has become evident that the consequences of maternal separation go well beyond the altered infant behavior in the period of mother’s absence (Spitz, 1967). A recent paper by van der Horst and van der Veer (2009a) presents a very detailed picture of the almost 40-year-long fight against the practice of separation from mother when a child goes to hospital, although the prominence of Bowlby and Robertson in this battle is a subject of debate (Lindsay, 2009; Robertson & McGilly, 2009; van der Horst & van der Veer, 2009b).

Based on Bowlby’s concept of internal working models, Main and her colleagues introduced the concept of “state of mind with respect to attachment” (Main, Kaplan, & Cassidy, 1985), and based on this concept they developed a widely used measure, the Adult Attachment Interview (George, Kaplan, & Main, 1985), which assesses adult attachment representations for both research purposes and in clinical practice (for a summary see Bakermans-Kranenburg & van IJzendoorn, 2009; for clinical applications see Steele & Steele, 2008b). The AAI is a semi-structured interview that focuses on an adult’s early memories of relationships with attachment figures, including both general impressions and specific memories. An attachment classification is derived by considering the coherence of an interviewee’s narrative. Beyond the three classical categories, Secure-Autonomous (F), Insecure-Dismissing (Ds), and Insecure-Preoccupied (E), the Unresolved (U) classification was introduced to indicate the existence of unresolved traumas. The unresolved state of mind measured by the U classification has special clinical significance, as recently revealed by Harari et al. (2009).

Using the AAI, it is possible to differentiate among attachment representations of adults who suffered early traumas, based on the level of processing of these early experiences. Some adults who experienced such traumas nevertheless produce coherent narratives in the AAI and are classified as secure (the scoring procedure is described in Main, Goldwyn, & Hesse, 2003). Modern attachment theory emphasizes the representations of childhood experiences rather than the experiences themselves, and special consideration is given to an interviewee’s ability to “mentalize” (i.e., consider the contents of their own and interaction partners’ minds). Fonagy et al. (1994) found that even children who experienced early deprivation can be secure with respect to attachment if their mother or other primary caregiver exhibited a high level of mentalization or “reflective function.”

Nevertheless, some studies of the long-term effects of separation, based on both human and animal subjects, suggest that maternal separation of deprivation can cause irreversible changes, which are expressed in behavior or in physiological parameters under certain circumstances. In the case of humans, early stress may sensitize children’s pituitary-adrenal responses to subsequent stress exposure (Essex, Klein, Cho, & Kalin, 2002), and the same has been found in studies of adults (Heim, Plotsky, & Nemeroff, 2004). In longitudinal studies of humans, early separations from mother (e.g., for one month or more during the first five years of life) have been associated with borderline pathology in adolescence and adulthood (Crawford, Cohen, Chen, Anglin, & Ehrensaft, 2009; Steele & Siever, 2010). Mice that experienced maternal separation during the neonatal period display significantly higher levels of anxiety and fear behavior as measured by the open field test (Romeo, Mueller, Sisti, Ogawa, McEwen, & Brake, 2003). Neonatal isolation impairs fear
conditioning in adult rats as reported by Kosten, Lee, and Kim (2006). Early repeated maternal separations during critical periods of hippocampal development can disrupt the normal development of hippocampal cytoarchitecture (Huot, Plotsky, Lenox, & McNamara, 2002). Further studies of rats have shown that a single day of maternal deprivation is sufficient to decrease brain-derived neurotrophic factor in the hippocampus and cause cell death (Zhang, Xing, Levine, Post, & Smith, 1997). Moreover, the expression of corticotropin-releasing factor receptor type 2 (CRF2) in the ventromedial hypothalamus and the basomedial amygdala can be suppressed by early maternal separation in rats (Eghbal-Ahmadi, Avishai-Eliner, Hatalski, & Baram, 1999). Recent findings report other consequences of maternal separation in rats: permanent changes in sleep architecture reflected in augmented time spent in REM sleep (Tiba, Tufik, & Suchecki, 2004; Tiba, Tufik, & Suchecki, 2008).

Regarding human sleep, research indicates that subjects with an insecure attachment style, measured by questionnaires and presumed to originate in atypical maternal behavior, experience intense dream images that contextualize strong emotions during sleep (McNamara, Andresen, Clark, Zborowsky, & Duffy, 2001; Mikulincer & Shaver, 2011). Moreover, elongated REM sleep and more frightening dreams with recurrent content were noted in insecurely attached adults (Csóka, Sverteczki, Lázár, Rigó, & Bódizs, 2006; McNamara et al., 2001). Sleep disturbances might be potential links between attachment insecurity and nightmares; not only frequent nightmares (Levin & Nielsen, 2007; Stephansky, Holzinger, Schmeiser-Rieder, Saletu, Kunze, & Zeithhofer, 1998), but also some patterns of insecure attachment were found to be associated with insufficient or even clinically disturbed sleep in a wide variety of non-clinical and clinical populations and various age groups (Carmichael & Reis, 2005; McNamara, Belsky, & Fearon, 2003; Sloan, Maunder, Hunter, & Moldofsky, 2007; Troxel, Cyranowski, Hall, Frank, & Buysse, 2007; Niko Verdecias, Jean-Louis, Zizi, Casimir, & Browne, 2008). Studies emphasizing that early traumas could be processed in compensatory ways during wakefulness have given less attention to other states of mind, such as REM sleep. The possibility exists that the long-term effects of early maternal separation affect REM sleep, because this state of mind is phylogenetically ancient (Nicolau, Akaarir, González, & Rial, 2000) and is emotionally driven (Maquet & Phillips, 1998).

Nightmares are long frightening dreams, typically occurring later in the night during rapid eye movement (REM) sleep and resulting in awakening. Complete awakenings, autonomic arousal, and detailed recall of the event distinguish nightmares from sleep terrors, the latter also being characterized by fear-related emotions but typically arising from non-REM sleep, without being associated with vivid dreams (Spoormaker, Schredl, & van den Bout, 2006).

Lifetime prevalence of nightmares in the general population is unknown, but large epidemiological studies indicate that about 85% of adults have experienced at least one nightmare within the past year (Levin & Nielsen, 2007), and further investigations suggest that the prevalence may approach 100% (Nielsen & Zadra, 2000). The estimated frequency of clinically significant nightmares (occurring at least weekly) is 4–10% in the general population (Levin & Nielsen, 2007). Similar rates are reported from different cultures (Belicki & Belicki, 1982; Bixler, Kales, Soldatos, Kales, & Healy, 1979; Coren, 1994; Fukuda, Ogilvie, & Takeuchi, 2000; Levin, 1994; Stephansky et al., 1998). There is a significant gender difference in nightmare frequency, with women of all ages reporting nightmares more frequently than men.
Age is also relevant: nightmares are less frequent among the elderly (Nielsen et al., 2006). Because nightmares are often (but not necessarily) associated with post-traumatic stress disorder (PTSD), many specialists distinguish post-traumatic and non-traumatic (idiopathic) nightmares. Post-traumatic nightmares reflect the long-lasting effect of a wakeful traumatic experience, whereas the cause of non-traumatic nightmares is unknown (Spoormaker, Schredl, & van den Bout, 2006). Numerous studies have found that nightmare frequency is associated with psychopathological symptoms (Levin & Nielsen, 2007), but because most of these studies do not distinguish between post-traumatic and non-traumatic nightmares, the meaning of the results is ambiguous. In an extended review, Levin and Nielsen (2007) described six broad psychopathology categories that are associated with nightmares: anxiety symptoms, neuroticism and global symptom reporting, schizophrenia-spectrum disorders, other psychiatric disorders, behavioral health problems and sleep disturbances, and PTSD. A common feature of these pathologies is notable waking emotional distress, suggesting that nightmares may play a role in processing of these experiences.

There are different models of nightmare production (see Levin & Nielsen, 2007, for a review), one of which is the affect network dysfunction (AND) model, which integrates recent findings from brain imaging studies with earlier results from studies of nightmares. According to the model, a network of affective processes serves the function of extinguishing fear memories during normal dreaming, but dysfunction in this network results in nightmares (Levin & Nielsen, 2007; Nielsen & Levin, 2007). Bad dreams are considered as intermediary phenomena between normal dreaming and nightmares, the latter differing quantitatively but not qualitatively from anxiety dreams that do not lead to awakening (Levin & Nielsen, 2007; Zadra, Pilon, & Donderi, 2006).

The studies reviewed above suggest that anatomical and biobehavioral changes caused by early maternal separation or deprivation might be involved in the production of nightmares (amygdala, hippocampal function, fear behavior, REM sleep). They also suggest that the connection between early experiences, brain development, and nightmare experiences might involve failures in emotion regulation (Levin & Nielsen, 2009). Our main hypothesis in the present study is that adults who experienced early maternal separation would report more frequent nightmares and bad dreams. Some support for this hypothesis was reported earlier by Agargün et al. (2003), who found that the prevalence of childhood traumatic experiences was higher among adult who “often” had nightmares than among adults who “sometimes” or “never” had nightmares.

Method

Subjects

Large nationally representative surveys were conducted in the Hungary in 1983, 1988, 1995, and 2002 (Kopp, Skrabski, & Szedmáš, 2000; Skrabski, Kopp, Sándor, Réthelyi, & Rahe, 2005). The samples represented the Hungarian population above the age of 18 in terms of gender, age, county, and sub-regions of counties. Among the 12,640 persons in Hungarostudy 2002, 4528 were interviewed again in 2005 and 2006 as part of the Hungarostudy Epidemiological Panel (HEP) follow-up study. Moreover, additional subjects were enrolled in the 2005/2006 survey to correct some
biased aspects of the sample. The total sample used in the present study consists of 5020 adults who answered the Dream Quality Questionnaire (2951 women and 2069 men), with ages varying between 17 and 98 years ($M = 47.6$, $SD = 17.9$). All of them gave informed consent and were guaranteed anonymity.

**Measures**

The Dream Quality Questionnaire (DQQ) concerns the emotional quality of dreams, the tendency to have frequent non-recurrent and recurrent nightmares and fearsome nocturnal awakenings (night terror-like symptoms), the effects of dreams on daytime mood, and the vividness as well as the bizarreness of dreams. The questions were based on our previous clinical and research experience; the validity of the measure is described elsewhere (Bódizs, Simor, Csóka, Bérdi, & Kopp, 2008). In the present study we used the following items from the DQQ:

1. Do you frequently have nightmares that wake you up? (yes, no)
2. How frequently is the emotional content of your dreams oppressive? (usually, frequently, rarely, never)
3. How frequently is the emotional content of your dreams unpleasant? (usually, frequently, rarely, never)
4. How frequently is the emotional content of your dreams neutral? (usually, frequently, rarely, never)
5. How frequently is the emotional content of your dreams pleasant? (usually, frequently, rarely, never)
6. How frequently is the emotional content of your dreams gratifying? (usually, frequently, rarely, never)

Habitual dream recall frequency was measured with the Hungarian version of seven-point Dream-Recall Frequency Scale (adapted from Schredl, 2002, 2004).

Maternal separation was assessed with the following question: did you have any durable (at least one month) absence from your family during your first year of life (hospital, institution, etc.)? Demographic questions were asked about age, gender, education, financial status, occupational category, and size of settlement (town or village where the subjects live). Educational level was measured in accordance with the Hungarian educational system as follows:

Your highest qualification is:

1. unfinished elementary school
2. elementary school
3. skilled worker
4. technical college
5. secondary school
6. college or university degree

We analyzed subjective financial status as follows: how would you sum up your financial status in comparison with other Hungarians? (Answered on a 10-point scale ranging from 1 = bad to 10 = good).
Occupational category was indicated on an ordinal scale ranging from “unemployed with no previous employment” to “professional leader,” according to a common listing of Hungarian occupational categories. Size of town or village was expressed in m². To indicate past and current life circumstances, subjects reported whether they were institutionalized as children and rated their childhood on a 10-point scale (“How would you qualify your childhood up to 10 years of age?” 1 = bad, 10 = good). They also completed a short Hungarian version of the Holmes-Rahe Life Event Rating Scale, which assesses the occurrence of important changes or events during the previous three years (Miller & Rahe, 1997; Szabó & Rózsa, 2006). Current depression was assessed with a short version of the Beck Depression Inventory (Kopp & Skrabski, 1990).

**Statistical analyses**

Effects of gender were analyzed with the Pearson Chi-Square test (for presence of frequent nightmares) and Independent Samples t-tests (for emotional load of dreams and dream recall frequency). Age and financial status effects were analyzed with Independent Samples t-tests (presence of frequent nightmares) and Pearson correlation coefficients (emotional load of dreams and dream recall frequency). Effects of education level were analyzed with a Mann-Whitney U-test (presence of frequent nightmares) and Spearman correlation coefficients (emotional load of dreams and dream recall frequency). The difference in frequent nightmares between early-separation and non-early-separation subjects was analyzed with logistic regression, and the emotional load of dreams was analyzed with a general linear model. In the latter analyses, gender, age, educational level, and financial status were statistically controlled. In the following the effects of other variables were controlled in separate models containing gender, age, educational level, subjective financial status and one of the following variables: occupation, settlement size, subjective qualification of own childhood, Holmes-Rahe life events, Beck Depression score. Finally, the analyses of the original model containing gender, age, educational level, and subjective financial status were repeated after removing subjects who were institutionalized during childhood (n = 664). All analyses were performed with the statistical package for the social sciences (SPSS) for Windows version 11.01.

**Results**

More women than men reported having frequent nightmares (13.7% vs. 9.2%; p < .001), as did older subjects (t = −3.27; p < .05). Having frequent nightmares was also more prevalent among people with less education (Z = −5.40, p < .001) and lower financial status (t = 7.13, p < .001). In accordance with our main hypothesis, more of the subjects who experienced early maternal separation (n = 157) reported frequent nightmares (Pearson Chi-Square = 4.77, p < .03; see Figure 1). Multiple logistic regression models were computed in order to ascertain when the experience of early separation was occluded by one or more other factors. These are shown below in Table 1.

Table 1 reveals that the effect of early separation on adult nightmares remained significant after controlling for gender, age, and education (p = .042), but was reduced to a non-significant trend when financial status was included in the model.
(\(p = .058\)). A similar trend was observed after the Holmes-Rahe life events score was included in the model (\(p = .090\)), or the subject’s (negative) childhood quality rating was included (\(p = .077\)), or the subject’s (lower) occupational category was included (\(p = .059\)), or the (smaller) size of the subject’s town or village was included (\(p = .050\)). Including the Beck Depression score in the model greatly weakened the relation between early separation and frequent nightmares (\(p = .249\)). After removing subjects who were institutionalized as children (\(n = 664\)), the relation between separation and nightmares was significant in the original model with gender, age, education, and financial status as covariates (\(p = .048\)).

The link between early separation (no/yes) and emotional load or valence was investigated in relation to diverse other variables in the study with a series of ANOVA results, including covariates, shown in Table 2 below.

Table 2 reveals that subjects who experienced early maternal separation reported expressly oppressive and bad dreams more frequently and neutral dreams less frequently. There was no difference in the prevalence of happy and expressly gratifying dreams. The effects of maternal separation on the prevalence of expressly oppressive and bad dreams remained significant and practically unchanged after the statistical control of gender, age, education, and subjective financial status. The inclusion of the additional covariates (BDI or life event score or childhood experience or occupation or settlement size or institutionalization) had no effect on the relationship between early maternal separation and negative dream affect. Similarly, the relationship between early maternal separation and the prevalence of neutral dreams was not affected by the above mentioned factors.

Dream recall frequency decreased with age (\(r = -.04; p = .003\)), was higher in women (\(t = -6.9, p < .001\)), and increased with education level (\(\rho = .058, p < .001\)). Early maternal separation did not influence dream recall frequency (\(t = -.76; p = .125\)).
Table 1. Reports of frequent nightmare experiences depending on early maternal separation and diverse other factors.

Did you have any durable (at least one month) absence from your family during your first year of life (hospital, institution, etc.)?

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Table 2. Dream recall frequency and the emotional valence (or load) of dreams depending on early maternal separation.

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<td>happy</td>
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Discussion

In accordance with previous results we found that women report dreams, negative dream affect, and nightmares more often than men, however the herein reported effect of age on nightmare experience and negative dream affect is different from results of epidemiological studies performed on English speaking populations (Nielsen et al., 2006), but partially similar to results based on German speaking populations (Stepansky et al., 1998). Moreover, a lower education was associated with more frequent nightmares in our sample. Although McNamara et al. (2001) showed that dismissing subjects report less dreaming than subjects characterized by other attachment styles, our separated and non-separated groups did not differ in dream recall frequency. Accordingly, the feasibility that our results are influenced by the differences in dream recall frequency is very low.

To our knowledge, this is the first large epidemiological study investigating the association of early maternal separation and frequent nightmare experience and negative dream affect in adulthood. The prevalence of frequent nightmare experience was more than 1.5 times higher among the subjects passing through early maternal separation. This effect remained significant after the statistical control of several factors influencing nightmare experience as well as after removing those subjects which were institutionalized during their childhood. However, after the additional control of financial status and the Holmes-Rahe life events score, the subjective quality of subjects’ childhood, occupation, or the settlement size the relationship between separation and frequent nightmare experience proved to be a tendency only. The control of depression scores abolished the relationship between early separation and nightmares, but not the relationship between negative dream affect and separation. Moreover, negative dream affect as measured by the reported frequency of expressly oppressive and bad dreams were even more reliably predicted by the separation experience. The higher prevalence of expressly oppressive/bad dreams in separated subjects was significant after the statistical control of all analyzed covariates. We might interpret these findings as a trait-like enhancement of negative emotionality during dreaming in subjects passed through early maternal separation, which is more or less constant, but turned into nightmares when facing depressive symptoms as measured by the Beck Depression Inventory. Early traumatic events in childhood such as physical and sexual abuse are known to be associated with high nightmare frequency (Agargün et al., 2003), however in the same study no significant correlation between early maternal separation and later nightmare prevalence was found. Early maternal separation up to five years of age was shown to be risk factor for borderline personality disorder (Crawford et al., 2009; Paris, Zweig-Frank, & Guzder, 1994a; Paris, Zweig-Frank, & Guzder, 1994b), whereas the latter is strongly associated with high Beck Depression Inventory scores (Wilson, Stanley, Ouendo, Goldberg, Zalsman, & Mann, 2007) and distressing nightmares (Semiz, Basoglu, Ebrinc, & Cetin, 2008; Simor, Csóka, & Bódizs, 2010). These results suggest that the first five years could be relevant for the future research efforts regarding the effects of early maternal separation on dreaming.

Although we do not have detailed information about the separation environment, due to the unique biopsychological and emotional features of the mother-infant relationship, we suggest that even the most sensitive caretakers and protective circumstances are not suited to substitute this special contact and to shelter the infant from the trauma caused by the temporal loss of the mother. Other aspects of
the separation emerge from an evolutionary perspective. Among mammals the chance to survive without the mother is very low (Nowak, Porter, Lévy, Orgeur, & Schaal, 2000) and this heritage might be working in the human infant too. As infant traumatic experiences are unsuitable to psychological integration, dissociation is thought be used as a defense mechanism (Putnam, 1985). Associations between frightening dreams and dissociative experiences were published earlier (Agargün et al., 2003). On the basis of previous and present results we suggest the reconsideration of the distinction of posttraumatic and non-traumatic nightmares. Although about a half of post-traumatic dreams have stereotypical content (Wittmann, Schredl, & Kramer, 2007), our results suggest that at least some nightmares which are not known to be anticipated by a trauma might also be trauma-related, however in those cases the trauma caused by early separation is not identifiable. Disorganized attachment which is known to be evolved due to the atypical, frightening, and frightened maternal behavior as measured by the AMBIANCE scale (Lyons-Ruth, Bronfman, & Parsons, 1999; Main & Hesse, 1990) was shown to be a risk factor of later PTSD (MacDonald et al., 2008). Based on our results and the results of MacDonald et al. (2008), we suggest that trauma caused by the early separation may play a role in the evolution of PTSD via the unresolved dissociation induced by maternal deprivation. It is worth noting that reports indicate a prevalence of 56% for nightmares in PTSD patients who had experienced their trauma more than 40 years earlier (Schreuder, Kleijn, & Rooijmans, 2000). Longitudinal studies of attachment styles report relatively high stability of attachment security over years (Waters, Merrick, Treboux, Crowell, & Albersheim, 2000; Zhang & Labouvie-Vief, 2004).

In point of happy and expressly gratifying dreams differences between the groups (separated vs. non-separated) were not found, however the separated group reported less neutral dreams. These results corroborate our previous findings suggesting that the positive, neutral, and negative affective loads of habitual dreaming are not forming a simple one dimensional dream quality, but load on three different components according to the outcomes of a factor analysis of DQQ items (Bódizs et al., 2008). Similar observations regarding wakeful affectivity are reliably supported by several studies (Diener & Emmons, 1984; Rafaeli, Rogers, & Revelle, 2007). Furthermore, our congruent results regarding frequent nightmares’, oppressive dreams’ and bad dreams’ dependence on age, gender, education, financial status and maternal separation support the concept of continuity between bad dreams and nightmares (Levin & Nielsen, 2007). Possible neuroanatomic correlates of our result are related to the hippocampus and the amygdala, which are central formulas in the nightmare production as suggested by the AND model. The altered hippocampal cytoarchitecture due to early maternal separation (Huot et al., 2002) may lead to altered function of this brain structure. Similarly, the suppressed expression of CRF2 receptors in certain hypothalamic and amygdala regions may lead to dysregulation of affective processes (Eghbal-Ahmadi et al., 1999). Analogously, the modified pituitary-adrenal stress responses (Essex et al., 2002; Heim et al., 2004), the increased level of fear behavior (Romeo et al., 2003) and the elongated REM sleep (Tiba et al., 2004, 2008) may promote the dysfunction of the affect network during dreaming.

Although our results are based on outcomes of analyses characterized by high statistical power and a high number of subjects, the interpretations are somewhat limited by the cross-sectional and retrospective design of our study. The presence
or absence of early maternal separation was assessed with a single item and based on a question which refers to the ages when autobiographical, declarative memory is far from being functional (Multhaup, Johnson, & Tetirick, 2005). Hence the question can only be answered on the basis of indirect information. Moreover, in spite of controlling the effects of a broad range of demographic and psychosocial variables, potential effects of other factors such as the reason or sequelae of separation (chronic illness in the child, child abuse, maternal illness, family breakdown) could not be fully analyzed. Albeit these might be considerable limitations our statistically reliable findings suggest that the effect of maternal separation on nightmares and bad dreams is a relevant one, which merits further attention. Further studies could focus on the relationship between early maternal separation and dreaming using an appropriate instrument (for example the AAI) for the assessment of the procession of the traumatic experience. This non-epidemiological approach could unravel the potential relationship between wakefulness-related and REM sleep-related organization of mental experiences following early trauma or loss.

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