

Too stressed to sleep

Alice M. Gregory and Nicola L. Barclay on whether stress early in life is linked to later sleep problems

Stress is common in early life, but is it associated with later sleep disturbance? This article reviews literature outlining longitudinal associations between stress early in life and subsequent sleep. Factors potentially influencing this association are discussed, as are possible pathways underlying these longitudinal associations.

It is all too clear that when we are stressed we find it hard to sleep. A large proportion of you will have experienced sleep disturbances, say, before exams; even the best sleepers occasionally suffer from sleepless and seemingly endless nights before big events. The undeniable links between stress and sleep have also been highlighted in the DSM-IV (American Psychiatric Association, 1994), where sleep difficulties (including difficulties falling and staying asleep) are amongst symptoms for the stress-related anxiety disorder PTSD. Of course, stress and sleep are linked in children too – relevant stressors documented in previous research include separations from key figures (e.g. parents, siblings, friends) as well as rarer events such as inhabiting war-zones (for a review, see Sadeh, 1996).

While it is clear that stressful events and poor sleep can occur at the same time, what is less clear is whether stress experienced early in life is linked to sleep difficulties later on. Here we refer to studies examining this issue and provide examples of mechanisms that could underscore these associations.

Does stress in childhood have consequences for later sleep?

Research that has examined longitudinal associations between sleep and stress suggests that associations could span developmental periods. For example, we examined data from the Dunedin Study (<http://dunedinstudy.otago.ac.nz>), a study of an entire birth cohort of individuals

born in Dunedin, New Zealand between 1 April 1972 and 31 March 1973 (Gregory et al., 2006). We looked to see whether children growing up in families for whom high levels of conflict had been reported (when the children were between 7 and 15 years) were more likely to have insomnia as young adults (aged 18 years). Interestingly, we found a clear dose-response relationship: the greater the number of assessments at which a family scored in the top 25 per cent for conflict, the more likely the participant was to suffer insomnia at 18 years of age. Of note, this association was found even when we controlled for sleep problems in childhood (ruling out the possibility that the longitudinal association between sleep problems and family conflict simply reflected the findings that sleep problems were present during childhood and persisted over time). We also found that the relationship held when we controlled for depression aged 18 years (ruling out the possibility that family conflict simply led to depression in adulthood, which is known to be associated with sleep problems).

Using data from a further prospective study, researchers compared the sleep of adolescents who had and had not been sexually abused during childhood (Noll et al., 2006). Those who had been sexually abused were more likely than the others to report greater sleep disturbances as adolescents (even when comorbid depression and PTSD was controlled).

While the aforementioned prospective studies measured sleep *subjectively*, there is also support for longitudinal links between stress and sleep measured *objectively*. For example, a retrospective study focused on 59 adults with primary insomnia who were asked to report on their adverse childhood experiences (Bader et al., 2007). A large proportion of the sample (46 per cent) reported moderate to severe adverse childhood experiences. Those reporting these adverse experiences, as compared to other insomniacs, were shown (using both polysomnography and actigraphy) to have poorer sleep. In particular they were more

questions

Why is it important to know more about the associations between stress and sleep?

Where should researchers now focus their attention in order to further understand the links between stress and sleep?

resources

American Academy of Sleep Medicine:
www.aasmnet.org
British Sleep Society:
www.sleeping.org.uk

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active during the night and experienced more awakenings. Such confirmation of associations between stress and sleep using objective measures is valuable as it removes the possibility that those who have experienced stress are simply more sensitive to their sleep difficulties or more likely to over-report their symptoms.

Insight into the longitudinal links between stress and sleep also comes from other, very different, lines of research. For example, one study examined the effects of prenatal stress on later sleep in rats (Dugovic et al., 1999). There were long-term differences between rats that had and had not been exposed to prenatal stress in terms of the structure and continuity of sleep. As an aside, it was interesting to note that the profile of sleep experienced by rats suffering prenatal stress shared similarities with that of depressed patients.

Despite such research, overall there is a scarcity of research investigating links between stress and sleep problems over extended periods. Nonetheless, it is possible to speculate about the mechanisms that could underlie associations between stress and insomnia.

Multiple pathways

There are likely to be multiple pathways by which stress and sleep difficulties are linked – and just a few examples are proposed here. One possibility is that children who experience high levels of stress are less likely than others to grow up in families that help children to establish good sleep patterns (e.g. setting a regular bedtime, providing light and noise conditions optimal for sleep onset). Another explanation for the link between stress and sleep is that it is possible that feelings of insecurity could follow certain stressful life events and lead to enduring hypervigilance. Sleep is a time when we have to 'let go' and is therefore incompatible with vigilance (see Dahl, 1996). A further pathway focuses on the HPA axis, which controls reactivity to stress. Stress is associated with higher levels of corticotrophin-releasing hormone, which may have insomnogenic actions (see Richardson, 2007, for a review). Focusing on neurobiology, and borrowing ideas from the PTSD literature, we know that fear conditioning is associated with amygdala hyperactivity and blunted medial prefrontal cortex activity, and that these changes could impact upon sleep (for a recent review, see Germain et al., 2008).

Other branches of psychology also provide insight into the association between stress and sleep – and it is likely that multiple factors mediate and

moderate the links. In support of this suggestion, one study found that coping style and arousal during the pre-sleep period mediated the association between stressful life events and sleep (Morin et al., 2003).

Associations are likely to be complex, and different types of stress will be associated with sleep differentially. Conversely, stress will impact upon certain aspects of sleep and not others.

Developmental stage is also likely to influence the associations between stress and sleep – and the effects of stress during one period will be different to those experienced at another. For example, prenatal stress may be particularly significant for later sleep problems given the importance of this developmental period. Also, the effects of a stressful life event (such as experiencing the divorce of parents) are likely to differ depending on a child's age. Finally, while we have focused on early stress linked to later insomnia, the pathways between stress and sleep are likely to be bidirectional, with sleep difficulties also leading to stress.

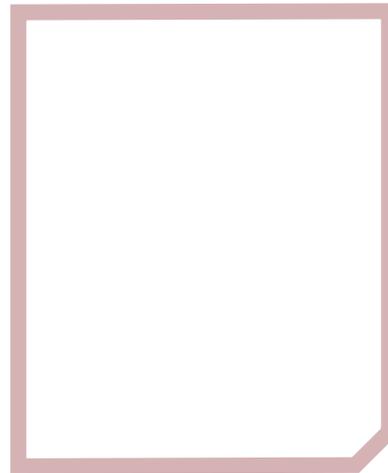
But don't lose sleep!

Although associations between stress and sleep have been reported, this is not a reason to stress (or to lose sleep). In fact, returning to our own research findings, we demonstrated that even those who had experienced family conflict at the maximum number of assessments (three or more) were more likely not to report insomnia later in life than they were to report it (only 23 per cent reported

insomnia at 18 years). While clearly much more research is needed in this area before solid conclusions can be drawn, even if experiencing stress is a sign that sleep difficulties may emerge later in life, there are effective and durable treatments in place to deal with these problems – such as cognitive behaviour therapy for insomnia (Morin et al., 2006).

Instead of worrying fruitlessly about longitudinal associations between stress and sleep, a useful way forward is to note that stress may be a risk indicator for later difficulties – including sleep problems – emphasising the need to control levels of stress in children where possible and to help children deal with high levels of stress should it occur.

The complex web of associations between stress and sleep also emphasises the need to generate and test novel hypotheses and for collaborative research between those with expertise in different areas. In particular, there is a need to develop and empirically test models of the associations underlying the links between stress and sleep – including careful consideration of risk and resilience factors that can explain why some children exposed to stress develop sleep difficulties and others do not. While a great deal has been learned from research employing expensive equipment, such as polysomnography and brain imaging, well-validated questionnaires and sleep diaries are without doubt useful too. Indeed, the typical absence of such measures in large-scale studies is a limitation of much of the research to date. Incorporating good measures of sleep into ongoing longitudinal prospective studies is easily achievable and holds great promise for allowing further significant developments in the field... allowing us to sleep easy.



ANNA HEATH

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