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GUEST EDITORIAL

Infant sleep interventions – Methodological and conceptual issues



Kempler et al. [1] authored in this issue a meta-analytic review on psychosocial interventions for infant sleep. Their review provides support for the hypotheses that such interventions would significantly improve infant sleep time and alleviate maternal post-natal depression, but did not provide support for a reduction in night wakings. The review covers nine studies that met the following criteria: (a) inclusion of infants up to 12 mo of age; and (b) intervention studies that include infant sleep measures or maternal depression ratings.

Previous narrative and meta-analytic studies have provided support for the efficacy of brief behavioral interventions for infant sleep problems [2,3]. They have also highlighted serious limitations in the existing literature including the heterogeneity of intervention methods, samples and ages, the insufficient number of RCT studies, the almost complete reliance on parental reports and the risks of publication biases. Notwithstanding these limitations, there seem to be a consensus that in infants and toddlers, brief interventions are effective in improving infant sleep and related parental characteristics (e.g., maternal depression and sense of competence) [2,3]. The review of Kempler and her colleagues (which mostly addresses studies on interventions for infants under the age of 6 mo), as well as an earlier review [4] challenge the validity of this conclusion in early infancy (during the first 6 mo).

Age and sleep development consideration

Sleep–wake patterns undergo radical developmental changes during the first six months of life. The most dramatic change is the rapid concentration and consolidation of sleep during the nighttime hours [5,6]. Difficulties in this normal maturational process lead to the common sleep complaints regarding multiple and prolonged night-wakings. Parents play a significant role in this process of infant sleep development and there is a good scientific rationale to assume that interventions addressing sleep-related parenting could lead to improved sleep [7]. Longitudinal developmental studies during the first year suggest that parental sleep-related behaviors (e.g., parental presence and involvement at bedtime and during the night) and cognitions (e.g., parental beliefs about infant distress during the night and infant's ability to self-soothe) are good predictors of infant sleep development [8–10]. The most predictive behaviors are parental presence and over-involvement at bedtime and during the night and the related cognitions are parental beliefs about infant distress during the night and infant's inability to self-soothe. However, the first 6 mo are considered as an unstable period of rapid brain maturation processes [11–13] as well as common physiological and health issues such as excessive crying (colic) [14], gastrointestinal reflux [15],

milk intolerance [16], and nocturnal feedings [17] that may adversely affect infant sleep and other regulatory behaviors [11,14–16,18]. These underlying processes are likely to undermine the effects of behavioral interventions during early infancy and could explain the conclusion that psychosocial intervention are not effective during the first 6 mo.

Outcome measures, drop-outs, and inclusion criteria

Most intervention studies rely on parental reports. However, it has been repeatedly demonstrated that there is significant discrepancy between parental reports and objective measures of infant sleep, particularly when sleep quality is considered [19,20]. For instance, based on comparison between parental reports and actigraphy it was argued that when parents are requested to complete sleep diaries for extended periods and report each night-waking every night, a false improvement effect could occur because of attrition and compliance difficulties (e.g., parents miss reporting more items and events) [20]. Parents are mostly aware of their infant's night-wakings when he or she signals or cries for attention. If the infant remains calm and resumes sleep alone (self-soothing) the parents are less likely to be aware of the event. Thus, parents can report reduction in night-wakings because infant sleep has actually become more consolidated or because their infant learned self-soothing and requires less attention when awake (or a combination of these two processes). This raises an important question: what are the important outcome measures? Are we interested in making sure that the infant is actually sleeping better or is it enough that the infant learned self-soothing and requires less parental involvement? Thus, to fully understand the outcomes of intervention studies we need to include objective (e.g., actigraphy, videosomnography) as well as parent-report measures. It is important to note that only two of the studies covered in the review paper have used actigraphy [21,22]. Furthermore, these two studies only reported outcomes based on actigraphy and thus the full picture that includes parental reports and the potential role of learned self-soothing versus sleep consolidation is missing. We recommend using and reporting both objective and reported outcome measures in infant sleep intervention studies. Both measures provide different perspectives with equal importance.

In the present review paper, significant drop-out rates from baseline to follow-up are reported. This is a very crucial issue that is often not properly addressed in intervention studies. Drop-out in intervention studies could result from various prosaic reasons (e.g., family relocation, loss of contact) but in many cases it could be due to motivational factors [23]. Motivational factors could be driven by crucial non-random factors including those related to

positive outcomes (e.g., “We received the help we needed and we have no further interest in participation”) or negative outcomes (e.g., “We gained nothing and we lost interest”). Various statistical methods have been proposed to handle the topic of non-random drop-out [24]. However, it is important to realize that parents who drop out of intervention studies should be considered as potential casualties in the sense they may not seek further help even if still needed and their sense of competence could be compromised by their failure to implement the intervention. This is a very sensitive issue because many of the infant sleep interventions incorporate minimizing parental involvement during the night which often triggers infant protest and crying which is difficult for parents to cope with. Future research should employ methodological and statistical measures to cope with these issues as well as put special emphasis on identifying parental or infant characteristics predicting drop-out or failure to benefit from these brief behavioral interventions and address a more sophisticated question of “what works for whom?” as practiced in modern psychotherapy research [25–27].

Another outstanding methodological issue is the difference in inclusion of studies across the reviews and meta-analyses that have been conducted over the years. As noted above, different reviews have led to different conclusions. There are several possibilities for these differential outcomes. One possibility is that as more studies are conducted, we are finding that the results of early studies were erroneous and behavioral interventions are not always effective in reducing night wakings. Another possibility is that the reviews have utilized differential inclusion criteria. For example, a recent meta-analysis [2] reported that behavioral interventions resulted in significant reductions in sleep onset latency and both frequency and duration of night wakings. The current paper found significant increases in total sleep time but not a reduction in night wakings. But a closer look at these two papers indicates that different inclusion criteria (e.g., type of control group; removal of studies with any participant older than 12 mo) led to a slightly different set of papers being selected and contradictory conclusions. It is difficult to ascertain which conclusion is correct. There are unfortunately no standards when conducting meta-analyses (e.g., type of control group to be utilized), and the resultant discrepant findings might be confusing to parents and practitioners who are trying to make clinical decisions.

Where is the father in infant sleep intervention studies?

The growing involvement of fathers in early child-care has been long identified and documented [28]. From developmental-systems perspective there are good reasons to assume that paternal involvement should exert significant influence on the developing child as well as on the mother [29]. Indeed, research on paternal involvement and infant sleep provided evidence regarding the role of the father in infant sleep development [30–32]. For instance, Tikotzky et al. found that higher paternal involvement in child-care during the first 6-mo predicted more consolidated sleep at 6-mo of age [31]. Fathers are more likely to hold cognitions promoting infant self-soothing and limiting night-time involvement (with the related higher tolerance for infant protest and crying) [30]. These are key features in behavioral interventions for infant sleep problems and based on these findings it has been argued that fathers should be included in clinical practice and research and perhaps targeted for implementing the behavioral intervention. However, most research in the field of infant sleep still focuses on mothers and ignores fathers. We believe that future research in this area should include paternal involvement, cognitions, behaviors, mood and psychopathology within a broader framework of systems perspective [33].

Moving the field forward

Reviews like these encourage us all to take a step back and assess the landscape. They lead to more questions than answers:

- Which interventions are most effective for which infants and parents?
- What are the crucial ingredients in effective interventions?
- What are the ultimate outcomes that we are seeking?
- Is it more important to consolidate sleep or to encourage self-soothing?
- Should reductions in parental depression be considered a primary outcome of behavioral interventions for infant sleep rather than being delegated as a secondary outcome?

And, finally, they push us to conduct more studies to answer these questions and move the field forward, with the ultimate goal of helping families and providing guidance for practitioners.

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