

## RESEARCH ARTICLE

## Toward an Integrated Anthropology of Infant Sleep

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**ABSTRACT** This article provides a novel synthesis of anthropological research on infant sleep, focusing on work in biological and sociocultural anthropology in the past decade. First, we briefly review early biological anthropological research into infant sleep from 1987 to 2007, which provided the evidence base for the argument that proximate parent–infant sleep combined with lactation represents a complex set of adaptations that constitute the human evolutionary norm. This work challenged the Western pediatric infant sleep research paradigm, which positioned formula- or bottle-fed solitary sleeping infants as the basis for research and universal models about human infant sleep. Next, we address how recent research has built on these foundations and extended anthropological insights into new aspects of infant sleep. Biological anthropologists, who continue to lead this research, have advanced into the hormonal and behavioral ecology of parent–infant sleep and trade-offs in nighttime care and parent–infant conflict. Moreover, they have made significant progress in translating anthropological research into policy and practice in clinical and health delivery settings. Until recently, sociocultural anthropology has primarily addressed infant sleep as part of broader endeavors, without an explicit focus on infant sleep. We highlight key ethnographic works that shed light on the cultural normalcy and interembodied experience of shared maternal–infant sleep with breastfeeding that help de-center Western discourses of infant sleep. We conclude by discussing future research agendas to forward an integrated anthropology of human infant sleep that considers its full biological and sociocultural context. Integrated anthropological approaches to infant sleep not only present a path forward for novel cross-subfield anthropological research but could help guide more effective and equitable approaches to maternal-infant health. [*nighttime care, parenting, infancy, sleep*]

**RESUMEN** Este artículo provee una síntesis novedosa de la investigación antropológica sobre el sueño de infantes, enfocándose en el trabajo en antropología biológica y sociocultural en la década pasada. Primero, brevemente revisamos la investigación antropológica biológica temprana en el sueño de infantes desde 1987 a 2007, la cual proveyó la evidencia base para el argumento que el sueño padres–infante cercano combinado con la lactación representa un complejo conjunto de adaptaciones que constituye la norma evolucionaria humana. Este trabajo reta el paradigma occidental de la investigación pediátrica en el sueño de infantes, el cual posiciona los bebés durmiendo solitarios alimentados con fórmula o biberón como la base de la investigación y modelos universales acerca del sueño de infantes humanos. Luego, abordamos cómo la investigación reciente ha construido sobre estas bases y extendido los conocimientos antropológicos en nuevos aspectos del sueño de infantes. Antropólogos biológicos, quienes continúan liderando esta investigación, han avanzado en la ecología hormonal y conductual

del sueño padres–infante y los intercambios en el cuidado nocturno y el conflicto padres-infante. Además, ellos han hecho un significativo progreso en traducir la investigación antropológica en política y práctica en el marco de prestación de servicios de salud y clínicos. Hasta recientemente, la antropología sociocultural ha abordado primariamente el sueño de infantes como parte de empeños más amplios, sin un enfoque explícito en sueño de infantes. Destacamos trabajos etnográficos claves que arrojan luz en la normalidad cultural y la experiencia intercorporeizada del sueño materno–infante compartido con lactancia materna que ayuda a descentrar los discursos occidentales de sueño de infantes. Concluimos discutiendo los futuros programas de investigación para promover una antropología integrada del sueño de infantes humanos que considera su contexto biológico y sociocultural completo. Aproximaciones antropológicas integradas al sueño de infantes no sólo presentan un camino hacia adelante para novedosa investigación antropológica a través de subcampos sino también puede ayudar a guiar aproximaciones más efectivas y equitativas a la salud materno-infantil. [*cuidado nocturno, crianza de los hijos, infancia, sueño*]

## INTRODUCTION

Substantial anthropological evidence indicates that evolution has produced an unusually helpless human neonate who is born into a cultural world that shapes their life experiences, including sleep, from the first moments after birth (Trevathan and Rosenberg 2016). While parents and carers in the majority of cultures around the world carry their infants and sleep in close proximity to them, dominant models of infant care in WEIRD settings (Western,<sup>1</sup> educated, industrial, rich, and democratic) emphasize lengthy periods of separation and minimal bodily contact, particularly at night (Ball 2008; Ball and Russell 2012; Jones and Ball 2012; Trevathan and Rosenberg 2016). These WEIRD models of infant care are biomedicalized—conceptualized to belong to the realms of medical experts that set the standards for what is considered “normal” and “healthy” sleep—and are codified in authoritative medical guidelines and recommendations (Ball 2008; McKenna, Ball, and Gettler 2007; Tomori 2014). A key anthropological finding, however, is that these models are incongruent with maternal–infant evolved biology and dramatically differ from infant care in other societies and cultures where a vast majority of the global population resides (Airhihenbuwa et al. 2016; Ball 2017a; McKenna, Ball, and Gettler 2007).

The engagement of anthropology with infant sleep began three decades ago when biological anthropologists focused an evolutionary lens upon issues of nighttime infant care. They observed that solitary infant sleep, dominant in these researchers’ own societies, was in fact an unusual and historically recent behavior confined to a historically and culturally limited subgroup of contemporary humans. Therefore, solitary infant sleep was both evolutionarily novel and incongruent with the limited biological and behavioral competence of the immature human infant (Trevathan and Rosenberg 2016). Yet Western biomedical and psychological infant-care experts at the time emphasized that solitary, continuous sleep was “normal” and desirable for infants, night wakings

were undesirable and to be eliminated, and shared sleep was unsafe and psychologically damaging. In contrast to these recommendations, anthropologists explored the potential negative relationship between solitary infant sleep and sudden and unexpected infant death (Konner and Super 1987; McKenna 1986). Super and Harkness (cited in Wolf et al. 1996, 365) drew attention to the characteristic pattern of frequent night waking and feeding among non-Western human infants and suggested that “pressuring” infants to sleep through the night with no parental involvement was “pushing the limits of infant adaptability.” These comparative observations provided the foundation for anthropological critiques of clinical and popular views regarding infant sleep environments and unexpected infant deaths. In drawing together the extant information on infant developmental biology and nighttime parent–infant behavior, McKenna (1986) hypothesized that close sleep proximity (co-sleeping) helped to regulate infant breathing and reduce the propensity for prolonged periods of deep sleep, thereby protecting against sudden infant death syndrome (SIDS). This novel synthesis galvanized interest in anthropological perspectives on infant sleep but also instigated an unanticipated collision between anthropologists and epidemiologists over the role of parent–infant sleep proximity in preventing or promoting sudden infant deaths.

The historical transition from shared to solitary infant sleep in Euro-American settings over the late nineteenth and twentieth centuries was accompanied by other substantial changes in infant care, such as the use of human-milk substitutes, highly regimented infant-feeding schedules, and long periods of infant isolation in confined spaces, all of which resulted in a dramatically different experience of infancy compared with previous infant-care practices (Ball 2007; Russell et al. 2016; Stearns et al. 1996; Tomori 2014, 2014). In researching infant sleep and SIDS, anthropologists quickly identified a crucial relationship between infant sleeping and feeding mode (Ball 2003, 2006b; Ball, Hooker,

and Kelly 1999) and the role of early nighttime separation in hindering the establishment of breastfeeding (Ball et al. 2006; McKenna, Ball, and Gettler 2007). This attention to the interrelationship of bodily proximity and breastfeeding as a central aspect of the evolutionary context of infant sleep set anthropological work apart from most biomedical research, which continued to treat these processes separately.

Over the past decade, the scope of anthropological research employing evolutionary, ethological, and biological perspectives on infant sleep has grown substantially, encompassing the interaction of mother–infant sleep proximity with lactation physiology (Ball et al. 2006, 2012) and breastfeeding behavior (Ball et al. 2016; McKenna and Gettler 2016), infant sleep development (Rudzik and Ball 2016, 2018), infant nighttime care following caesarean section (Tully and Ball 2012), the effects of co-sleeping on paternal hormonal physiology (Gettler et al. 2012), parental coping strategies (Ball 2018; Rudzik and Ball 2016; Volpe and Ball 2015), and the role of parent–infant conflict theory in understanding infant sleep and nighttime care (Haig 2014; Hinde 2014; Tully and Ball 2013; Volpe, Ball, and McKenna 2013). Together, this work strengthens the evidence base for the core biological anthropological argument that proximate parent–infant sleep combined with lactation represents a complex set of adaptations that constitute the human evolutionary norm.

Interest in infant sleep has also spread across anthropology more broadly as colleagues have begun to apply critical medical and sociocultural anthropological perspectives to these topics. Ethnographic research has provided rich understandings of nighttime breastfeeding and sleep practices in different cultural settings and has illuminated the cultural ideologies and power dynamics entailed in negotiating Western biomedical models of infant sleep, which have helped to de-center dominant Western paradigms of infant sleep (Gottlieb 2004; Tahhan 2014; Tomori 2014; Wolf-Meyer 2012). Despite significant progress, however, the sociocultural aspects of infant sleep remain far less studied compared to biological anthropological work on the topic.

In the sections below, we provide a brief contextual overview of the first two decades of anthropological involvement in infant sleep research, with its close focus on the behavior and biology of co-sleeping (for greater detail, see McKenna, Ball, and Gettler 2007). We synthesize and consider the increasingly diverse anthropological and anthropologically informed work addressing issues of parent–infant sleep and nighttime infant care conducted over the past decade and then advance a discussion of future research agendas for an integrated anthropology of infant sleep. We argue that the discipline of anthropology, with its four-field approach, is uniquely positioned to address the complexities of infant sleep, which is a simultaneously biological and cultural phenomenon.

## CONTEXTUAL BACKGROUND—A BRIEF OVERVIEW 1987–2007

In the last decade of the twentieth century, the anthropology of infant sleep was dominated by McKenna's and Mosko's studies of mother–baby co-sleeping pairs (McKenna et al. 1994; McKenna and Mosko 1993; McKenna, Mosko, and Richard 1997; Mosko et al. 1993, 1996, 1997; Mosko, Richard, and McKenna 1997a, 1997b; Richard et al. 1996), which aimed to empirically test McKenna's hypothesis that solitary sleeping removes the infant from the regulatory effects of its mother's body and places it in a more physiologically challenging sleep environment. The polysomnography and observation of forty-three breastfeeding mothers and babies who slept together and apart in the University of California, Irvine, Sleep Lab found that babies experienced more light sleep, less deep sleep, and longer total sleep time (TST) when bed-sharing than when sleeping alone and that they and their mothers experienced more overlapping arousals (McKenna, Ball, and Gettler 2007; McKenna and Mosko 1993; Mosko et al. 1993; Mosko, Richard, and McKenna 1997a), supporting the hypothesis that sleep contact between mother and baby provided an empirically different infant sleep experience than solitary infant sleep.

During these experiments, mothers also experienced more light sleep and less deep sleep, but with no difference in overall TST (Mosko, Richard, and McKenna 1997b), suggesting that maternal sleep biology is altered by infant presence—an important finding overlooked in epidemiological critiques of co-sleeping and insufficiently replicated by other research teams with the capacity to conduct infant polysomnography. Examination of breastfeeding interfeed intervals found that regular bed-sharing dyads fed twice as frequently (every 97 minutes, on average) than separately sleeping dyads (every 187 minutes on average; McKenna, Mosko, and Richard 1997a, Mosko, Richard, and McKenna 1997b) demonstrating that maternal and infant experiences of both feeding and sleep differ substantially according to their immediate sleep ecology. McKenna postulated that the solitary sleeping infant's experience of prolonged deep sleep with fewer arousals increased their vulnerability to SIDS and noted that breastfeeding bed-sharing mothers were particularly responsive to their infants during the night (McKenna, Ball, and Gettler 2007). These comparative studies provided the beginnings of an evidence base with which Western epidemiological and psychological perspectives on infant sleep could be critiqued.

Building on this novel work, anthropologists in the United Kingdom began developing their own strands of infant-sleep and nighttime-care research, examining parental attitudes and behaviors around bed-sharing/co-sleeping (Ball 2006b; Ball, Hooker, and Kelly 1999; Hooker, Ball, and Kelly 2001) and twin infant sleep arrangements (Ball 2006a, 2007), and conducting a series of studies in a UK postnatal unit of mother–infant sleeping and feeding behavior in the immediate post-birth period (Ball et al. 2006; Ball and Klingaman 2007). Although McKenna's research

continued with various collaborations (Gettler and McKenna 2011; McKenna and Volpe 2007), the implications of his work on the role of co-sleeping in SIDS prevention faced significant resistance from biomedical practitioners, including clinicians, pathologists, and epidemiologists, who felt strongly that parents should be advised against bed-sharing with their babies (e.g., Carpenter 2006; Fleming, Pease, and Blair 2015; Hauck, Darnall, and Moon 2014; Mitchell 2007, 2010; Thogmartin, Siebert, and Pellan 2001). Consequently, a major strand of McKenna's work in the United States turned toward critical papers that aimed to expose, challenge, and gradually alter the dominant ideologies around infant sleep (e.g., Gettler and McKenna 2010; McKenna and Gettler 2016; McKenna and McDade 2005).

The first twenty years of anthropological infant sleep research was therefore dominated by a bioanthropology and evolutionary medicine perspective that revealed:

- an intricate interrelationship between mother–infant sleep contact and nighttime breastfeeding behavior (McKenna and Bernshaw 1995; McKenna, Mosko, and Richard 1997a; Mosko, Richard, and McKenna 1997b)
- the mutual physiological regulation of mother–infant sleep architecture during sleep contact (Mosko et al. 1996; Mosko, Richard, and McKenna 1997a, 1997b)
- an appreciation of the variability of sleep ecology within UK families and the (often hidden) prevalence of social sleep arrangements (Ball 2006c; Ball, Hooker, and Kelly 1999; Blair and Ball 2004)
- an understanding of the wide range of motivations for and circumstances of different parent–infant sleeping arrangements (Ball 2002, 2003, 2006a; Ball, Hooker, and Kelly 2000)

This work provided a foundational evidence base for the core biological anthropological argument that proximate parent–infant sleep combined with lactation represents a complex set of adaptations that constitute the human evolutionary norm upon which more recent work has built. Given the applied value of this research, these findings also informed researchers working in a wide array of disciplines, influencing and challenging health-care practice and policy in the United States, the United Kingdom, and around the world (e.g., Fleming and Blair 2006; McKenna 2000; Thoman 2006; Wailoo et al. 2004).

### **Evolutionary Anthropology of Adult Sleep**

In addition to these advances in anthropological infant sleep research, the last decade has seen anthropologists challenging the Western model of adult sleep by exploring sleep patterns in nonelectrified societies (e.g., Knutson 2014; Samson, Crittenden, et al. 2017a; Yetish et al. 2015). For instance, in documenting sleep ecology and behavior among hunter-gatherers, Samson, Crittenden, et al. (2017b) highlighted a lack of sleep synchrony among co-resident group mem-

bers, potentially linked to group defenses, and demonstrated that human sleep is more flexible than nonhuman-primate sleep, with humans exhibiting less overall sleep and more REM sleep than would be predicted by body size (Nunn and Samson 2018). Consonant with rich historical reporting on the segmentation of sleep into two distinct nighttime periods in preindustrial Europe (Ekirch 2005), Samson, Manus, et al. (2017) revealed a similar structure of sleep among hunter-gatherers. Furthermore Nunn, Samson, and Krystal have used evolutionary interpretations of human sleep to question the status of several so-called sleep disorders diagnosed by Western biomedicine (see Nunn, Samson, and Krystal 2016). This work builds upon the cross-cultural examination of sleep budgets and sleep sufficiency among Egyptian families and exploration of the ecological circumstances under which human sleep evolved (Worthman and Brown 2013; Worthman and Melby 2002).

### **DEVELOPMENTS IN ANTHROPOLOGICAL INFANT SLEEP RESEARCH 2008–2018**

Anthropological research in infant sleep has flourished over the past decade by building incrementally on preceding work, integrating new methodological approaches, applying new theoretical perspectives, and offering critical insights to mainstream infant sleep science. In summarizing this work, we have grouped the contributions of anthropologists to parent–infant sleep research into the following thematic strands:

1. Advances in biological and biocultural anthropology of infant sleep;
2. Translation of biological anthropological research into policy and practice in clinical and health-delivery settings; and
3. Sociocultural anthropology of infant sleep and nighttime care.

### **Advances in Biological Anthropological Research on Infant Sleep**

#### **a. Hormonal and Behavioral Ecology of Nighttime Infant Care**

This work considers the bidirectional nature of sleep relationships, examining the influence of maternal and paternal behavior on infant physiology, and, in turn, the effects of infant sleep on parental physiology. Given the public-health emphasis placed on improving breastfeeding rates in the United States and United Kingdom and the perceived conflict between breastfeeding support and SIDS reduction (Fetherston and Leach 2012), the relationship between breastfeeding and sleep proximity has been the most intensely investigated of these.

#### *1. Sleep Location and Breastfeeding*

Research on sleep location and breastfeeding yielded the key insight that small deviations in sleep ecology have substantial

consequences for the functioning of maternal lactation biology. Ball et al. (2006) found that infant sleep location affects infant feed frequency among breastfeeding mother–infant dyads in the immediate postpartum (Ball 2008; Ball et al. 2006; Ball and Klingaman 2007). This is important due to the effect of feed frequency in modulating human lactation physiology, with earlier and more vigorous onset of lactogenesis II (LII, copious milk production; Riordan 2011; Salariya, Easton, and Cater 1978; Tennekoon et al. 1994). LII is triggered when prolactin levels in maternal plasma reach a threshold accumulated over several days (Neville 2001; Neville and Morton 2001). As a prolactin surge is experienced with every feed or attempted feed, and as each surge in prolactin declines after forty-five minutes, repeated frequent feeding day and night results in circulating blood prolactin rising swiftly and earlier attainment of the threshold that triggers onset of LII (Neville 2001). Contemporary postnatal hospital environments that enforce mother–infant separation at night (even separation via the wall of a hospital bassinette) therefore exert physiological and psychological influences on the behavioral and biological relationship between mother and baby (Ball 2008).

A subsequent study by the same team, involving 1,200 UK mother–newborn pairs, examined whether variations in early postnatal sleep ecology might also affect long-term breastfeeding outcomes. This hypothesis was based on the physiological link between frequent feeding in the early postnatal period and the establishment of a robust long-term milk supply, predicated on the prolactin receptor hypothesis (Marasco and Barger 1999). The latter (based on some evidence from nonhuman lactation) posits that prolactin receptors in the breast proliferate under the influence of prolactin secretion immediately postpartum. More frequent feeding produces higher concentrations of prolactin, which in turn promotes the development of more receptors. At galactopoiesis, when control of breast milk switches from endocrine to autocrine control, the density of prolactin receptors previously established influences the establishment of long-term milk production. Ball et al. (2011) hypothesized that close proximity in the immediate postpartum would, via more frequent suckling, promote prolactin receptor development and thereby support sustained lactation. The trial found no difference in breastfeeding duration between the two groups overall. However, subgroup analysis demonstrated greater breastfeeding duration for those dyads who slept in close contact following vaginal deliveries with no medical interventions (Robinson 2014). Dyads in the sample that experienced clinical interventions, such as opiate analgesia (including epidurals), or assisted delivery (which were excluded from the previous trial) did not show higher rates of breastfeeding with close sleep contact. The impediments to breastfeeding associated with birth interventions appear likely to pose greater breastfeeding challenges to mothers and babies than changes in sleep proximity can overcome (Tully and Ball 2018).

The above trial also found that, regardless of sleep location on the postnatal unit, 56 percent of mothers opted to bed-share at least occasionally with their infant during the first thirteen weeks of life, and twice the proportion of these dyads were still breastfeeding at six months compared to those who did not bed-share (Howel and Ball 2013). Those mothers who chose to sleep with their babies, and who subsequently exhibited the longest breastfeeding durations, also had the strongest prenatal intentions to breastfeed (Ball et al. 2016). These findings support McKenna and Gettler's (2016) proposal that breastfeeding and co-sleeping form an adaptive and mutually reinforcing behavioral complex that they have termed “breastsleeping.” This concept is further explored in Tomori's work below.

## 2. Circadian Development and Infant Sleep Patterns

Cortisol and melatonin are important hormones involved in the regulation of mammalian circadian rhythms and synchrony with diurnal patterns. Researchers have begun exploring the implications of nighttime-care behavior on infant hormonal development, particularly regarding sleep patterns and circadian rhythms. Human infants have no independent circadian clock at birth. It is largely under maternal control in utero (Mirmiran and Lunshof 1996) and emerges over the first few months of life. Joseph et al. (2015) found that the diurnal antagonistic production of cortisol and melatonin appear earliest during infant development, with other circadian processes (such as day–night change in body temperature) subsequently taking on a diurnal pattern, and peripheral clock gene activity appearing at the end of the sequence. These biological rhythms are closely linked to sleep patterns, and the timing of both circadian development and sleep consolidation (the joining up of sleep bouts into longer nighttime sleep periods) appear to be linked with sleep ecology and caregiving behavior (Joseph 2011). The role of infant-care practices in the development of infant rhythms is particularly important for understanding external influences on the regulators of infant sleep. Infant sleep development in different micro- and macroenvironments is an important emerging research area, where the development of robust methodologies is needed to facilitate cross-cultural study.

One intriguing question involves how maternal melatonin, passed to the infant via breastfeeding, affects the development of infant circadian rhythms and sleep patterns. Melatonin concentration in human milk displays a clear circadian rhythm that runs in parallel to the concentration present in maternal blood (Illnerová, Buresová, and Presl 1993). Melatonin levels in human milk produced during daytime are extremely low and peak around 3 a.m. (Cohen Engler et al. 2012). As melatonin rhythms appear stable during the early postpartum period, melatonin is well suited to regulate the circadian system of the infant when other potential entrainers, such as maternal activity and sleep-wake cycles are disrupted (Illnerová, Buresová, and Presl 1993), and so endocrine signals in maternal milk such as melatonin may prime the development of circadian

biological systems. Rudzik, Robinson, and Ball (2016) found that day and nighttime concentrations of melatonin (measured as a urinary metabolite) among exclusively breastfed infants were strongly predictive of sleep duration during the first eight postpartum weeks. For exclusively formula-fed infants, there was no relationship. Beyond eight weeks postpartum, there was no association between day-night melatonin concentrations and sleep duration for either group. The strength of the relationship between melatonin and infant sleep duration among exclusively breastfed infants suggests that maternal melatonin, transmitted through breast milk, may play a functional role in promoting infant sleep prior to the development of the endogenous melatonin circadian rhythm (Rudzik et al. 2016). This is a promising area for further investigation examining the socioecology of infant circadian development and the role of maternal biological signaling under a variety of infant-care regimes and in different cultural settings.

### 3. Paternal Testosterone and Father–Infant Co-sleeping

Although various clinical studies conducted over the last decade have begun to extend McKenna's and Mosko's work on the effects of co-sleeping on maternal sleep (e.g., Hunter et al. 2009; Volkovich et al. 2015), the behavioral and physiological consequences of sleeping arrangements are not limited to mothers and babies. An anthropological study of father–infant sleep proximity in the Philippines extended the literature regarding the effects on male hormonal physiology of paternal involvement in daytime care to examine the role of sleeping arrangements (Gettler et al. 2012). Previous research had found an association between lower testosterone and more hands-on childcare (Storey et al. 2011), with fathers having lower testosterone than nonfathers (Gettler, McDade, and Kuzawa 2011). Gettler found that same-surface co-sleeping by fathers was associated with significantly lower evening testosterone levels and a greater diurnal decline in testosterone compared to fathers who did not share a sleep surface with their child(ren). In a subsequent analysis comparing cross-sectional testosterone data on men collected at two time points, four years apart, those who had become fathers and were co-sleepers exhibited a significantly greater reduction in testosterone than those who had become fathers but did not co-sleep. Men's testosterone levels at baseline, however, did not predict their future paternal sleep arrangements (Gettler et al. 2012). This work suggests possible future areas for research on the bidirectional relationship between paternal involvement in nighttime care and infant outcomes. The examination of the relationship between paternal sleep architecture and hormones associated with shared and separate father–infant sleep practices in different settings would shed light on the ramifications of father–infant sleep contact.

The above work of biological anthropologists exploring the hormonal and behavioral ecology of nighttime care of course intersects with the work of researchers in other disciplines who are also interested in these topics.

## b. Trade-Offs/Selection Pressures and Parent–Infant Nighttime Conflict

Theoretical evolutionary concepts of parental investment, parent–infant conflict, and life-history trade-offs are frequently used by biological anthropologists to consider the evolutionary ramifications of parental behavior, such as infant feeding, carrying, and weaning (e.g., Fouts, Hewlett, and Lamb 2005; Jones 1986; Quinlan, Quinlan, and Flinn 2003; Sellen 2001; Tomori, Palmquist, and Quinn 2018). Over the past decade, these concepts have begun to be employed to better understand the trade-off decisions associated with infant sleep biology and nighttime infant care.

### 1. Reducing the Burden of Nighttime Breastfeeding

The concept of parent–infant conflict has been used to consider maternal investment decisions regarding nighttime breastfeeding (Tully and Ball 2013a, 2018) under the proposal that individual women experience different thresholds at which real or perceived costs to themselves or their future offspring outweigh the real or perceived benefits of continuing to breastfeed their current infant. Factors that lower the real or perceived maternal costs of nighttime breastfeeding, such as bed-sharing or partner support, help mothers to breastfeed their infant for longer than they might otherwise do (Tully and Ball 2018). Tully's study examining the nighttime experiences of mothers and infants following C-section delivery explored whether the use of sidecar cribs could facilitate breastfeeding initiation among this group (already challenged by the consequences of operative delivery) by reducing the costs (physical, emotional, motivational, etc.) to mothers of nighttime feeding (Tully and Ball 2012, 2013a, 2013b). The difficulties faced by mothers and babies in establishing breastfeeding post-C-section were too great for this intervention to overcome, and many mothers reached their breastfeeding investment threshold (the point at which they were no longer willing/able to invest effort in continued breastfeeding) sooner than did mothers experiencing less-challenging births (Tully and Ball 2012). An evolutionary-informed approach can therefore help us to better understand how parent–infant needs conflict in the experiences of individual mothers and infants and therefore provide better support to mothers who are experiencing challenges.

### 2. Risks and Benefits in Nighttime Infant Care

Concepts from evolutionary theory have also been used to explore why and how parents might implement risky sleep practices as part of nighttime infant care (Volpe, Ball, and McKenna 2013). One of the key categories of trade-offs related to parental effort involves investing in one's own growth and maintenance versus an offspring's growth and maintenance (Borgerhoff Mulder 1992; Clutton-Brock 1991). Volpe (2010) explored differences in nighttime infant-care behavior of adult and adolescent mothers in the context of life-history strategy. Overnight observations found that adolescent mothers kept their infants in

close proximity and were more likely to bed-share, experiencing more frequent but shorter nighttime awakenings; infants slept in more locations compared to infants of adult mothers, and a greater overlap was seen between maternal and infant sleep periods for adolescent mothers. In contrast, adult mothers spent more of their infant's sleep time awake and with longer periods of separation, often sleeping in different rooms. Adult mothers invested more time in breastfeeding their infant, while teen mothers more frequently implemented infant self-feeding from bottles propped on blankets or pillows (Volpe, Ball, and McKenna 2013).

Efforts to prevent the exposure of infants to sleep-related risks require a good understanding of why, when, and how such risks occur. Volpe's study found that although their mothers employed different nighttime care strategies, neither group of infants was exposed to fewer risks, but the two groups of infants experienced different risks known to increase sleep-related infant mortality. Risks introduced by adult mothers attempting to reduce nighttime investment involved sleeping infants alone in separate rooms and using pillows, loose covers, and soft toys to promote comfort and prolonged sleep. Adolescent mothers introduced risk by reducing maternal investment during the night in other ways (e.g., falling asleep on sofa with baby while watching TV, bottle propping with pillows; Volpe, Ball, and McKenna 2013). Psychological literature on adolescent parenting suggests that young mothers reduce maternal investment by distancing themselves from, and therefore neglecting, their baby, but this was not observed (Volpe 2010). Volpe therefore was able to document that teen and adult mothers managed the "work" involved in caring for their babies at night by employing different infant sleep environments. Examination of such caregiving strategies from social anthropological perspectives (such as examination of social structures of power and socialization) are clearly warranted, offering an opportunity for social and biological anthropologists to provide a more holistic perception of adolescent mother–infant care.

### 3. *Intragenomic Conflict?*

Although biological anthropologists tend to view bed-sharing behavior as a maternal strategy to reduce the costs of nighttime feeding during early infancy, another view invokes a more reductive evolutionary approach focused on intragenomic competition. In considering the parent–infant conflict inherent in nighttime infant care, Haig (2014, 34) proposed that "natural selection will have preserved suckling and sleeping behaviors of infants that suppress ovarian function in mothers because infants have benefitted from delay of the next birth." Using the work of Blurton Jones and Costa (1987) regarding prolonged maternal lactational amenorrhea, Haig argued that conflict operates through the infant, with paternally derived genes promoting infant nighttime breastfeeding to delay maternal ovulation and thereby reduce sibling competition by lengthening the interbirth interval and extracting increased maternal investment in the present infant. He takes issue with anthropological approaches to

evolutionary medicine for challenging the assumptions of pediatric sleep medicine and for depicting proximate mother–infant sleep arrangements as the evolutionary "norm" (Haig 2014).<sup>2</sup> Haig, however, fails to acknowledge that the research by biological anthropologists working on infant sleep to date has focused upon the sleep ecology of infants in the first six months of life, a period during which physicians and anthropologists agree that human infants are wholly dependent upon close proximity with their mothers/allocarers for survival, both in terms of feeding and sleeping (Sellen 2016; Tully, Stuebe, and Verbiest 2017). In response to Haig, biological anthropologists argue that the expectation of clinicians that infants should develop consolidated sleep and mothers should be able to sleep uninterrupted is a historical artifact, and that embracing an evolutionary perspective to understand human health allows us to gain critical insights based on better understanding of our baseline expectations (Ball 2013; Hinde 2014). In addition to the large body of early ethnographic evidence, Hewlett and Roulette's (2014) recent review provides further support for the argument that human juveniles sleeping close to their parents throughout their childhood and even in adolescence is the likely human evolutionary norm.

Together, biological anthropological work in the past decade has significantly advanced knowledge about biologically normal patterns of human infant sleep in an evolutionary theoretical framework. Nevertheless, there is significant need for further research, including comparative work from non-Western settings, now beginning to emerge (e.g., Crittenden et al. 2018; Vitzthum et al. 2018).

### **Translation of Anthropological Research into Clinical and Public Health Settings**

Although McKenna's impetus for exploring parent–infant sleep biology and behavior was an interest in the conundrum of unexpected and unexplained sudden infant deaths, it soon became apparent that the anthropology of parent–infant sleep and nighttime infant care would make substantial contributions to clinical practice and public health in a range of related areas.

The bioanthropological approach to infant sleep has found particular translational success in the framing and testing of questions regarding breastfeeding and the practice and policy applications of this work (Ball 2017a). The postnatal ward studies of Ball, Russell, Tully, and colleagues (above) based on evolutionary-informed hypotheses about mother–infant separation has encouraged health professionals to question whether mother–infant sleep locations on postnatal wards optimize mother–infant well-being and facilitate breastfeeding initiation (e.g., Bartick and Smith 2014; Crenshaw 2014; Drever-Smith, Bogossian, and New 2013; Fetherston and Leach 2012; Laurent 2011). This work has been widely cited in practice and policy recommendations that aim to support the intertwined behavior and biology of mothers and babies in the early postpartum and remove barriers to the initiation of breastfeeding

(e.g., Edwards et al. 2014; Feldman-Winter and Goldsmith 2016; Holmes, McLeod, and Bunik 2013; World Health Organization 2017).

Anthropological research has also brought new perspectives to the discussion of infant sleep-related risks (Ball and Volpe 2013; Volpe and Ball 2015). In critiquing the hazardous sleep narrative, this work provides evidence contradicting the assumption that any sleep environment is inherently safe or inherently risky and suggests ways an evolutionary perspective might be applied to modifying public health policy related to infant sleep. Because mothers arrive at parenting from very different life trajectories, and because each of these trajectories causes them to experience and manage parenting costs in different ways, it is unrealistic to expect that they should all structure their infants' sleep ecology in a uniform way according to safe sleep guidelines. The results of Volpe's study support the idea that one-size-fits-all approaches to infant sleep safety are inappropriate and that public health recommendations should be sufficiently elastic to allow for the range of contexts and trajectories within which infant care occurs. Volpe's "risk trade-off" approach to understanding nighttime infant care is enhanced by Tomori's (2014) discussion of the social construction of risk as moral danger (see below).

Expanding upon McKenna's (1986) original neurophysiological model for SIDS, McKenna, Middlemiss, and Tarshay (2016) developed a translatable model for the role that human speech breathing adaptations may play not only in infant susceptibility to SIDS while asleep but in inconsolable infant crying (also known as colic), when awake. Using diverse lines of evidence, this model proposes that during bouts of colic, hyperaroused infants are unable to cease either crying or the involuntary breathing that sustains it, with voice and breath being functionally bound together during a short developmental period of respiratory instability at two to three months of age. The proposal argues this occurs due to an infant's lack of inhibitory neurons in the basic mammalian cry circuitry of the prefrontal cortex during this phase of development. This model can be tested safely in infants with magnetic resonance imaging, offering a new perspective on the medical conundrum of infantile colic that has been clinically described, but not explained, for sixty-five years (Wessel et al. 1954).

Finally, qualitative and quantitative exploration of ethnic differences in nighttime infant-care practices by anthropologists have increased awareness of the ways in which infant-care messages are received and perceived by minority populations and how culturally determined infant-care practices are prioritized by immigrant mothers seeking to raise their infants according to the traditions of their culture of origin rather than that of the dominant culture in their new home (Ball et al. 2012a, 2012b; Crane and Ball 2016; Cronin de Chavez, Ball, and Ward-Platt 2016). Developing a multisubfield approach to the complex interweaving of biological and sociocultural aspects of infant sleep has produced applied insights to address clinical and public health

issues such as mother–infant experiences of sleep on postnatal units (Taylor, Tully, and Ball 2015), factors that prevent parents from implementing infant sleep recommendations (Volpe, Ball, and McKenna 2013), and responses of immigrant communities to safe sleep guidance (Crane and Ball 2016). Building on this rich body of evidence, anthropological understandings of infant sleep are now challenging mainstream sleep medicine around the conceptualization of "infant sleep problems" (Ball 2013, 2017a; Ball, Douglas, et al. 2018; Rudzik and Ball 2016).

## **Sociocultural Anthropology of Infant Sleep**

### **a. De-Centering Western Models of Nighttime Infant Care**

Questions about human infant sleep patterns across cultural settings and what constitutes a "sleep problem" are central in the emerging sociocultural anthropological literature on infant sleep. To date, however, this literature has been fragmented and hampered by the simultaneous historical marginalization of the study of women and children (Gottlieb 2000), as well as limited interest in breastfeeding and sleep (Tomori 2014). Whereas early generations of anthropologists, led by Margaret Mead, have provided detailed comparative observations about infants and infant care, sociocultural anthropological work on the topic peaked during the 1950s and 1960s with the undertaking of the Six Culture Studies led by the Whitings (LeVine 2007, 2010),<sup>3</sup> with the last large-scale comparative analysis of infant-care practices undertaken by Barry and Paxson (1971). Although infant care, including sleep, remained of interest to biological anthropologists and to some sociocultural anthropologists, work on infant care in later decades increasingly shifted to interdisciplinary researchers, especially among psychologists and psychological anthropologists (LeVine 2007).<sup>4</sup> Significant theoretical challenges to the foundations of anthropology led to the decline of large-scale comparative ethnographic research, a widening gap between biological and sociocultural anthropology, and declining interest in this area in sociocultural anthropology. While feminist anthropology reignited interest in the anthropology of reproduction (c.f. Ginsburg and Rapp 1991, 1995), this burgeoning literature focused primarily on women, with far less consideration of infants as part of reproduction. Nearly twenty years ago, Gottlieb (2000) lamented the absence of infants in anthropology, asking "Where have all the babies gone?" Gottlieb attributed this absence to lack of parenting experience among anthropologists, a difficulty in conceptualizing infant agency, communication and rationality, the marginalization of women and children, and the challenges of working with infant bodies that do not conform to adult norms. Despite Gottlieb's calls for further work on infancy, and continued growth in the anthropology of reproduction (cf. Browner and Sargent 2011) and childhood (Lancy [2008] 2014; Montgomery 2008) in the last two decades, few monographs focus especially on infants, and infant sleep is rarely the subject of sustained attention.



Although now fifteen years old, Gottlieb's (2004) outstanding ethnography of the Beng from Côte d'Ivoire remains an exception in its careful attention to social interaction and infant agency, its reflexive approach, and its in-depth discussion of infant sleep. Gottlieb found that, in contrast to her expectations based on American parenting discourses, Beng mothers were not particularly concerned about infant sleep. They (and other helpers) carried babies around on their backs during the day in a *pagne*—a cloth wrapped around their bodies—and mothers laid down with them at night, breastfeeding them as their infants desired. Importantly, they did not track how often their infants breastfed and could not recall when asked because they were not entirely awake during feedings. Mothers did report some night wakings, during which babies were always offered the breast, and some babies clearly woke up more than others. While mothers considered these events bothersome at times, they also considered them perfectly normal and not exceptionally burdensome. Beng mothers responded to their babies without hesitation and in a matter-of-fact manner. Paying attention to infant needs constitutes a central element of the Beng belief system in which infants are perceived as highly agentic due to their arrival from the afterlife, or *wrugbe*. Gottlieb's ethnographic work and her comparative discussion of middle-class US practices provide a classic sociocultural critique that helps to de-center Western models of infant care and personhood.

Infant sleep continues to receive limited attention even in recent sociocultural anthropological edited volumes on sleep (cf. Brunt and Steger 2008; Glaskin and Chenhall 2013). Nevertheless, the sharp contrasts observed by Gottlieb and prior ethnographic researchers between Euro-American traditions of nighttime infant care that attempt to regiment infant sleep and limit nighttime feedings, compared with other ethnographic settings where mothers and infants sleep in close proximity to one another and breastfeed throughout the night, remains a central theme in these works. Notably, it is primarily biocultural anthropologists who have continued to accumulate detailed evidence that proximate sleep arrangements with breastfeeding constitute culturally normative practices for infants and children (cf. Crittenden et al. 2018; Hewlett and Lamb 2013; Hewlett and Roulette 2014).

### **b. Sleep at the Intersections of Capitalism, Biomedicine, and Colonialism**

Recent sociocultural studies have provided key insight into the origins, rise, and increasing global dominance of Western biomedical conceptualizations of sleep for all ages. Wolf-Meyer's pioneering monograph *The Slumbering Masses* (2012) explored how sociohistorical transformations that led to industrialization and the dominance of capitalist economic system ultimately drove the growing biomedicalization of sleep. Wolf-Meyer argues that these biomedical approaches problematize and pathologize normal variation in sleep and foster highly profitable industries in pharmaceutical

treatment of sleep disorders. In the context of this larger project, Wolf-Meyer also devotes a chapter to American practices of children's sleep and highlights the importance of solitary infant sleep as a cultural value in the United States that is reinforced through children's literature as well as medical recommendations. Wolf-Meyer's insights unite the study of capitalism and sleep medicine and highlight how thoroughly infant sleep science is influenced by Euro-American cultural assumptions that are presumed to be universally applicable—arguments that echo those made by McKenna regarding SIDS epidemiology.

The presumed universality and “correctness” as well as the globalizing power of Euro-American sleep ideologies is pursued further in other sociocultural works on sleep. In Brunt and Steger's (2008) edited volume on sleep, Ben-Ari's (2008) chapter draws on his ethnographic research in Japan and secondary analysis of ethnography from Western settings to de-center Western middle-class approaches to “bedtime” and the Western cultural imperative to get infants to sleep through the night using a variety of “sleep training” methods. Ben-Ari demonstrates that the entire concept and perceived necessity of bedtime rituals are cultural constructions that only preoccupy a specific and highly privileged minority of the world's population.

Couched in moral and medical terms, these cultural ideologies were first propelled to novel settings by colonial efforts to transform domestic practices of indigenous populations. Today, Indigenous groups continue to negotiate the legacies of colonial power relations as they come up against these cultural ideologies once again, this time as they have been codified within authoritative biomedical recommendations. Alexeyeff (2013), writing in Glaskin and Chenhall's edited volume *Sleep around the World* (2013), provides a brief example of this conflict in New Zealand. Despite colonial attempts to transform domestic spaces and sleep habits, Cook Islanders continued to practice social sleep practices, with families sleeping in the same room and mothers sleeping next to their breastfeeding infants. Cook Islanders made no attempts to schedule infant sleep, and the concepts of “private space” and of uninterrupted sleep for long blocks of time were unknown. When Cook Islanders migrated to New Zealand, however, they were confronted with SIDS-reduction messages that strongly argued against sleeping next to infants. Alexeyeff found that Cook Islanders were not familiar with SIDS and dismissed this advice. Instead, they believed that the proximity between the mother and child was protective. As one woman explained, “So, I think the main reason we don't have SIDS is that we've tended to sleep the children ‘in’ us so there's skin to skin contact and you're at hand when there's a problem.” Alexeyeff notes that this sense of safety is constructed through intercorporeality—through the children sleeping “in” the mother's body—a conceptualization that is fundamentally at odds with the biomedical model that focuses on separation of bodies to ensure “safety.” Together, the above works demonstrate the importance of situating Western medical

treatment of infant sleep in its broader comparative, socio-historical context: as fundamentally entangled in ideologies and power dynamics of capitalism and colonialism.

### c. Embodied Experience and Intercorporeality

A focus on cultural variation in the embodied aspects of infant sleep and the interembodied experience of shared sleep is another significant strand in the sociocultural literature, including the work of the scholars above. Diana Tahhan's (2013, 2014) phenomenological approach to exploring the intercorporeal dimensions of shared sleep in Japan provides a particularly nuanced and significant contribution to this literature. In Tahhan's study, both men and women believed that co-sleeping (*soine*) was a central part of caring for children. Parents co-slept for multiple reasons: to provide physical safety (e.g., to keep children safe in case of earthquakes), to facilitate caregiving, including breastfeeding, and to ensure their children's well-being. Tahhan's participants discuss how co-sleeping produces a feeling of *anshinkan*—a sense of safety, security, and reassurance—for both parents and children. The sense of safety and reassurance achieved via shared sleep echoes Cook Islanders' descriptions (Alexeyeff 2013) as well as other ethnographic evidence (cf. Gottlieb 2004; Morelli et al. 1992). The traditional co-sleeping arrangement is called *kawa no ji*, or "sleeping like the Chinese character for river" (Tahhan 2014, 110), after the visual resemblance of the arrangement of sleeping bodies to the three lines that comprise this character (*kawa*). In this arrangement, children sleep in the center, usually in close tactile contact with at least one parent, surrounded by the safety and protection of both. While such shared sleep is considered to be a highly desirable and positive experience for all involved, Tahhan also documents the constraints of gendered expectations for mothers and marital tensions around nighttime sleep practices that prioritize mother-child connection and unity over, and sometimes to the exclusion of, connectedness with fathers.<sup>5</sup>

### d. Embodied Moral Dilemmas in a Capitalist Biomedical System

Tomori's monograph (2014) unites several strands of sociocultural anthropological literature on infant sleep and locates breastfeeding and infant sleep at the center of constructing persons, kinship, and reproduction. She takes a historical and comparative ethnographic approach to situate the moral dilemmas contemporary US parents face when the intercorporeal practices of nighttime infant care clash with capitalist biomedical regimes. Her ethnographic findings, drawn from more than two years of participant observation, demonstrate that Western biomedical recommendations for solitary sleep not only conflict with non-Western cultural norms but they also present significant challenges for Western families whose cultural expectations align with these Western ideologies but who decide to breastfeed. Unlike Cook Islanders, the Beng, or Japanese families who value bodily proximity, prior to their babies' birth, the mostly

middle-class white families in Tomori's study believed that sleeping on a separate surface was safer, desirable, and beneficial for their infants. Most invested a great deal of effort during pregnancy to create a separate, special space for their infants where they would eventually sleep on their own (the nursery).<sup>6</sup> Moreover, most believed that it was important to get babies to sleep separately for increasing periods of time, ultimately "sleeping through the night," not only to gain more sleep for themselves but to facilitate "independence" for their children.

Through their embodied experiences with their infants, however, US parents in Tomori's ethnography learned that infants do not simply fall asleep and stay asleep in their bassinets. Instead, infants fell asleep at the breast and woke up as soon as they were put down, only to be soothed and fall asleep at the breast once more. This posed significant pragmatic and moral concerns: if parents responded to their infants' cues as they were directed in breastfeeding classes, they could not put their infants down in their own space. But if they brought their babies into bed with them to breastfeed and sleep, they went against sleep guidelines and were told that they would endanger their babies' lives. Most families ultimately brought their babies into bed with them to facilitate breastfeeding, at least for periods of time, and hid this practice, especially from medical providers, precisely repeating the practices of families in the northeast of England documented a decade previously (Ball 2002, 2003; Ball, Hooker, and Kelly 1999; Hooker, Ball, and Kelly 2001). Some families continued to practice breastfeeding in the context of bed-sharing over the course of the first year postpartum and found that their sleep synchronized, and mothers no longer woke up fully to breastfeed. These families also challenged American ideologies about parent-child relations and infant personhood—that "training" infants to fall asleep and stay sleep in their own rooms "through the night" would yield "independence" and self-sufficiency.

Throughout the negotiation of these sleep arrangements, however, even relatively well-resourced white middle-class families faced considerable barriers to breastfeeding and stigmatization of their nighttime care practices (Tomori 2014; Tomori, Palmquist, and Dowling 2016). Families faced enormous pressure from authoritative biomedical experts who emphasized separate sleep with minimal and eventually no nighttime breastfeeding for safety and for optimal development as well as from family, friends, and others. In a sense, then, this ethnography highlights cracks in the dominant Western ideologies driven by the return of breastfeeding in the United States.<sup>7</sup> Importantly, the ethnography documents the profound inequities in families' ability to participate in these intercorporeal practices and to challenge dominant models of infant care. Tomori draws on the concept of stratified reproduction, coined by Shellee Colen and developed by Ginsburg and Rapp (1995, 3), as a central theme in the anthropology of reproduction, to highlight the lack of support for breastfeeding and moral judgment for shared sleep faced by families of color

driven by pervasive racism. These findings comprise a part of the global power dynamics of biomedical models of infant sleep, wherein research reflecting dominant Western cultural ideologies of separation without significant integration of breastfeeding dictates guidelines and expectations for infant sleep for all groups.

### e. Bridging the Subfields: Breastsleeping as a Biocultural Body Technique

The above research offers multiple avenues for building bridges across sociocultural and biological anthropology. Tomori (2014) has previously argued that Mauss's ([1935] 1973) classic essay "Techniques of the Body" offers a productive line of inquiry for breastfeeding, as Mauss recognized that body "habits" or *habitus* that may appear solely biological not only vary across individuals but "they vary especially between societies, educations, proprieties and fashions, prestiges." Talal Asad (1997) encouraged anthropologists to revisit Mauss's construct as an "anthropology of practical reason" to better understand embodied experience. Recently, Tomori (2018a) has drawn together Mauss's concept of *habitus* with McKenna and Gettler's novel construct of "breastsleeping" (2016) in order to develop a biocultural framework for studying mother–infant sleep. In her comparative analysis, Tomori has found clear ethnographic descriptions of the interembodied body technique of breastsleeping in numerous non-Western cultures where infants practice continuous bodily proximity during the day and night times. In these settings, such as among the Beng described above (Gottlieb 2004), breastfeeding is simply a part of mother–infant sleep, and synchronized patterns of mother–infant sleep emerge in which breastfeeding is not considered to be a disruption because mothers are not fully awake for feedings. These patterns are consistent with McKenna and Gettler's (2016) discussion of breastsleeping as an evolutionary adaptation. Tomori argues that this interembodied *habitus* is culturally contingent—in WEIRD settings where solitary infant sleep and artificial feeding was the cultural norm during the twentieth century, breastsleeping virtually disappeared for decades. Tomori's own ethnographic findings in the United States as well as work by Ball and colleagues in the United Kingdom, however, demonstrate that, driven by the return of breastfeeding, this *habitus* has been rediscovered despite cultural prohibitions and much to parents' own surprise. Breastsleeping in such settings may be practiced in secret because bed-sharing and breastfeeding throughout the night remain stigmatized (Tomori, Palmquist, and Dowling 2016). Tomori's (sb) current research explores the historical origins, rising dominance, and consequences of the fragmentation of breastfeeding and sleep, as well as possibilities for reintegration. Situating breastsleeping in its historical and cultural context, and associated power dynamics, offers a productive avenue for multisited, comparative intersubfield collaborative work.

Together, sociocultural anthropology work on infant sleep provides further support for biological anthropological

insights about the interembodied dynamics of parent–infant sleep, their cultural contingency as well as different theoretical approaches to their experience. Importantly, this work helps to situate the rise and globalizing spread of Western biomedicalized concepts of infant sleep that dominate contemporary medical guidance in WEIRD settings.

### TRANSFORMING THE PARADIGM: AN INTEGRATED ANTHROPOLOGICAL APPROACH TO INFANT SLEEP

Anthropological infant sleep research has made significant strides in the study of SIDS, co-sleeping, and breastfeeding, and has increasingly expanded to examining the biology of parent–infant sleep. To date, most of this work has been carried out in Western settings by biological anthropologists, framed by a foundational evolutionary paradigm for infant sleep, which has remained intact and has been further elaborated.

Dialogue between anthropology and infant sleep research has been developing, with some significant uptake of anthropological concepts in some health-care settings. The work of anthropologists in shaping policy at the intersection of SIDS and infant sleep location is increasingly being recognized in policy discussions in the United States (e.g., Altfeld et al. 2017; Gordon, Rowe, and Garcia 2015; Mileva-Seitz et al. 2017) and practice recommendations in the United Kingdom (e.g., UNICEF UK 2018), and is firmly embedded in policy and practice recommendations addressing breastfeeding initiation and nighttime infant feeding (e.g., Ball and Blair 2017; Feldman-Winter and Goldsmith 2016; Holmes, McLeod, and Bunik 2013; Rapley 2002). There is a growing recognition in both settings that, compared with formula feeding, breastfeeding is associated with considerably lower risk of SIDS and that mother–baby bed-sharing facilitates breastfeeding.<sup>8</sup> However, considerable debate remains over whether bed-sharing is intrinsically hazardous. In the United Kingdom, guidelines have established that it is the context in which bed-sharing is performed, and the behavior of parents, that can make it hazardous (Ball 2017b). In contrast, the most recent US guidelines (Moon and Task Force on Sudden Infant Death Syndrome 2016) still consider bed-sharing to be associated with greater risk, even in the context of breastfeeding.<sup>9</sup> Nevertheless, the guidelines emphasize breastfeeding and room sharing, recognize that breastfeeding parents often fall asleep with their infants in bed, and encourage healthcare providers to have more open conversations around sleep practices and ways to reduce risk, which represent a significant shift in approach from prior guidance.

Building upon these advances, anthropology could further revolutionize the field of infant sleep. With its focus on biological and cultural variation and its multisubfield approach, anthropology is uniquely placed to advance understanding into the landscape of human infant sleep across diverse cultural settings and the varied sleep issues affecting parents and babies in contemporary societies (Ball 2017a).

From its beginnings, anthropologists researching infant sleep have challenged the cultural assumptions underlying Western biomedical paradigms for infant sleep science. Recent sociocultural anthropological research has built on these biocultural critiques. This work has explored how dominant biomedical guidance arises from and reproduces Western cultural ideologies that aim to regulate moral and embodied dimensions of infant personhood and parent–child relations via physical separation and regimentation of infant bodies. These ideologies are profoundly intertwined with the rise of capitalism, colonialism, and biomedicalization, wherein all aspects of life are increasingly brought under scrutiny and become objects of surveillance and pathologization (Lock and Nguyen 2010; Wolf-Meyer 2012; Tomori 2014, 2018b). Consequently, medical guidance on infant sleep both reflects power relations and becomes an instrument of power; in its assumption that separation is the default safe state for infants, it can powerfully shape and limit parent–child proximity.

We argue that an integrated anthropological approach to infant sleep, encompassing evolutionary, historical, ethnographic, and biosocial perspectives, provides the foundation for a Kuhnian paradigm shift in infant sleep science. We suggest that contemporary approaches to infant sleep must be reoriented with critical awareness of Western cultural ideologies embedded in biomedical approaches to infant sleep in order to better reflect the full breadth of human infant evolutionary adaptations and biocultural infant-care practices. The mismatch between Western cultural family sleep expectations and the biological constraints of human babies exacerbates inequalities in infant development, undermines parental resilience, and compromises family well-being (Ball 2013, 2018). Addressing this mismatch is a matter of urgency not only for Western parents and babies but for ensuring that Western assumptions embedded in globalizing biomedical research and guidelines do not further undermine interembodied infant-care practices in non-Western settings.

The development of an integrated anthropology of infant sleep has the potential to be culturally and scientifically transformational (Ball 2013, 2018). Greater dialogue and collaboration between sociocultural and biocultural approaches to infant sleep in both Western and non-Western settings is needed to achieve these aims. Additional research from archaeological anthropology (e.g., addressing the spatial organization of home sleep space and its associated material culture) and linguistic anthropology (e.g., on ideologies of infant personhood) could further illuminate the full history and complexity of human infant sleep. By exposing and evaluating historical and ethnocentric assumptions around sleep that have exerted heavy influence on clinical and parental practice, epidemiological and intervention studies, and public-health guidance, anthropology is beginning to offer a social scientific counterpoint to currently mainstream medical and psychological views on parent–infant sleep. Integrated approaches to infant sleep not only present new opportunities for innovative cross-subfield research, but

could help guide more effective and equitable approaches to maternal–infant health around the globe.

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## NOTES

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1. We understand “Western” as an ideological construct, not a geographic one.
2. Haig supports his position by noting that babies with Prader-Willi syndrome (PWS, a condition dominated by the expression of paternal genes) are particularly sleepy with a weak cry and feeble suck while babies with Angelmann syndrome (AS, a condition dominated by the expression of maternal genes) wake frequently at night. This, he claims, is evidence that paternal influence on infants promotes night waking while maternal influence promotes prolonged sleeping. Clinically, however, the babies with Prader-Willi syndrome suffer with sleep apnea—a condition in which babies experience frequent oxygen desaturations, associated with frequent night waking, leaving them experiencing excessive daytime sleepiness. Some individuals with PWS also have narcolepsy. AS babies have disrupted sleep architecture and frequent nocturnal awakenings. The sleep patterns associated with these syndromes therefore relate to the proximate clinical problems these babies face.
3. See also ethnographic works reviewed in McKenna, Ball, and Volpe (2007) and Tomori (2014) for specific discussions of infant sleep.
4. Cf. Morelli et al. (1992), Schweder et al. (1995), and Wolf et al. (1996).
5. The embodied experience of night-time infant care is also the subject of Melody Howse’s (2017) collaborative work among ten mothers of multiple nationalities mostly from Western settings living in Berlin, Germany, and in Los Angeles, USA, in which she employed novel collaborative, autoethnographic, and visual anthropological methods to produce an experience-oriented website: [www.upallnightphenomenon.com](http://www.upallnightphenomenon.com). In contrast to Japanese, Beng, and many other non-Western ethnographic perceptions of shared sleep, here intercorporeality is far more fraught, night-time infant behavior is considered a main source of disruption, and negotiating it presents a significant challenge. This work

highlights the cultural construction and resultant wide range of embodied experiences. Moreover, it opens up new possibilities for the incorporation of novel methods and research outputs beyond conventional academic written form that is accessible to a wider range of audiences.

6. The disruption of cultural norms of nighttime home space is further explored in Tomori and Boyer (2019).
7. There has always been considerable variation in infant sleep practices in the United States, but solitary sleep has been considered the dominant cultural expectation, especially among middle-class Americans, while alternatives to this have been considered suspect and subject to surveillance and intervention (Tomori 2014).
8. Notably, breastfeeding is still positioned as a risk-reduction agent, or “benefit,” demonstrating the cultural default of formula feeding against which breastfeeding is measured.
9. The recommendation against bed-sharing in all circumstances is made even though the detailed report for the guidelines acknowledges conflicting and limited evidence on this issue (Task Force on Sudden Infant Death Syndrome 2016). A more comprehensive recent review emphasizes contextual rather than inherent risk (Baddock et al. 2019).

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