



The contribution of sleep to 'Closing the Gap' in the health of Indigenous children: a methodological approach

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Abstract

Objective: Research on Indigenous children's sleep quality is likely to play a significant part in 'Closing the Gap' between Indigenous and non-Indigenous children's health, academic performance and social outcomes. However, examination of the sleep of Australian Indigenous children presents some unique challenges, particularly in terms of community input, study design and in the collection of relevant data.

Methods: The current literature on Indigenous sleep research is reviewed and includes factors such as mental and physical health, socioeconomic disadvantage, and their relationships to sleep. Challenges encountered in researching Indigenous sleep and strategies for best practice are explored.

Conclusions: Many challenges exist in researching sleep in Indigenous children, but the imperative of undertaking this task is clear. An assessment of the sleep of Australian Indigenous children requires a thorough evaluation of factors that contribute to sleep health such as co-morbid disease, regional factors and social disadvantage. Methodological issues include appropriate assessment tools, affordable and objective sleep quality measures, accounting for differing cultural beliefs and practices and timekeeping associated with bedtimes and get-up times.

Keywords: Indigenous, Children, Sleep, Health, Behaviour.

Introduction

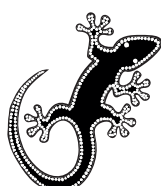
Factors that impact on the sleep profile of Indigenous children

Australian Indigenous children are reported to have higher incidences of diabetes [1-3], obesity [4-6], asthma [7, 8] and sleep disordered breathing [9], when compared with Australian non-Indigenous children. These complex and serious health conditions, include some form of secondary sleep disturbance [10-17] with associated deficits in academic performance [18, 19], attention [20, 21], executive function, memory, emotional regulation [20, 22], mood, behaviour such as hyperactivity, aggression and increased suicide risk [18, 21]. Physiological impacts include reduced cardiac and metabolic function and an increased risk of diabetes and obesity [5, 23]. To date, the few studies on the sleep of Indigenous children suggest that they experience poorer quality sleep when

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compared to Australian non-Indigenous children [24-26], and report similar deficits in academic performance [27, 28], emotional regulation [29] and behaviour [29]. We believe that sleep health, which is largely modifiable, can be an important contributory factor towards 'Closing the Gap' in Indigenous disadvantage [17], however research in the sleep health of Indigenous children presents some unique and complex challenges.

In 2011, only 2.6% of the total Australian population were estimated to be Indigenous [30, 31]. Further, many demographic differences exist between the Indigenous and non-Indigenous Australian populations. The Indigenous population is relatively much younger overall with about one third of Indigenous Australians being under 15 years of age, compared to one fifth of the non-Indigenous population [32]. With non-Indigenous paediatric sleep disorders ranging in prevalence from 2-40 %, depending on its aetiology [33], the larger ratio of Indigenous children would suggest that associated sleep problems could be a significantly greater problem for the Indigenous community.

The Indigenous population is also more dispersed across the Australian continent than the non-Indigenous population with 32% living in major cities, 43% living in regional areas and 25% residing in remote communities [34]. The dispersion of Indigenous children living in more regional and remote, often isolated, communities may further contribute to their sleep profile [35]. For example, transport to school remains a barrier to many families, particularly where public transport is virtually non-existent or unreliable; therefore many Indigenous pre-schools and schools provide a bus service funded by the Australian Government which requires set timetabling in the morning [89]. Transport requirements to get to school may require earlier and consistent getup times to attend schools which usually function at standard office hours. Inconsistent Wake times which have been discussed in detail elsewhere [17], as noted in the study by Blunden and Camfferman (2012), could plausibly impact upon transport requirements for school attendance, timely school arrival and subsequent academic performance.

The socio-economic profile of Indigenous children may also provide a different distribution of sleep problems than those found in the non-Indigenous population in Australia. It is well known that lower socio-economic status results in both poorer general health and sleep health [36]. In non-Indigenous populations, socio-economic factors have been found to be related to sleep quality [37], sleep and academic performance [38], and obesity [39, 40]. Indigenous disadvantage has several flow-on effects that would plausibly impact their sleep and performance in a similar fashion. One well-documented disadvantage that would impact sleep is overcrowded housing. Crowded conditions have been associated with lower socio-economic status, poorer self-reported mental health, reduced physical health, and poor sleep [41]d. Overcrowded housing has been reported in 4% of non-remote

Indigenous households compared to almost 20% of households in remote areas. In some remote communities, the number of people per house has been reported to be as high as 33.

In fact, geographical location contributes significantly to the health disadvantages of Indigenous Australian children in other domains. Environmental factors, such as the abundance of pollen and dust also affect allergy type reactions such as eczema [42-44], asthma [15, 45], nasal rhinitis [46-48] that impact both health and sleep quality [41, 49]. Rural and remote centres are less well serviced with health care delivery to address these issues.

Cultural beliefs are also likely to impact the sleep profile of Indigenous children. The Indigenous population is divided among over 380 different tribal groupings with wide variations in cultural practices spread across 18 regions in Australia. Individual languages and belief structures ascribe differing cultural values and beliefs on the nature of sleep and sleep behaviour. For example, traditional Indigenous concepts of time differ from the Judeo-Christian linear view of where the past is behind us, the future is in front of us and the present is where we are now. For traditional Indigenous people, time is multidimensional and can be described 'as a pond you can swim through, up, down, around', and time cannot be separated from living, nor can it be viewed as purely functional groups of seconds, minutes and hours [99]. This is not to say that traditional Indigenous Australians have no understanding of the linear concept of time as mainstream non-Indigenous society applies it, but resist seeing time as a 'dictator' of life. Hence an Indigenous maxim illustrates this contextualised notion of time in that, 'it is not important when things happen, it is important that they happen' [50]. Indeed, if this is the case, this may explain why more Indigenous children have inconsistent bed and wake times compared with non-Indigenous children as noted in Blunden and Camfferman (2012). It may also explain the anecdotal information relayed in communications with Mr P. Cooper, (Cooper et. al. 2012) during his work with Indigenous communities that Indigenous parenting styles and cultural practices have fewer parental restrictions over bed and wake times compared to non-Indigenous cultures. In addition, Cooper et al. (2012) noted that a significant number of Indigenous families participating in that particular study, did not commonly have clocks and did not use clock time to regulate bedtimes (communication with author P. Cooper, March 2012) [24].

Further, cultural beliefs about the Dreamtime may also have an impact on the sleep behaviour of Indigenous children. The Dreamtime represents the legendary past of the Aborigines, known in anthropology as foundation myths. The Dreamtime of the past was the era in which spirit ancestors travelled throughout the Earth, changing its topographies and providing societal rules for 'the people that were always there', to follow [51]. Traditional Indigenous Australians believe that they can enter the Dreamtime by 'Dreaming', not to be confused or limited to REM sleep related

dreaming. 'Dreaming' is a specific activity that may occur during sleep or REM related dreams during sleep, or through the taking of medications, or through visions and rituals. The individual who enters the Dreamtime feels no separation between themselves and their ancestors and the limitations of time and space are overcome. It is a common belief that a person leaves their body during sleep and temporarily enters the Dreamtime, and further, can access the strengths and resources of the timeless, into what is needed in the life of the present [52].

Subsequently, it may be considered inappropriate for some Indigenous parents to control or disrupt the sleep of their children on a clock-based timeframe which may, in their view, disrupt Dreamtime experiences. To some degree, this may inhibit parents from waking their child in the morning in a timely fashion to attend school, promoting longer sleep and contributing to the variation in get-up times for school days described in previous work [26]. Whilst this approach may provide adequate Total Sleep Times, it would also reflect poorly on measures of academic performance. Regardless of differing viewpoints, cultural beliefs indicate that the usual benchmarks in the study of sleep quantity and sleep quality may need to be applied with some caution in this group.

Summary of factors that may impact on the sleep of Indigenous children

- Demographic and socio-economic factors may affect the prevalence and the types of sleep problems in different communities through travelling time to school, obesity, allergy, diabetes, poverty etc. Sub groups of children with sleep deficits need to be identified.
- Regional, demographic and environmental factors contribute to snoring, asthma, rhinitis, eczema, and other co-morbid health problems which likely contribute to sleep problems in Australian Indigenous children. Regional differences need to be identified.
- Cultural factors including parenting styles, concepts of time, the nature of sleep, and spiritual beliefs related to sleep, may contribute to sleep problems in this group. Cultural factors will need to be identified.

The effects of poor sleep on Indigenous health and development

The known detrimental effects of poor sleep on neuropsychological, physiological and psychosocial health development of children, cited above, could be partly modified if sleep is taken into account. A specific example of how improved sleep can have significant and real life advantages for these children is school performance. Indigenous children are significantly lagging behind their non-Indigenous peers in this domain [53], and sleep may well be a contributor. Non-Indigenous children far out-perform Indigenous children in benchmark tests for reading, writing and numeracy in Year 3, Year 5 and Year 7 [28]. Indigenous children living in isolated

areas have even lower literacy rates. In the Northern Territory, only one in five children living in very remote Indigenous communities can read at the accepted minimum standard. By Year 7, just 15% achieved this benchmark, 47 percentage points behind their urban Indigenous peers and 74 percent less than non-Indigenous students [28]. The rate of school absenteeism is another factor that differentiates Indigenous and non-Indigenous students and one of the areas recently identified that contributed to school absenteeism is sleep. Absenteeism from school clearly affects student's academic performance [28]. Indigenous children miss an average of about 26 days of school per year compared to 8 days for all Australian children. Indigenous children living in remote and very remote locations are further likely to miss an even greater number of school days [28]. *The Western Australian Aboriginal child health survey* report that Indigenous students who had trouble getting to sleep were over one and a half times more likely to be absent for at least 26 days [27]. Recent data analysed from *The Footprints in time, longitudinal study of Indigenous children study* [54] reported a strong and significant ($p < .05$) relationship between school absenteeism and sleep problems [55]. Furthermore, recent data by Blunden & Camfferman [28] show that Indigenous children's school week bedtimes (and subsequent wake times) vary so significantly (up to 3 hours variability from night to night) that this could indeed be a contributor for non-attendance at school [56]. Current approaches to facilitating school attendance rates have not included sleep. Efforts to 'Close the Gap' in these children's academic performance could be significantly improved if their sleep patterns were taken into account.

Research approaches with Indigenous groups

When non-Indigenous groups undertake research in Indigenous groups, they are likely to bring assumptions, prejudices and differing value structures and cultural expectations into the assessment. Such is the nature of the sensitivities in this area of research when dealing with Indigenous groups. For example, if sleep researchers observe sleep practices that are contrary to non-Indigenous sleep patterns and current sleep guidelines, they run the risk of ascribing poor sleep hygiene behaviours as dysfunctional rather than supporting Indigenous cultural norms. Pyett et al. (2008), for example, state that there is a need to challenge the deficit model in health promotion and research which may inflict further 'damage' onto the community through reinforcing stereotypes, creating fear or contributing to further bad press. They argue for adopting a methodology that requires sensitivity to Indigenous cultural differences, shifting power and enabling Indigenous communities to frame research to their specifications, and taking a holistic approach while focussing on community strength and resilience [57]. It is important to understand that the belief systems and practices about sleep in Indigenous communities

may not necessarily be perceived as problematic, given they are not informed by the same culture. Future collaborative projects, for awareness building and understanding sleep from both Indigenous and non-Indigenous viewpoints need to be undertaken with the assistance of culturally informed parties in the collection and interpretation of sleep data.

Indeed, research proposals directed at Indigenous health research have been criticised for these reasons. Street, Baum and Anderson (2009) interviewed 18 individuals from the Cooperative Research Centre for Aboriginal Health to better understand this issue. The participants were chosen to provide a representative cross-section of researchers (potential and past grant applicants), staff, Board members, health service partners, academic partners, reviewers, and members of the research development group. The authors concluded from these interviews that traditional peer review was inappropriate for quality assessment in Indigenous research. Track record, measured in terms of numbers of publications in peer-reviewed journals, is usually of paramount importance in academic assessment of grant applications, but irrelevant in the Aboriginal community where the research may be carried out. The consensus was that a collaborative system, cultivating relationships with participants and building joint research projects between researchers and the community promote more relevant research outcomes [58]. Shifting power to the Indigenous community by enabling them to actively participate in the research process rather than being 'subjects under the microscope', would better focus the research on what the community believes is important and further maximise the advantages and rewards from being a part of research projects. In the field of sleep research, conversations about the importance of sleep and its impact on child development may be a necessary precursor for Indigenous communities before they would consider, firstly sleep as a problem, and secondly, as a problem that needs fixing. Effectively, this would suggest a need for increased numbers of Indigenous research staff available to foster these collaborations.

Methodological approaches and concerns

The measurement of sleep is either undertaken with subjective reporting (parental or self-report) or objective measurement (overnight polysomnographic sleep studies or wrist monitors such as actigraphy). Approaches to examining the sleep of Indigenous children have been predominately through parental report questionnaire or structured interview, although the pilot study by Blunden and Camfferman (2012) [26] was directed at the children themselves. Some benefits in employing a subjective parental/self-report research model include a relatively lower cost, the ability to obtain large samples and a higher response rate, for example Valery et al. (2004) reported a very high response rate of 98% [9], but has the disadvantage of self and response report bias [59]. Whilst

Indigenous workers can assist in questionnaire completion as employed in Blunden & Chervin, (2007), the diversity of languages among the Indigenous community provide additional problems in the acquisition and interpretation of questionnaire type data. For example, half of the Indigenous families living in very remote communities have English as a second or even third language as they are reported to predominantly speak an Indigenous language at home [60]. Considering these factors and the nature of sleep research, it is highly desirable that more objective data be obtained in this area of study. Objective, yet easily portable measures of sleep behaviour, such as actigraphy, may be the best approach compared to the difficulties associated with supporting a comprehensive polysomnographic sleep study. Even the use of actigraphy in a remote Indigenous population, as achieved by Cooper et al. (2012), was successfully implemented and measured, but nonetheless needed specific cultural consent and sensitivity. In short, the highest possible standard of methodological process and collection of objective data needs to be harmonious with cultural issues.

Summary of research and methodological difficulties in examining the sleep of Australian Indigenous children

- Sharing concerns and information about the impact of poor sleep practices with Indigenous communities needs to be the precursor to all research initiatives.
- Involving community members in designing the research so that the community is engaged, informed, and benefits from participating in the research.
- Culturally informed collection and analyses of data to assist in the interpretation of outcomes.
- Reviewing and incorporating various Indigenous sleep beliefs into the methodology of the research.
- Utilising objective sleep measures that can accommodate cultural concerns and the diversity of language among the Indigenous community.

Conclusion

Why is it important to examine the sleep behaviour of Indigenous children? Because sleep is a foundation stone of good mental and physical health, and more importantly, poor sleep is inherently modifiable. Therefore, any contribution sleep has to downstream factors (e.g. health, wellbeing, academic performance, behaviour) is also potentially modifiable. This is an unexplored area that has enormous potential for improving the health and development of Indigenous children. The difficulties faced by researchers in this area of study are many, varied and complex. Factors that need consideration include geographical location and remoteness, permission and acceptance by Indigenous communities to participate in research, and the need for collaborations from informed community leaders and current medical and educational staff already interacting with and working within the community. Methodological issues include the need for objective measures of sleep, the consideration of spiritual beliefs about sleep, and clock-time sleep. This approach should also include strategies for measuring and addressing potential sleep deficits which incorporates mediation and input from the Indigenous community. It is also highly desirable for future studies to obtain appropriate data from urban, rural and remote centres that are representative of regional differences in Australian Indigenous children. Indeed, analysis of *The Footprints in time* data, which includes some information on the sleep patterns in Indigenous children, is currently underway, and with data from 10 years across multiple Australian sites, is offering an initial opportunity to address this need. Finally, the primary aim for the future should be the formation of guidelines to produce a methodological, structured and comprehensive approach to examining the sleep quality of Indigenous children that incorporates informed members of the Indigenous community. For these reasons, research efforts into understanding Indigenous sleep are necessary, if we are serious about improving Indigenous wellbeing and Closing the Gap.

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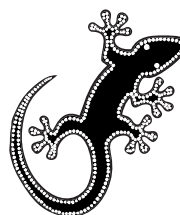
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