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Article:

Rowe, R. orcid.org/0000-0001-5556-3650 (2023) The potential of sleep research to contribute to our understanding on antisocial behaviour – a reflection on Brown, Beardslee, Frick, Steinberg & Cauffman (2022). *Journal of Child Psychology and Psychiatry*, 64 (2). pp. 329-331. ISSN 0021-9630

<https://doi.org/10.1111/jcpp.13712>

This is the peer reviewed version of the following article: Rowe, R. (2022), Commentary: The potential of sleep research to contribute to our understanding on antisocial behaviour – a reflection on Brown, Beardslee, Frick, Steinberg and Cauffman (2022). *J Child Psychol Psychiatr.*, which has been published in final form at <https://doi.org/10.1111/jcpp.13712>. This article may be used for non-commercial purposes in accordance with Wiley Terms and Conditions for Use of Self-Archived Versions. This article may not be enhanced, enriched or otherwise transformed into a derivative work, without express permission from Wiley or by statutory rights under applicable legislation. Copyright notices must not be removed, obscured or modified. The article must be linked to Wiley's version of record on Wiley Online Library and any embedding, framing or otherwise making available the article or pages thereof by third parties from platforms, services and websites other than Wiley Online Library must be prohibited.

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September 10, 2022

Commentary: The potential of sleep research to contribute to our understanding on antisocial behaviour – a reflection on Brown, Beardslee, Frick, Steinberg & Cauffman (2022)

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Word count: 1620

Running title: A reflection on Brown, Beardslee, Frick, Steinberg & Cauffman (2022)

Abstract

A growing body of work indicates that sleep problems are associated with antisocial behaviour in young people. This opens up the opportunity for interventions that improve sleep to reduce antisocial behaviour. Brown et al. (2022) provide important new leads that can help to target interventions, highlighting that the relationship may be most relevant to aggressive offending and that it is consistent across adolescence and young adulthood. The within-individual design adopted in this study has a number of methodological strengths. This commentary evaluates the effectiveness of the approach in terms of accounting for confounding effects and addressing temporal ordering. Directions for future research to build on the target paper are considered.

Antisocial behaviour in young people and the potential of sleep interventions

The impacts of antisocial behaviour, of which offending indexes a serious form, are felt keenly by the victims. The costs of law enforcement and other service provision are borne across society. There is also substantial evidence that young people exhibiting antisocial behaviour are at increased risk of a range of contemporaneous difficulties including many psychiatric disorders, impaired relationships with family and peers and disrupted educational achievement. Longitudinal studies confirm that the risks from antisocial behaviour in childhood and adolescence will persist well into adulthood, for example in terms of employment prospects, substance use and general health problems. Therefore, understanding the factors that underlie variations in antisocial behaviour is a key challenge for developmental psychopathology researchers. If we can identify the factors that underlie the onset or persistence of antisocial behaviour then these can be targeted by interventions to reduce offending to the benefit of all the stakeholders identified above.

In this context, research exploring the role of sleep in antisocial behaviour, to which Brown, Beardslee, Frick, Steinberg, and Cauffman (2022) make an important contribution, is particularly valuable. If sleep contributes to adolescent antisocial behaviour then this is exciting for those who want to improve wellbeing in this population. First, the benefits for adolescents are likely to be much more widespread than reducing antisocial behaviour, with the potential to improve cognitive functioning and physical health through a variety of mechanisms. Second, there are many different ways to improve sleep in adolescents including delaying school start times as well as targeted therapy. With regard to the latter, an established adult literature has demonstrated that Cognitive Behaviour Therapy (CBT) improves sleep and there is experimental evidence that CBT targeting sleep can alleviate mental health symptoms in university students (Freeman et al., 2017). A literature is also emerging that indicates CBT is effective in improving adolescent sleep (Blake, Sheeber, Youssef, Raniti, & Allen, 2017). Third, many sleep interventions are likely to be lower cost and more acceptable to adolescent participants and to the public in general than some other approaches to combatting antisocial behaviour. Therefore, researching the role of sleep in adolescent antisocial behaviour seems a very important endeavour.

Brown et al. (2022) contribute important new leads on how sleep quality relates to antisocial behaviour, including evidence that the link may be stronger for aggressive offending and that the relationship is similar across adolescence and young adulthood. These findings can help to target interventions to where they will be most effective. All the potential regarding intervention will come to nothing, however, if the assessment of the link between sleep and antisocial behaviour is not rigorous. Brown et al.'s work demonstrates a number of strong methodological features in this regard. This includes capitalising on an existing dataset that provides a large sample size followed for a long period with a strong retention rate. The focus on individuals that have been involved in the justice system is an interesting feature. Clearly this is a highly relevant population and many readers will also be interested in whether the findings generalise to the broader community.

Controlling confounded nuisances

Brown et al. adopt a within-person design that is becoming increasingly popular in developmental psychopathology. This approach has a number of strong features in eliminating potential alternative explanations for the association between sleep quality and offending that they find. As eloquently described in the target paper, the analysis allows the association between within-person fluctuations in sleep quality and offending to be assessed at each study timepoint. This has the crucial advantage of preventing the association between sleep quality and offending from being confounded by unmeasured factors that do not vary over time. Brown et al. find that the association is significant independent from these confounders. The association is consistent with the hypothesis that poor sleep quality leads to an increase in offending behaviour.

Despite the strengths of the design, in anything other than a randomised controlled trial (RCT) there are always likely to be competing causal explanations. One set of alternatives revolves around the possibility that sleep quality is not really the key factor; instead, it could be some other time-varying factor that is correlated with sleep quality. Brown et al. have anticipated possible confounders of anxiety, substance use and exposure to violence. Including these covariates in the analysis attenuate the relationship between sleep quality and offending as demonstrated by comparing the regression coefficients in Table 3 of the target paper with the

unadjusted coefficients presented in the Supplementary Table. The inclusion of these covariates is based on the rationale that they may have causal effects on both sleep quality and offending. If this assumption is false then their inclusion may result in an underestimate of the relationship between sleep quality and offending. For example, exposure to violence, such as being beaten up, may not be a cause of offending. Instead, exposure to violence may result from the participant's aggressiveness increasing their risk of violence exposure. Therefore, including covariates of this sort provides a conservative estimate of the strength of the relationship between sleep quality and offending.

It is also possible that the included covariates do not account for all potential time-varying confounders. The anxiety measure seems important; sleep quality is a subjective assessment and therefore people who are suffering with internalising problems may be more likely to perceive their sleep quality as worse than it actually is. A measure of depressed mood may be more useful here, as depression-distortion has been identified elsewhere as a source of reporter bias. However, given the well-documented correlation between anxiety and depression, the anxiety covariate goes a long way towards alleviating this concern; including anxiety as a covariate also accounts for any variance in depressed mood that is correlated with anxiety.

Other potential covariates that might have contributed to the observed relationship between sleep quality and offending include different aspects of sleep. One unmeasured aspect of sleep is diurnal preference. A preference for functioning in the evening rather than the morning, termed eveningness, has been shown to correlate with sleep quality and with conduct problems in adolescents (Barclay, Eley, Maughan, Rowe, & Gregory, 2011). Therefore, it is possible that diurnal preference contributes to the relationship between sleep quality and offending shown here. The design employed in the target paper mitigates this concern; eveningness seems likely to be a trait that varies between individuals and between-individual effects are controlled by the within-individual analytic strategy. It is only within-person variation in eveningness that could confound the relationship observed here.

Duration is another aspect of sleep that has been associated with antisocial behaviour that was not included here. Meaningful within-participant variation in sleep duration also seems likely and it would be interesting to see how this relates to offending. As reviewed in the target article, other research has found correlations between duration and quality to be small, in which case its omission

as a covariate would not affect the results. The strength of the correlation may depend on how sleep quality is assessed and the measure used here is not a standard one. Looking at the items used to measure sleep quality, it seems possible that there is some relationship with duration, but that is an empirical question.

It may be valuable for further research to address the role of depressed mood and other aspects of sleep in following up this study's findings on the links between sleep quality and offending. Overall, however, Brown et al. have done an excellent job of controlling confounders through the inclusion of key measured time-varying covariates and their within-person analyses that implicitly control between-person effects.

Testing temporal ordering

As noted by Brown et al., the longitudinal data supports the within-individual analysis, but the correlation between sleep quality and offending is assessed contemporaneously. This approach makes perfect sense given the time periods between assessments, but carries the usual difficulties with inferring direction of effect from cross-sectional relationships. It is plausible that low quality sleep leads to offending and Brown et al. cite evidence from other studies that support this pathway. Reverse causality is also plausible; increased offending might lead to lower quality sleep. For example, increased offending might bring a more antisocial lifestyle involving deviant peers and staying out late, which could affect sleep. Cognitions relevant to offending, perhaps involving worry about the repercussions, might also disturb sleep. Although there is nothing in the presented data to prefer one of these hypotheses over the other, the context that Brown et al. present certainly emphasises the feasibility of sleep quality effects on offending.

Directions for future research

Future research addressing this question is likely to include work that builds on Brown et al.'s within-individual approach. It may be that more frequent contacts will be useful in teasing out the temporal ordering of effects. This may allow associations between sleep measures and offending on the next day to be assessed. As I was writing this commentary, *Journal of Child Psychology and Psychiatry's* Early View Alert landed in my inbox. Here I learnt about Hamilton et al. (2022)'s study

that tests the relationship of sleep quality and duration with suicide ideation using exactly this sort of intensive monitoring design.

More traditional designs that test causality may also be helpful. For example, RCT studies addressing the effect of interventions to improve sleep quality on conduct problems already seem warranted on the basis of Brown et al.'s results. Improved sleep is likely to benefit a wide range of outcomes, as discussed above, many of which are likely to be correlated with offending behaviours. Therefore, sleep interventions that are targeted to those with a propensity for offending may reduce their antisocial behaviour and help to alleviate many of the other difficulties that they face as well.

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