Bedtime, shuteye time and electronic media: sleep displacement is a two-step process

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SUMMARY

This study argues that going to bed may not be synonymous with going to sleep, and that this fragmentation of bedtime results in a two-step sleep displacement. We separated bedtime (i.e. going to bed) from shuteye time (i.e. attempting to go to sleep once in bed) and assessed the prevalence of electronic media use in both time slots. A convenience sample of 338 adults (aged 18–25 years, 67.6% women) participated in an online survey. Results indicated a gap of 39 min between bedtime and shuteye time, referred to as 'shuteye latency'. Respondents with a shuteye latency of, respectively, ≤30 min, ≤1 or >1 h, were 3.3, 6.1 and 9.3 times more likely to be rated as poor sleepers compared to those who went to sleep immediately after going to bed. Before bedtime, volume of electronic media use (17 h 55 min per week) was higher than non-media activities (14 h per week), whereas the opposite was true after bedtime (media = 3 h 41 min, non-media = 7 h 46 min). Shuteye latency was related exclusively to prebedtime media use. Findings confirmed the proposed fragmentation of bedtime. Sleep displacement should therefore be redefined as a two-step process, as respondents not only engage in the delay of bedtime, but also in the delay of shuteye time once in bed. Theoretical, methodological and practical implications are discussed.

INTRODUCTION

Young people today are accustomed to a media environment that is strikingly different from that of previous generations. Because of the growing mobility, accessibility and user-friendliness of electronic media, we spend an increasing amount of time in front of a screen (Rideout *et al.*, 2010). As we devote more time to media, there is less time available for other activities, including sleep. One of the most profound effects of media use on sleep is sleep displacement, whereby media use leads to later bedtimes and shorter sleep duration (Cain and Gradisar, 2010; Van den Bulck, 2000, 2010).

Over the years, electronic media have followed us not just into the bedroom, but into our beds as well. Even though most of the research on the effects of media use on bedtime behaviour has focused upon media use before bedtime, it has become increasingly common for media use to happen in bed (Fossum *et al.*, 2014; Lemola *et al.*, 2015) and even after lights out (Gradisar *et al.*, 2013; Munezawa *et al.*, 2011; Troxel *et al.*, 2015; Van den Bulck, 2007). Exelmans and Van den Bulck (2015) posited that going to bed may therefore no longer automatically imply an intention to go to sleep. In a rapidly increasing number of cases it implies an intention to use electronic media.

This study aims to present a fresh view on people's bedtime ritual, the prevalence of electronic media in it and its implications for general sleep quality. We provided respondents with a timeline representing their bedtime ritual and distinguished bedtime, defined as the time at which respondents decided to go to bed, from shuteye time, defined as the time at which respondents decided to go to sleep. From this perspective, the commonly used term 'sleep latency' needs to be redefined. It should no longer be used to refer to the interval between bedtime and actual sleep, but rather to the interval between shuteye time and sleep. The gap between bedtime and shuteye time will therefore be referred to as shuteye latency, or the time in bed before attempting to go to sleep. In this scenario, sleep displacement becomes a two-step process (see Fig. 1). We formulate the following research questions:

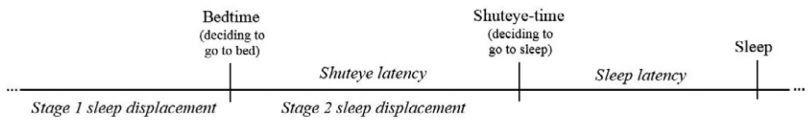

Figure 1. Proposed timeline.

- RQ1: Do people report a shuteye time that differs sufficiently from bedtime to mark it as a separate step preceding sleep?
- RQ2: How does shuteye latency affect sleep quality?
- RQ3: What are people doing before bedtime and before shuteye time, and what is the role of electronic media use?

METHOD

Data collection

Cross-sectional data were acquired from Belgian adults (18–25 years old) in February–March 2016. A convenience sample was used: an invitation to participate in a study on leisure time and sleep behaviour was disseminated via Facebook. Respondents were informed about the topic of the survey and voluntary nature of participation. Strict confidentiality was assured and informed consent was obtained from all respondents. The study was approved by the Social and Societal Ethics Committee of the KU Leuven. This procedure yielded 343 completed questionnaires. Five respondents exceeded the age limit proposed in the literature to define emerging adulthood (18–25 years old) (Arnett, 2000), resulting in a final sample of 338 respondents.

Measures

Bedtime and shuteye time

To capture respondents' bedtime behaviour as hypothesized, we designed the Bed Time Shuteye Time (BTST) measure (see Supporting information, Appendix S1). Providing a similar timeline to that shown in Fig. 1, respondents were also asked to read carefully a definition of bedtime (i.e. the time at which you decide to go to bed) and shuteye time (i.e. the time at which you decide to go to sleep). We also described a situation in which bedtime and shuteye time were equal (i.e. a person goes to bed, switches off the lights immediately and tries to sleep) and a situation where both differed (i.e. a person goes to bed, reads a book for half an hour and goes to sleep afterwards). They then had to report their usual bedtime and shuteye time on weeknights (Sunday night—Thursday night) and weekend nights (Friday and Saturday night).

Prebedtime and preshuteye time media use

Respondents were asked to report what they were usually doing (1) during the last 2 h prior to bedtime (prebedtime activities) and (2) once they were in bed, prior to going to sleep (preshuteye activities). We offered them a list comprising media and non-media activities. The non-media activities were adjusted slightly in the preshuteye measure. We provided three blank lines in case respondents wanted to add other activities, but these were used rarely and all suggestions could be recategorized under the predefined categories. The frequency (0 = never, 1 = 1 day per week or less, 2.5 = 2–3 days per week, 4.5 = 4–5 days per week, 6.5 = 6–7 days per week) and duration (eight time slots representing 15 min each, adding up to 2 h) of each activity was multiplied to obtain an estimate of average weekly volume (h/week).

Sleep quality

The Pittsburgh Sleep Quality Index (PSQI) comprises 19 self-report questions assessing sleep quality over the past month. The questions can be grouped into seven components (subjective sleep quality, sleep latency, sleep efficiency, sleep duration, daytime dysfunction, sleep disturbances, use of sleep medication) each weighed on a scale from 0 to 3, resulting in an overall score between 0 and 21. Lower scores indicate a better sleep quality, and respondents scoring more than 5 are rated as poor sleepers (Buysse *et al*., 1989) ($\alpha = 0.70$).

Demographic variables

We recorded gender (0 = male, 1 = female), age, status (1 = dorm student, 2 = non-dorm student, 3 = working full time, 4 = working part time, 5 = unemployed), educational level, clinical history of sleep problems (0 = no, 1 = yes) and self-perceived physical health status as confounding variables. Educational level was assessed by asking the highest educational degree they obtained: finished primary school (K6 equivalent), finished secondary school (K12 equivalent), college degree, university degree. To assess their health status, respondents were asked 'in general, would you say your health is:' and response categories were 1 = poor, 2 = fair, 3 = good, 4 = very good, 5 = excellent.

Analyses

Statistical analyses were performed using SPSS version 22 (Statistical Package for the Social Sciences, Inc., Chicago, IL, USA). Descriptive analyses were conducted for the variables of interest. Bivariate statistics (*t*-tests and correlation analyses) and hierarchical and logistic regression analyses were computed. Missing values for key variables were replaced with mean values of the respondent on the remaining cases.

RESULTS

Sample description

The sample ($n = 338$) contained a larger proportion of females (67.6%) than males and mean age was 22.27 years old [standard deviation (SD): 1.77]. Almost 70% of the respondents (68.9%) were currently enrolled as student at a college or university. The majority of the students (59.7%) were dorm students. One in four respondents (24.9%) was working at a full-time job, 3.6% were doing so at a part-time job and 2.7% of the respondents was unemployed at the time of data collection. Regarding their self-perceived physical health status, 8.3% rated this as excellent, 43.2% as very good, 40.2% as good, 8.0% as fair and 0.3% as poor. Average score on the PSQI was 5.79 (SD: 3.22) and 45.3% of the sample scored more than 5, indicating a poor sleep quality. Finally, 10.1% of the sample had consulted a doctor previously regarding sleep difficulties, and were therefore categorized as having a clinical history of sleep problems.

RQ 1: Do people report a shuteye time that differs sufficiently from bedtime to mark it as a separate step preceding sleep?

Respondents' average bedtime was 23:15 hours (SD: 1 h 16 min) during the week and 00:45 hours during the weekends (SD: 1 h 53 min). Their average shuteye time was 23:58 hours (SD: 1 h 17 min) during the week and 01:20 hours (SD: 1 h 54 min) during the weekend. Consequently, there was an average gap of 43 min (SD: 49 min) between their self-reported bedtime and shuteye time during the week and of 35 min (SD: 48 min) during the weekend. On average, 12.1% of respondents reported that their bedtime was equal to their shuteye time. In other words, these respondents tried to go to sleep as soon as they went to bed, resulting in a shuteye latency of 0. Shuteye latency was < 15 min for one in five respondents (21.9%), between 15 and 30 min for 19.5% of respondents, between 30 and 45 min for 21.0% of respondents and between 45 min and 1 h for one in 10 respondents (9.5%). Notably, an additional 16.0% reported a difference of > 1 h. Men's bedtime (mean: 00:34 hours, SD: 1 h 29 min) and shuteye time (mean: 01:16, SD: 1 h 30 min) were significantly later than the bedtime and shuteye time of women (mean: 23:43 hours, SD: 1 h 11 min) ($t_{(174.81)} = 5.122$, $P < 0.001$; mean: 00:19, SD: 1 h 7 min, $t_{(166.83)} = 5.820$, $P < 0.001$), but shuteye latency did not differ according to gender (see Fig. 2). There was a small negative association between respondents' age and their shuteye latency ($r = -0.121$, $P < 0.05$), indicating that older respondents' bedtime and shuteye time were more proximate to each other than that of younger respondents.

RQ2: How does shuteye latency affect sleep quality?

We related respondents' shuteye latency to their self-reported sleep quality. Correlation analyses revealed a significant positive association ($r = 0.226$, $P < 0.001$), indicating that longer shuteye latency was associated with poorer sleep quality. Logistic regression analysis was conducted to document a dose–response relationship. We recoded respondents' shuteye latency into four categories so that each contained a reasonable proportion of the sample: a shuteye latency of 0 (i.e. those who tried to go to sleep immediately after going to bed, the reference category) (12.1%), $0 > \times \leq$ 30 min (41.4%), 30 < 0215 ≤ 60 min (30.5%), > 60 min (16.0%). We controlled for respondents' gender, age, educational level (dummy-coded), status (1 = dorm student, 2 = non-dorm student, 3 = working full time, 4 = working part time, 5 = unemployed; dummy-coded), clinical history of sleep problems, self-perceived physical health and bedtime (see Table 1). Results indicated that, compared to those who tried to go to sleep immediately after they went to bed, respondents who stayed awake ≤ 30 min were 3.25 times more likely be categorized as poor sleepers (PSQI > 5). Respondents who stayed awake, respectively, for ≤ 1 or > 1 h were 6.13 and 9.32 times more likely be categorized as poor sleepers. Attributable risk calculations were computed, which indicate the proportion of

Table 1 Dose–response relationship between shuteye latency and sleep quality using logistic regression analysis

	Exp (B)	*95% CI*
Gender[†]	1.345	0.751–2.408
Age	1.057	0.888–1.259
E1_secondary school	2.220	0.247–19.919
E2_college	2.348	0.256–21.559
E3_university	1.579	0.167–14. 960
S1_dorm	1.553	0.833–2.896
S2_full-time	1.827	0.406–8.219
S3_part-time	1.034	0.472–2.264
S4_unemployed	0.219	0.037–1.280
Sleep problem[‡]	2.466*	1.054–5.772
Health	0.517***	0.362–0.739
Bedtime	1.310**	1.071–1.601
Shuteye latency[§]	***	
0 > × ≤ 30 min	3.251*	1.317–8.027
30 < × ≤ 60 min	6.134***	2.367–15.899
> 60 min	9.316***	3.142–27.620

CI: confidence interval.
E1: (0 = primary school, 1 = secondary school); E2: (0 = primary school, 1 = college); E3: (0 = primary school, 1 = university).
S1: (0 = non-dorm student, 1 = dorm student); S2: (0 = non-dorm student, 1 = full-time employee;. S3: (0 = non-dorm student, 1 = part-time employee); S4: (0 = non-dorm student, 1 = unemployed).
Model: $R^2 = 0.172$ (Cox and Snell), 0.230 (Nagelkerke).
*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.
[†]Reference category = male; [‡]reference category = no sleep problem; [§]reference category = 0.

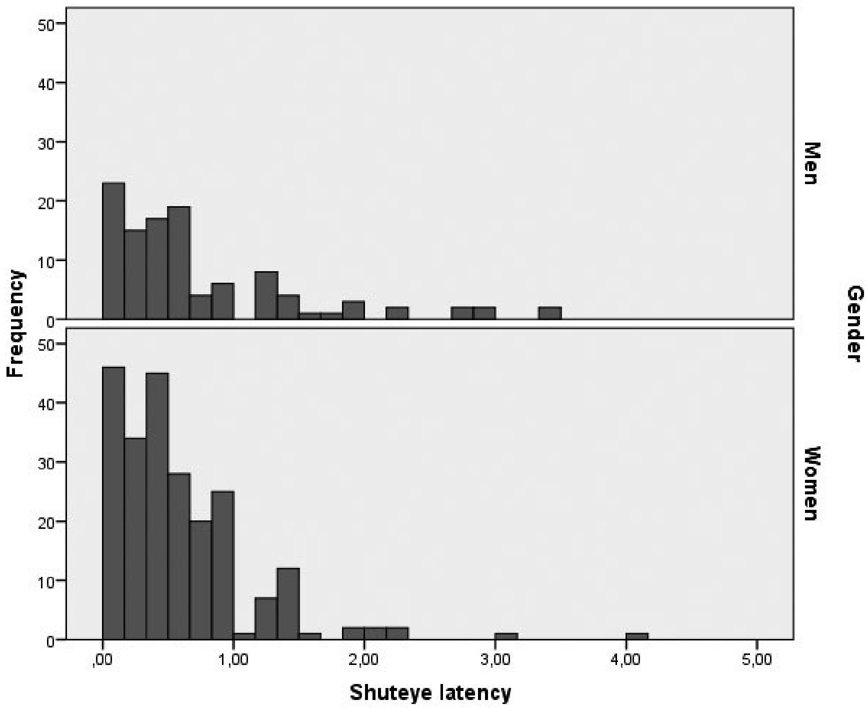

Figure 2. Histogram of shuteye latency by gender.

poor sleep quality in each group due to the duration of shuteye latency. Among respondents who reported a shuteye latency of ≤ 30 min, 45.1% of the incidence of poor sleep quality (PSQI > 5) could be attributed to their shuteye latency. Among respondents who stayed awake, respectively, for ≤ 1 or > 1 h, 58.0% and 61.7% of the incidence of poor sleep quality could be attributed to their amount of shuteye latency.

RQ 3: What are people doing before bedtime and before shuteye time, and what is the role of electronic media use?

As shown in Fig. 3, electronic media use takes up the larger share of respondents' prebedtime activities. Per week, they spent 4 h 58 min watching television (SD: 4 h), 5 h 15 min in front of their computer or laptop (SD: 4 h 22 min) and 4 h 15 min on their mobile phone (SD: 3 h 56 min). Videogames and tablet computer use were far less popular, accounting for, respectively, 1 h 50 min (SD: 3 h 19 min) and 1 h 37 min per week (SD: 3 h 15 min). Together, they spent approximately 17 h 55 min (SD: 12 h 31 min) on electronic media use per week before deciding to go to bed. Conversely, prebedtime non-media activities accounted for 14 h per week (SD: 10 h 2 min). Social activities (such as meeting friends, talking, ...) (mean: 3 h 41 min, SD: 2 h 55 min), work or school (mean: 2 h 42 min, SD: 3 h 22 min) and time spent on hygiene (mean: 2 h 34 min, SD: 1 h 57 min) took up the most time.

There were some differences between men and women in their prebedtime activities. Overall, men spent more time on electronic media use before bedtime than women ($t_{(164.957)} = 2.291$, $P < 0.05$). Men spent substantially more time in front of the computer ($t_{(192.402)} = 2.278$, $P < 0.05$) or playing videogames ($t_{(159.717)} = 4.936$, $P < 0.001$) than women. For non-media activities, women scored significantly lower than men for time spent on hobbies ($t_{(138.416)} = 2.886$, $P < 0.01$).

The same procedure was followed to chart respondents' preshuteye activities (i.e. what respondents were doing once they were in bed, but before they decided to go to sleep). In total, they spent approximately 3 h 41 min (SD: 5 h 42 min) on electronic media use per week during this time. Mobile phone and computer usage were the most popular activities in this category, taking up, respectively, 1 h 5 min (SD: 1 h 30 min) and 1 h 3 min (SD: 1 h 46 min). Non-media activities took up approximately 7 h 46 min (SD: 3 h 58 min). In this category, sex, hobbies and social activities (e.g. talking) took up the most time: respectively, 1 h 37 min (SD: 2 h 10 min), 1 h 22 min (SD: 1 h 52 min) and 1 h 13 min (SD: 2 h 44 min) per week. There were no significant differences according to gender.

We explored the contribution of electronic media use to respondents' shuteye latency using hierarchical regression analysis, controlling for the aforementioned control variables and bedtime. The volume of prebedtime media activities was divided by the total volume of prebedtime activities to investigate if a larger ratio of prebedtime media activities was associated with a longer shuteye latency. The same procedure was followed for preshuteye time media activities. As shown in Table 2, a larger ratio of prebedtime electronic media use ($\beta = 0.202$, $P < 0.01$) was associated with a

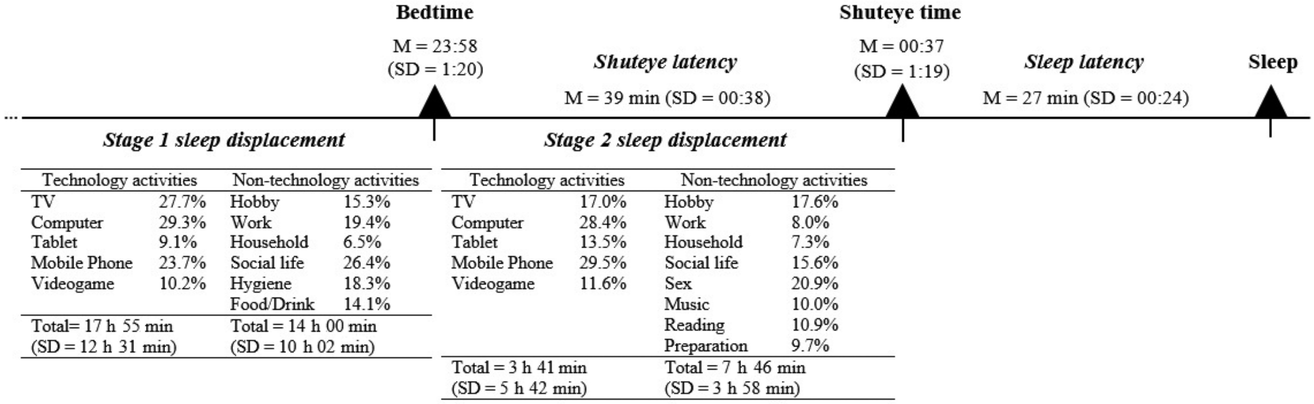

Figure 3. Reported time-line.

Table 2 Hierarchical regression analysis predicting shuteye latency

	Shuteye latency		
	B	*SE*	β
Step 1			
Gender	−0.250	0.092	−0.172**
Age	−0.019	0.027	−0.054
E1_secondary school	0.333	0.458	0.212
E2_college	0.335	0.464	0.230
E3_university	0.216	0.466	0.163
S1_dorm	−0.051	0.098	−0.035
S2_full-time	0.015	0.234	0.004
S3_part-time	−0.356	0.127	−0.217**
S4_unemployed	0.669	0.251	0.165**
Sleep problem	0.008	0.137	0.004
Health	−0.035	0.054	−0.041
R^2	0.111**		
Step 2			
Bedtime	−0.094	0.032	−0.187**
$R^2/\Delta R^2$	0.150/0.039**		
Step 3			
Prebedtime media exposure/total†	0.719	0.217	0.202**
$R^2/\Delta R^2$	0.187/.037**		
Step 4			
Preshuteye media exposure/total‡	−0.046	0.142	−0.020
$R^2/\Delta R^2$	0.187/.000		

SE: standard error.
E1: (0 = primary school, 1 = secondary school); E2: (0 = primary school, 1 = college); E3: (0 = primary school, 1 = university).
S1: (0 = non-dorm student, 1 = dorm student); S2: (0 = non-dorm student, 1 = full-time employee); S3: (0 = non-dorm student, 1 = part-time employee); S4: (0 = non-dorm student, 1 = unemployed).
*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.
†Prebedtime media exposure/(prebedtime media + prebedtime non-media exposure); ‡preshuteye media exposure/(preshuteye media + preshuteye non-media exposure).

longer shuteye latency, thus spending more time awake in bed before going to sleep. There was no significant relationship between preshuteye activities and shuteye latency.

DISCUSSION

As electronic media use also continues after bedtime, this study has argued that the definition of bedtime may have become increasingly problematic, and wondered whether we should reconsider what constitutes sleep displacement. We introduced an updated timeline for respondents' bedtime ritual, demarcating clearly the time at which they decide to go to bed (i.e. bedtime) from the time at which they decide to go to sleep (i.e. shuteye time) and charted to the role of media use in both time slots.

Respondents went to bed at midnight on average and were preoccupied mainly with media during the two final hours before bedtime: they devoted 17 h 55 min to electronic media before bedtime per week, among which computer use, television viewing and mobile phone use were the most popular. Note that we calculated volumes of time to avoid a confounding between frequent but short and occasional but long activities. The totals are thus rescaled and no longer add up to 14 h per week. Estimates could also be inflated because respondents may attend to several electronic media at once, called media multi-tasking (Rideout *et al.*, 2010). For prebedtime non-media activities, which amounted to 14 h per week, most time was spent on social activities or work and school. These findings confirm earlier ones: electronic media use peaks before bedtime (Kubiszewski *et al.*, 2013; Westerik *et al.*, 2005).

After respondents went to bed, they spent an average of 39 min per day on other activities before trying to go to sleep, referred to as their shuteye latency. While a minority of respondents (12.1%) reported trying to go to sleep immediately after bedtime, 21.9% reported a shuteye latency of 15 min, 19.5% one of 15–30 min and 21.0% one of 30–45 min. Bedtime and shuteye time were more than 1 h apart for 16% of the respondents. During this time in bed, they spent the most time on hobbies, sex and social activities. Media usage was thus not the most dominant activity before shuteye time, but it still accounted for 3 h 41 min per week, among which portable media outlets (i.e. mobile phone and computer) were the most popular.

A larger ratio of media activities before bedtime time predicted a longer shuteye latency. The duration of respondents' shuteye latency thus appears particularly vulnerable to the prevalence of electronic media before deciding to go to bed. The increased likelihood of sleep displacement when engaged in media use may lie in its unstructured time-profile. Electronic media use typically lacks clear boundaries in time, as there are often no predefined beginning or endpoints (Kubey, 1986). In addition to displacing bedtime, it seems that the displacement of actually going to sleep once in bed by engaging in electronic media use is a distinct phenomenon. This suggests that the traditional concept of sleep displacement could or should be redefined as a two-step process.

Shuteye latency was related to a considerable decrease in sleep quality. Those with a shuteye latency of $\leq$ 30 min were 3.3 times more likely to be rated as a poor sleeper (i.e. a PSQI-score $>$ 5), and 45% of the incidence of poor sleep quality was due to this amount of shuteye latency. These odds increased steadily with a longer shuteye latency: those with a shuteye latency of, respectively, $\leq$ 1 or $>$ 1 h were 6.0 and 8.9 times more likely to be a poor sleeper. Attributable risk for having poor sleep quality due to shuteye latency in these groups was, respectively, 58 and 62%.

Together, these findings point out that bedtime and sleep are no longer synonymous. Instead of considering the bedroom as a room primarily used for sleeping, it has become a multipurpose, media-rich location where sleep is one of many competing activities. While our findings are cross-sectional and there are no baseline indications, it is safe to assume that electronic media use in bed and after lights out is a modern phenomenon that is likely to become more commonplace as media become increasingly mobile, wearable and integrated into our bedtime routine. The recent launch of Pokemon Go, for example, brought along millions of young players wandering the streets at a time where, previously, most of them would have been sleeping. Most importantly, the displacement of shuteye time is harmful to our sleep quality.

Several limitations deserve mentioning. We used a convenience sample and a cross-sectional design. Reverse causality thus also remains plausible, i.e. those who go to bed later use media to fill in the time before sleep. The diversity of measurement in previous studies studying postbedtime media use precludes an accurate test of whether it has increased. We recommend the implementation of longitudinal designs to keep track of how the association between electronic media and bedtime behaviour evolves. In addition to a disproportionate demographic distribution, we recruited our respondents via Facebook, inducing self-selection bias in our sample. As previous studies have highlighted that both media use and sleep behaviour is dependent upon age and culture (Owens, 2004; Rideout *et al*., 2010), our findings may not be generalizable to a larger population or other countries. Furthermore, the findings on prebedtime and preshuteye time activities warrant a cautious interpretation. Respondents had to indicate frequency and duration for each possible activity in their bedtime ritual, which could have been tedious for them, resulting in missing data. Other formats (such as listing) could be valuable in future research. We calculated the volume of these activities to avoid a confounding effect, but it seems advisable to ask about their usual activities on a weekly basis. When asking about reading a book in bed, we did not differentiate between reading on paper versus on a screen, a distinction that could be made in future research.

As we found a significant association with sleep quality, we wonder how poor sleep advances the fragmentation of bedtime. People suffering from chronic sleep difficulties or insomnia might deliberately postpone the moment of going to sleep, thereby prolonging each step of the proposed displacement process. Notably, electronic media can be regarded as useful tools for such procrastination (Kroese *et al*., 2014; Tavernier and Willoughby, 2014).

Finally, bedtime behaviour was assessed using self-report measures that are vulnerable to bias. Although studies argued that surveys are as reliable as diary data and objective sleep measures (Monk *et al*., 2003; Westerlund *et al*., 2014), we wonder whether the proposed fragmentation of bedtime can also be identified in actigraphy data. If so, this validates further our idea of two-step sleep displacement. If not, this could tell us a little more about the validity or added value of surveys versus objective measures. The existence of shuteye time and shuteye latency may be artefacts of question wording, meaning that actigraphy measures are more reliable. However, it could also mean that actigraphy measures are not able to detect behaviour patterns that result as significant in survey research.

Implications

Our findings, while limited clearly by the aforementioned caveats, have methodological, theoretical and practical implications for sleep research. Although there has been some recognition that not all time in bed is spent sleeping (such as the sleep efficiency score in the PSQI), survey measures rarely define what is to be understood when asking about people's bedtime. Almost half our sample had a shuteye latency $>$ 30 min. Without a differentiation between bedtime and shuteye time, these respondents would have been categorized as having sleep-onset insomnia (Lichstein *et al*., 2003), even though they had no intention of trying to sleep during that time window. The use of a similar timeline format and clear definitions of each stage in the bedtime ritual could prove useful in future survey research. It could even be argued that this study warrants an update of validated sleep scales, such as a revision for bedtime along the lines of 'When have you usually gone to bed, with or without the intention of going to sleep immediately' and an incorporation of an item for shuteye latency ['After going to bed, how long are you awake (doing other things than sleeping) before trying to go to sleep?'].

In Cain and Gradisar's (2010) model, sleep displacement is one of three answers to the question of how technology affects our sleep. We extend their model by adding postbedtime activities to the picture and uncovering a second step in the displacement process. In a broader sense, our results illustrate an increased difficulty in time-managing media use to the point where we are occupied with media in bed, which highlights an important gap in Cain and Gradisar's model: apart from asking how technology affects our sleep, we should also ask why. Why is it so difficult to refrain from the screen, even when we are in bed? Research has linked this with concepts of media engagement such as flow (Smith *et al.*, 2017) or habitualness in media use (Exelmans and Van den Bulck, 2016), but there is ample room for progress in this area.

Finally, assuming that bedtime equals shuteye time, sleep hygiene guidelines have, so far, focused mainly upon what happens before bedtime. Recommendations on best practices after bedtime are needed. Moreover, reports keep demonstrating a steady increase in the time we devote to our screens. Facilitated by a trend towards mobile and wearable media, sleep still seems a prime candidate for many to cram a few more minutes of media use into a busy schedule. Sleep thus appears to become optional rather than essential. The cultivation and education of a prosleep attitude with up-to-date guidelines are therefore needed.

AUTHOR CONTRIBUTIONS

LE conducted the data collection and performed the statistical analyses to examine the research question. She was the primary author of the manuscript. JVdB was involved in the design of the study and served as a consultant in preparing the manuscript.

CONFLICT OF INTEREST

The authors disclose no conflicts of interest.

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SUPPORTING INFORMATION

Additional Supporting Information may be found online in the supporting information tab for this article:

Appendix S1. BedTime Shuteye Time measure (BTST).