

## CHAPTER 5

# Bedtime Procrastination: A Behavioral Perspective on Sleep Insufficiency

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Although the prevalence of procrastination has been frequently noted (e.g., Ferrari, O’Callaghan, & Newbegin, 2005; Ferrari, Díaz-Morales, O’Callaghan, Díaz, & Argumedo, 2007), less attention has been paid to the diversity of domains in which it occurs. Many discussions have focused on situational procrastination in academic or workplace contexts, although it is also widely recognized that procrastinating can be a more generalized, trait-like tendency (e.g., Lay, 1986). For example, a tendency to procrastinate may be illustrated in a broad range of daily behaviors such as returning a phone call, responding to an invitation, or getting to the train station on time for your trip. Researchers are increasingly focusing on the importance of procrastination for health and well-being, and intriguing insights are emerging into the various ways in which procrastination behavior is related to outcomes in these domains, for example, through experiences of stress (Sirois, 2007; Tice & Baumeister, 1997). In this chapter, we will focus on a specific domain of procrastination, namely “bedtime procrastination”: the phenomenon of postponing going to bed, typically resulting in a lack of sleep (Kroese, De Ridder, Evers, & Adriaanse, 2014; Kroese, Evers, Adriaanse, & de Ridder, 2014). We will discuss how a lack of sleep significantly affects health and well-being, how bedtime procrastination plays a role in this regard, and why people engage in bedtime procrastination. Finally, we will suggest interventions that may help people hit the pillow on time, and will discuss avenues for future research.

As a paradigm example of bedtime procrastination, consider the case of Sarah. Sarah thinks it is important to get sufficient sleep, and she knows from experience that she has to be in bed by 11:00 pm to avoid feeling tired and grumpy the next day, when her alarm will callously ring at 6:30 am.

Nonetheless, on this particular Tuesday night, Sarah decides at 10:45 pm to “just have a peek” at Facebook. There she finds a link to an interesting news clip online, and the next thing she knows, she is watching funny YouTube videos of cats, rearranging her sock drawer, and playing Call of Duty, ending up mindlessly binge-watching reruns of MacGyver. And she does not even *like* MacGyver. Sarah does not get to bed until 2 am, and when the alarm goes off at 6:30 am, she feels annoyed with herself for letting herself go.

Anecdotal evidence suggests that many will find Sarah’s case all too familiar, and recent studies from our research group have documented this impression. For example, in a representative sample of 2431 Dutch adults, over 50% of participants (excluding people diagnosed with a sleeping disorder or people working nightshifts) reported going to bed later than they would like to. Accordingly, 45% indicated feeling tired during the day on 2 or more days per week (Kroese et al., 2014b). These numbers indicate that going to bed late is indeed very common in the general population. Although this behavior may seem rather harmless, the sleep insufficiency that often results from bedtime procrastination (Kroese et al., 2014a) can have a range of negative consequences in terms of health and well-being.

## **SLEEP INSUFFICIENCY: A NEGLECTED HEALTH PROBLEM?**

Getting sufficient sleep is essential for people to function well. This may be most apparent in terms of daily performance, where the loss of concentration or grogginess resulting from a bad night’s sleep may be all too familiar to most people: everything you do just seems to take more effort; it is harder to focus on this book chapter, and more difficult to tolerate others around you who are being annoying. The importance of sleep, however, becomes significantly more salient once the focus shifts to the detrimental effects that sleep deprivation can have on long-term well-being and mental and physical health (e.g., Strine & Chapman, 2005).

For example, the perils of a lack of sleep range from declines in performance (Belenky et al., 2003; Curcio, Ferrara, De Gennaro, 2006) to road traffic injuries or mortalities (Connor et al., 2002). Chronically getting insufficient sleep can also lead to serious health problems such as hypertension, obesity, diabetes, and depression (e.g., Strine & Chapman, 2005; Gangwisch et al., 2006; Roane & Taylor, 2008). Moreover, in terms of well-being, a lack of sleep has been found to lead to lower levels of optimism and sociability (Haack & Mullington, 2005), and to be negatively associated with positive affect and having a sense of purpose in life (Steptoe, O’Donnell, Marmot, & Wardle, 2008).

There are several physiological and behavioral pathways that may explain the relationship between insufficient sleep and ill health. For example, experimental research suggests that even seemingly modest amounts of sleep loss, such as when people sleep 5 or 6 h per night for 1 week, leads to a suppression of immune functioning (e.g., [Banks & Dinges, 2007](#); [Vgontzas et al., 2004](#)). In addition, insufficient sleep yields increased cortisol levels, implying that sleep affects the resiliency of the physiological stress response ([Leproult, Copinschi, Buxton, & van Cauter, 1997](#)). It also decreases insulin sensitivity, a factor that is known to contribute to the development of diabetes ([Buxton et al., 2010](#); [Spiegel, Tasali, Penev, & van Cauter, 2004](#)). Moreover, sleep loss increases appetite by deregulating leptin levels ([Omisade, Buxton & Rusak, 2010](#); [Spiegel et al., 2004](#)), which particularly induces craving for sweet and salty food ([Tasali, Chapotot, Wroblewski, & Schoeller, 2014](#)). Besides these physiological pathways, the relation between sleep and health may also be explained by behavioral effects. Just think of individuals whose sleep deprivation leaves them too tired to go the gym or cook a healthy meal.

Getting sufficient sleep is clearly important for mental and physical fitness. Not without reason, the Centre for Disease Control and Prevention has recently labeled getting insufficient sleep a “public health epidemic” ([Centre for Disease Control and Prevention, 2014](#)). Sleep researchers typically agree that 7 to 9 h of sleep would be “sufficient,” leaving room for individual variation ([Hirshkowitz et al., 2015](#)). In light of this, it is striking how endemic sleep deprivation seems to have become in today’s society. Corroborating our findings in the Dutch sample, Americans on average sleep 6.8 h per night, which is a full hour less than they did 70 years ago ([Gallup, 2013](#)). Moreover, 40% of Americans are getting less than the recommended number of hours of sleep per night (i.e., on average 6 h or less per night) and a similar percentage indicates they would feel better if they got more sleep. These numbers highlight the need to understand and reduce this self-undermining behavior.

To understand sleep deficiency, it is important to acknowledge the many factors that may contribute to it. Traditionally, studying sleep deficiency has largely been the domain of medical researchers, who are mostly interested in sleep disorders. These sleep disorders, such as insomnia (a sleep disorder that is characterized by an inability to initiate or maintain sleep as long as desired), sleep apnea (where interrupted breathing leads to poor sleep quality), and delayed sleep phase disorder (involving disrupted circadian rhythms) seriously affect sleep quantity and quality, leading to unfavorable outcomes in

terms of health and well-being such as those discussed earlier (e.g., [Karlson, Gallagher, Olson, & Hamilton, 2013](#); [Al Lawati, Patel, & Ayas, 2009](#)). Another special group of interest comprise people working irregular nightshifts, who constantly have to adjust their sleep–wake cycles. Indeed, nightshift workers have been found to experience more sleeping problems (both in terms of sleep quality and quantity) than the general population (e.g., [Ohayon, Smolensky, & Roth, 2010](#)). An important research area in this domain investigates physiological determinants of sleep such as the “sleep hormone” melatonin that regulates circadian rhythms, explicating how disturbances in these factors—for example, due to working night shifts—impact sleep (e.g., [Pandi-Perumal, Srinivasan, Spence, & Cardinali, 2007](#)).

Obviously, the clinical perspective on sleep problems is important, with an estimated 10% of the population having been diagnosed with a sleep disorder ([Ram, Seirawan, Kumar, & Clark, 2010](#)). However, given that roughly 90% of people do *not* suffer from a sleep disorder—many of whom nevertheless suffer from sleep insufficiency—it is vital to also study sleep insufficiency from different vantage points. Other factors that have been put forward to explain the increasing lack of sleep pertain to environmental influences. As noted previously, people nowadays sleep more than an hour less than they did 70 years ago ([Gallup, 2013](#)), suggesting that getting insufficient sleep is a cultural product of our time. Whereas our ancestors would naturally go to sleep whenever it got dark outside, our current 24/7 entertainment industry does not mark a clear endpoint of the day. Particularly, the current widespread use of electronic devices—and more specifically those that emit blue light that is known to disrupt people’s circadian rhythms—is blamed as a threat to a healthy night of sleep (e.g., [Cain & Gradisar, 2010](#)). Furthermore, it has been suggested that people’s social schedules (e.g., school and work) are sometimes out of sync with their biological schedules (e.g., melatonin levels), leading to a situation where people become sleep-deprived due to not being able to go to sleep at the time their body demands. For example, someone may physically feel like sleeping from 2:00 am to 10:00 am, but be dictated by societal duties to get up at 7:00 am. This phenomenon has been coined “social jetlag,” and it was found to be particularly prevalent in evening types ([Wittmann, Dinich, Mellow, & Roenneberg, 2006](#)).

A perspective that remains relatively understudied in the general population, however, is the role of behavioral factors. That is, sleep disorders and environmental factors do not suffice to fully explain the case of Sarah, who wanted to go to bed on time, had every opportunity to do so, but just did

not. Recent research corroborates our contention that many people get insufficient sleep due to factors that are within their control (Kor & Mullan, 2011; Kroese et al., 2014a, 2014b; Loft & Cameron, 2013, 2014; Todd & Mullan, 2013, 2014). Some of these cases of sleep insufficiency may be related to sleep difficulties as a result of stress or external reasons such as crying babies (e.g., Lund, Reider, Whiting, & Prichard, 2010). However, the evidence suggests that oftentimes, people get insufficient sleep not because they are *unable* to fall asleep, but because they *simply do not put themselves in a position to fall asleep*, implying that there is a behavioral component to the problem.

The behavioral vantage point on understanding sleep insufficiency has recently started to gain momentum, for example, through the work of Loft and Cameron (2013) who showed that a self-regulation intervention could improve sleep-related behaviors. Research has also shown that so-called sleep hygiene behaviors (e.g., disengaging from arousing activities close to bedtime, sticking to regular sleeping schedules) can affect the amount and quality of sleep (e.g., Gellis & Lichstein, 2009) and that effective self-regulation can improve such behaviors (Kor & Mullan, 2011; Todd & Mullan, 2013). Our distinctive contribution lies in focusing on the seemingly obvious (but still understudied) role of *going to bed* as a key behavioral determinant of sleep sufficiency. It is important to notice that when discussing sleep insufficiency from a behavioral point of view, we specifically focus on “going to bed” rather than “falling asleep” (hence, the term “bedtime procrastination”). Furthermore, we conceptualize “going to bed” quite broadly, namely as the activity of getting oneself in a position to go to sleep, which includes not only getting oneself into bed, but also turning off the light and powering down any electronic equipment. This way, delaying one’s bedtime while lying in bed using a smartphone or tablet can still be categorized—depending on other conditions being met—as bedtime procrastination.

When we say that Sarah “wanted to go to bed on time, had every opportunity to do so, but just did not,” psychologists will immediately think of a phenomenon that has been labeled the “intention-behavior gap”: people who often have good intentions, but fail to behave accordingly (Sheeran, 2002). This incongruence between intentions and behavior has often been studied in the context of health behavior such as exercising, quitting smoking, or healthy eating. For all such behaviors, people tend to want to change—think, for example, of your past New Year’s resolutions—but are unsuccessful in doing so. While Sarah seems to experience the same kind of problem, going to bed has not typically been approached as a case of a gap

between intentions and behavior. Thus, one of the promises of considering going to bed as a self-regulation behavior is that it puts it on par with other behaviors such as healthy eating and physical exercise, which have received much more research attention from behavioral scientists. This would offer interesting insights into underlying mechanisms as well as potential solutions to getting insufficient sleep.

However, the dominant attention to insufficient sleep from a medical or environmental rather than a behavioral perspective also seems to be reflected in public perceptions of sleep insufficiency, which does not readily seem to be considered as a lifestyle problem that is within people's own control. Public health campaigns directed at raising awareness about the risks of alcohol use, obesity, and smoking are ubiquitous, with public service announcements, billboards, flyers, and other promotional materials emphasizing the importance of exercise, smoking cessation, and a healthy diet. In contrast, public health campaigns aimed at promoting sleep in the general population are virtually nonexistent. To test if the lack of such campaigns is indeed reflected in people's perceptions about health problems, we asked a sample of participants on Amazon's Mechanical Turk ( $N = 163$ ; 58% men, age range 18–68) to think of important ways in which people can improve their health by changing their lifestyle (Nauts & Kroese, 2014). A large majority of participants spontaneously mentioned exercise (86%) or diet (84%) as a health-related lifestyle choice, but only a small minority mentioned sleep (12%). This suggests that getting more sleep is not at the forefront of people's minds when they are thinking about ways of living a more healthy life—which is not to say that sleep is considered unimportant: in the representative Dutch sample discussed earlier, a majority of people who indicated going to bed late and getting insufficient sleep saw this as “problematic” (Kroese et al., 2014b).

In the next section, we further elaborate on our conceptualization of bedtime procrastination as a cause of sleep insufficiency. What is important to add here is that, while we think that bedtime procrastination is a behavioral factor that is distinct from the medical and environmental factors contributing to sleep insufficiency, this does not mean that it is entirely unrelated to these other factors. For example, we found evidence for bedtime procrastination in the normal population (i.e., people who do not suffer from sleeping disorders), but it may well be the case that bedtime procrastination aggravates problems in sleep-disordered patients or that sleep disorders may exacerbate bedtime procrastination. Similarly, we believe that bedtime procrastination is key to explaining a reduced sleep duration, but

being exposed to bright lights in the evening may contribute to later bedtimes through an additional biological route as well. Hence, being a complex behavior that is affected by many factors, it is worthwhile to now focus on the relatively understudied behavioral aspects of getting sufficient sleep.

## **BEDTIME PROCRASTINATION AS A CAUSE OF SLEEP INSUFFICIENCY**

We posit that one way of understanding the behavioral cause of sleep insufficiency is by approaching it as a form of procrastination. That is, one reason as to why people increasingly get insufficient sleep is simply because they go to bed too late, even if they have to get up early in the morning—the phenomenon we labeled “bedtime procrastination” (Kroese et al., 2014a, 2014b). Procrastination typically involves unnecessarily delaying an intended course of action (e.g., doing the dishes after dinner), despite expecting to be worse off as a result (e.g., delaying dish-washing makes the task more difficult and aversive due to the accumulation of mold and dried muck; Heath & Anderson, 2010). In this sense, procrastination concerns a misalignment of intentions and behavior that can be regarded as a self-regulation problem (Van Eerde, 2000; Steel, 2007). Based on prior definitions of procrastination, and illustrated by the case of Sarah as discussed at the beginning of this chapter, we identify three criteria that determine whether a certain behavior qualifies as bedtime procrastination (for a further discussion regarding this approach to defining procrastination, see Chapter 3, Structured Nonprocrastination: Scaffolding Efforts to Resist the Temptation to Reconstruct Unwarranted Delay).

### **Criterion 1: Delay**

“Going to bed later than planned” has been formulated as a central aspect of bedtime procrastination (Kroese et al., 2014b). Indeed, delaying an action can be regarded as a core aspect of procrastination. Although not all delay is procrastination (see Section “Criterion 3”), all procrastination does involve delay. In many cases, procrastinators are keenly aware of the time at which they intended to do something and are quite conscious of disregarding the fact that they have scheduled a point in time at which to do something—such as going to bed at 11 pm. But not all procrastination involves temporally specific plans or explicit awareness of delay. In defining “bedtime procrastination” in terms of going to bed “later than planned,” we do not want to suggest that this means that going to bed a couple minutes

after, say, 11 pm has to count as “delaying.” Indeed, another MTurk study we conducted ( $N = 145$ , 58% men; excluding people who were diagnosed with a sleeping disorder or working night shifts) revealed that 43% of self-proclaimed bedtime procrastinators did not have a planned bedtime (Nauts, Kroese, de Ridder & Anderson, 2014). Usually procrastinators do have a nagging—if vague—sense that they are delaying an intended task.

Mindless delay can, however, still be procrastination. In cases where the delay results from inattention—a common occurrence in our studies of bedtime procrastination—it may only become clear in retrospect that one was delaying and could have known it. Procrastination does not require either explicit awareness of delay or a precise temporal plan, but as a failure of self-regulation, it does ultimately need to be connected to the procrastinator’s intentions regarding acting in a timely way. In sum, then, the form of task delay involved in procrastination involves either acting with a sense that one is departing from a more-or-less clear intention to do something within a particular timeframe or acting in a way that, according to one’s later judgment, one could have seen to be an instance of delaying.

## Criterion 2: Lack of a Valid Reason to Delay

A second important criterion is that the delay of going to bed needs to be unwarranted: someone could have gone to bed in time, but chose not to. In other words, a person does not have a *valid reason* (e.g., stuck in traffic, caring for an infant, working night shifts) for going to bed late. Indeed, most definitions make clear that procrastination is one form of delay: delay is only procrastinatory if it is needless and voluntary (Lay, 1986; Steel, 2007). That is, people who procrastinate have the ability and the opportunity to start a task (e.g., do homework, go to bed), but choose not to. Sarah, our paradigm case of bedtime procrastination, could have gone to bed earlier, but chose to watch reruns of *MacGyver* over getting a good night’s sleep. If Sarah had gone to bed at 2 am not because she was watching reruns of *MacGyver*, but because she had to take care of her sick infant, her behavior would not have constituted bedtime procrastination. Likewise, Sarah’s behavior would not constitute bedtime procrastination if she stayed up until 2 am because she suffers from a sleep disorder (e.g., delayed sleep phase disorder) that simply would not allow her to fall asleep before that time. Put this way, bedtime procrastination is restricted to cases in which people are in a position to go to bed but, for some reason, do not. Thus, delaying sleep only constitutes procrastination if the delay in bedtime is needless.



### Criterion 3: Foreseeably Being Worse Off

Finally, an important criterion for procrastination—including bedtime procrastination—is that people should expect to be worse off as a result of their behavior. Prudent delay is not procrastination at all. Indeed, many definitions of procrastination emphasize that delay, next to being needless and voluntary, should have negative consequences, or should be expected to have negative consequences, to qualify as procrastination. Some researchers have suggested that procrastination is accompanied by psychological upset (e.g., Milgram, Gehrman, & Keinan, 1992) or negative emotions (Ellis & Knaus, 1977; Solomon & Rothblum, 1984), while others have emphasized that procrastination involves needlessly delaying an action *despite being worse off as a result of doing so* (Lay, 1986; Steel, 2007).

Notably, we prefer the phrase “foreseeable consequences,” thereby avoiding assuming that people have an explicit belief that things will be worse, or clearly *expect* such outcomes. People who engage in procrastination may not always have this level of insight, particularly in the case of bedtime procrastination. After all, people engage in bedtime procrastination at night, when executive functioning is often impaired as a result of fatigue (possibly combined with the effects of alcohol; Baumeister, 2002), and people’s level of insight in the potential consequences of their behavior is not at its peak. Sarah, for example, is clearly worse off as a result of her bedtime procrastination, but the question is whether she expected this. On our definition, Sarah’s MacGyver-watching can count as procrastination even if she did not explicitly weigh the pros and cons, as long as she meets the counterfactual requirement that, if someone would have stepped in and asked her to reflect on her behavior she would have likely been able to indicate that it would have negative consequences. In many cases of mindless procrastination, one’s subsequent regret expresses one’s acknowledgement that one *could have known* the delay would leave one worse off. (Note that much the same can be said for after-the-fact realizations that one was, indeed, delaying; see Section “Criterion 1.”)

Also, the “foreseeable negative consequences” cannot be established on the basis of actual consequences of bedtime procrastination, given that people sometimes expect negative consequences but do not experience them or elect to delay without being in a position to know that the consequences will be disastrous (Heath & Anderson, 2010). For example, if Sarah were to unexpectedly get a day off from work (e.g., due to a snow day), her MacGyver-watching behavior would still constitute procrastination because she could have reasonably expected to be worse off as a result. Thus, even if

people do not expect to be worse off as a result of procrastinating, but any reasonable person would expect them to be, their behavior would still constitute procrastination. By adding this “reasonable person standpoint,” the definition includes cases in which people stay up until 2 am while having to get up at 6 am, but were too inattentive to foresee that doing so would yield negative consequences. That is, as long as they clearly could have expected these consequences if they had thought about it, and any reasonable person could have recognized that going to bed late will likely make them feel tired, their behavior would still be procrastinatory in nature. In other words, the point is not that the person actually thinks “I am going to regret this” but rather that, with the knowledge available at the moment of procrastinating, it is vastly more likely that the delay will lead to results that are worse than the results of doing it now.

Conversely, bedtime procrastination still counts as procrastination even when the delay ends up having positive results, as when going to bed later than planned leads to an unexpectedly good night of sleep. Unless the results are foreseeable, the fact that they are positive is irrelevant when determining whether something is procrastination or not. In sum, aligning with commonly used definitions of procrastination, bedtime procrastination would then constitute “needlessly and voluntarily delaying going to bed, despite foreseeably being worse off as a result.”

Approaching cases like Sarah’s as procrastination yields interesting new perspectives on sleep insufficiency and its underlying mechanisms. It is important to stress again that going to bed (or sleeping behavior, for that matter) has not been conceived of as a self-regulation or health behavior problem before. This novel perspective thus gives rise to exciting new roads to help people get a better night’s sleep and hence improve their health. Before we continue to speculate on implications for health interventions, we first discuss the prevalence of bedtime procrastination in the general population and dig a bit deeper into the underlying mechanisms of bedtime procrastination as a self-regulation problem.

## **BEDTIME PROCRASTINATION IN THE GENERAL POPULATION**

Of course we do not want to stick to an anecdotal case, without giving attention to bedtime procrastination in the general population. Intriguingly, bedtime procrastination turns out to be a highly prevalent phenomenon: in the representative Dutch sample referred to earlier in this chapter, 74%

of participants indicated going to bed later than planned at least once a week, while no “external reasons” could be held accountable (Kroese et al., 2014b). Within the subsample of bedtime procrastinators, 49% went to bed later than planned three times or more in an average week, with 7% going to bed later than planned on a daily basis. Data from American samples suggest that the high prevalence of bedtime procrastination is not limited to the Dutch cultural context (Kroese et al., 2014a; Nauts et al., 2014), although more research is needed to investigate its prevalence cross-culturally. In sum, these data suggest that people often go to bed later than they could have, should have, and/or intended to. Moreover, bedtime procrastination was strongly related to sleep insufficiency ( $r = 0.61$ ) and daytime fatigue ( $r = 0.46$ ; Kroese et al., 2014a), also after controlling for demographics and the self-reported extent to which external factors such as crying children or medical problems generally make it difficult for people to go to bed on time (Kroese et al., 2014b). Hence, these findings suggest that bedtime procrastination is a prevalent phenomenon that negatively affects sleep-related outcomes.

Not surprisingly, then, bedtime procrastination is also negatively related to well-being. We ran a survey on Amazon’s Mechanical Turk (MTurk) among a sample of 85 US-based adults (42% male; again excluding people who had been treated for sleeping problems and those working nightshifts; Kroese & Nauts, 2015). Well-being was assessed with the WHO-5 Well-Being Index (Heun, Bonsignore, Barkow, & Jessen, 2001). Controlling for demographics and self-perceived physical health, a significant relation was found between bedtime procrastination and psychological well-being ( $\beta = -0.43, p < 0.001$ ). The greater the extent to which people reported going to bed later than intended, the lower their subjective well-being, although part of the effect seemed to be explained by trait self-control (i.e., the ability to inhibit impulses; Tangney, Baumeister, & Boone, 2004) which is a factor known to be associated with both bedtime procrastination and well-being. Similar relations were found between bedtime procrastination and social and emotional health. In sum, these findings show that bedtime procrastination is negatively associated with psychological well-being.

In order to better understand bedtime procrastinators and their motivations, we asked participants in our earlier study (Nauts et al., 2014) to think back to the last time they went to bed late and indicate why they went to bed late. Their answers were coded by two independent raters into categories of “leisure” (e.g., watching TV, playing computer games) or “obligations” (e.g., having to finish work). A majority of 61% of the people

mentioned engaging in leisurely activities, 25% was fulfilling an obligation and 14% did not mention what he or she was doing. Examples of leisure activities mentioned by participants are “Yankees on TV played extra innings,” “I was playing a computer game and time got away from me,” and “I was binge watching *Orange is the New Black* on Netflix.” This corroborates findings by Kroese et al. (2014b) suggesting that people who engage in bedtime procrastination often spend their time watching TV or using the computer. We also coded if people mentioned not going to bed because they did not feel tired (3%), had trouble falling asleep (5%), or were too tired to go to bed (1%). These factors were spontaneously mentioned by a minority of people, corroborating our viewpoint that many people who went to bed late could have gone to bed earlier, but simply did not.

Taking a closer look at our third definitional criterion—foreseeable negative consequences—we asked participants in the same study to write down how they felt the day after they went to bed late. A large majority of participants (79%) spontaneously indicated feeling tired or fatigued as a result of engaging in bedtime procrastination (e.g., a participant mentioned “I felt tired and groggy all day”). Moreover, 27% of participants indicated feeling irritable (e.g., “Tired, frustrated, irritable and unhappy”), and 10% mentioned negative self-based emotions such as guilt or shame (e.g., “guilty,” “I felt drained and tired and ashamed”). Interestingly, 10% of participants mentioned something positive, such as feeling relaxed as a consequence of having some time for themselves (e.g., noticing that they felt “relaxed, comfortable”). If these positive outcomes were foreseen, these instances would not qualify as bedtime procrastination. However, for a large part the positive emotions appeared to have arisen from the fact that people felt better than they anticipated (e.g., “clearer headed than I expected,” “ironically, I feel great today”). In sum, next to the previously discussed broader relationships between bedtime procrastination and well-being, these findings more specifically show how for a majority of bedtime procrastinators unnecessarily going to bed late has a negative impact on well-being right the next day.

Up to this point, we discussed the definition of bedtime procrastination and illustrated the prevalence of this phenomenon in the general population, as well as some consequences of bedtime procrastination for health and well-being. Many readers may have recognized this phenomenon as something they experience themselves or see with others around them. Next, we turn to the underlying mechanisms that may play a role, and that will lead us into a discussion of potential interventions to reduce bedtime procrastination. To this end, we first discuss the association between bedtime

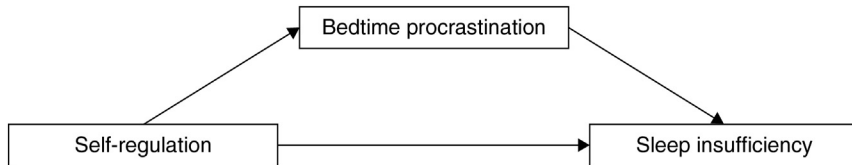
procrastination and general procrastination and some common underlying factors, while also highlighting how bedtime procrastination may be different from other types of procrastination. We then focus on three classes of strategies that may help in combating bedtime procrastination, namely instigating public awareness campaigns about the importance of sleep, teaching people the advantages of engaging in more specific planning, and structuring the environment to be goal conducive. We conclude with a discussion of possible avenues for research that we think will be fruitful.

## **BEDTIME PROCRASTINATION VERSUS GENERAL PROCRASTINATION**

Like other forms of procrastination, going to bed too late involves delaying an intended course of action: in this case, hitting the pillow. In this sense, bedtime procrastination may be a form of procrastination that is in many ways comparable to other forms of procrastination such as academic procrastination, delaying the start of your diet, or procrastinating saving for retirement. In line with this view, there is a rather strong correlation between general procrastination (as measured by Lay's General Procrastination Scale; Lay, 1986) and bedtime procrastination ( $r = 0.60$ , Kroese et al., 2014a), suggesting that people who are more likely to procrastinate in general in their daily life are also more likely to go to bed later than they intended.

One explanation for the association between general procrastination and bedtime procrastination could be that people who have been delaying their duties during the day still need to finish work at night, preventing them from going to bed on time. For example, if someone has to submit a conference abstract before the deadline tomorrow morning, but has been postponing this long-known task such that he or she has still nothing written down when leaving work at the end of the day, the person may end up having no other option than writing it at night, even though it could interfere with an intention to go to bed early. Having said that, our MTurk study discussed earlier revealed that “obligations” were only mentioned by a minority of people as a reason for going to bed late, while fun activities seemed to account for a much larger proportion of bedtime procrastination. Thus, it would not be valid to assume that bedtime procrastination occurs as a mere *consequence* of general procrastination.

The most prominent candidate to explain the relationship between general and bedtime procrastination, then, would be a common underlying personality trait of having low self-control—a personality characteristic that



**Figure 5.1** *Self-regulation is associated with sleep insufficiency through bedtime procrastination (Kroese et al., 2014b).*

reflects the extent to which people are able to resist temptations and inhibit their impulses (Tangney et al., 2004; see Fig. 5.1). Low self-control would be a typical explanation of why people tend to postpone their duties and fail to complete a conference abstract in time, while it would also be plausibly related to being unable to quit doing fun activities (e.g., watching *Orange Is the New Black*) for the sake of other goals such as getting sufficient sleep. General procrastination has indeed been commonly associated with low self-control, and is even considered a typical illustration of it (Baumeister, 2002). Accordingly, bedtime procrastination is also associated with low self-control ( $r = -0.39$ ; Kroese et al., 2014b). A composite measure of scales related to self-regulation (i.e., self-control, conscientiousness, impulsivity and action control) yielded a similar negative relationship to bedtime procrastination ( $r = -0.52$ ; Kroese et al., 2014a). This suggests that people who are generally easily distracted from their long-term goals are also more likely to delay their bedtimes.

In line with these findings, we suggest that, like many other health-related behaviors (e.g., breaking a diet, having unprotected sex, drinking too much alcohol), bedtime procrastination can be regarded as an instance of self-regulatory failure (Baumeister & Heatherton, 1996; van Eerde, 2000; Steel, 2007). Instead of resisting the temptation to look for funny cartoons online or binge-watch a TV show, procrastinators indulge, jeopardizing higher-order goals in the service of immediate gratification. In other words, bedtime procrastination, like other forms of procrastination, often involves “giving in to feel good” (Sirois & Pychyl, 2013), even though doing so may come at the expense of well-being in the near future as well as in the long run (see Chapter 10, Temporal Views of Procrastination, Health, and Well-Being).

An important question in this regard is whether procrastinators give in to temptation deliberately (by *choosing* not to go to bed), or whether lying on the couch watching TV is an act that occurs mindlessly. It is only quite recently that these two separate routes toward self-regulatory

failure—deliberate versus impulsive—have been clearly distinguished. Research on self-regulation failure originally focused on mere impulsive “breakdowns of willpower.” Prominent models of self-regulation distinguish two processes that determine behavior: one impulsive or “hot” route, and one reflective or “cool” route (dual-process models, e.g., [Strack & Deutsch, 2004](#); [Metcalf & Mischel, 1999](#)). Whereas the reflective route is directed by goals and long-term interests, the impulsive route is oriented toward immediate pleasure. According to these models, self-regulatory failure is due to the impulsive system taking precedence over the reflective system, for example, because people are in “hot states” that trigger hedonic orientations and inhibit long-term goals. Examples of such hot states are mental fatigue, being under the influence of alcohol, or being under high cognitive load ([Hofmann, Friese, & Strack, 2009](#)). Thus, (only) when people have sufficient willpower to override their hedonic impulses and favor the reflective system, successful self-regulation should follow. Recent research, however, has challenged the idea that self-regulatory failure is caused by impulsive processes only. Instead, deliberate rationalization processes such as self-licensing have been shown to contribute to goal-disruptive behavior as well ([De Witt Huberts, Evers, & De Ridder, 2014](#)). For example, when people feel they have exerted a lot of effort, when something positive (or negative!) just happened, or when it is a “special occasion,” they may feel licensed to indulge in temptation. This would then not be attributed to a lack of willpower or a dominant impulsive system, but is rather a reasoned route toward self-regulatory failure.

The same line of reasoning may apply to bedtime procrastination. One reason people may not go to bed is because they do not have the willpower to do so (e.g., they are very tired and completely immersed in an engaging game), while another reason may be because they simply do not want to (e.g., they consciously decide they need some extra time to unwind). This is a relevant distinction, not only for the bedtime procrastination context but also for procrastination research in general. For one, these different routes to procrastination may require different types of interventions. In this context, it is interesting to think again about the 10% of participants in the previously discussed study ([Nauts et al. 2014](#)) who mentioned positive consequences of going to bed later than planned. Although the data suggested that for most people the positive consequences were unanticipated, there could be a small subsample who deliberately decide to delay their bedtimes because they give priority to other activities, and who benefit from feeling relaxed after having taken some time for themselves to unwind from their stressful

daily lives. These people would not be bedtime procrastinators, even if their preference for having “slack time” means incurring negative effects on their health. On the other hand, there may be people who deliberately decide to procrastinate while knowing they will regret it the next morning. Thus, in line with recent suggestions in other self-regulatory domains, it seems reasonable to expect that procrastination (general as well as bedtime procrastination) can follow an impulsive or deliberate route. Specifically, people may deliberately come up with excuses as a license to watch just one more episode of their favorite TV show before turning off the TV and turning in, or they may mindlessly keep watching.

## **BEDTIME PROCRASTINATION VERSUS OTHER FORMS OF PROCRASTINATION**

Although bedtime procrastination shares many similarities with other forms of procrastination as pointed to earlier, there may also be several differences. First, procrastination usually involves delaying a task that people find aversive, for example, because it is perceived as boring, frustrating, or anxiety provoking (e.g., [Blunt & Pychyl, 2000](#); [Ferrari, Keane, Wolfe, & Beck, 1998](#); [Milgram, Marshevsky, & Sadeh, 1995](#); [Solomon & Rothblum, 1984](#); [Steel, 2007](#)). Unlike doing the dishes or writing a paper, however, going to bed is unlikely to be considered aversive by a majority of people. In fact, diary studies suggest that sleep has above-average enjoyment ratings ([Gershuny, 2013](#)). Thus, unlike other activities that are often unnecessarily put off, going to bed is not generally considered aversive. Nonetheless, it could be the case that bedtime routines (e.g., flossing, brushing one’s teeth) or morning routines (e.g., going to work while it is still dark out) are aversive to some people, thereby contributing to bedtime procrastination. Alternatively, it may not be the initiation of going to bed but rather having to quit other activities—analogue to the classic negative punishment paradigm whereby the removal of something pleasurable is punishing—is what is aversive. For example, people may not like to stop watching a movie, or may have trouble accepting that the day is over. Thus, whereas the relationship between task aversiveness and procrastination is straightforward for many kinds of procrastination (e.g., academic procrastination, procrastinating on household chores), this relationship may be more complex in the case of bedtime procrastination.

A second difference is that, unlike other types of procrastination, bedtime procrastination is inherently depleting. Depletion refers to the



phenomenon that regulatory resources, or the capacity to control one's behavior (willpower), are drained. Research has consistently shown that once people have used their regulatory resources on one task, they will perform worse on subsequent tasks requiring willpower (Baumeister & Heatherton, 1996; Hagger, 2010). For example, after a long day of work where someone has had to concentrate on a boring task, resist the urge to snap at a colleague, and say "no" to the treats offered during coffee breaks, not much willpower is left to resist the temptation of a scrumptious dessert. Procrastination itself is not depleting; people do not necessarily become more tired or depleted from surfing the web looking for funny videos of cats while they are at work. Bedtime procrastination, on the other hand, occurs at a time of the day when regulatory resources are inherently low (Baumeister & Heatherton, 1996) and, moreover, regulatory resources suffer as a result of sleep deprivation (e.g., by not going to bed, people become more and more depleted; see, for example, Hagger, 2010). Since bedtime procrastination coincides with depletion of resources, it would be a particularly pernicious, self-perpetuating form of procrastination that robs people of the regulatory resources they need to "pull themselves together" to override their impulse and go to bed.

Hence, we think of bedtime procrastination as a particular form of procrastination that shares a common ground with general procrastination but also has some distinct properties. These warrant specific research attention in future studies to be able to further understand this novel phenomenon that appears to be a relevant contributor to insufficient sleep.

## POSSIBLE INTERVENTIONS

So far, we have argued that (1) sleep insufficiency is a serious health issue that has a behavioral component; (2) conceptualizing going to bed late—cases such as Sarah's—as a form of procrastination helps to shed light on underlying mechanisms; and (3) empirical data support the conceptual associations between bedtime procrastination and general procrastination, thereby confirming that it is related to self-regulation.

As touched upon before, introducing procrastination as a novel perspective from which to approach sleep insufficiency sheds light not only on the underlying mechanisms but also on potentially effective strategies for addressing this health issue. Based on our conceptualization of bedtime procrastination as a self-regulation issue, we see a number of possible routes toward getting people to go to bed earlier. Specifically, interventions may

be most promising if they focus on helping people align their behavior with their intentions. Importantly, this does not mean that everyone should sleep at least 8 h a night or go to bed before midnight; rather, this is about supporting interventions that could help people self-regulate more effectively by scaffolding (backing up) people's own intentions, regardless of whether they prefer to make long nights and go to bed at 10 pm or they need less sleep but feel they should still hit the pillow before 1 am.

As a starting point, [Pychyl \(2013\)](#) listed a number of intervention strategies that could be helpful in reducing (general) procrastination. It is good to note here, however, that there has been surprisingly little empirical research on interventions targeting general procrastination. Most procrastination research seems to have focused on identifying procrastinators based on personal characteristics or investigating contributing factors to, and outcomes of, procrastination. Hence, before beginning to discuss potential interventions for bedtime procrastination specifically, we suggest that more research attention should be devoted to how procrastination can be reduced. Having said that, we will consider a number of the suggested strategies by [Pychyl \(2013\)](#) for our specific case of bedtime procrastination.

## Raising Awareness

An essential starting point should be awareness. Given that sleeping behavior does not appear to be on the top of people's minds when they are thinking about health—as illustrated earlier in this chapter—it may be worthwhile to raise awareness about the negative health and well-being consequences of sleep insufficiency. In our view, awareness should specifically be directed to improving people's insights into their own behavior. When asked, a strikingly large number of people indicate sleeping too little and going to bed too late, yet going to bed earlier is not typically considered something they might change. Monitoring one's own behavior, and noting the discrepancy between one's current state and a desired state, is indeed considered an essential first step in the process of self-regulation according to cybernetic models (e.g., [Carver & Scheier, 1998](#)). For example, research in the domain of eating behavior illustrated that just monitoring behavior by keeping food intake diaries already led to behavior change (i.e., eating less unhealthily; [Verhoeven, Adriaanse, De Vet, Fennis, & De Ridder, 2014](#)). Translating this to the domain of bedtime procrastination, what would be needed is for people to more explicitly think about their evening routines and how that aligns with their sleeping preferences. For example, people could ask themselves what their intended bedtime would actually be, what they will be

doing during the evening, why they could potentially end up delaying going to bed, and how they would feel about it the next day if they did.

## Planning

A second strategy that has proven effective for other self-regulation problems is making effective plans. As alluded to previously, many people seem to have no explicit plans regarding the specific time they would like to go to bed, even though they realize in hindsight that they may have gone to bed “too late.” This lack of planning may constitute an important part of the problem, because it makes it difficult to monitor “in the heat of the moment” whether behavior is in accordance with one’s intentions. For example, if people intend to go to bed on time without specifying a *specific* time or situation, they may not realize whether “on time” has already passed when they are in the middle of a movie or computer game. It has been often demonstrated that specific planning greatly increases the alignment of intentions and actual behavior (Gollwitzer, 1999). Particularly, the use of specific if-then plans, known as *implementation intentions* has shown to be effective in boosting behavior in a wide range of domains including recycling (Holland, Aarts, & Langendam, 2006), taking vitamin pills (Sheeran & Orbell, 1999), going to a medical screening (Sheeran & Orbell, 2000), and reducing unhealthy snacking (Adriaanse, de Ridder, & de Wit, 2009).

Implementation intentions are effective because of two underlying mechanisms (Webb & Sheeran, 2007). First of all, if-then plans specifying a situation (the “if”) and a behavior (then) help to make this critical situation more salient as a good opportunity to perform the behavior. For example, specifying that a person will go to bed at 11 pm or after the “Tonight Show with Jimmy Fallon” has finished will provide this person with a clear cue to act once he or she encounters these respective situations. The second underlying mechanism is that the if-then format of the plan yields a mental association between these two parts, that is, the situation and the behavior. This means that when the “if” situation arises (e.g., the Tonight Show is over), the planned behavior (e.g., going to bed) automatically comes to mind (Webb & Sheeran, 2007). Without having to deliberate about the planned behavior, people will then automatically perform the intended path of action.

We suggest that, in line with the impressive results found for other self-regulation issues, implementation intentions could be an effective strategy to reduce bedtime procrastination. As previously illustrated, a typical implementation intention might look like this: “if the Tonight Show is over,

then I will go and brush my teeth.” Challenges for a successful application of this strategy are to identify good if-statements, and to formulate clear then-statements. The “if” needs to refer to a situation that is concrete and unambiguous (e.g., “if I come back from walking the 11 o’clock walk with the dog” would be better than “if I feel like it”). At the same time, there is a trade-off between specificity and flexibility in the formulation of good action plans: putting a specific situation in the if-part of the plan makes it more likely that solid mental associations are established and that the plan will be executed (e.g., [Van Osch, Lechner, Reubsat, & Vries, 2010](#)); however, if the situation is too specific, the plan may lose flexibility. For example, the bedtime implementation intention example provided earlier (if the Tonight Show is over...) would not work when the show does not air (e.g., on Sundays) or when someone is away from home that night. Thus, a good plan needs to be specific enough to involve clearly identifiable cues, and flexible enough to allow for its execution in various situations. As for the then-part of the implementation intention, the literature suggests that it could both refer to concrete behavior (e.g., brushing one’s teeth, starting one’s bedtime routine) or to the overarching goal (e.g., going to bed on time). While the effectiveness of implementation intentions in the specific context of bedtime procrastination remains to be empirically tested, we think this is a type of intervention well worth pursuing.

### **Adapting the Environment**

A third route toward reducing bedtime procrastination would be to adapt the environment in such a way that the presence of temptations is limited and/or people are automatically and subtly reminded of their bedtimes. Similar to throwing out cigarettes when trying to quit smoking, or refraining from buying large bags of crisps when on a diet, removing temptations from the environment could work well in the case of bedtime procrastination. For example, the use of electronic devices has been highlighted as a factor that disturbs natural sleeping patterns ([Wood, Rea, Plitnick, & Figueiro, 2013](#)). This is due to two reasons. First, electronic devices have a bad reputation for interfering with sleep because of the emission of blue light that disturbs the process of melatonin production and consequently affects people’s circadian rhythms ([Chang, Aeschbach, Duffy, and Czeisler \(2015\)](#)). A second reason, which is more relevant for our current behavioral perspective, is that people get immersed in entertaining videos, games, or online social activities: these alluring temptations make people forget about time, making it difficult to stick to their good intentions. An intuitive solution, then, would be to limit

the use of such devices during evening hours. Indeed, this form of *stimulus control* has been advocated by researchers and professionals in the field of sleep disorders (Morin et al., 1999), and is also a typical self-regulation strategy in other health contexts, such as unhealthy eating (Berkel, Poston, Reeves, & Foreyt, 2005).

Additionally, the environment could be used to provide cues that act as reminders for people's bedtime intentions. For example, a signal in the room (e.g., a noise, a light) at a certain time in the evening could remind people that it is time to go to bed. This could be a successful strategy especially when this cue would be automatically linked to the behavior: as soon as you see the lights turn purple, you get up to go to bed. This way, people do not need to deliberate on when they should go to bed, which would require too much cognitive effort of people when they are already tired. This automatic activation of the desired behavior can either be established by *creating* an association between an environmental cue and the intended behavior, similar to the implementation intention procedure described earlier, or by using cues that have a *natural* association with going to bed, such as dimming lights. Again, the purpose would be to trigger the intended behavior without requiring deliberative effort. This is important since self-regulation strategies that rely on sheer strength of will are likely less effective, particularly in the long run (Baumeister, 2002). As alluded to earlier, this may especially be true when targeting bedtime behavior, because the end of the day is a typical state in which self-regulatory resources are low. Thus, strategies to prevent bedtime procrastination should essentially *make it easier* for people to perform the desired behavior (for a discussion of environmental approaches to reducing procrastination, see Chapter 3, Structured Non-procrastination: Scaffolding Efforts to Resist the Temptation to Reconstruct Unwarranted Delay).

## AVENUES FOR FUTURE RESEARCH

Research on bedtime procrastination is still in its infancy. At the same time, in light of the negative consequences of sleep insufficiency, knowledge about contributing factors and potential solutions to bedtime procrastination could have important implications in terms of health and well-being. Therefore, we strongly advocate paying more attention to sleep as a *health behavior*. That is, we contend that insufficient sleep should not only be studied in clinical subgroups, but also in the general population. Moreover, besides biological and environmental factors that may play a role, it is now

time to also consider behavioral aspects of getting too little sleep. In fact, sleep should receive a similar status as healthy eating and exercising both in terms of research efforts but also as a point of attention for health professionals working in the field. As some first guidelines, we suggest three avenues for future research that may be particularly fruitful.

First, it would be worthwhile to further explore people's reasons for engaging in bedtime procrastination. In particular, it would be interesting to consider if the two routes of self-regulation failure described earlier—impulsive versus deliberate—can also be distinguished for bedtime procrastination. People who deliberately decide to stay up may require different intervention strategies than people who impulsively let themselves get lured into all kinds of activities instead of going to bed. For example, for the former group, the problem may lie in an incongruence between how they expect to feel after a short night's sleep and how they actually feel. On the other hand, the impulsive types may instead have issues with reminding themselves of their intentions since they do not reflect on their behavior while in the middle of fun activities. Hence, insight into the reasons for bedtime procrastination is necessary for understanding where and how to intervene when aiming to reduce this behavior.

Second, research should be devoted to the connection between biological and behavioral factors related to sleeping. For example, as evening types are known to experience more difficulties going to bed on time (i.e., "on time" in terms of their social schedule as discussed earlier), it is likely that an association between chronotype (i.e., the manifestation of people's circadian rhythms) and bedtime procrastination would be found. Indeed, initial data suggest that this is the case, although bedtime procrastination still explains a unique proportion of insufficient sleep on top of what is explained by individual chronotypes (Broers, 2014). It would be interesting to see how biological and actual bedtimes interact: do people tend to go to bed late because they do not feel physically tired yet, implying that disturbed circadian rhythms may contribute to the development of bedtime procrastination; or could it also be vice versa—that people go to bed late despite their body telling them it is bedtime earlier, thereby creating a mismatch between biological and actual bedtimes and potentially contributing to further circadian rhythm disturbances? This is mere speculation at this point, but distinguishing between people who go to bed late because they are actually not tired versus those who are tired but still do not go to bed may yield important implications for understanding various sleep problems, especially since the research focus so far has mostly been on biological determinants.

A third avenue for future research pertains to investigating potential interventions to deal with bedtime procrastination. In the previous section we outlined a number of potentially promising interventions based on the self-regulation literature. Testing the effectiveness of such interventions not only has clear practical relevance, but also allows for the exploration of interesting theoretical questions. For example, how should interventions optimally be designed to be effective in states of low self-control? This is a question that would be relevant in a much broader context of (health) interventions, although it has hardly received any explicit empirical attention so far. Some first insightful work has illuminated how the characteristics of low self-control states (i.e., being more impulsive and sensitive to environmental cues) can actually be used to people's benefit: interventions could install cues to which people are impulsively drawn to steer them toward the desired behavioral choice. [Salmon, Fennis, de Ridder, Adriaanse, and De Vet \(2014\)](#), for example, showed that people with low self-control are particularly susceptible to an intervention promoting healthy food choices by *heuristics* (i.e., decisional shortcuts that are especially appealing to people who do not have the cognitive resources to deliberate; [Tversky & Kahneman, 1974](#)), even to the extent that people with low self-control were led to make healthier choices than those with high self-control—a very atypical but highly intriguing result. Given the evening context in which bedtime procrastination occurs, these and other questions may be worthwhile to explore in this novel behavioral context.

## CONCLUSION

In this chapter, we discussed how a specific form of procrastination can affect health and well-being. Introducing bedtime procrastination as a predictor of getting insufficient sleep, we advocate going to bed on time being included in the list of behaviors that are typically studied in the context of healthy lifestyles. Considering going to bed from a self-regulation perspective yields interesting new leads for understanding and trying to reduce this self-undermining form of procrastination.

## ACKNOWLEDGMENTS

The work for this chapter was supported by the Dutch Technology Foundation STW, which is part of the Netherlands Organization for Scientific Research (NWO), and which is partly funded by the Ministry of Economic Affairs. The authors are grateful to Fuschia Sirois and members of the self-regulation lab (Utrecht University) for their helpful comments on earlier versions of this chapter.

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