The Aftermath of Rash Action: Sleep-Interfering Counterfactual Thoughts and Emotions

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ABSTRACT

A consistent body of evidence suggests that excessive cognitive activity at bedtime is a key factor in insomnia. It is generally assumed that sleep-interfering cognitions are affect laden, but still little is known about the precise nature of the affective processes that are involved. The present study sought to explore the role of counterfactual thinking and counterfactual emotions (regret, shame, and guilt) in insomnia as a function of impulsivity. It was hypothesized that when retiring for the night, individuals scoring high on urgency review their rash daytime behavior and are therefore likely to engage in counterfactual thinking and to experience associated feelings of regret, shame, and guilt. A sample of 101 undergraduate students completed three questionnaires: the UPPS Impulsive Behavior Scale, the Bedtime Counterfactual Processing Questionnaire, and the Insomnia Severity Index. Results indicated that both urgency and counterfactual processing were related to insomnia severity and that the effect of urgency on insomnia was mediated by counterfactual processing. These findings reveal for the first time that impulsivity relates to counterfactual cognitive-affective processing and that this type of processing contributes to sleep disturbances.

Insomnia can be considered as one of the most widespread health problems. In a recent survey of the National Sleep Foundation, 65% of the respondents indicated that, within the past year, they had experienced at least one symptom of insomnia a few nights a week or more often (National Sleep Foundation, 2008). Over the last 3 decades, cognitive approaches have led to significant advances in the modeling of insomnia (e.g., Harvey, Tang, & Browning, 2005). According to these approaches, excessive cognitive activity at bedtime may be viewed as the main "enemy" of good sleep because it interferes with processes of de-arousal necessary for falling asleep.

Cognitive accounts of insomnia generally assume that inadequate emotional processing during the day will result in a surge of affect-laden concerns during the presleep period, thereby fueling excessive negatively toned cognitive activity (e.g., Harvey, 2002). Recently,

studies have begun to buttress these claims by showing that to cope with stress, insomniacs rely on emotion-focused strategies more often than good sleepers do (e.g., LeBlanc et al., 2007). In general, however, a surprising scarcity of research into the precise nature of affective experiences of insomniacs both during the daytime and at night may be noted. For instance, Harvey (2002) observed in her review of the literature that only one previous study (Kuisk, Bertelson, & Walsh, 1989) had specifically assessed the valence of presleep cognitive activity, with insomniacs reporting more negative mentation than good sleepers did.

In the present study, we sought to determine whether counter- factual thoughts and emotions might occur during the presleep period and contribute to sleep disturbances. Regret, shame, and guilt are generally conceptualized as counterfactual emotions (e.g., Zeelenberg & Pieters, 2007) because they involve comparing reality with imagined alternatives (Kahneman & Miller, 1986). For instance, it has been shown that these emotions are uniquely associated with endorsement of the appraisal item "you wished you had not done something, or that you could undo it" (Frijda, Kuipers, & ter Schure, 1989), suggesting that counterfactual thinking is inherent in these affective experiences. Given that bedtime may be the first quiet period in the course of the day available to review one's behavior, we hypothesized that this time window might be particularly suitable for the emergence of counterfactual thinking and related feelings of regret, shame, and guilt.

Even though the three emotions often arise in similar situations and easily amalgamate with each other, they differ in several respects (e.g., Tangney & Dearing, 2002). Shame and guilt are typically experienced in interpersonal contexts and involve internal attributions of negative events, such as moral failures or transgressions. Nevertheless, whereas shame implicates concern with others' evaluation of the self (focus on the "bad self"), guilt implicates concern with one's effect on others (focus on "bad behavior"). Correspondingly, the experience of shame is characterized by feeling exposed, small, worthless, and powerless, as well as by a desire to hide, escape, or strike back. The experience of guilt, in contrast, typically features feelings of tension and remorse, which translate into a desire to confess, apologize, or repair. Resembling shame and guilt, regret also involves internal attributions of negative events (e.g., Gilovich & Medvec, 1995). However, it arises not only in social contexts but also in nonsocial settings, for example, following impulse purchases (e.g., Spears, 2006). Crucially, regret seems to result from the impression of having occasioned *intra*personal rather than *inter*personal harm and is typically accompanied by such action tendencies as to "kick oneself" and to correct one's mistake (Berndsen, van der Pligt, Doosje, & Manstead, 2004).

Various types of individual differences in the propensity for counterfactual processing have been described in the literature (e.g., Sanna, Carter, & Small, 2006), but as far as we know, impulsivity has never been considered in this regard. However, when Gilovich and Medvec (1994) asked their participants what they regretted most in their lives, the most common regret of action was "rush in too soon"—a behavior potentially linked to impulsive rash action. In a recent investigation, we found that propensity for rash action, also termed urgency (Whiteside & Lynam, 2001), predicted insomnia and that the effect of urgency on insomnia was partially mediated by negatively toned hypnagogic and dreamlike mentation (Schmidt, Gay, & Van der

Linden, 2008). Taken together, these two lines of evidence suggest that rash individuals might be particularly susceptible to engage in counterfactual thinking and to experience counterfactual emotions at bedtime, that is, to get caught up in a state of cognitive and emotional activation likely to interfere with the process of falling asleep.

In short, the present study sought to test the following three hypotheses: (1) Impulsive urgency is linked to the frequency of counterfactual thoughts and emotions (regret, shame, and guilt) at bedtime; (2) the frequency of counterfactual thoughts and emotions at bedtime is linked to insomnia severity; and (3) the previously found effect of urgency on insomnia severity (Schmidt et al., 2008) is at least partially mediated by the frequency of counter-factual thoughts and emotions at bedtime.

Method

PARTICIPANTS AND PROCEDURE

There were 101 undergraduate students of psychology at the University of Geneva (94 women and 7 men), aged 18 to 45 (M = 22.06; SD = 5.95), who completed the questionnaires described hereafter. The students participated to fulfill a course requirement and were assessed in groups of up to 40 people.

MEASURES

Impulsive Behavior Scale (UPPS). The French version of the UPPS Impulsive Behavior Scale (Van der Linden et al., 2006) was used to evaluate impulsivity. The UPPS contains 45 items that are rated on a 4-point Likert scale ranging from 1 (*agree strongly*) to 4 (*disagree strongly*). It comprises four subscales corresponding to the four distinct, yet related, facets of impulsivity as identified by Whiteside and Lynam (2001): (1) urgency (e.g., "When I am upset I often act without thinking"); (2) (lack of) premeditation (e.g., "I usually make up my mind through careful reasoning"); (3) (lack of) perseverance (e.g., "Once I start a project, I almost always finish it"); and (4) sensation seeking (e.g., "I welcome new and exciting experiences and sensations, even if they are a little frightening and unconventional"). Answers to some items are reversed so that higher scores always indicate a higher level of impulsivity. Both the English and the French versions of the UPPS have evidenced robust four-factor dimensionality and sound internal consistency for each subscale (Cronbach's alpha range = .77 to .91). Attesting to the concurrent validity of the UPPS, urgency and lack of perseverance have been shown to relate to distinct inhibitory functions in behavioral tasks (Gay, Rochat, Billieux, d'Acremont, & Van der Linden, in press).

Bedtime Counterfactual Processing Questionnaire. The Bed- time Counterfactual Processing Questionnaire (BCPQ) was developed by the first author of this study to assess the frequency of counterfactual thinking and attendant feelings of regret, shame, and guilt during the presleep period. In a pilot phase, a series of questions on counterfactual thoughts and emotions occurring at bedtime were repeatedly tested on native French speakers who were invited to comment on the wording of the items. Based on the comments and ratings of these participants, seven items were retained for the BCPQ. The questions are preceded by the

following instruction: "When in bed in the evening, one sometimes reviews the day that has just come to an end. Hereafter, please indicate how often different kinds of thoughts occur to you as you are trying to get to sleep." The wording of the seven items is as follows: (1) "After going to bed, how often do you regret your behavior toward others?"; (2) "After going to bed, how often do you think: 'If only I had made another choice!'"; (3) "After going to bed, how often do you feel guilty because you have the impression of having done wrong to others?"; (4) "After going to bed, how often do think: 'If only I were more prudent!'"; (5) "After going to bed, how often do you feel ashamed of yourself because of your behavior?"; (6) "After going to bed, how often do you imagine how you would have liked to behave, but did not?"; and (7) "After going to bed, how often do you feel preoccupied with the consequences of your behavior toward others?" Answers are given on a 5-point Likert scale ranging from 0 (*almost never*) to 4 (*very often*). Analyses revealed that the BCPQ captures a single dimension and possesses high internal consistency (see below).

Insomnia Severity Index. The French version of the Insomnia Severity Index (ISI) (Blais, Gendron, Mimeault, & Morin, 1997) was used to evaluate sleep impairment. The ISI contains seven items that are rated on a 5-point Likert scale ranging from 0 (*none* [Items 1a to 1c]; *very satisfied* [Item 2]; *not at all* [Items 3 to 5]) to 4 (*very* [Items 1a to 1c]; *very dissatisfied* [Item 2]; *very much* [Items 3 to 5]). Respondents are asked to evaluate the following dimensions of insomnia: (1) severity of insomnia (difficulty falling asleep, difficulty staying asleep, problem waking up too early); (2) satisfaction with current sleep patterns; (3) interference with day- time functioning; (4) noticeability of impairment to significant others; and (5) level of distress caused by the sleep problem. Total scores range from 0 to 28, with higher scores indicating higher perceived insomnia severity. The French version of the ISI has been shown to possess good internal consistency (α = .88) and to correlate strongly (r = .67) with the Pittsburgh Sleep Quality Index (PSQI; Blais et al., 1997; Buysse, Reynolds, Monk, Berman, & Kupfer, 1989). Concurrent validity of the ISI has also been demonstrated using other-administered versions of this instrument and polysomnography (Bastien, Vallières, & Morin, 2001). In addition to the ISI, two questions of the PSQI were used in the present study: Item 5h ("During the past month, how often have you had trouble sleeping because you had bad dreams?") and Item 7 ("During the past month, how often have you taken medicine [prescribed or "over the counter"] to help you sleep?"). Answers to these items are given on a 4-point Likert scale ranging from 0 (*not during the past month*) to 3 (*three or more times a week*).

Results

PRELIMINARY ANALYSES

Cronbach's alpha coefficients, mean scores, and standard deviations for the UPPS, the BCPQ, and the ISI were as follows: UPPS urgency (α = .87, M = 29.15, SD = 6.57); UPPS lack of premeditation (a = .87, M = 21.85, SD = 5.07); UPPS lack of perseverance (α = .84, M = 19.59, SD = 4.43); UPPS sensation seeking (α = .86, M = 30.19, SD = 7.63); BCPQ (α = .87, M = 12.15, SD = 6.02); ISI (α = .83, M = 10.77, SD = 5.79). Given that the BCPQ constitutes a novel instrument, we investigated its structure by means of a scree-plot and an

exploratory factor analysis using the maximum likelihood estimator. Results indicated that responses to this questionnaire are best reflected by a single-factor solution accounting for 49.7% of the variance. The factor loadings ranged from .59 (Item 4) to .84 (Item 3).

According to the norms for the ISI provided by Bastien et al. (2001), 33.7% of our participants did not show any sign of clinically significant insomnia (score range [Bastien et al.] = 0 –7), 39.6% gave evidence of subthreshold insomnia (range = 8 –14), 21.8% could be considered as suffering from moderate clinical insomnia (range = 15–21), and 5.0% obtained scores indicating severe clinical insomnia (range = 22–28). Regarding the two PSQI questions, 55.4% of our participants reported not having had trouble sleeping as a result of bad dreams during the past month, whereas 27.7% indicated having had such problems less than once a week, 7.9% once or twice a week, and 8.9% three or more times a week. Finally, 5.0% of our participants reported having taken medicine to help them sleep during the past month.

CORRELATIONAL ANALYSES

Pearson correlations between the four UPPS subscale scores, the BCPQ total score, the ISI total score, and the PSQI Item Score 5h (reflecting the frequency of sleep-interfering dreams) are presented in Table 1. As can be seen, urgency was the only facet of impulsivity to be significantly linked to bedtime counterfactual processing ($r = .54$, $p < .001$), as well as to insomnia severity ($r = .27$, $p < .01$). Moreover, urgency was also significantly associated with sleep-interfering dreams ($r = .33$, $p < .001$), as was, to a lesser degree, lack of perseverance ($r = .27$, $p < .01$).

Bedtime counterfactual processing was significantly related to insomnia severity ($r = .39$, $p < .001$) and to sleep-interfering dreams ($r = .40$, $p < 001$). Finally, as might be expected in view of the one dimensional structure and high internal consistency of the BCPQ, the three items assessing bedtime counterfactual emotions were closely intercorrelated (regret and shame: $r = .47$, $p < .001$; regret and guilt: $r = .68$, $p < .001$; shame and guilt: $r = .57$, $p < .001$).

REGRESSION AND MEDIATION ANALYSES

To explore whether the effect of urgency on insomnia severity was mediated by bedtime counterfactual processing, we computed a mediation analysis following the principles set out by Baron and Kenny (1986). Results were as follows: (1) Urgency affected frequency of bedtime counterfactual processing ($\beta = .54$, $t = 6.40$, $p < .001$); (2) urgency affected insomnia severity ($\beta = .27$, $t = 2.82$, $p < .01$); (3) frequency of bedtime counterfactual processing affected insomnia severity ($\beta = .34$, $t = 3.08$, $p < .01$) when the latter was simultaneously regressed on urgency ($\beta = .089$, $t = 0.81$, $p = .42$), the adjusted R^2 for this model being .14, $F(2, 98) = 9.08$, $p < .001$); and (4) according to the Sobel test, the mediator-related reduction in the effect of urgency on insomnia severity was significant ($Z = 2.77$, $p < .01$).

The mediation analysis thus suggested that frequency of bedtime counterfactual processing mediated the relation between urgency and insomnia severity (see Figure 1).[1]

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[1] *Following the suggestion of an anonymous reviewer, we conducted confirmatory factor*

Discussion

The results of the present study indicate that impulsive rash action entails a surge of counterfactual thoughts and emotions (regret, shame, and guilt) at bedtime, thereby contributing to insomnia. More specifically, our findings may be summarized as follows: (1) Urgency—the propensity toward rash action—was the only facet of impulsivity to be associated with the frequency of counterfactual thoughts and emotions at bedtime and with insomnia severity; (2) the frequency of counterfactual thoughts and emotions at bedtime was associated with insomnia severity; and (3) the effect of urgency on insomnia severity was mediated by the frequency of bedtime counterfactual thoughts and emotions.

As straightforward as it may seem that rash action entails feelings of regret, shame, and guilt, neither impulsivity in general nor urgency in particular has previously been considered as a "risk factor" for counterfactual emotions. Some indications, however, have long since pointed at a possible link between impulsive behavior and regrets: As mentioned in the introduction, Gilovich and Medvec reported as early as 1994 that the most commonly endorsed category of lifetime regrets of action was "rush in too soon." In what might look like a self-contradictory move, the same authors suggested one year later in a review article that to better manage their regrets, "people should be encouraged to act on their impulses more often" (Gilovich & Medvec, 1995, p. 393). This seeming paradox resolves itself once the distinction between regrets of action and those of inaction is taken into account: Gilovich and Medvec referred to the latter, which, according to their research, tend to gather momentum in the long run and are therefore most prominent when people look back on their lives. Taken together, their findings and ours suggest that impulsive urgency might be linked to regrets of commission rather than those of omission—an intriguing hypothesis calling for further investigation.

Our finding that the effect of urgency on insomnia severity was mediated by the frequency of counterfactual thoughts and emotions at bedtime extends the results of the study of Schmidt et al. (2008). This latter study revealed a relation between urgency, negatively toned nighttime mentation, and sleep disturbances, but it left the question of the nature of the sleep-interfering mentation unanswered. The fact that, in the present study, both urgency and bedtime counterfactual processing were also significantly linked to the frequency of sleep-interfering dreams suggests, in accord with the findings of McNamara, Andresen, Arrowood, and Messer (2002), that counterfactual operations continue during sleep and may manifest themselves on the mental stage of the dreamer. In view of these findings, an important challenge for future research will be to compare levels of counterfactual processing in daytime and nighttime

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analyses to determine whether shared method variance (resulting from the combined use of three questionnaires) could partially account for the correlations between urgency, bedtime counterfactual pro- cessing, and insomnia. Results revealed that adding a shared-method-variance factor to the model depicted in Figure 1 did not significantly improve the adjustment to the data ($Ay^2 = 5.59$, df = 4, p > .23), suggesting that the correlations between the three constructs cannot be attributed to a common underlying factor.

mentation.

Table 1 - *Pearson Correlations Between the UPPS (Subscale Scores), the BCPQ (Total Score), the ISI (Total Score), and the PSQI (Item Score 5h)*

Variables	1	2	3	4	5	6	7
1 UPPS urgency	1						
2 UPPS lack of premeditation	.37***	1					
3 UPPS lack of perseverance	.18	.45***	1				
4 UPPS sensation seeking	.05	.17	−.19	1			
5 BCPQ total score	.54***	.08	.15	−.16	1		
6 ISI total score	.27**	.06	.16	−.09	.39***	1	
7 PSQI item score 5h (bad dreams)	.33***	.14	.27**	−.06	.40***	.36***	1

Note. UPPS = impulsive Behavior Scale; BCPQ = Bedtime Counterfactual Processing Questionnaire; ISI = Insomnia Severity Index; PSQI = Pittsburgh Sleep Quality Index.

×× Significant at the 0.01 level. ××× Significant at the 0.001 level (two-tailed).

Figure 1. *Mediation analysis for the effect of urgency on insomnia severity. Standardized coefficients are given for the simple regression analyses and the multiple regression analysis (in parentheses).*
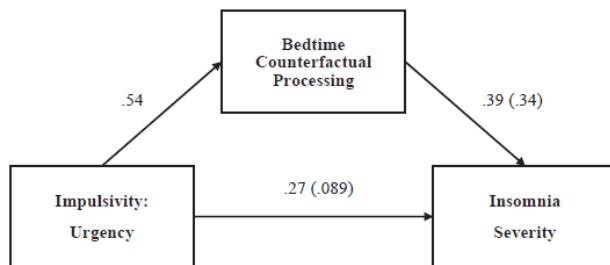
We hypothesized in the introduction that bedtime may be the first quiet period available to review one's daytime behavior and that this time window might therefore be particularly suitable for the emergence of counterfactual thoughts and emotions. However, lack of time to review one's behavior may not be the only reason for lower levels of counterfactual processing in daytime mentation: Because counterfactual emotions are aversive, people may be motivated to actively avoid them, for example, by engaging in suppression (e.g., Zeelenberg & Pieters, 2007). Yet given that such emotion regulation strategies suppose attentional control processes and that the latter are undermined by the sleep-related deactivation of the prefrontal cortex (Muzur, Pace-Schott, & Hobson, 2002), the use of these strategies may result in a rebound of previously avoided content as sleep sets in (Schmidt & Gendolla, 2008). Experience sampling methods offer a viable approach for testing this hypothesis by tracking circadian variations of counterfactual processing. These methods might also help detect whether the higher frequency of bedtime counterfactual mentation in rash- action-prone individuals reflects a higher number of instances of impulsive daytime behavior, a more

pronounced propensity to engage in counterfactual processing, or both.

Further research efforts are also needed to explore how impulsivity is related to distinct types of counterfactual processing and how each of them may contribute to insomnia. As detailed earlier, our analyses revealed that the BCPQ captures a single experiential dimension that includes the proneness for end-of-the-day feelings of regret, shame, and guilt. In light of the substantial overlap in the types of events and behaviors that give rise to these emotions and their partially shared appraisal profile, close associations between these emotions were to be expected and are in line with previous findings indicating their co-occurrence (e.g., Zeelenberg & Pieters, 2007). However, these emotions also differ in several respects that are directly relevant to their relations with impulsivity.

For instance, shame-prone individuals are more likely to experience intense anger, to express that anger in destructive ways, to engage in risky or antisocial behaviors, and to suffer from a wide variety of psychological symptoms (e.g., Tangney, Stuewig, & Mashek, 2007). Moreover, it has recently been shown that shame can trigger impulsive-compulsive, urge-related behaviors, such as overeating and substance use (Abramowitz & Berenbaum, 2007). Guilt, in contrast, typically motivates individuals to take reparative action and is inversely related to antisocial and risky behaviors (e.g., Tangney et al., 2007). Regarding regret, it has been found to either promote or inhibit urge-related actions (e.g., impulse purchases), depending on whether individuals preferentially seek to avoid future regrets about missed short-term gratifications or about foregone longer-term advantages (Spears, 2006).

Taken together, the available evidence suggests that although regret, shame, and guilt may likewise arise in the wake of failures and moral transgressions, they differ markedly in the behavioral outcomes that they promote. Impulsivity-driven shame might be particularly pernicious because it potentially sets into motion a vicious circle, with rash behavior fueling shame and shame in turn unleashing reckless behavior. Moreover, such a spiral of shame might result in prolonged sleep loss, and the latter may further undermine impulse control through a process of resource depletion (Baumeister, Vohs, & Tice, 2007). An intriguing question for future research is whether the comparatively higher levels of shame-proneness that are typically observed in women (Tangney & Dearing, 2002) may contribute to the higher prevalence of insomnia in this gender (e.g., National Sleep Foundation, 2008). If so, women's sleep quality in particular might be enhanced by interventions that help shift maladaptive shame reactions toward more adaptive guilt responses (cf. Dearing, Stuewig, & Tangney, 2005). A guilt-oriented emotional response style, albeit potentially sleep-disruptive in the short run, may prove sleep-protective in the long run because of its well-documented tendency to translate counterfactual processing into reparative action.

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