

Validation of a French version of the thought control questionnaire-insomnia revised (TCQI-R)

Validation d'une version française du questionnaire révisé de contrôle mental-insomnie

R.E. Schmidt^a, P. Gay^b, M. Van der Linden^{ab}

^a*Cognitive Psychopathology and Neuropsychology Unit, Department of Psychology, University of Geneva, 40, boulevard du Pont-d'Arve, CH-1205, Geneva, Switzerland*

^b*Swiss Center for Affective Sciences, University of Geneva, 7, rue des Batoirs, CH-1205, Geneva, Switzerland*

KEYWORDS: Insomnia; Mental control; Thought suppression; Worry

ABSTRACT

Counterproductive strategies of mental control are assumed to contribute to excessive cognitive activity, thereby exacerbating sleep disturbances. The present study examined the psychometric properties of a French version of the thought control questionnaire-insomnia revised (TCQI-R; Ree, M.J., Harvey, A.G., Blake, R., Tang, N.K.Y., Shawe-Taylor, M., 2005. Attempts to control unwanted thoughts in the night: development of the thought control questionnaire-insomnia revised (TCQI-R). *Behaviour Research and Therapy* 43, 985-998.), a new instrument designed to capture different strategies of thought management that people use when trying to fall asleep. Analysis of the responses of 298 adults replicated the six-factor solution involving aggressive suppression, behavioral distraction, cognitive distraction, reappraisal, social avoidance, and worry. The corresponding subscales showed sound internal consistency. Further, all thought control strategies correlated significantly with some facets of insomnia, with aggressive suppression and worry being most strongly related to sleep disturbances. These findings suggest that the French TCQI-R constitutes a valuable instrument for investigating the implications of mental control in insomnia.

1. Introduction

A growing body of evidence suggests that unwanted intrusive thoughts are a common denominator of a wide range of clinical disorders, including post-traumatic stress disorder, phobias, depression, obsessive-compulsive disorder (OCD), and insomnia (for a review, see [Clark, 2005](#)). In an attempt to control unwanted cognitions, people spontaneously rely on thought management techniques such as suppression, distraction or reappraisal. While

some of these strategies may prove helpful, others are likely to perpetuate or even exacerbate unwelcome mental experiences (e.g., [Abramowitz et al., 2003](#); [Harvey, 2001](#); [Najmi et al., 2007](#); [Salkovskis and Campbell, 1994](#)).

With the intention of laying the foundation for a more systematic comparison of thought control strategies, [Wells and Davies \(1994\)](#) elaborated the thought control questionnaire (TCQ), which inquires about the frequency with which 30 different mental control techniques are used. As the authors report, a factor analysis on the initial version of the TCQ revealed a six-factor structure; the factors were labeled behavioral distraction, cognitive distraction, social control/reassurance, worry, punishment, and reappraisal. A subsequent factor analysis on the definite version of the TCQ yielded a five-factor solution, the behavioral and cognitive distraction items now combining to form a single subscale. In a later validation study involving a clinical sample, evidence for a distinction between cognitive and behavioral distraction was once again found ([Reynolds and Wells, 1999](#)). More recently, [Fehm and Hoyer \(2004\)](#) administered the TCQ to a clinical sample comprising various anxiety disorders and to two non-clinical samples; in subsequent exploratory factor analyses (EFAs), the five-factor structure could largely be replicated to a large extent, but several items showed low loadings (<0.40), did not load on the predicted factors, or loaded strongly on more than one factor (cross-loadings). Finally, in a study involving students and non-student adults from the general population, [Luciano et al. \(2006\)](#) performed a confirmatory factor analysis (CFA) on TCQ scores using the five-factor model as an a priori structure and found that several items did not significantly load on their theoretical factors. This finding led the authors to propose a 16-item short version of the TCQ; in a follow-up CFA, the five-factor model showed an adequate fit, and all items loaded significantly on their respective factors.

According to recent models of insomnia, negatively toned excessive cognitive activity plays a key role in the development and maintenance of this disorder (e.g., [Espie, 2002](#); [Harvey, 2002](#); [Morin, 1993](#)). Insomniacs typically complain of a “racing mind” when trying to get to sleep (e.g., [Harvey, 2001](#)), and they attribute their sleep disturbances to cognitive arousal up to 10 times more often than they do to somatic arousal (e.g., [Espie et al., 1989](#); [Harvey, 2000](#); [Lichstein and Rosenthal, 1980](#)). In further support of a link between excessive cognitive activity and insomnia, a number of correlational studies have found a significant positive association between measures of presleep cognitive activity and sleep-onset latency (e.g., [Kelly, 2002](#); [Nicassio et al., 1985](#); [Van Egeren et al., 1983](#)). In addition, experimental induction of worrisome cognitive activity during the presleep period by telling participants that they would have to give a speech after sleep has been found to increase sleep-onset latency (e.g., [Gross and Borkovec, 1982](#); [Hall et al., 1996](#); [Tang and Harvey, 2004](#)).

A number of studies suggest that counterproductive thought management strategies may fuel this sleep-incompatible state of mind (for a review, see [Harvey, 2005](#)). To facilitate research into the involvement of thought control in insomnia, [Harvey \(2001\)](#) developed a new version of the TCQ specifically adapted to sleep disturbances. This 43-item questionnaire, labeled thought control questionnaire-insomnia (TCQI), differed from the TCQ in four respects:

- the instructions of the TCQI asked respondents to indicate the frequency with which they employ each thought control strategy “while being kept awake by thoughts”;
- the TCQI featured a new introductory question that asked respondents to rate the frequency with which thoughts keep them awake at night;
- the TCQI contained new items pertinent to insomnia (e.g., “I decide to put them on hold until the morning”);

- the TCQI incorporated a suppression and a replacement scale in place of the original distraction scale of the TCQ, with new items being added to both of these scales.

This modification was inspired by the findings of [Salkovskis and Campbell \(1994\)](#) supporting a clear differentiation between “simple distraction” and “focused distraction”. Simple distraction refers to attempts to divert attention away from unwanted thoughts without using specific contents to replace them; this strategy is captured by the suppression items of the TCQI (e.g., “I tell myself not to think about the thought”). Focused distraction involves diverting attention away from unwanted thoughts through concentration on specific alternative contents; this strategy is evaluated by the replacement items of the TCQI (e.g., “I call to mind positive images instead”).

In a follow-up validation study, the thought control questionnaire-insomnia revised (TCQI-R) was elaborated ([Ree et al., 2005](#)). An initial item selection procedure led to the elimination of six of the 43 items of the TCQI; specifically, items were discarded if they were not easily interpretable in the context of insomnia (e.g., “I find out how my friends deal with these thoughts”), if the respondents did not employ the full response range when answering the items (e.g., “I slap or pinch myself to stop the thought”), or if the items were considered redundant (e.g., “I don’t talk about the thought to anyone” and “I keep the thought to myself”). A principal component analysis conducted on the remaining 37 items revealed a six-factor solution. The corresponding subscales, which all showed satisfactory internal consistency, were labeled as follows: aggressive suppression (e.g., “I get angry at myself for having the thought”), cognitive distraction/suppression (e.g., “I think pleasant thoughts instead”), behavioral distraction/suppression (e.g., “I try to block them out by reading, watching TV, or listening to the radio”), social avoidance (e.g., “I avoid discussing the thought”), worry (e.g., “I worry about more minor things”), and reappraisal (e.g., “I try to reinterpret the thought”). Two items (“I count sheep” and “I get out of bed and write about them”) did not show any loading superior to 0.35 on any of these factors and were therefore discarded. As a result, the final version of the TCQI-R comprises 35 items.

A comparison between the respective TCQI-R scores of good sleepers and insomniacs revealed that the latter more frequently employed every thought control strategy, except for cognitive distraction. The strategies of aggressive suppression and worry proved particularly unhelpful, with the use of these techniques predicting poorer sleep quality as measured by the Pittsburgh sleep quality index (PSQI; [Buysse et al., 1989](#)) in a sample including good sleepers, subthreshold insomniacs and insomniacs (M. Ree, personal communication, July 3, 2007); in contrast, the use of cognitive distraction predicted better sleep quality. This finding is in line with previous experimental evidence ([Harvey and Payne, 2002](#)) and suggests that cognitive distraction may buffer a “racing mind”, thereby functioning as a protective factor against insomnia.

Our study was designed to validate a French version of the TCQI-R in a non-clinical sample. In view of the high prevalence rates of insomnia in the general population reported in the literature (e.g., [National Sleep Foundation, 2005](#)), we assumed that a large non-clinical sample would encompass a sleep-disturbance spectrum ranging from good sleep to clinical insomnia, which would allow us to investigate the relation between the use of different thought control strategies and the severity of sleep impairment. Of particular interest was the question of whether the six-factor structure found by [Ree et al. \(2005\)](#) could be replicated in a French-speaking sample and whether the same strategies of mental control would be associated with sleep disturbances.

2. Method

2.1. Participants

Two hundred and ninety-eight individuals (241 women and 57 men) aged 17 to 65 ($M = 23.10$; $s.d. = 6.21$) were administered the French version of the TCQI-R. The sample consisted of 265 undergraduate students of psychology at the University of Geneva who participated to fulfill a course requirement and who were assessed in groups of up to 40 people. The remaining 33 respondents were recruited in other faculties and were assessed individually. A subsample of 273 participants (224 women and 49 men) aged 17 to 49 ($M = 22.63$; $s.d. = 5.24$) also completed the insomnia severity index (ISI; [Blais et al., 1997](#)); because of time constraints, one group of 25 participants of the 298 did not complete the ISI.

2.2. Measures

2.2.1. Thought control questionnaire-insomnia revised ([Ree et al., 2005](#))

The French version of the TCQI-R was elaborated as follows:

- the instruction, the introductory question and the 35 items of the original TCQI-R were translated into French;
- an English-French bilingual person translated the French version back into English;
- discrepancies between the original TCQI-R and the back-translation were analyzed and adjustments made to the French TCQI-R accordingly.

2.2.2. Insomnia severity index ([Blais et al., 1997](#))

The French version of the ISI ([Blais et al., 1997](#)) was used to evaluate sleep impairment. The ISI contains seven items that are rated on a 5-point Likert scale ranging from 0 (*not at all*) to 4 (*extremely*). Respondents are asked to evaluate the following dimensions of insomnia:

- severity of insomnia (difficulty falling asleep; difficulty staying asleep; problem waking up too early);
- satisfaction with current sleep patterns;
- interference with daytime functioning;
- noticeability of impairment to significant others;
- 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 (Cronbach's $\alpha = 0.88$) and to correlate strongly ($r = 0.67$) with the French version of the PSQI ([Blais et al., 1997](#); [Buysse et al., 1989](#)).

3. Results

3.1. Factor analyses for the French TCQI-R

In order to determine the number of factors to extract from the French TCQI-R correlation matrix, we conducted a parallel analysis and computed a Velicer's minimum average partial (MAP) test (O'Connor, 2000; Velicer, 1976). Both methods clearly suggested a six-factor solution. We then performed an EFA with Mplus (Muthén and Muthén, 2006). As the factors were expected to correlate (Ree et al., 2005), we opted for a promax rather than a varimax rotation; when compared with the orthogonal method of varimax rotation, the oblique method of promax rotation presents the double advantage of being generally better adapted to intercorrelated factors and of being better able to identify the presence of a "simple structure" (e.g., DeVellis, 2003; Fabrigar et al., 1999). The Eigenvalues for the six factors were 5.93, 4.17, 3.45, 2.62, 2.21, and 1.99, respectively. Taken together, the factors accounted for 58.2% of the total variance; for comparison, the corresponding percentage in the study of Ree et al. (2005) amounted to 47.0%. As may be gathered from Table 1, except for item 6, all items loaded most strongly on the predicted factors. Thus, the clustering of the TCQI-R items around the six factors as originally found by Ree et al. could largely be replicated. However, it should be noted that three items (8, 10, and 30) presented relatively low factor loadings (<0.35) and that two items (6 and 13) presented relatively high loadings on a second factor. In the study of Ree et al. (2005), two of the mentioned items (6 and 30) had also shown relatively low loadings (0.35 and 0.36, respectively), and Item 10 had shown a cross-loading (numbering of the items according to the TCQI-R version in the appendix of Ree et al., 2005).

Scale item	Aggressive suppression	Behavioral distraction	Cognitive distraction	Reappraisal	Social avoidance	Worry
Item 1	0.60	-0.13	0.39	-0.03	-0.03	0.11
Item 2	0.54	-0.03	0.35	-0.12	-0.03	0.05
Item 9	0.60	0.12	-0.03	0.22	0.11	0.02
Item 12	0.70	-0.09	-0.03	-0.01	0.02	-0.21
Item 17	0.79	0.16	-0.09	-0.01	0.02	-0.04
Item 19	0.78	0.13	-0.25	-0.01	0.03	-0.12
Item 30	0.33	0.12	-0.12	-0.11	-0.12	-0.21
Item 34	0.51	-0.10	0.39	-0.01	0.00	0.13
Item 5	0.21	0.71	-0.03	-0.05	-0.03	0.00
Item 23	-0.18	0.67	0.23	0.16	0.09	0.06
Item 25	0.08	0.58	-0.07	0.01	-0.05	-0.00
Item 31	0.08	0.97	0.09	-0.06	0.06	0.10
Item 35	0.26	0.37	-0.01	-0.13	-0.10	-0.08
Item 3	-0.11	0.00	0.81	0.09	-0.05	-0.29
Item 7	0.15	-0.04	0.41	0.05	0.02	0.22
Item 8	-0.02	-0.13	0.30	-0.07	0.10	0.25
Item 15	-0.04	0.19	0.71	-0.01	-0.05	-0.06
Item 21	-0.27	0.07	0.98	0.01	-0.04	-0.30
Item 4	-0.20	0.08	0.00	0.62	-0.09	0.02
Item 16	0.18	0.06	0.09	0.64	-0.04	0.15
Item 20	-0.14	0.03	0.12	0.73	0.04	0.06
Item 24	0.07	0.01	0.01	0.86	0.04	0.10
Item 26	0.05	-0.06	0.14	0.67	-0.03	0.00
Item 29	0.27	-0.02	-0.07	0.64	0.00	0.13
Item 32	-0.07	-0.12	-0.24	0.71	-0.04	-0.17
Item 14	-0.11	-0.08	0.03	-0.11	0.74	-0.02
Item 18	-0.09	-0.06	0.08	0.01	0.84	0.07
Item 33	0.08	0.06	0.03	0.19	0.70	0.01
Item 6	0.42	-0.13	-0.21	0.19	-0.04	-0.36

Scale item	Aggressive suppression	Behavioral distraction	Cognitive distraction	Reappraisal	Social avoidance	Worry
Item 10	-0.02	-0.09	-0.09	0.36	0.06	-0.33
Item 13	0.44	-0.03	-0.05	0.07	0.15	-0.41
Item 22	0.03	0.04	0.24	-0.10	0.02	-0.66
Item 27	0.15	-0.10	0.18	-0.03	-0.01	-0.66
Item 28	0.11	-0.06	0.17	-0.11	0.01	-0.99

As an additional test of the factorial structure found by [Ree et al. \(2005\)](#), we computed a six-factor CFA with MPlus, the latent variables being allowed to correlate. Model fit was evaluated with the root mean square error of approximation (RMSEA; [Steiger, 1990](#)) and the standardized root mean square residual (SRMR; [Bentler, 1995](#)). When compared with other fit indexes, the RMSEA and the SRMR present the advantage of being less sensitive to small misspecifications of the factor structure that are very common in the domain of personality research ([Beauducel and Wittmann, 2005](#)). An RMSEA below 0.05 and 0.05 indicates a good fit, and values between 0.05 and 0.08 an acceptable fit; an SRMR between 0 and 0.05 indicates a good fit, and values between 0.05 and 0.10 an acceptable fit ([Schermelleh-Engel et al., 2003](#)). The six-factor model showed a significant chi-square [χ^2 (545, $n = 298$) = 1405.34; $p < 0.001$], an RMSEA of 0.073 (90%-CI = [0.068, 0.077]), and an SRMR of 0.087. According to the above-mentioned criteria, all these indices suggest an acceptable fit for the model and thus lend support to a six-factor solution. The six latent variables were weakly to moderately intercorrelated (range of estimated r s = 0.00-0.50), indicating that they were not redundant; as in the EFA, each factor was significantly correlated to at least one other factor.

$n = 298$	Aggressive suppression	Behavioral distraction	Cognitive distraction	Reappraisal	Social avoidance	Worry
Aggressive suppression	1					
Behavioral distraction	0.27** (0.16 0.37)	1				
Cognitive distraction	0.17** (0.06 0.28)	0.13* (0.01 0.24)	1			
Reappraisal	0.08 (-0.03 0.19)	0.02 (-0.09 0.13)	-0.02 (-0.13 0.10)	1		
Social avoidance	0.14* (0.03 0.25)	-0.00 (-0.12 0.11)	-0.00 (-0.12 0.11)	-0.10 (-0.21 0.02)	1	
Worry	0.28** (0.17 0.38)	0.08 (-0.03 0.19)	-0.16* (-0.27 -0.04)	0.35** (0.24 0.44)	0.10 (-0.01 0.21)	1

The loadings on the anticipated factors are highlighted (bold italics). Given that [Wells and Davies \(1994\)](#)—in contrast to [Reynolds and Wells \(1999\)](#) and to [Ree et al. \(2005\)](#)—found evidence for a five-factor structure underlying the TCQ, we compared a five-factor model (the behavioral and cognitive distraction items being combined to form a single scale) to the previously described six-factor model for the TCQI-R. The five-factor model showed a significant chi-square [χ^2 (550, $n = 298$) = 1708.27; $p < 0.001$], an RMSEA of 0.084 (90%-CI = [0.080, 0.089]), and an SRMR of 0.096. These indices suggest that the five-factor model possesses a poorer fit than does the six-factor model—a difference that proved significant ($\Delta\chi^2 = 302.93$, $ddf = 5$, $p < 0.001$).

3.2. Scale reliabilities for the French TCQI-R and for the ISI

In order to evaluate the reliability of the French TCQI-R subscales, Cronbach's alpha coefficients were calculated.

The results were as follows (for comparison, the respective alpha coefficients of [Ree et al. \(2005\)](#) appear in parentheses): 0.74 for aggressive suppression (0.79), 0.75 for behavioral distraction (0.66), 0.69 for cognitive distraction (0.64), 0.82 for reappraisal (0.76), 0.75 for social avoidance (0.69), and 0.66 for worry (0.78). These values reflect acceptable to good internal consistency and are comparable to those found by [Ree et al. \(2005\)](#). Cronbach's alpha coefficient for the ISI amounted to 0.84, which indicates good internal consistency.

3.3. Scale intercorrelations for the French TCQI-R

The scale intercorrelations for the TCQI-R are presented in [Table 2](#). As in the study of [Ree et al. \(2005\)](#), these correlations ranged from small to medium. Two of the scales significantly correlated with the introductory question of the TCQI-R ("How often does thinking too much keep you awake?"), namely, aggressive suppression ($r = 0.34$, 95% CI = [0.22, 0.44], $p < 0.01$) and worry ($r = 0.43$, 95% CI = [0.32, 0.52], $p < 0.01$).

3.4. Prevalence of insomnia according to the ISI and correlations between thought control strategies (TCQI-R) and insomnia (ISI)

According to the normative data for the ISI provided by [Bastien et al. \(2001\)](#), 48.4% of our participants did not show any sign of clinically significant insomnia, 33.3% gave evidence of subthreshold insomnia, and 18.3% could be considered as suffering from clinical insomnia, with 1.1% of the latter attaining the level of severe clinical insomnia. In accordance with the high prevalence rates reported for insomnia in the literature (e.g., [National Sleep Foundation, 2005](#)), these percentages underscore the pervasive presence of sleep impairments even in non-clinical populations.

In order to explore the relation between use of different thought control strategies and perceived insomnia severity, Pearson correlations were calculated between the TCQI-R subscale scores and the ISI total score (see [Table 3](#)). Three thought control strategies correlated positively with insomnia severity as assessed by the ISI total score: worry, aggressive suppression, and reappraisal. Worry correlated positively with all ISI item scores. With the exception of ISI Item 1b (difficulty staying asleep), aggressive suppression was also positively related to all ISI item scores. Reappraisal correlated positively with two ISI item scores: Item 2 (dissatisfaction with sleep) and Item 5 (distress caused by sleep problem).

The other three thought control strategies were significantly associated with only one ISI item, respectively: social avoidance correlated positively with ISI Item 1b (difficulty staying asleep), behavioral distraction was positively related to ISI Item 3 (interference with daytime functioning), and cognitive distraction correlated *negatively* with ISI Item 2 (dissatisfaction with sleep).

This pattern of associations is in accord with the findings of [Ree et al. \(2005\)](#). In their study, worry and aggressive suppression also turned out to be the thought control strategies most strongly related to insomnia severity. As for the remaining four strategies, they were also significantly related to insomnia, although to a lesser degree than worry and aggressive suppression. Finally, [Ree et al.](#) also found cognitive distraction to be *negatively* related to insomnia, which suggests that this thought control strategy may shield against sleep disturbances.

3.5. Comparison between the TCQI-R scores of ISI-defined normal sleepers, subthreshold

insomniacs, and clinical insomniacs

In order to determine the TCQI-R factors that discriminated most strongly between the ISI-defined subsamples of normal sleepers, subthreshold insomniacs, and clinical insomniacs, we conducted a multivariate analysis of variance (MANOVA) with insomnia level according to the ISI as independent variable (no insomnia, subthreshold insomnia, clinical insomnia) and the six TCQI-R subscale scores as dependent variables. This analysis indicated that the three groups differed significantly on two TCQI-R subscales, namely, aggressive suppression, $F(2, 270) = 6.54, p < 0.01, \eta^2 = 0.046$ ($M = 1.75, s.d. = 0.44$ [no insomnia]; $M = 1.97, s.d. = 0.49$ [subthreshold insomnia]; $M = 1.89, s.d. = 0.49$ [clinical insomnia]), and worry, $F(2, 270) = 19.43, p < 0.001, \eta^2 = 0.13$ ($M = 1.49, s.d. = 0.36$ [no insomnia]; $M = 1.70, s.d. = 0.39$ [subthreshold insomnia]; $M = 1.87, s.d. = 0.45$ [clinical insomnia]). Follow-up t -tests revealed that when compared with participants without any sign of clinical insomnia, those with subthreshold insomnia scored significantly higher on the aggressive suppression subscale, $t(221) = 3.59, p < 0.001$, and on the worry subscale, $t(221) = 4.01, p < 0.001$. When compared with participants without any sign of insomnia, those with clinical insomnia scored marginally higher on the aggressive suppression subscale, $t(180) = 1.91, p = 0.058$, and significantly higher on the worry subscale, $t(180) = 5.93, p < 0.001$. Finally, when compared with participants with subthreshold insomnia, those with clinical insomnia did not score significantly higher on the aggressive suppression subscale, $t(139) = 0.95, p = 0.35$, but did score significantly higher on the worry subscale, $t(139) = 2.44, p < 0.05$.

Discussion

The purpose of the present study was to validate a French version of the TCQI-R as elaborated by [Ree et al. \(2005\)](#). The main results of our investigation may be summarized as follows:

- the six-factor structure subtending the original English version of the TCQI-R could be clearly replicated with the French TCQI-R; critically, the six-factor model showed a significantly better fit than a five-factor-model;
- the six subscales of the TCQI-R (aggressive suppression, behavioral distraction, cognitive distraction, reappraisal, social avoidance, and worry) showed internal consistency ranging from acceptable to good, the respective Cronbach's alpha coefficients being comparable to those found by [Ree et al.](#) for the TCQI-R and to those found by [Wells and Davies \(1994\)](#) and [Reynolds and Wells \(1999\)](#) for the TCQ;
- as in the study of [Ree et al.](#), criterion validity of the TCQI-R could be established by showing that all six thought control strategies were significantly related to facets of insomnia, with worry and aggressive suppression being most powerfully related to sleep disturbances and cognitive distraction functioning as a potential buffer against the latter.

As reported earlier, the first factor analysis that [Wells and Davies \(1994\)](#) conducted on the TCQ suggested a six-factor solution, whereas a subsequent analysis yielded a five-factor solution, the behavioral and cognitive distraction items now combining into a single subscale. In contrast, [Ree et al. \(2005\)](#) once again obtained evidence for a six-factor structure and for a distinction between the strategies of behavioral and cognitive distraction. By clearly fitting a six-factor structure, our findings offer further support for differentiation between behavioral and cognitive distraction. As in the study of [Ree et al.](#), the differentiation between behavioral and cognitive distraction is

additionally buttressed by the fact that behavioral distraction was *positively* correlated to one aspect of insomnia (interference with daytime functioning), whereas cognitive distraction was *negatively* related to another aspect of insomnia (dissatisfaction with sleep). This pattern of findings suggests that behavioral distraction constitutes a dysfunctional thought control strategy in the context of sleep disturbances; cognitive distraction, in contrast, may protect against insomnia-related complaints. Consistent with this hypothesis, experimental induction of cognitive distraction has been shown to shorten self-evaluated sleep-onset latency and to reduce unwanted cognitive activity when compared with conditions of “general distraction” or of “no instruction” (Harvey and Payne, 2002).

A positive influence of cognitive distraction has also been found in other psychopathological states. For example, Amir et al. (1997) found that healthy individuals employ cognitive distraction more often than do patients with OCD. Abramowitz et al. (2003) replicated and extended these findings: these authors examined changes in thought control strategies following a cognitive-behavioral treatment for OCD based on exposure and response prevention and found that treatment responders reported an increase in the use cognitive distraction. More recently, Coles and Heimberg (2005) discovered that patients with generalized anxiety disorder also indicated less frequent use of cognitive distraction than did non-anxious controls. Taken together, these findings suggest that the potentially beneficial role of cognitive distraction in the context of insomnia merits further investigation.

Our findings that the thought control strategies of worry and aggressive suppression were most strongly related to insomnia severity and that they discriminated between good and poor sleepers are in accord with the results of Ree et al. (2005) and with previous research suggesting that these strategies may be counterproductive. Investigations of mental content in the presleep period have typically revealed that insomniacs tend to be more worry prone than normal sleepers (e.g., Harvey, 2002; Kuisk et al., 1989; Wicklow and Espie, 2000). Furthermore, experimentally increasing worrisome thought in the presleep period has been found to delay sleep onset (e.g., Gross and Borkovec, 1982; Hall et al., 1996; Tang and Harvey, 2004). In a similar vein, experimentally inducing thought suppression has been shown to entail a rebound of target-thought frequency at sleep onset (Schmidt and Gendolla, in press), to delay the moment of falling asleep and to worsen sleep quality (Harvey, 2003). As a consequence, research currently concentrates on therapeutic interventions that may help insomniacs to replace maladaptive thought control techniques with more beneficial coping strategies. The latter may include promotion of emotional processing of current concerns through Pennebaker-like writing sessions (e.g., Harvey and Farrell, 2003) or mindfulness-based stress reduction techniques (e.g., Haynes et al., 2006).

As mentioned in Section 3.1., three items of the French TCQI- R presented relatively low factor loadings and two presented relatively high cross-loadings. In the study of Ree et al. (2005), two of these items (6 and 30) had also shown relatively low loadings, and one of them (item 10) had shown a cross-loading. Tentatively, these item characteristics might be explained by their respective semantic properties. Item 6 (“I ruminate about them”) showed a relatively low loading on worry in both studies; in our study, it additionally showed a relatively high loading on aggressive suppression. It might be surmised that this item captures two different forms of rumination, namely, depressive rumination and angry rumination (for this differentiation, see Whitmer and Banich, 2007). Item 10 (“I focus on the thought”) showed a modest loading on worry in both studies; in the study of Ree et al. (2005), it additionally showed a negative loading on cognitive distraction. A negative association between this item and distraction had already been found by Fehm and Hoyer (2004) for the TCQ; these authors deemed plausible that concentration be conceptualized as contrary to distraction. Furthermore, focusing on a thought does not seem to

be compellingly tied to worrying—focusing might also express a process of reappraisal as in the study of Wells and Davies (1994). Finally, item 30 (“I tell myself that something bad will happen if I think the thought”) showed a low loading on aggressive suppression in both TCQI-R studies. Whether the expectation of ill effects related to thinking a thought necessarily entails suppressing that very thought might indeed be subject to debate. Although the mentioned items do not present perfect statistical properties, we decided not to discard them because the factor structure of the French 35-item TCQI-R and the internal consistency of its subscales possess sound psychometric properties.

There are two limitations to the present study that warrant consideration. First, our sample of participants comprised mostly young adults (mean age = 23.10 years) and women (80.9%). These sample characteristics reflect the age distribution and gender imbalance at the faculties of the University of Geneva where the participants were recruited. In the study of Ree et al. (2005), participants were also mostly young (mean age = 27.41 years) and female (62.6%). Given that insomnia is more prevalent in older people than it is in younger people and that it is less prevalent in men than it is in women (e.g., Lichstein et al., 2004), further research is needed to examine the association between thought control strategies and sleep disturbances in these two segments of the population. Second, our sample of participants was composed of university students who were assessed in a non-clinical context. Even though our sample did not encompass a group of clinically diagnosed insomniacs as did the study of Ree et al. (2005), 33.3% of our participants obtained ISI scores that correspond to subthreshold insomnia, and another 18.3% obtained scores signaling the presence of clinical insomnia, with 1.1% attaining the benchmark for severe clinical insomnia. The presence of clinically diagnosed, presumably severe insomniacs in the study of Ree et al. (2005) might explain why these authors found slightly stronger associations between the use of different thought control techniques and insomnia than we did. The fact that we nevertheless obtained a similar overall pattern of associations in a non-clinical sample speaks in favor of continuity in terms of the cognitive processes that underlie poor sleep in non-clinical and clinical populations.

In conclusion, the French TCQI-R has been shown to possess psychometric properties that are comparable to the original English version developed by Ree et al. (2005): both questionnaires demonstrated a clear six-factor structure and featured good internal consistency of their subscales. In both studies, the thought control strategies of worry and of aggressive suppression emerged as the most pernicious in the context of insomnia, whereas cognitive distraction turned out to be a potentially beneficial technique. By allowing researchers to profile the repertoire of thought control techniques that people use when trying to fall asleep, the TCQI-R constitutes a valuable instrument for tracking vulnerability factors and tracing treatment outcomes in the field of insomnia research.

Acknowledgments

The authors are grateful to Allison G. Harvey and Melissa Ree for giving them the permission to develop a French version of the thought control questionnaire-insomnia revised. The authors also thank Marc Baertschi and Malika Tiercy for help in data collection

Appendix A

French version of the thought control questionnaire-insomnia revised (TCQI-R)

De nombreuses personnes constatent que, lorsqu'ils essaient de s'endormir la nuit, des pensées concernant la journée qui vient de s'écouler ou des pensées concernant le lendemain leur viennent à l'esprit. D'autres fois, des pensées concernant des problèmes actuels ou des événements stressants au travail ou à la maison viennent à l'esprit. Parfois, ces pensées rendent l'endormissement difficile.

À quelle fréquence le fait de trop penser vous garde-t-il éveillé(e)? Veuillez encercler le chiffre approprié :

0123456789

10

Jamais

Toutes les nuits

Ci-après se trouvent un certain nombre de choses que les gens font pour contrôler ces pensées. Veuillez lire chaque énoncé attentivement et *indiquer en encerclant le chiffre approprié* à quelle fréquence vous utilisez chaque technique pour contrôler les pensées qui vous passent par l'esprit lorsque vous essayez de vous endormir la nuit. Il n'y a pas de réponse juste ou fausse. Veuillez ne pas prendre trop de temps à réfléchir à chacune des réponses.

Quand des pensées me passant par l'esprit me gardent éveillé(e) la nuit...

1. Je me dis de ne pas y penser maintenant.
2. J'essaie de chasser les pensées de ma tête.
3. J'évoque des images positives à la place.
4. Si les pensées se rapportent à un problème, je prends une décision dans le but de résoudre ce problème.
5. J'essaie de les repousser en lisant un livre, en regardant la télévision ou en écoutant la radio.
6. Je les ressasse (je reviens sur ces pensées encore et encore).
7. Je décide de les mettre entre parenthèses jusqu'au matin.
8. Je fais le vide dans mon esprit.
9. Je me dis de ne pas être si stupide.
10. Je me concentre sur la pensée.
11. Je remplace la pensée par une pensée négative plus insignifiante.
12. Je me punis d'avoir cette pensée.
13. Je ne peux m'empêcher de penser à d'autres soucis.
14. Je garde la pensée pour moi.

15. À la place, je pense à quelque chose d'autre.
16. Je mets en question le bien-fondé de la pensée.
17. Je me fâche contre moi-même pour avoir cette pensée.
18. J'évite de discuter de la pensée (d'en parler à autrui).
19. Je m'engueule pour avoir cette pensée.
20. J'analyse la pensée rationnellement.
21. À la place, j'évoque des pensées agréables.
22. À la place, je me fais du souci pour des choses plus secondaires.
23. Je fais quelque chose que j'apprécie.
24. J'essaie de réinterpréter la pensée.
25. À la place, je m'occupe en travaillant.
26. J'essaie d'y penser différemment.
27. À la place, je pense à des soucis passés.
28. Je me concentre sur des pensées négatives différentes.
29. Je remets en question les raisons qui me font avoir cette pensée.
30. Je me dis que quelque chose de mauvais va arriver si j'y pense.
31. Je trouve à m'occuper.
32. Je préfère examiner la pensée en détail que m'en détourner.
33. Je cherche du réconfort auprès d'autrui (par exemple la personne qui partage mon lit ou un (une) ami(e) le jour suivant).
34. Je me dis « stop » à moi-même.
35. Je fais quelque chose de physique pour les arrêter (par exemple me retourner, sortir du lit).

Note: format des réponses: 1 (presque jamais); 2 (parfois); 3 (souvent); 4 (presque toujours); score à l'item 33 à renverser.

References

- Abramowitz, J.S., Whiteside, S., Kalsy, S.A., Tolin, D.F., 2003. *Thought control strategies in obsessive-compulsive disorder: a replication and extension. Behaviour Research and Therapy* 41, 529-540.
- Amir, N., Cashman, L., Foa, E.B., 1997. *Strategies of thought control in obsessive-compulsive disorder. Behaviour Research and Therapy* 35, 775-777.
- Bastien, C.H., Vallières, A., Morin, C.M., 2001. *Validation of the insomnia severity index as an outcome measure for insomnia research. Sleep Medicine* 2, 297-307.
- Beauducel, A., Wittmann, W.W., 2005. *Simulation study on fit indexes in CFA based on data with slightly distorted simple structure. Structural Equation Modeling* 12, 41-75.
- Bentler, P.M., 1995. *EQS Structural Equations Program Manual. Multivariate Software, Encino, CA.*
- Blais, F.C., Gendron, L., Mimeault, V., Morin, C.M., 1997. *Évaluation de l'insomnie: validation de trois questionnaires [Evaluation of insomnia: Validation of three questionnaires]. L'Encéphale* 23, 447-453.
- Buysse, D.J., Reynolds III, C.F., Monk, T.H., Berman, S.R., Kupfer, D.J., 1989. *The Pittsburgh sleep quality index: a new instrument for psychiatric practice and research. Psychiatry Research* 28, 193-213.
- Clark, D.A. (Ed.), 2005. *Intrusive Thoughts in Clinical Disorders. Guilford Press, New York.*
- Coles, M.E., Heimberg, R.G., 2005. *Thought control strategies in generalized anxiety disorder. Cognitive Therapy and Research* 29, 47-56.
- DeVellis, R.F., 2003. *Scale Development: Theory and Applications, 2nd ed. Sage, Thousand Oaks, CA.*
- Espie, C.A., 2002. *Insomnia: conceptual issues in the development, persistence, and treatment of sleep disorders in adults. Annual Review of Psychology* 53, 215-243.
- Espie, C.A., Brooks, D.N., Lindsay, W.R., 1989. *An evaluation of tailored psychological treatment of insomnia. Journal of Behavior Therapy and Experimental Psychiatry* 20, 143-153.
- Fabrigar, L.R., Wegener, D.T., MacCallum, R.C., Strahan, E.J., 1999. *Evaluating the use of exploratory factor analysis in psychological research. Psychological Methods* 4, 272-299.
- Fehm, L., Hoyer, J., 2004. *Measuring thought control strategies: the thought control questionnaire and a look beyond. Cognitive Therapy and Research* 28, 105-117.
- Gross, R.T., Borkovec, T.D., 1982. *The effects of a cognitive intrusion manipulation on the sleep onset latency of good sleepers. Behaviour Therapy* 13, 112-116.
- Hall, M., Buysse, D.J., Reynolds, C.F., Kupfer, D.J., Baum, A., 1996. *Stress-related intrusive thoughts disrupt sleep-onset and continuity. Sleep Research* 25, 163.
- Harvey, A.G., 2000. *Pre-sleep cognitive activity: a comparison of sleep-onset insomniacs and good sleepers. British Journal of Clinical Psychology* 39, 275-286.
- Harvey, A.G., 2001. *I can't sleep, my mind is racing! An investigation of strategies of thought control in insomnia. Behavioural and Cognitive Psychotherapy* 29, 3-11.

- Harvey, A.G., 2002. A cognitive model of insomnia. *Behaviour Research and Therapy* 40, 869-893.
- Harvey, A.G., 2003. The attempted suppression of presleep cognitive activity in insomnia. *Cognitive Therapy and Research* 27, 593-602.
- Harvey, A.G., 2005. Unwanted intrusive thoughts in insomnia. In: Clark, D.A. (Ed.), *Intrusive Thoughts in Clinical Disorders*. Guilford Press, New York, pp. 86-118.
- Harvey, A.G., Farrell, C., 2003. The efficacy of a Pennebaker-like writing intervention for poor sleepers. *Behavioral Sleep Medicine* 1, 115-124.
- Harvey, A.G., Payne, S., 2002. The management of unwanted pre-sleep thoughts in insomnia: distraction with imagery versus general distraction. *Behaviour Research and Therapy* 40, 267-277.
- Haynes, P.L., Bootzin, R.R., Smith, L., Cousins, J., Cameron, M., Stevens, S., 2006. Sleep and aggression in substance-abusing adolescents: results from an integrative behavioral sleep-treatment pilot program. *Sleep* 29, 512-520.
- Kelly, W.E., 2002. Worry and sleep length revisited: worry, sleep length and sleep disturbance ascribed to worry. *Journal of Genetic Psychology* 163, 296-304.
- Kuisk, L.A., Bertelson, A.D., Walsh, J.K., 1989. Presleep cognitive hyperarousal and affect as factors in objective and subjective insomnia. *Perceptual and Motor Skills* 69, 1219-1225.
- Lichstein, K.L., Durrence, H.H., Riedel, B.W., Taylor, D.J., Bush, A.J., 2004. *Epidemiology of sleep: Age, Gender, and Ethnicity*. Lawrence Erlbaum, Mahwah, NJ.
- Lichstein, K.L., Rosenthal, T.L., 1980. Insomniacs' perceptions of cognitive versus somatic determinants of sleep disturbance. *Journal of Abnormal Psychology* 89, 105-107.
- Luciano, J.V., Belloch, A., Algarabel, S., Tomas, J.M., Morillo, C., Lucero, M., 2006. Confirmatory factor analysis of the white bear suppression inventory and the thought control questionnaire. A comparison of alternative models. *European Journal of Psychological Assessment* 22, 250-258.
- Morin, C.M., 1993. *Insomnia: Psychological Assessment and Management*. Guilford Press, New York.
- Muthén, L.K., Muthén, B.O., 2006. *Mplus User's Guide*, 4th ed. Muthén and Muthén, Los Angeles, CA.
- Najmi, S., Riemann, B., Wegner, D.M., 2007. How to respond to an unwanted intrusive thought in normal experience and in obsessive-compulsive disorder: the ills of suppression and the gains of some alternatives. Manuscript submitted for publication.
- National Sleep Foundation, 2005. 2005 sleep in America poll. Retrieved March 12, 2007, from http://www.sleepfoundation.org/_content/hottopics/2005_summary_of_findings.pdf.
- Nicassio, P.M., Mendlowitz, D.R., Fussell, J.J., Petras, L., 1985. The phenomenology of the pre-sleep state: the development of the pre-sleep arousal scale. *Behaviour Research and Therapy* 23, 263-271.
- O'Connor, B.P., 2000. SPSS and SAS programs for determining the number of components using parallel analysis and Velicer's map test. *Behavior Research Methods, Instruments, and Computers* 32, 396-402.
- Ree, M.J., Harvey, A.G., Blake, R., Tang, N.K.Y., Shawe-Taylor, M., 2005. Attempts to control unwanted thoughts in the night: development of the thought control questionnaire-insomnia revised (TCQI-R). *Behaviour Research and Therapy* 43, 985-998.
- Reynolds, M., Wells, A., 1999. The thought control questionnaire: psychometric properties in a clinical sample, and

relationships with PTSD and depression. Psychological Medicine 29, 1089-1099.

Salkovskis, P.M., Campbell, P., 1994. *Thought suppression induces intrusion in naturally occurring negative intrusive thoughts. Behaviour Research and Therapy* 32, 1-8.

Schermelleh-Engel, K., Moosbrugger, H., Müller, H., 2003. *Evaluating the fit of structural equation models: test of significance and descriptive goodness- of-fit measures. Methods of Psychological Research Online* 8, 23-74.

Schmidt, R. E., Gendolla, G. H. E. (in press). *Dreaming of white bears: the return of the suppressed at sleep onset. Consciousness and Cognition*, doi:10.1016/j.concog.2007.09.002.

Steiger, J.H., 1990. *Structural model evaluation and modification: an interval estimation approach. Multivariate Behavioral Research* 25, 173-180.

Tang, N., Harvey, A.G., 2004. *Effects of cognitive arousal and physiological arousal on sleep perception. Sleep* 27, 69-78.

Van Egeren, L., Haynes, S.N., Franzen, M., Hamilton, J., 1983. *Presleep cognitions and attributions in sleep-onset insomnia. Journal of Behavioral Medicine* 6, 217-232.

Velicer, W.F., 1976. *Determining the number of components from the matrix of partial correlations. Psychometrika* 41, 321-327.

Wells, A., Davies, M.I., 1994. *The thought control questionnaire: a measure of individual differences in the control of unwanted thoughts. Behaviour Research and Therapy* 32, 871-878.

Whitmer, A.J., Banich, M.T., 2007. *Inhibition versus switching deficits in different forms of rumination. Psychological Science* 18, 546-553.

Wicklow, A., Espie, C.A., 2000. *Intrusive thoughts and their relationship to actigraphic measurement of sleep: towards a cognitive model of insomnia. Behaviour Research and Therapy* 38, 679-693.

Table 3 - Correlations between the use of thought control strategies (TCQI-R) and insomnia severity (ISI)

<i>n</i> = 273	Aggressive suppression	Behavioral distraction	Cognitive distraction	Reappraisal	Social avoidance	Worry
ISI Total score	0.21** (0.100.32)	0.09 (-0.03 0.20)	-0.07 (-0.19 0.05)	0.14* (0.02 0.25)	0.09 (-0.03 0.21)	0.39** (0.29 0.49)
ISI Item 1a:						
Difficulty falling asleep	0.16** (0.040.28)	0.10 (-0.02 0.22)	-0.03 (-0.14 0.09)	0.08 (-0.03 0.20)	0.09 (-0.03 0.20)	0.31** (0.20 0.41)
ISI Item 1b:						
Difficulty staying asleep	0.11 (-0.01 0.23)	0.06 (-0.06 0.17)	-0.12 (-0.23 0.00)	0.06 (-0.06 0.18)	0.13* (0.02 0.25)	0.21** (0.09 0.32)
ISI Item 1c:						
Waking up too early	0.14* (0.02 0.25)	-0.05 (-0.17 0.07)	0.04 (-0.08 0.16)	0.06 (-0.05 0.18)	0.10 (-0.02 0.21)	0.21** (0.09 0.32)
ISI Item 2:						
Dissatisfaction with sleep	0.20** (0.090.31)	0.07 (-0.05 0.19)	-0.13* (-0.24 -0.01)	0.14* (0.02 0.25)	0.06 (-0.06 0.18)	0.34** (0.23 0.44)
ISI Item 3						
Interference with daytime functioning	0.16** (0.040.27)	0.13* (0.01 0.24)	-0.04 (-0.16 0.08)	0.09 (-0.02 0.21)	0.07 (-0.05 0.19)	0.31** (0.19 0.41)
ISI Item 4						
Impairment noticeable for others	0.14* (0.02 0.25)	0.10 (-0.02 0.22)	-0.04 (-0.16 0.08)	0.11 (-0.01 0.23)	0.04 (-0.08 0.16)	0.30** (0.19 0.40)
ISI Item 5						
Distress caused by sleep problem	0.16** (0.05 0.28)	0.06 (-0.05 0.18)	-0.06 (-0.17 0.06)	0.17** (0.05 0.28)	-0.03 (-0.15 0.08)	0.33** (0.22 0.43)

TCQI-R, thought control questionnaire-insomnia revised; ISI, insomnia severity index.

* Significant at the 0.05 level (two-tailed).

** Significant at the 0.01 level (two-tailed); 95% confidence intervals appear in parentheses.

