Italian adaptation of the Insomnia Catastrophising Scale (ICS): A tool to evaluate insomnia-specific catastrophic thinking.

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Compliance with Ethical Standards

The study was approved by the Institutional Review Board of the Department of Psychology, Sapienza University of Rome.

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Abstract

Purpose: Several cognitive mechanisms have been hypothesized to be involved in insomnia disorder. Insomnia catastrophising thinking consists of overestimating the sleep disturbance and the related daytime impairment. The present study aimed to develop and assess the psychometric properties of the Italian adaptation of the Insomnia Catastrophising Scale (ICS) in a sample of 434 university students. **Methods**: The ICS is a self-report tool assessing catastrophic thoughts related to nighttime (ICS-N) and daytime symptoms of insomnia (ICS-D). Participants completed the ICS as well as the Insomnia Severity Index (ISI). Factorial structure, internal consistency, as well as convergent and discriminant validity of the ICS scales were estimated. Further, analysis of variance and bivariate correlations were computed to explore the relationship between ICS and ISI. **Results:** We showed the one-factor structure of each ICS subscale as demonstrates their validity and reliability in assessing insomnia specific catastrophising thinking. Finally, we demonstrated that catastrophic thinking is associated with insomnia severity. **Conclusions**: Overall, here we showed that ICS has excellent psychometric properties and our results suggest that ICS may be a useful screening tool to assess insomnia-specific catastrophic thoughts in both research and clinical practice.

Keywords: insomnia; catastrophising; validation; factor analysis.

Introduction

Insomnia disorder involves difficulties in falling asleep or maintaining sleep accompanied by impaired daytime functioning, negative mood, and fatigue [1]. To diagnose the disorder of insomnia, symptoms are required to occur for at least three nights per week over a period of at least three months [2]. Insomnia is the most prevalent sleep disorder affecting one-third of the general population [3]. It is often associated with comorbid psychiatric and/or medical conditions [4] and it is considered an independent risk factor for depression [5].

Individuals with insomnia are usually characterized by a hyperactive and dysfunctional cognitive activity, which deeply affect the maintenance of the disorder [6,7]. According to Morin [8], both dysfunctional behavioral and cognitive factors facilitate the development and the maintenance of insomnia. In particular, dysfunctional beliefs, such as worrisome thought, unrealistic expectation and catastrophic consequence about their sleep (and lack of) seem to play a key role in the perpetuation of the disorder [9]. Similarly, Harvey's Cognitive Model of Insomnia [10,11] proposes that insomnia is the consequence of an "excessive negatively toned cognitive activity", mainly focused on the sleep disturbance or on the potential consequences due to poor sleep. This activity can trigger a cascade of events such as physiological hyper-activation, biased attentional and perceptual processes toward sleep and potential sleep-related threat cues, and dysfunctional attempts to control the undesired intrusive ruminative thinking (e.g., implementation of thought control strategies).

Interestingly, a cognitive construct that received little attention in the insomnia literature is catastrophising thinking. Catastrophising is defined by overestimating negative consequences of an event and is considered a transdiagnostic process across mental disorders (i.e., a process relevant to several disorders) [12]. In the context of insomnia research, catastrophising thinking has been mostly assessed measuring the number of catastrophic worries generated by patients in the procedure called "catastrophising interview" [13]. Thus, Harvey & Greenall [14] found that individuals with insomnia generated more catastrophic worries than healthy controls, and more recently, a similar result was found using the same procedure by Barclay & Gregory [15]. Additionally, comparable results were found in children with sleep disturbances [16]. Only very recently, though, standardized questionnaires evaluating catastrophising thinking in

insomnia were developed and validated, such as the Insomnia Catastrophising Scale (ICS) [17], and The Catastrophic Thoughts about Insomnia Scale [18].

The ICS [17], is a 17-item self-report questionnaire evaluating catastrophising thoughts related to both nighttime symptoms (ICS-N) and daytime impairment (ICS-D) of insomnia. The ICS seems to discriminate well individuals with insomnia from those with poor sleep without a specific disorder, and good sleepers. Comparing individuals with insomnia and good sleepers, the ICS showed a sensitivity and specificity of 84.1% and 81.5%, respectively [17]. Considering the potentiality of the ICS for both initial and post-treatment assessments of catastrophising thoughts in insomnia, we aimed to develop and assess the psychometric properties of the Italian adaptation of the ICS. Related to this, we also aimed to explore the relationship between catastrophising thinking and insomnia severity.

Materials and methods

Participants

Participants were recruited at Sapienza University of Rome, Italy, through a convenient sampling procedure. The total sample consisted of 434 Italian speaking young adults (age: 23.5 ± 4.68 years; 333 women), both undergraduate and graduate students.

Measures

The Insomnia Catastrophising Scale (ICS)

The ICS is a self-report questionnaire evaluating catastrophising thoughts related to night-time symptoms (ICS-N) and daytime impairment (ICS-D) of insomnia. The ICS-N was measured by eleven items (e.g. “My poor sleep will have serious consequences”; “My ability to function will be seriously affected”) while ICS-D by six items (e.g. “I will function poorly all day”; “My daily activities will be seriously affected”). Respondents were asked to rate on a Likert-scale how often they have these thoughts during the night or the day after a bad night of sleep (from 0= Never to 5= Always). The scale has been shown to be reliable and valid for indexing insomnia-specific catastrophising [17]. In the present study, the Italian version of the scale was administered. For the Italian adaptation, the Translation/Back-translation method was used as suggested by Brislin [19].

Insomnia Severity Index (ISI)

The ISI is a brief self-report instrument measuring the severity nighttime and daytime symptoms of insomnia [8,20]. A 5-point Likert scale is used to respond to each of the 7 items (from 0 = no problem to 4 = very severe problem), and the ISI score can range from 0 (insomnia absent) to 28 (very severe insomnia). The ISI has been shown to be a valid and reliable instrument for identifying individuals with insomnia, with a sensitivity and specificity of 78.1%-99.8% and 91.8%-100%, respectively, depending on the threshold used [20]. In the present study, the cut-off of 11 was used to divide our participant in Individuals with Insomnia and Good Sleepers, due to the high sensitivity (97.2%) and specificity (100%) of this cut-off in detecting insomnia cases [20]. In the present study, the Italian version by Battagliese & Lombardo [21] was used.

Procedure

Participants signed a consent form and completed the ISI and the ICS. The order of test presentation was the same across all participants. They completed both questionnaires in large group sessions during their lecture time or through an online link distributed by the researchers on the platform SurveyMonkey (https://www.**surveymonkey.com**/*)*.The session lasted about 20 minutes.

Data Analyses

Confirmatory factor analyses (CFA) of the ICS-N and the ICS-D were conducted using MPLUS7 software [22]. An initial CFA for each measure was conducted using data from the entire sample (N = 434). Model parameters were estimated using the maximum likelihood (ML) estimation method, and the quality of the measurement model was visually examined through the fit indices estimates. The literature indicates the following as good fit model indices: TLI (Tucker-Lewis Index) or CFI (Comparative Fit Index) values close to 0.95; SRMR (Standardized Root Mean Squared Residual) value below 0.08, and RMSEA (Root Mean Square Error of Approximation) value below 0.06 [23]. For each instrument, two additional CFA was also performed to verify the additional measurement hypothesis that there was measurement invariance respectively across gender (Male=101; Female= 333) and sleep groups (Individuals with Insomnia =49; Good sleepers=383), respectively. In line with the literature [e.g. 24], these multi-group CFAs tested the

configural equivalence (i.e., the number of factors and their loading pattern are invariant across groups) and the *measurement or metric equivalence* (i.e., all the factor loadings are invariant across groups)[1].

Cronbach's alpha coefficients were estimated to evaluate the reliability of each scale. Generally, alpha's values below.60 are considered not acceptable, while values above .90 indicate an excellent internal consistency of the items within the scale [25].

ANOVAs considering ICS-N, ICS-D, as well as ISI as dependent variables were carried out in order to ascertain gender differences in the levels of insomnia catastrophising, also controlling for possible effects of participants' age.

Bivariate correlations between ICS-N, ICS-D, and ISI were also estimated to evaluate the convergent validity of the ICS sub-scales. Additionally, these correlations were estimated separately for male and female in order to analyze possible differences in the relationship' magnitude linking insomnia catastrophising and insomnia severity.

Results

Descriptives

Participants were 434 Italian speaking young adults (mean age: 23.5 ± 4.68 years; 333 women). According to the ISI [20], 136 participants reported symptoms of subclinical insomnia (ISI between 8 and 14), 4 reported clinically significant insomnia of moderate severity (ISI between 15 and 21) and 5 reported severe insomnia (ISI>22). Given the disparity of size between insomnia severity categories, the sample was divided into two groups, according to the cutoff of 11 due to the high sensitivity (97.2%) and specificity (100%) of this cut-off in detecting insomnia cases [20]. According to this, 49 participants were classified as Individuals with Insomnia and 383 as Good Sleepers.

Confirmatory factor analyses (CFA)

[1] In testing invariance, each model including a specific constraint (e.g., equivalence of the factor loadings across groups) is nested into a model without this constraint, and thus the two models can be compared by the chi-square difference test, using the difference in their χ^2 values and in their degrees of freedom. If chi-square difference value is statistically significant, it suggests that the specific constraint included does not hold (i.e., is not equivalent) across groups. Conversely, if the chi square difference value is statistically non-significant, this finding suggests that the specific constraint (e.g. the equivalence of the factor loadings) included is tenable across the groups. In order to establish the significance of the chi-square difference test, we set the critical p-level to .05.

With respect to the overall factorial structure of the two measures, the CFA on the entire sample showed that the one-factor model fit the data well both for the ICS-N ($\chi^2_{(44)}$=366.349, p<.001;CFI=.901, SRMR=.048) and the ICS-D ($\chi^2_{(9)}$=81.688, p<.001;CFI=.906; SRMR=.022).

Table 1 also shows the results of the multi-group CFAs which were performed to verify configural and measurement equivalence of the two scales (i.e. ICS-D and ICS-N) across gender (Male and Female) and sleep quality (Good Sleepers and Individuals with Insomnia).

With respect to the ICS-D, the CFAs supported the hypothesis of *configural equivalence*, that is, the one-factor hypothesis that item response data loaded significantly only on the expected latent factor, and this held true in male and female ($\chi^2_{(23)}$ = 101.224, p <.001; CFI = .944; SRMR = .053) and in Individuals with Insomnia and Good sleepers ($\chi^2_{(23)}$ = 90.707, p <.001; CFI = .968; SRMR = .033). Furthermore, the multi-group CFAs fully support the hypothesis of invariance in *measurement equivalence* (i.e., the hypothesis that factor loadings are statistically equivalent across gender and sleep quality). In fact, when in the model were included the constraint of loadings equality across the gender groups (i.e. male and female) and the sleep quality groups (i.e. good sleepers and individuals with insomnia), the model's fit indices overall improved both for gender groups ($\chi^2_{diff(6)}$= 9.421, p=.151) and sleep quality groups ($\chi^2_{diff(6)}$= 9.523, p=.146).

With respect to the ICS-N, the CFAs supported the hypothesis of *configural equivalence* of the scale across both gender ($\chi^2_{(98)}$ = 486.59, p <.001; CFI = .883; SRMR = .057) and sleep quality ($\chi^2_{(98)}$ = 447.42, p <.001; CFI = .879; SRMR = .068). However, the multi-group CFAs did not support the hypothesised invariance in *measurement equivalence* both across gender ($\chi^2_{diff(11)}$= 21.709, p=.026) and sleep quality ($\chi^2_{diff(11)}$= 23.645, p=.014). Upon an examination of the CFA modification indices obtained (i.e., indices providing information on equalities that do not hold across the groups), this null finding seemed to be due to differences in factor loadings of items 8 between male and female and in factor loadings of item 10 between good sleepers and individuals with insomnia. In other words, these two items loaded on the expected factor (ICS-N) in each group, but the loading size was not statistically equivalent across these groups**.** In order to statistically control these differences and test a partial measurement equivalence, a

second set of multi-group CFAs was performed after releasing the equality constraints for these two items across groups (i.e., they were freely estimated), namely item 8 for multi-group CFA across gender and item 10 for multi-group CFA across sleep quality.

Results of these analyses supported a *partial measurement equivalence* across gender ($\chi^2_{diff\ (10)}$=10.14; p=.42) and sleep quality ($\chi^2_{diff\ (10)}$= 5.53; p=.86), as evidenced by not significant chi-square differences.

Table 1 shows, for each team instrument, the standardized factor loadings that were invariant across gender and sleep quality. As one can see, the factor loadings of the ICS-N items on its latent factor were all above .65, while the factor loadings of ICS-D items were all above .76. All the factor loadings resulted statistically significant (p<.001).

Table 1. Standardized factorial loadings for each items of the ICS-N and the ICS-D.

	Standardized Latent Factor loadings	Alpha if item is deleted	Item-total correlations
Insomnia Catastrophizing Scale- Nighttime symptoms (ICS-N)			
1. My poor sleep will always continue	.779	.740	.927
2. There is nothing I can do to get to sleep	.700	.696	.929
3. My physical health will be negatively affected	.798	.768	.925
4. I will get far too little sleep tonight	.647	.641	.932
5. My poor sleep will have serious consequences	.838	.808	.924
6. My thoughts will race all night	.660	.657	.931
7. My poor sleep will get worse	.841	.800	.925
8. My physical appearance will be negatively affected	.723	.686	.929
9. I will lose control over my ability to sleep	.781	.736	.927
10. My poor sleep will result in a nervous breakdown	.783	.739	.927
11. My ability to function will be seriously affected	.751	.736	.927
			alpha= .934
Insomnia Catastrophizing Scale- Daytime impairment (ICS-N)			
1. I will feel awful all day	.758	.742	.939
2. My poor sleep will have serious consequences today	.866	.847	.925
3. I will feel worse and worse	.821	.805	.931
4. I will function poorly all day	.889	.850	.925
5. My daily activities will be seriously affected	.914	.867	.923
6. I will lose control over my ability to function	.853	.817	.929
			alpha= .940

Internal consistency

With respect to the reliability of the two measures, the estimates showed Cronbach's alpha values of .934 and .940, respectively for ICS-N and ICS-D. All the items have a great contribution to their scale, since they show very high correlations with the total items, and the possible elimination of each of them reduces the alpha values (see Table 1).

Diurnal and nocturnal insomnia catastrophising across gender

Overall the ANOVAs showed no significant effect of the participants gender on the level of diurnal ($F_{(1,430)}$ =1.00; p =.317) and nocturnal ($F_{(1,430)}$ =.88; p =.348) sub-scales of the ICS. However, the analysis showed a significant effect of the participants' age as covariate on nocturnal ($F_{(1,430)}$ =15.46; p<.001; partial eta square=.035) and diurnal ($F_{(1,430)}$ =5.52; p=.019; partial eta square=.013) subscales of ICS. In particular, older participants seem to report higher values of catastrophising about the nocturnal (r=.184; p<.001) and diurnal (r=.111; p=.021) consequences of insomnia. With respect to the ISI, no statically differences across gender emerged from the ANOVA ($F_{(1,429)}$ =.22; p =.638).

Convergent validity

The two ICS sub-scales showed a high correlation (r=.806; p<.001). As showed by Fisher r-to-z analysis, this correlation did not statistically differ (z= 0.64; p= .522) across male (r=.825; p<.001) and female (r=.800; p<.001). Furthermore, both ICS-N and ICS-D positively correlated with ISI (r=.562,p<.001 for ICS-N and r=.492, p<.001 for ICS-D), revealing that higher insomnia severity results in higher tendency to catastrophise both diurnal and nocturnal consequences of the insomnia (Fig. 1). However, when we considered the bivariate correlations separately for male and female, the results showed a slightly different pattern. In particular, for males the correlations of ISI with ICS-N and ICS-D (r=.703, p<.001, and r=.624, p<.001, respectively) resulted higher in magnitude than those linking the ISI with the same constructs in female (r=.516, p<.001, and r=.449, p<.001, respectively for ICS-N and ICS-D). These differences resulted statistical significant both for ICS-N (z= 2.62; p= .009) and ICS-D (z= 2.15; p= .032).

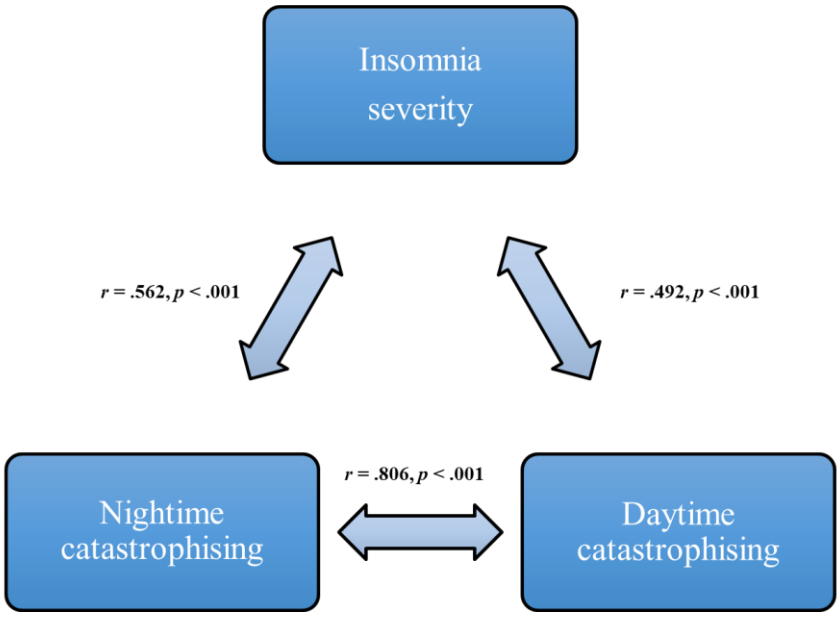

Figure 1. Correlations between insomnia severity (ISI), nighttime (ICS-N) and daytime (ICS-D) catastrophizing**.**

Discussion

In the current study, we aimed to develop and assess the psychometric properties of the Italian adaptation of the ICS in a sample of 434 university students with and without insomnia. Results from CFA confirm the presence of one-factor structure for both the ICS-N and the ICS-D. That is, items of the two scales loaded significantly over their latent factor, respectively catastrophising thinking about nighttime and daytime symptoms of insomnia. ICS-N and ICS-D also showed to be reliable at satisfactory levels, with Cronbach's alpha values >.90. Additionally, ICS sub-scales highly correlated with insomnia severity, supporting convergent validity of the ICS. All in all, these results support the inclusion of ICS as a screening instrument to assess insomnia-specific catastrophic thoughts in both research and clinical practice. A second aim was to explore the construct of insomnia-specific catastrophising. We found that catastrophising thinking about nighttime symptoms and daytime consequences of insomnia increases with age. Epidemiological literature shows that the prevalence of insomnia increases with age [3]. Thus, it is plausible that the more insomnia becomes a chronic condition, the more sufferers may fear its consequences and engage in catastrophising. Notably, we also evidenced that gender seems to moderate the relationship between catastrophising and insomnia severity. Specifically, we found a higher correlation between insomnia severity and catastrophising in males

than in females. Previous evidence on gender differences in catastrophising mostly comes from pain research, showing that women seem more prone to catastrophise than men [e.g. 26]. Nevertheless, in the context of insomnia disorder too little research has been conducted to draw conclusions about the existence of the same pattern. It is possible to hypothesize that catastrophising thinking may be linked with insomnia severity through different paths across genders. For instance, given that insomnia is frequently associated with depression [3], and being women at higher risk of both the conditions than men, it is possible that levels of depression may moderate the relationship between insomnia severity and catastrophising thinking. Thus, future research is needed to test the role of potential psychological variables that may play a role in the relationship between catastrophising thinking and insomnia. Additionally, multigroup CFA highlighted that the loading size item 8 of ICS-N, i.e., *my physical appearance will be negatively affected*, was higher in females than in males. It is possible to hypothesize that physical appearance may be more relevant for young females than for young males; thus, females may more easily engage in catastrophising about this concern. Similarly, the loading size item 10 of ICS-N, i.e., *my poor sleep will result in a nervous breakdown*, resulted higher in those with insomnia as compared to those without. At least two reasons may explain this result. First, insomnia is associated with mental disorders including anxiety and depression [2-4]. Thus, it is possible that those participants with insomnia may more strongly and more frequently be concerned about their psychological state and more easily catastrophise about their mood as compared to those without insomnia. Second, mood disturbances and difficulties in emotion regulation are themselves diurnal symptoms of insomnia [7]; consistently, item 10 may capture aspects of emotion dysregulation typical of insomnia [2].

Limitations and future research

This study has several strengths, including the sample size and the use of sophisticated statistical analyses used to test the validity of the ICS. Nevertheless, several limitations must be acknowledged. First, we included a convenience sample of university students and this may limit the generalization of our findings. Although some research evidenced prevalence of insomnia among university students similar to those reported in the general population (12-13%) [27], our results should be considered preliminary, and replication studies on large clinical populations are warranted. A second factor that impacted our results is the lack of control measures. In fact, due to absence of measures of depression and anxiety, we could not ascertain whether psychopathological symptoms may moderate the relationship between

catastrophic thinking and insomnia severity. Thus, future studies would benefit from the inclusion of patients with a diagnosis of insomnia of different ages and from the inclusion of additional control measures. Related to this, a limitation of our study was to not explore the differences in catastrophising between individuals with insomnia with and without other mental disorders (e.g. depression). It is also essential for future research to investigate the relationship and the potential overlap between catastrophising and similar, cognitive constructs. This is particularly evident for cognitive constructs such as cognitive arousal [28,29], worry [10], and rumination [30]. Currently, the associations between catastrophising and other cognitive constructs are unknown. Further studies are also needed to better understand the role of catastrophising cognitions in the evolution of insomnia disorder. Specifically, longitudinal studies are needed to clarify the impact of catastrophising on sleep of people with acute short-term insomnia and people with chronic insomnia. Additionally, future studies would benefit from exploring the role of catastrophising thinking in the maintenance of different insomnia subtypes (e.g., sleep onset insomnia, sleep maintenance insomnia, insomnia with or without short sleep duration). Interventional studies are also needed. Specifically, randomized controlled trials are needed to clarify the impact of standard psychological treatment for insomnia (CBT-I) on catastrophising thinking.

Conclusion

Overall, here we showed that ICS has excellent psychometric properties and our results suggest that ICS may be a useful screening tool to assess insomnia-specific catastrophic thoughts in both research and clinical practice.

Conflict of interest disclosure:

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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