The impact of COVID-19 on Italian adolescents' sleep and its association with psychological factors

The Impact of Covid-19 on Italian Adolescents' Sleep and its association with Psychological Factors

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Abstract

Insomnia and circadian dysregulation during adolescence represent important risk factors for emotional and psychological problems. Recent studies showed that Covid-19 pandemic have been linked to high prevalence of behavioral sleep problems in the general population. This study aimed to provide two pictures of two different time points of the pandemic regarding the prevalence of sleep problems in adolescents and their association with psychological health variables. Two different independent large samples of Italian adolescents aged 13 – 17 years were recruited at two pandemic time points. 1146 adolescents at Time 1 (April 2020) and 1406 at Time 2 (April 2021) took part to the study. Measures of insomnia symptoms, sleep hygiene, chronotype, psychological distress and emotion regulation were collected.

Prevalence of insomnia was 12.13% at T1 and 23.19% at T2. Furthermore, high levels of poor sleep habits (late bedtime, poor sleep hygiene, use of electronic devices during bedtime) were also detected in both time points. Insomnia symptoms strongly correlated with poor sleep hygiene, higher psychological distress and emotional suppression at both time points.

Results highlighted an alarming picture for two large samples in two different time-point of the pandemic that showed a potential negative impact of Covid-19 pandemic in both the first outbreak and in the later phase of the pandemic on sleep habits, psychological distress and insomnia symptoms in adolescents. This strongly suggests the need for monitoring these variables and their interaction in the post-pandemic period and to develop and promote interventions for insomnia and circadian disturbances during adolescence.

Keywords: Covid-19; adolescents; sleep; health; insomnia; psychology

Introduction

A multitude of variables can affect the quality and quantity of sleep throughout adolescence (e.g. school start times, caffeine and use of electronic devices; Adolescent Sleep Working Group, 2014; Gradisar et al., 2013). Over the past decades, a decrease in sleep duration was observed during adolescence worldwide (Hysing et al., 2013; Gradisar, Gardner, & Dohnt, 2011). Recently it was estimated that insomnia (accordingly to DSM- fifth edition; American Psychiatric Association, 2013) prevalence is around the 18.5% during this age range (23.6% in girls and 12.5% in boys; Hysing et al., 2013). Furthermore, adolescence is a particularly vulnerable period for problems in circadian regulation (Hagenauer & Lee, 2012), presenting the most irregular sleep behavior (Gradisar et al., 2011). Insufficient sleep has been associated with adverse consequences, including mood disturbances (Moore et al., 2011), other mental and physical health outcomes (Shochat, Cohen-Zion, & Tzischinsky, 2014), increased risk of injuries (Lam & Yang, 2007), and poor school performance (Wolfson, Spaulding, Dandrow, & Baroni, 2007). Moreover, night-time sleep affects daytime mood, emotional reactivity and the capacity to regulate positive and negative emotions (Gruber & Cassoff, 2014). Adolescent insomnia severely impacts future health and functioning (Roberts, Roberts, & Duong, 2008). Nowadays, more than half of adolescents from technologically advanced countries reported using electronic media most evenings during the last hour before they go to bed (Gradisar et al., 2013). Cain and Gradisar (2010) propose several mechanisms through which the use of electronic media in the evening may reduce sleep duration and interfere with sleep quality: displacing other possible activities and sleep; increasing mental, emotional, or physiological arousal; light emission of the screens of electronic media devices. Furthermore, sleep hygiene factors (such as appropriate sleep schedule, use of sleep-disturbing products and adequate sleep environment) are of utmost importance for healthy sleep in adolescence. Previous literature proposed that the relations between sleep and psychiatric risk may be embedded in disrupted emotional processes, such as emotion regulation (Baglioni, Spiegelhalder, Lombardo, & Riemann, 2010; Harvey, Murray, Chandler, & Soehner, 2011; Palmer & Alfano, 2015). Previous research suggested that disrupted sleep increases vulnerability to anxiety and depression via emotional processes (Harvey et al., 2011; Gregory &

Sadeh, 2016). The scarce ability to reduce negative emotions is a transdiagnostic feature of many disorders (Gross & Jazaieri, 2014).

An external situation that could have played a crucial role in impacting adolescent insomnia and wellbeing was the pandemic situation due to Covid-19 (Altena et al., 2020). Italy was one of the first European nations to be exposed to the outbreak. The rapid growth of contagion from the first case identified on January led to implementation of strict measure in affected zones (February 2020). Since March 11th Italian Government imposed a total lockdown on the whole national territory (Phase 1) that continued until May 3rd (end of Phase 2). People were forced into home confinement and movement were allowed only for documented necessities. Phase 3 started on June 11th, when measures were lifted and some activities reopened. Until then, adolescents could not go to school, play sports, have social leisure and, in many cases, meet friends. With the start of the new academic year (September 2020), school reopened and adolescents regained some freedom to meet friends and participate in social activities. Before the end of the year, the rapid growth of the new wave of contagion forced new restrictive measures. As a consequence, on the 6th of November 2020, the Government implemented a system of restrictions based on risk for the diffusion of the disease and the pressure on local healthcare systems. Particularly, Italian regions have been classified across three risk levels (yellow, orange, and red, ordered in terms of the severity of the restrictions). In territory not at high risk, schools were reopened and mandated to ensure to at least 50% (for a maximum of 75%) of students the possibility to attend lessons, while the remaining were connected via online platforms. In medium and high risk zones, school was closed, and learning was possible only by online lessons. These limitations had important effects on adolescents, with significant lifestyle changes and a widespread reporting of negative feelings associated with Covid-19 (Esposito et al., 2021).

Due to this severe situation, several studies focused on the negative psychological effect of Covid-19 in the Italian general population (e.g., Rossi et al., 2020), highlighting high rates of perceived stress, depression and anxiety symptoms and insomnia complaints. Another large study evaluated the Italian

general population, focusing on the impact of the Covid-19 pandemic and related consequences on sleep quality and circadian rhythms (Salfi et al., 2021; Bacaro et al., 2021). These previous studies observed high prevalence of sleep disturbances and heightened rates of delayed sleep phase. Participants rated home confinement as a factor which negatively influenced their sleep quality and habits. Furthermore, the evening chronotype was underlined as vulnerability factor, while the morning chronotype was a protective factor for sleep quality and psychological problems. One study (Amicucci et al., 2021) focused specifically on the Italian adolescents selecting, through the snowball technique, during the first wave of Covid-19, 670 late adolescents aged on average 19.38 years old. Results showed that during that period adolescents reported high levels of poor sleep quality, long sleep onset latency and irregular sleep habits. Another recent study (Bruni et al., 2021) evaluated sleep patterns of Italian children and adolescents during the first wave of Covid-19 in 2020 and the authors found similar results, with all the age groups reporting a delay in bedtime and risetime (with the most of school-aged children and adolescents reporting to go to bed after 11:00 pm). These previous studies highlighted how the pandemic situation and its restriction had a strong impact on both psychological wellbeing and sleep quality of the general population and adolescents in particular. Nevertheless, these studies focused mainly on late adolescents and provided a picture of the situation mostly in the first wave of Covid-19. For these reasons, it is of utmost importance to understand the impact of the changes in lifestyles on sleep during the different times of the pandemic focusing on all the adolescence period. The present study aimed at providing two photographs of two different phases of the pandemic on two independent large samples of Italian adolescent population at the start of Covid-19 pandemic and after 1 year. By observing two independent large samples of adolescents in two different pandemic timepoints, we aimed at providing a more comprehensive picture of variables associations in different pandemic phases.

Secondly, we aimed at analyzing the association of insomnia disorder with anxiety and depression symptoms, and at evaluating possible mediating factors in this relationship. Specifically, we aimed at evaluating:

1) Prevalence of insomnia in a large sample in Phase 1 pandemic;
2) Prevalence of insomnia in a large independent sample in Phase 2 pandemic;
3) Prevalence of all considered variables and their association with insomnia severity in the two time points,
4) A model evidencing the factors which are strongly associated to insomnia disorders in the two time points.

Method

Procedure and Participants

The first time point recruitment started on the 14th of April 2020 and was completed on the 4th of May 2020, the period in which the more restrictive measures and national lockdown was implemented. The second time point was exactly after 1 year, the recruitment started on 12th of April 2021 and was completed on the 3rd of May 2021. During the second time point in Italy most of the regions were in the medium or high risk zone with restrictive measures, social distancing and home confinement. Two independent large samples were recruited. An online survey was created on Survey Monkey platform, an anonymous data bank and data repository commonly used in research (Fox, Murray, & Warm, 2003). At least one parent with at least one adolescent child aged between 13 to 17 years old were invited to participate. The completion of the study was voluntary and anonymous and required an average compilation time of 10 minutes. If participants were interested to participate, they were asked to read accurately the information about the study and to reading and fill in a written and informed consent form before starting the survey. Contacts of researchers were given in the informative page and participants could contact them for any doubt or need.

Surveys were systematically distributed in all Italian territory by sending e-mails to all the regional offices of the ministry of education, and consequently to the mailing lists of all the schools in the area available on the ministry of education website. In these e-mails the rationale and the aim of the study

were explained, furthermore, we asked the help of the schools' head in sending the link of the survey to all the parents of their institution.

Parents were asked to answer to general information about the family composition and then to answer to some question targeting habits and eventual changes of their adolescents. After that, parents were asked a consent to let their adolescents to answer to some question. Only if both parents read and filled in this consent, adolescent could answer to the remaining questions. No compensation for participating in the study was provided. All procedures were performed in accordance with the 1964 Helsinki Declaration and its later amendments, and the study was approved by the Ethical Committee of the University of Rome Guglielmo Marconi (Acceptance_Letter_Ethic Committee_Data_10032021).

Instruments

- *General information questionnaire for parents*

An ad hoc questionnaire was created to collect general information. The following information was collected: who was filling in the questionnaire (mother, father, other); nationality; region; family composition; current insomnia in the family; past insomnia in the family; worry about the pandemic situation; positivity to the virus; parents' perception of adolescent' changes in sleep, eating behavior and use of technologies.

- *General information questionnaire for adolescents*

An ad hoc questionnaire was created to collect general information of adolescents. The following information was collected: age; gender; height; weight; attended school; actual use of remote school modality; physical activity before and after the pandemic; use of drugs; habitual sleep pattern; use of technologies before and after the pandemic.

- *Insomnia Severity Index (ISI; Bastien, 2001)*

Participants provided answer on a five-point Likert scale, and summing up the results of the respective seven items, ranging from 0 to 28, a total score of insomnia severity during the preceding two weeks could be obtained. The total score is interpreted as follows: clinically irrelevant insomnia (0 -7); subthreshold insomnia (8-14); moderate insomnia (15-21); and severe insomnia (22-28).

- *Sleep Hygiene Index (SHI; Bacaro, Curati, & Baglioni, 2021)*

The Sleep Hygiene Index is a 13-item self-administered questionnaire which evaluate sleep hygiene behavior. The items included on the SHI were derived from the diagnostic criteria for inadequate sleep hygiene included in the International Classification of Sleep Disorders (American Academy of Sleep Medicine, 2005). Participants were asked to indicate how frequently they engage in specific behaviors (always = 5, frequently = 4, sometimes = 3, rarely = 2, never = 1). Higher scores are indicative of poorer sleep hygiene status.

- *Morningness Eveningness Questionnaire Reduced (MEQr; Natale, Esposito, Martoni, & Fabbri, 2006)*

MEQr included five questions: three items requested preferred time for going to bed, getting up and the hour of the day when personal efficiency is at maximum. Moreover, participants also had to assess the degree of tiredness within the first half hour after their awakening and to indicate which circadian type they thought they belonged to. The MEQr score was obtained by summing scores of each question and ranged from 4 to 25. Scores above 18 identified subjects as morning types and scores below 11 as evening types.

- *Emotion Regulation Questionnaire (ERQ; Gross & John, 2003)*

The ERQ is a 10-item self-report scale assessing two individual strategies that people adopt in order to regulate their emotions: cognitive reappraisal and expressive suppression. Participants rate the how much they agree with self-descriptive statements reflecting cognitive reappraisal or expressive suppression on a 7-point Likert-type scale.

- *Hospital Anxiety and Depression Scale (HADS; Zigmand & Snaith, 1983)*

The HADS consists of seven items rating anxiety and seven items rating depression. Each item is scored from 0 to 3. Anxiety and depression values are the sums of the corresponding item scores. Patients can be subsequently allocated to one of the three following categories for anxiety and depression, based on the individual sum scores: non-case (0–7), borderline case (8–10) and definite case (11 and above).

Statistical Analysis

Collected data were analyzed using SAS Software 9.4 version with SAS/STAT version 14.1 (SAS Institute Inc., Cary, NC, USA) by a professional biostatistician (S.C.). Descriptive statistics were performed on demographic data and sleep parameters. Preliminary student T test showed no significant differences in the main variables of the study. Results for descriptive statistics were expressed in means ± standard deviations for continuous variables and in absolute and relative frequencies for categorical variable. Pearson's correlations analyses were performed on the analyzed variables at Time 1 and Time 2. The internal consistency of the instruments used were evaluated calculating Cronbach's α coefficient (good internal consistency was considered $0.70 > \alpha < 0.90$) (Cronbach, 1951). Linear multivariable regression model was used to determine the

association between several independent variables considered as predictors and severity of insomnia as outcome at both Time 1 and Time 2.

Results

Cross-sectional Characteristics of the two Samples

Two samples were analyzed: Time 1 and Time 2' samples. In Supplemental Material Document S1 the flow chart of two time points samples are documented. In Table 1 descriptive data for the two samples are summarized. Respectively Time 1 and Time 2' samples were composed of 1146 and 1406 participants (Mean age: Time 1: 14.95±1.38; Time 2: 15.68±1.11).

Please insert here Table 1: "Demographic characteristics"

In table 2 main results for psychological and sleep variables are reported for both samples. Results showed that at both time points high presence of insomnia symptoms, poor sleep hygiene and presence of evening type adolescents (categorized as explained in the instruments section) and anxiety symptoms were detected. The number of participants that went to bed late (after 11:00 p.m.) was strongly high at both time points and this difference was more qualitatively evident during the weekend (Time 1: weekdays: 54%; weekend: 78.6%; Time 2: weekdays: 56.54%; weekend: 82.21%). Moreover, in Supplemental Material Document S2 mean scores at questionnaires for both time points are reported.

Please insert here Table 2: "Psychological and sleep categories"

In Document S3 are summarized the descriptive statistics (number and percentage) about the use of electronic devices. Results showed high level of use of phones and tablets more than six hours and during bedtime. The same situation was highlighted for the PC and social media use but not for the TV.

Correlations Analyses Between Predictors and Insomnia

Results of correlations analyses at Time 1 and Time 2 are resumed in Document S4. At Time 1 insomnia severity was significantly and positively correlated with poor sleep hygiene, high anxiety and depression symptoms and with emotion regulation strategy of emotional suppression. At Time 2 insomnia severity was associated with the same variables and also with lower total MEQ scores and higher emotion regulation strategy of cognitive reappraisal.

Factors Associated with Insomnia

In Figure 1 the forest plot for linear multivariable regression model at Time 1 and Time 2 is showed. At Time 1 larger effects were detected for poor sleep hygiene (β=0.15513, 95% CI [0.11; 0.20], $p<0.0001$) and anxiety symptoms (β=0.73341, 95% CI [0.64; 0.83], $p<0.0001$). Furthermore, at Time 2 results showed that sleep hygiene behaviors (β=0.14857, 95% CI [0.11; 0.19], $p<0.0001$), anxiety (β=0.70146, 95% CI [0.62; 0.78], $p<0.0001$) and depression (β=0.17867, 95% CI [0.05; 0.31], $p<0.01$) symptoms are associated to insomnia severity.

Please insert here Figure 1: "Forest plot for Time 1 and Time 2 linear multivariable regression model"

Discussion

This was a large repeated cross-sectional study that aimed at evaluating the different impact of Covid-19 pandemic on adolescents' sleep at two different pandemic time points on two distinct large samples. We therefore assessed insomnia prevalence, sleep pattern and psychological factors in Italian adolescents at the start of the pandemic and after one year. As a primary result, we found high presence of clinical insomnia in adolescents aged 13-17 years after at both time points analyzed, at the start of the pandemic and after 1 year from Covid-19 outbreak. The same result was found for the use of electronic, particularly at bedtime.

Results confirmed a trend that was previously observed in the literature for which Italian adolescents' sleep duration is short (around 8 hours), and bedtime and waketime patterns are strongly discrepant between weekdays and weekends (Bacaro, Gavriloff, Lombardo, & Baglioni, 2021). Furthermore, previous work also revealed the role of Covid-19 pandemic in increasing sleep disturbances percentages and in delaying sleep-wake patterns (Bruni et al., 2021). This is particularly important considering that previous studies highlighted the potential role of later weeknight bedtime, shorter weeknight sleep duration, greater weekend bedtime delay, and both short and long periods of weekend oversleep for increasing the odds of mood, anxiety, substance use, and behavioral disorders, as well as suicidality, tobacco smoking, and poor perceived mental and physical health (Zhang et al., 2017). The use of electronic devices could intensify sleep problems because it was demonstrated that higher use of electronic devices during bedtime increased the risk of short sleep duration, long sleep onset latency and increased sleep deficiency (Hysing et al., 2013).

Furthermore, changes in sleep during Covid-19 pandemic contribute to the increase in psychopathology symptoms. A particularly clinically relevant result from this study is the high presence of anxiety symptoms at both time points and their potential role in predicting insomnia symptoms. It was previously highlighted the role of lockdowns, physical distancing, school suspension and quarantining in worsening fears, stress, and anxiety symptoms in individuals

worldwide (Ahorsu et al., 2020; King, Burke, Halson, & Hawley, 2020). The factors that could be involved in this association are cognitive processes such as worry and rumination. They were found to be significantly correlated with anxiety and depression symptoms in adolescents (Verstraeten, Bijttebier, Vasey, & Raes, 2011). As theorized by Harvey (2002) the tendency to worry and ruminate during the day may extend to the pre-sleep period, resulting in biased attention to threat, unpleasant intrusive thoughts, and excessive and uncontrollable worry about getting enough sleep. These processes could exacerbate worry, anxiety, and low mood that, in turn, could culminate in a real sleep deficit as well as counter-productive behaviors such as avoiding bed or getting out of bed. Moreover, results of this study also highlighted the role of the circadian preference in predicting insomnia symptoms and this is consistent with the pre-pandemic literature (Adan et al., 2012) and confirmed previous results on the impact of circadian preference also on psychopathology and emotional dysregulation in adolescents.

During the pandemic, remote teaching gave adolescents more opportunities to wake up later. In our study we collected data at two time points with different restrictions concerning school attendance: at Time 1 (April 14 – May 4, 2020) remote teaching was mandatory in all the Italian territory; at Time 2 (April 12 – May 3, 2021) different patterns of remote and in presence teaching were disseminated across regions based on the risk of contagion. With full school reopening, we could expect that T2 was linked with a worse situation of the mismatch between adolescent's rhythm, with a marked propensity for delayed sleep and rise time, and social demands (e.g., school start time, Alfonsi et al., 2020).

The correlations found at Time 2 between insomnia symptoms and emotion regulation are also consistent with pre-pandemic reports (Palmer et al., 2018). Enhancing adaptive emotion regulation skills in adolescents may help them in dealing with difficult emotions and stress sources, resulting in less engagement with daily worries and deactivation of sleep-related arousal. This could be particularly important for the implementation of preventing and promoting intervention targeting insomnia symptoms in the post-pandemic scenario.

This study presents some limitations. First, it was not possible to perform a longitudinal study with the same sample of adolescents. Despite that, we were able to recruit a sample that was comparable both in terms of size and characteristics that was representative of the adolescent population and at the same time ensuring privacy for the participants. Furthermore, the systematic recruitment and the accessibility was a strength of this study, but the telematic format made the use of objectives measures and sleep diaries unfeasible. Future studies should evaluate longitudinally the effects of this pandemic using also objective measures. Another limitation of the study was the fact that the distribution of the sample of the study was not balanced in all the Italian territory. Despite the survey was systematically distributed in the Italian territory through an official mailing list, the participation at the study was voluntary and participants from the North and the Centre were less involved in the study compared to participants from the South of Italy that were more likely to participate. Finally, the follow-up assessment took place during a period of lighter restraining measures. Despite that, the results pointed to a detrimental effect of the pandemic period itself, regardless of the restrictions in force. Furthermore, another strength of this study was the selective age range of the participants that allowed to have a specific picture of Italian adolescents.

The results of this study confirm recent literature on the negative effect of Covid-19 pandemic in worsening sleep quality and sleep schedule of adolescents (e.g., Bruni et al., 2021). Furthermore, a longitudinal study (Salfi et al., 2021), focusing on adult Italian population during two different time points of the first wave of Covid-19 (2020) found several crucial predictors of poor sleep and insomnia symptoms: female gender, low education, evening chronotype and evening smartphone overuse. This study confirms the trend due to Covid-19 pandemic and its restrictions for adolescence in worsening poor sleep quality and delaying bedtime. This is particularly important for clinical implications of this specific population allowing to identify specific risk factor for the development of sleep disturbance that could also impact psychological wellbeing. Indeed, while this age range was particularly negatively impacted by the pandemic, post-pandemic health politics should focus on young teenagers and adults. Future health-promoting interventions are needed in

this specific population targeting sleep patterns, insomnia symptoms and emotion regulation strategies. These interventions could be based on the first-line treatment for insomnia and could be integrated with emotion regulation, implementing new clinical approach focusing on sleep and emotion regulation strategies; offering different preventive and interventional programs both face-to-face and online; and increasing collaboration between clinical psychologists experts of sleep and schools.

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Tables:

Table 1. *Demographic characteristics*

Socio-demographic variable				
	Time 1		**Time 2**	
Age	**N**	**%**	**N**	**%**
13	214	18,7	21	1,49
14	264	23	229	16,29
15	247	21,6	357	25,39
16	203	17,7	373	26,53
17	218	19	426	30,3
Mean ± SD	14.95±1.38		15.68±1.11	
Gender				

Female	637	55,6	782	55,62
Male	509	44,4	624	44,38
Region				
North	60	5,24	267	18,99
Center	43	3,75	87	6,19
South	906	79,06	927	65,93
Islands	137	11,95	125	8,89
All (N=)	1,146		1,406	

Note: North was composed of Lombardia, Piemonte, Veneto, Liguria, Emilia Romagna, Valle D'Aosta, Trentino Alto Adige, Friuli Venezia Giulia; Center was composed of Lazio, Toscana, Marche, Umbria; South was composed of Abruzzo, Molise, Campania, Basilicata, Puglia, Calabria; Islands: Sicily, Sardinia.

Table 2. *Psychological and sleep variables*

Categories	**Time 1**		**Time 2**	
Circadian typology (MEQ)	**N**	**%**	**N**	**%**
Evening type	134	11,69	298	21,19
Intermediate type	422	36,82	938	66,71
Morning type	152	13,26	170	12,09
NA	125	10,9	187	12,09
Depression symptoms (HADS_D)	**N**	**%**	**N**	**%**
Normal	234	20,42	440	31,29
Borderline	477	41,62	546	38,83
Clinic	435	37,96	420	29,87

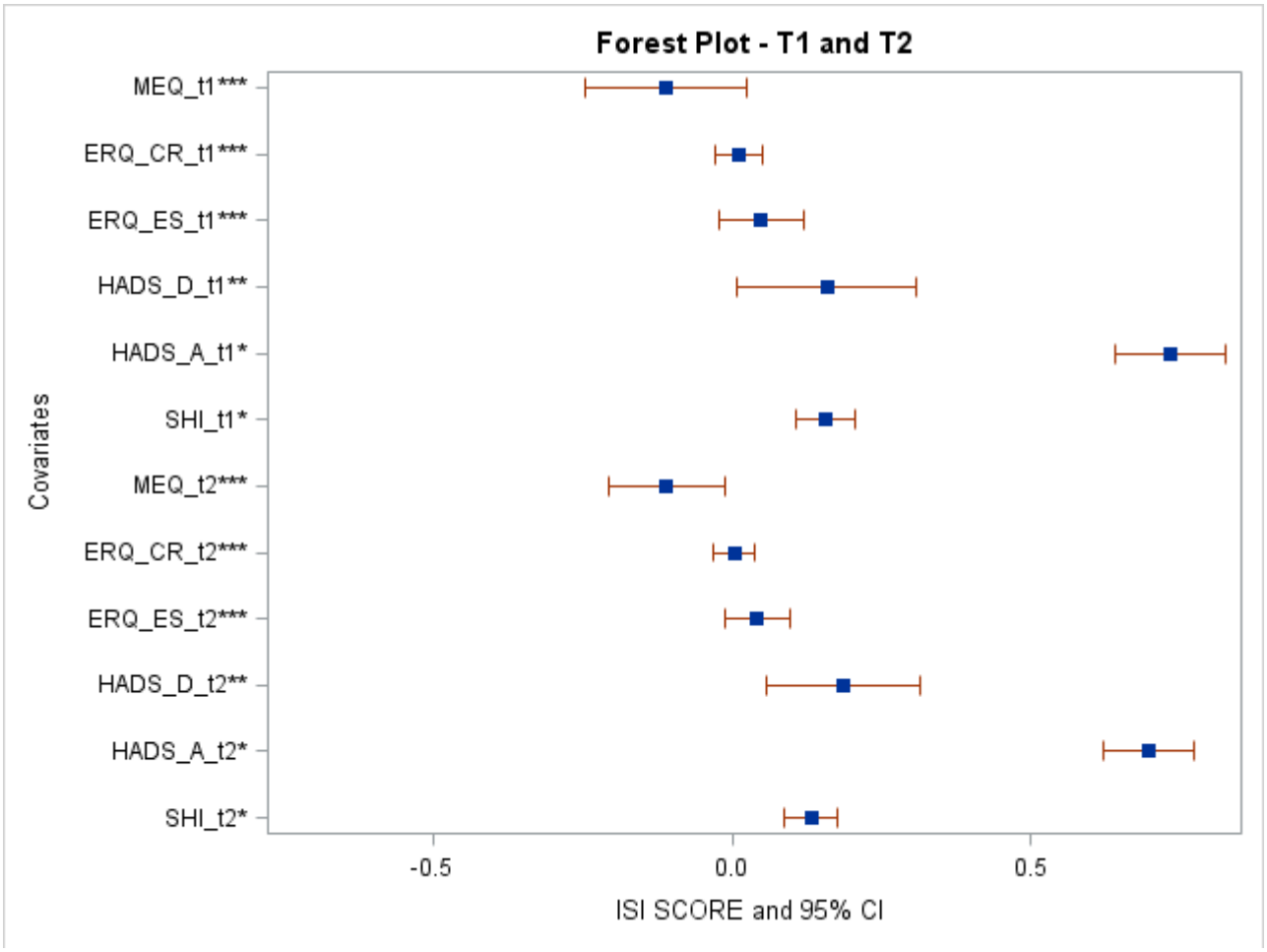
Anxiety symptoms (HADS_A)	**N**	**%**	**N**	**%**
Normal	773	67,45	734	52,2
Border	214	18,67	245	17,43
Clinic	159	13,87	427	30,37
Insomnia symptoms (ISI)	**N**	**%**	**N**	**%**
Absence of insomnia	690	60,21	640	45,52
Subthreshold insomnia	317	27,66	440	31,29
Moderate insomnia	117	10,21	265	18,85
Severe insomnia	22	1,92	61	4,34
Bedtime week	**N**	**%**	**N**	**%**
Before 9 pm	4	0,35	6	0,43
Between 9 and 10 pm	150	13,09	159	11,31
Between 10 and 11 pm	373	32,55	446	31,72
Between 11 and 12 pm	393	34,29	492	34,99
After 12 pm	226	19,72	303	21,55
Wake time week	**N**	**%**	**N**	**%**
Before 7 am	160	13,96	499	35,49
Between 7 and 8 am	437	38,13	766	54,48
Between 8 and 9 am	412	35,95	113	8,04
Between 9 and 10 am	100	8,73	24	1,71
Between 10 and 11 am	19	1,66	1	0,07
Between 11 and 12 am	8	0,7		
After 12 am	10	0,87	3	0,21

Bedtime weekend	**N**	**%**	**N**	**%**
Before 9 pm	1	0,09	1	0,07
Between 9 and 10 pm	31	2,71	36	2,56
Between 10 and 11 pm	213	18,59	213	15,15
Between 11 and 12 pm	486	42,41	497	35,35
After 12 pm	415	36,21	659	46,87
Wake time weekend	**N**	**%**	**N**	**%**
Before 7 am	15	1,31	20	1,42
Between 7 and 8 am	63	5,5	115	8,18
Between 8 and 9 am	210	18,32	270	19,2
Between 9 and 10 am	350	30,54	418	29,73
Between 10 and 11 am	292	25,48	277	19,7
Between 11 and 12 am	162	14,14	209	14,86
After 12 am	54	4,71	97	6,9

Legend: HADS: Hospital Anxiety and Depression Scale; ISI: Insomnia Severity Index; MEQ: Morningness Eveningness Questionnaire;

Figures

Figure 1



*Significant at $p \leq .0001$; ** Significant at $p < .01$; *** Significant at $p < .50$

Figure captions

Figure 1: “Forest plot for Time 1 and Time 2 linear multivariable regression model”. Legend: ERQ_CR: Emotion Regulation Questionnaire – Cognitive Reappraisal subscale; ERQ_ES: Emotion Regulation Questionnaire – Expressive Suppression subscale; HADS_A: Hospital Anxiety and Depression Scale – Anxiety subscale; HADS_D: Hospital Anxiety and Depression Scale – Depression subscale; SHI: Sleep Hygiene Index; ISI: Insomnia Severity Index; MEQ: Morningness-Eveningness Questionnaire