

# Project Proposal

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## Examining the Role of Stress and Emotion Regulation in Adolescent Insomnia

### Background:

Insomnia is highly prevalent in adolescence, affecting up to 23% of teenagers. As sleep restriction is pervasive in adolescents, insufficient and poor sleep quality may be perceived as normal and underreported by adolescents due to the lack of awareness of sleep problems and associated consequences.

Chronic insomnia can negatively impact adolescents' physical health, psychological wellbeing, and development. Research shows that factors like hyperarousal, excessive rumination, ineffective emotion regulation, and heightened stress reactivity play an important role in the pathology of insomnia. However, our understanding of how these mechanisms interact to produce and perpetuate sleep disruption in teenagers remains limited. Importantly, adolescent insomnia is more common in girls than boys, with this sex difference emerging in adolescence; there is a 2.75-fold increased risk for insomnia in girls after the onset of menses [1], making them the primary risk group to develop the disorder.

### Objectives:

This project aims to leverage a multidimensional dataset of 95 adolescents aged 16-19 years (Kiss et al., 2022) to elucidate the complex relationships between stress, emotion regulation, and insomnia symptomatology. Specifically, we will:

1. Identify symptom clusters and central symptoms linked to poor sleep in teenagers using network analysis. This can inform targets for treatment and prevention.
2. Test if adolescents with insomnia show greater self-reported stress reactivity across different contexts compared to good sleepers.
3. Examine whether difficulties in emotion regulation mediate the effects of stress reactivity on sleep disruption. We hypothesize that heightened reactivity to stressors will interfere with sleep particularly when coupled with ineffective emotion regulation.

### Methodology:

This study will utilize the available dataset consisting of extensive measurements of sleep parameters, stress, emotion regulation, childhood experiences, and other relevant domains in adolescents with and without insomnia.

Here is a more detailed methodology for the proposed project on examining stress, emotion regulation, and sleep in adolescents:

**Participants** The study will utilize an existing dataset consisting of 95 adolescents aged 16-19 years. This includes n=48 healthy sleepers, n=26 adolescents meeting DSM-5 criteria for insomnia disorder, and n=21 with subthreshold insomnia symptoms.

Measures the following key measures assessed via validated questionnaires will be utilized in analyses:

- Insomnia Severity Index (ISI): Assesses perceived insomnia severity
- Pittsburgh Sleep Quality Index (PSQI): Evaluates sleep quality and disturbances
- Ford Insomnia Response to Stress Test (FIRST): Measures vulnerability to sleep disruption during stress
- Perceived Stress Reactivity Scale (PSRS): Assesses stress reactivity magnitude across contexts
- Difficulties in Emotion Regulation Scale (DERS): Evaluates emotion regulation deficits

### Analysis Plan:

Descriptive statistics will first characterize the sample. For hypothesis testing, multivariate modeling approaches including mediation analysis structural equation modeling will be implemented. Effect sizes, confidence intervals, and model fit indices will be reported alongside inferential statistics.

Here is a detailed data analysis plan for the proposed project:

#### Data Preparation

- Evaluate univariate and multivariate normality assumptions
- Transform non-normal variables or use robust estimators as needed

### Preliminary Analysis

- Obtain descriptive statistics on all variables
  - Calculate means and standard deviations for stress reactivity scores in each context for both groups.
- Correlation Analysis:
  - Begin by examining correlations between stress reactivity, difficulties in emotion regulation, and sleep disruption to understand the bivariate relationships between these variables.

### Primary Analysis

#### ▼ Network Analysis

- Visualize overall network topology and group differences
- Identify central symptoms via stability analysis

#### ▼ self reported stress reactivity

- Group Comparison: Conduct inferential statistical tests (e.g., t-tests or ANOVA) to compare the mean stress reactivity scores between adolescents with insomnia and good sleepers across different contexts.
- Controlling for Confounders: Consider controlling for potential confounding variables such as age, gender, and severity of insomnia symptoms in the analysis.
- Effect Size Calculation: Calculate effect sizes to determine the magnitude of differences in stress reactivity between the two groups.
- Subgroup Analysis: Explore whether there are differences in stress reactivity between subgroups of adolescents with insomnia (e.g., clinical vs. sub-clinical insomnia).
- Overall, this plan leverages robust statistical techniques optimized for the complex dataset structure to rigorously test study hypotheses regarding mechanisms underlying adolescent insomnia.

#### ▼ Emotion Regulation

- Mediation Analysis: Use mediation analysis to test whether difficulties in emotion regulation mediate the relationship between stress reactivity and sleep disruption.
- First, regress sleep disruption on stress reactivity to determine the total effect.
- Then, regress difficulties in emotion regulation on stress reactivity to determine the effect of stress reactivity on emotion regulation.
- Finally, regress sleep disruption on both stress reactivity and difficulties in emotion regulation to determine the direct effect of stress reactivity on sleep disruption, controlling for the mediator (emotion regulation).
- Assess the significance of the indirect effect to determine if difficulties in emotion regulation mediate the relationship between stress reactivity and sleep disruption.
- Controlling for Confounders: Consider controlling for potential confounding variables such as age, gender, and other relevant factors in the mediation analysis.

### Expected Results and Implications:

The analysis of stress reactivity among adolescents with insomnia versus those who are good sleepers aims to illuminate the relationship between insomnia and stress perception across different contexts. This understanding is critical for designing targeted interventions to manage stress and enhance the well-being of adolescents facing sleep challenges.

The analysis of emotion regulation's mediating role between stress reactivity and sleep disruption will provide insights into the underlying connections between these elements. Recognizing the importance of emotion regulation in reducing stress's impact on sleep is key to developing effective interventions.

If the analysis demonstrates that deficits in emotion regulation exacerbate stress's effect on sleep, it highlights potential targets for psychosocial interventions. Such interventions would aim to improve adolescent sleep health by focusing on both stress management and enhancing emotion regulation capabilities.

## References

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