Author's response to reviews

Title: The Effects of Irregular Bedtime on Sleep Quality, Daytime Sleepiness, and Fatigue in University Students in Taiwan

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Author's response to reviews:

Dear Professor Norton,

Our revised manuscript, entitled “Effects of Irregular Bedtime on Sleep Quality, Daytime Sleepiness, and Fatigue among University Students in Taiwan”, is resubmitted to BMC Public Health.

We sincerely appreciate the reviews' constructive comments. We also thank you for giving us the opportunity to have revision of our manuscript to clarify and improve our study. We have made a point-by-point response to the reviewers' concerns mainly on 1) clarifying the issue on data collection 2) re-analyzing the data with more suitable and robust statistical method 3) editing and re-organizing the manuscript.

For comments from Professor. BaHammam,

1. We used a random sample from first-year undergraduate students. This point has been added in the manuscript.
2. The subjects with a history of either chronic medical or psychotic disorders, as well as those currently on medication were excluded from our study. We did collect the data regarding the conditions of part-time job or other activities which could be associated with a shifting of bedtime schedule, however, these data is too diverse to be further analyzed. We hypothesize the severity of irregular bedtime may be more associated with sleep parameters rather than its causes. Nevertheless, our hypothesis needs to be investigated in further study.

3. To our knowledge, the data regarding variability of sleep schedule on normal adult is scanty. The sample size is difficult to be estimated since the variability of parameters can not be obtained in previous study. We mainly selected this sample size according to our maximal resources in conducting this study.
4. We agree with reviewer's comment. The statement in the article has been amended.

For comments from Professor Palermo

Major
1. We agree with reviewer's comment. The statement in the articles has been amended.

2. Limited studies available to study the variability of sleep schedule, particularly in adults. To our knowledge, the data regarding the operating definition of irregular sleep schedule of adults is lacking. Yet no data are available to explore the “normal” range of variability of bedtime in normal subjects. Our study's main goal was to investigate whether poorer sleep quality and more daytime consequence are associated with increased irregular bedtime rather than establish the “threshold” of variability of bedtime.

Because we found the recall bias could be happened when the subjects gave their bedtime schedule occurred in past 2 weeks during the interview. We decided to use a semi-quantitative scale to substitute exact number of irregular bedtime to decrease the difficulty and uncertainty in data collection. One hour shifting is an arbitrary determination, because we found the uncertainty when the subjects recalled their sleep schedule and determined the frequency of irregular bedtime can be minimize in the interview. As we mentioned in the section of discussion, further study with other objective measurements could decrease this ambiguity and confirm our findings.

3. As partially mentioned in second point. A short interview to each subject was conducted to clarify sleep schedule and estimate their average daily sleep time according subject’s self-reported sleep log in prior 2 weeks. In our definition, a shifting of bedtime schedule or decreased sleep time during the weekend still should be considered as a “poor sleep hygiene”, although it is a usual circumstance in the population. We found the irregular bedtime frequency and average sleep time per day can be easily determined in most subjects in combing with 2 weeks sleep log during interview.

4. We agree with reviewer’s concern. Indeed, some outcome variables form our study could be potential overlapping. The PSQI score is higher, indicating lower sleep quality, in subjects who have lower average sleep time but irregularity of sleep schedule is not included in rating of PSQI. We also found the subjects who had higher frequency of irregular bedtime were associated with decreased average sleep time per day. To control for the potential confounding effects of sleep insufficiency, multi-variable linear regression adjusted for average daily sleep time per used to analyze how irregular bedtime frequency related to scores for each of the PSQI, ESS and FSS. We believe this method could improve the interpretation of our data and prevent the confounding effects.

5. Similar to above response, the confounding effect of total sleep time contributing in rating of PSQI was adjusted by reanalysis data with multi-variable regression. We highly appreciate this comment highlighted by the reviewer.

Minor

6. The non-standard acronyms have been removed as reviewer's suggestion.
7. The grammar and writing style have been edited by a native English speaker.
8. We reanalyze the data with multi-variable regression to explore the potential confounding. This method may be more informatics and robust than analysis of
variance (ANOVA/MANOVA).

9. The figure has been removed as reviewer’s suggestion.

10. We have listed the zero-order, partial and p-value of the correlation among the variables to improve the understandings of our data in New Table 3.

11. All variables are given as number (%) in Table 2.

Discretionary

12. It may be more suitable that the metric unit of sleep onset latency is expressed in min and the average sleep time per day in hour.

13. We believed that Table 1 could improve the overview of our data in addition to compare the gender difference.

Grammatical and writing style in the revised version have been checked and copyedited carefully by a native English speaker again. The format of the revised manuscript has been edited to conform to the journal style. This article represents an important and useful finding in the field of public health and we are eager to see it in print.

With best wishes,

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