SOF AP #835

SOF Analysis Plan Submission Form

Date: 2015/10/18

Investigator’s Name: Yue Leng

Clinical Center:

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Other investigators who will be working on this analysis: Sonia Ancoli-Israel

Analysis Plan Title: Correlation between subjective and objective daytime napping and night time sleep parameters

Data sets to be used: SOF visit 8: Sleep actigraphy, sleep habits questionnaire, PSQI, polysomnography study, demographics, anthropometric Measures, lifestyle, medical history, medications, quality of life and cognitive function.

Primary variables to be used in the analysis: Daytime napping habits measured by actigraphy and questionnaire report; Night time sleep measured by actigraph; Nocturnal hypoxemia and sleep disordered breathing by overnight polysomnography (see attached for more details)

Does this analysis plan involve a consortium or meta-analysis project? [ ] YES [ ] NO
If YES,
1. Does this plan propose to use GWAS data? [ ] YES [ ] NO
2. Who is the investigator leading the analysis?
   a. If not a SOF investigator, please note the lead investigator’s affiliations.
3. What other cohorts are involved in the consortium or meta-analysis?
4. What are the definitions of the primary phenotypes of interest?
5. Describe any authorship policies of the consortium.

Do you plan to submit an abstract based on these results? [ ] YES [ ] NO
If YES, when is the abstract due? Dec 2015

Who will perform the analyses?
[ ] Coordinating Center
[ ] Other local analyst, please specify: Yue Leng

Is this the first analysis plan you are submitting to utilize SOF data? [ ] YES [ ] NO
If YES, please provide 2-3 sentences about your professional background and research interests.
I am a postdoctoral fellow working with Dr. Yaffe. Before joining Dr. Yaffe’s group, I completed PhD studies, working on sleep epidemiology in the European Prospective Investigation of Cancer (EPIC)-Norfolk study. My main research interests are in epidemiology, sleep, psychosocial factors and cognition.
Please attach a 1-2 page description of your analysis plan. Please include the following:
1) Short background/rationale for addressing the research question
2) Brief description of statistical methods
3) Mock tables

E-mail this completed form (as an attachment) to Liezl Concepcion (lconcepcion@sfcc-cpmc.net).

Background

Older adults undergo significant changes in sleep patterns and circadian rhythms, and increasing presence of
daytime napping is one of them (1)(2). A growing number of studies have examined the relationship between
daytime napping and health risk, and have yielded conflicting results (3–5). Notably, one of the explanations for
the increased health risk associated with daytime napping is through underlying sleep disorders and the resulted
excessive daytime sleepiness (6). It is debatable whether older adults should take naps or not, especially given
the controversial effects of day naps on night time sleep (7)(8). Reduced sleep efficiency and earlier awakening
times have been proposed as potential consequences of day napping(9), and it is unsurprising that some sleep
hygiene guidelines have suggested avoiding day naps in order to maintain optimal overall sleep quality. By
contrast, several studies found no significant effects of daytime napping on nocturnal sleep parameters (10–12).
Moreover, there is evidence that a short nap during the day might serve as a good way to offset insufficient
night time sleep and improve daytime alertness (8,13).

To date, it remains unclear whether daytime napping is a marker of underlying sleep disturbances, a cause for
night time sleep impairment, or if it influences health independently of night time sleep patterns. Previous
studies have mostly used a laboratory study design in small samples of individuals (9,13), while the question
was rarely examined in population-based samples with objective measures of napping and sleep.
Understanding the correlations between both subjectively and objectively measured daytime napping and other
sleep measures in community-dwelling older adults might be crucial for studying the link between daytime
napping and subsequent health risk.

Aims

1) To study the cross-sectional relationship between daytime napping, measured by both questionnaire and
actigraph, and other actigraphic sleep measures.

2) To explore whether nocturnal hypoxemia and sleep disordered breathing measured by polysomnography
(PSG) is associated with daytime napping in a subset of the population.

Methods

Predictor variables (measured during visit 8)

1) Subjective sleep: global sleep quality as measured by the Pittsburgh Sleep Quality Index (PSQI)
2) Actigraph measures
Total sleep time: the minutes per night spend sleeping while in bed
Sleep efficiency: the percentages of time in bed spent sleeping
Sleep onset latency: minutes from start of in-bed interval to start of sleep
Wake time after sleep onset: minutes of wake after sleep onset during the in-bed interval

3) PSG measures on sleep disordered breathing
Apnea-hypopnea index (AHI): Continuous scale of total apneas/hypopneas per hour of sleep
Central apnea index (CAI): Number of central apneas associated with oxygen desaturation per hour of sleep
Blood oxygen saturation (SaO2): Dichotomous variable indicating 10% or more time spent below a SaO2 level of 90%; a continuous variable indicating SaO2 level; number of desaturations per night indicating intermittent hypoxemia.

Outcome variables (visit 8)
Daytime napping variables from actigraph and questionnaire, measured during visit 8.

Actigraphy
1) VXTNAP2P: Mean nap time, defined as the total hours scored as sleep (between wake up time and time to bed), averaged across all days of recording.
2) VXNAP5MP: Number of minutes scored as sleep during the “up” interval for bouts ≥ 5 minutes long

Questionnaire
1) VXNAP: Napping regularly (Yes/No);
2) VXNAPDY: Number of days napped per week;
3) VXNAPHR: Number of hours napped each time;
4) VXNAPDLY: Takes daily naps (y/n)
5) VXNAPHWK: Number of hours of napping per week

Covariates (visit 8)
Age, Body Mass Index (BMI), smoking, alcohol intake, caffeine use, depression, history of at least one medical condition, history of cardiovascular disease, history of hypertension, walking for exercise, cognitive impairment (MMSE), currently taking estrogen, currently taking benzodiazepines, anti-depressant use, pre-existing illness, IADL impairment and self-rated health.

Analysis
1) Correlation between night time sleep characteristics and daytime napping will be firstly examined, and Spearman correlation coefficient will be presented. Univariate analysis will be performed, and the distribution of different sleep measures will be described according to both subjectively and objectively measured napping (yes/no) and napping durations (<120min or ≥120min/day), using t-test or wilcoxon rank sum test for continuous variables and chi-square test for categorical variables. Logistic regression analysis will be used to examine the association between different sleep measures and daytime napping or napping durations. The first multivariable regression model will include all sleep variables to determine the independent effects of each sleep measure. Subsequently, all covariates will be added into the model to test whether the association between daytime napping and sleep quality stays independent of associated factors. The choice of covariates will be based on the previous analysis on daytime napping and associated factors, and covariates will be included if found to be associated with napping outcomes (at p < 0.10) in univariate analyses.

2) To determine whether nocturnal hypoxemia and sleep disordered breathing are dependently associated with day napping, we will perform exploratory analysis in a subsample with PSG measures. Logistic regression will
be used to examine the association between AHI, CAI, SaO2 and daytime napping, adjusted for other sleep parameters and then including all covariates.

Table 1 Correlation coefficients for night time sleep and daytime napping

<table>
<thead>
<tr>
<th></th>
<th>Daytime napping by actigraph (yes/no)</th>
<th>Napping duration by actigraph</th>
<th>Daytime napping by questionnaire (yes/no)</th>
<th>Napping duration by questionnaire</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PSQI global score</strong></td>
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<tr>
<td><strong>Actigraph</strong></td>
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<tr>
<td>Total sleep time</td>
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<tr>
<td>Sleep efficiency</td>
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<td>Sleep onset latency</td>
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<tr>
<td>Wake time after sleep</td>
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<td>onset</td>
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<tr>
<td><strong>Polysomnography</strong></td>
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<tr>
<td>AHI</td>
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<td>CAI</td>
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<td>SaO2</td>
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</tbody>
</table>

*Results are presented for a subset of the population with polysomnography measures (N=xxx)

Table 2 Distribution of night time sleep characteristics by daytime napping

<table>
<thead>
<tr>
<th></th>
<th>Actigraph measure</th>
<th>Subjective report</th>
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<tbody>
<tr>
<td></td>
<td>Napping daily</td>
<td>Daily napping</td>
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<tr>
<td></td>
<td>duration</td>
<td>duration</td>
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<tr>
<td></td>
<td>Yes</td>
<td>&lt;120min</td>
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<tr>
<td></td>
<td>No</td>
<td>≥120min</td>
</tr>
</tbody>
</table>

**PSQI global score**

**Actigraph**
Total sleep time
Sleep efficiency
Sleep onset latency
Wake time after sleep onset

**Polysomnography**
AHI
CAI
SaO2

*Results are presented for a subset of the population with polysomnography measures (N=xxx)
Table 3 Multivariate analysis on night time sleep characteristics and daytime napping

<table>
<thead>
<tr>
<th></th>
<th>Actigraph measure (OR, 95%CI)</th>
<th>Subjective report (OR, 95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Napping daily (Yes vs. No)</td>
<td>Napping daily (Yes vs. No)</td>
</tr>
<tr>
<td>Daily napping duration</td>
<td></td>
<td>Daily napping duration</td>
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<td>(≥120min vs. &lt;120min)</td>
<td></td>
<td>(≥120min vs. &lt;120min)</td>
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</tbody>
</table>

**PSQI global score**

**Actigraph**
- Total sleep time
- Sleep efficiency
- Sleep onset latency
- Wake time after sleep onset

**Polysomnography**
- AHI
- CAI
- SaO2

*Results are presented for a subset of the population with polysomnography measures (N=xxx)*
References


7. Vitiello MV. We have much more to learn about the relationships between napping and health in older adults. J Am Geriatr Soc. 2008 Sep;56(9):1753–5.


