Sleep Changes Through the Fall Daylight Saving Time Transition Observed in Objectively Measured Sleep in the Home

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Background and Aims:

A Wireless System (Zeo, Inc., Newton, MA) has been developed that utilizes a no-prep dry fabric sensor incorporated in a headband that transmits data to a base station. The data is processed by a neural network, which determines and records sleep stages in real time. The Wireless System has been previously validated[1,2].

The DOZER sleep registry is an IRB approved research database of sleep in the US population in the home. Its participants purchase and use the Wireless System as they see fit. Data that has been uploaded are de-identified and coded before inclusion in the registry. To date, this registry contains data from over 7,000 subjects, and over 200,000 nights.

The aim of this study was to observe changes in sleep patterns on the nights of and days following the transitions into and out of Daylight Saving Time (DST) in a large sample using objective data collected in the home.

Methods:

Subjects:

- All subjects in the DOZER sleep registry who contributed either:
  - Both the night of the DST transition and the prior Saturday, or:
  - Al least 3 nights of data from each of the weeks following and prior to the transition
- Fall 2009 DST transition (n=201, 18% female), Fall transition week (n=280, 16% female), Spring 2010 DST transition (n=370, 24% female), Spring transition week (n=454, 21% female)

Analysis:

- Transition nights were compared with the previous Saturday.
- Transition weeknights were compared with the average of all nights of the prior week.
- Sleep measures included:
  - Total Sleep Time (**TST**)
  - Wake Time During Sleep (between LPS and last epoch of sleep) (**WTDS**)
  - Time in REM (**TR**)
  - Time in Light (corresponding to Rechtschaffen & Kales[3] [R&K] Stages 1 and 2) (**TL**)
  - Time in Deep (R&K Stages 3 and 4) (**TD**)
  - Bedtime
  - Risetime
- Paired t-tests on nights of transition (significant if $p<0.05$). ANOVAs on transition weeks, and if significant ($p<0.05$), Tukey's HSD on individual pairs.

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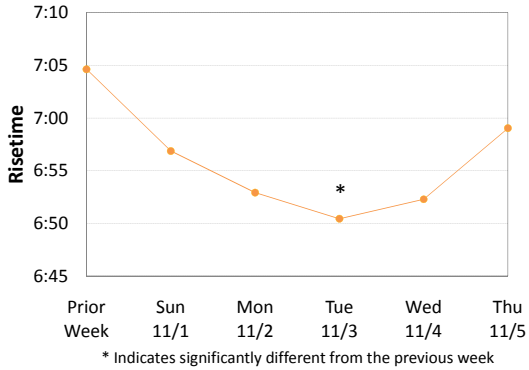
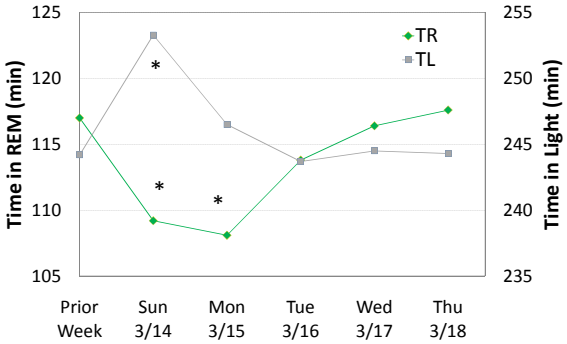
Fall DST Transition Week



* Indicates significantly different from the previous week

Spring DST Transition Week



Fall DST Results:

- No significant changes were observed in any sleep measure on the night of the transition compared to the previous Saturday.
- Risetime was significantly impacted in the week following the transition compared to the prior week.

Spring DST Results:

- On the night of transition, significant reductions were observed in TST (436 vs 424 min) and TR (130 vs 124 min).
- TST did not change significantly on the nights following the transition compared to the prior week. However, a decrease in TR and an increase in TL were observed.

Discussion and Conclusion:

- More changes to sleep patterns were observed during Spring transition than the Fall transition, consistent with commonly held beliefs.
- No increase in TST was observed on the night of the Fall transition, in spite of the subjects' opportunity to do so.
- Subtle but significant changes in the distribution of sleep stages were observed following the Spring transition, with a reduction in REM and a nearly equal increase in Light sleep. These may be explained by the forced advancement of circadian phase, which is known to mediate REM sleep.[4]
- The DOZER sleep registry shows promise as a resource for observing subtleties in sleep patterns in large populations.

References:

1. Shambroom, J. et al (2009). Evaluation of a portable monitor… *Sleep*, 32(Suppl.), A386. Abstract 1182.
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3. Rechtschaffen, A, Kales, A, eds. (1965). A manual of standardized terminology… Los Angeles, CA: BI/BR.
4. Dijk, D.J. et al (1995). Contribution of the circadian pacemaker… *J of Neuroscience*, 15:3526-3538