Panel Discussion "Daylight Saving Time – Forever?" | ESRS 2018 | Summary

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CONCLUSION

Indirect evidence suggests that the risk of negative effects on public health and safety of perennial Daylight Saving Time (DST) will be higher than that under perennial Standard Time (ST). At this time, however, there is no direct evidence to reliably determine the magnitude of the health and safety effects and these will likely depend on longitude (i.e., position on east-west axis), latitude (i.e., position on north-south axis), individual working hours, artificial light consumption and individual vulnerability factors (e.g., chronotype and disease susceptibility).

In terms of the effects of perennial DST vs. ST, the following issues should be considered:

- **Safety (darkness during commute to and from school/work; traffic accidents due to lack of daylight)**
- **Physical and mental health (effects on sleep and circadian rhythms, positive effects of morning light on mood, physical activity in the morning/evening, social life)**
- **Quality of life (one more hour of morning/evening light allows for more outdoor activities before/after office hours)**

Please note that this is only a summary of the contents discussed during the panel discussion "Daylight Saving Time - forever?" on 27th September 2018 held at the meeting of the European Sleep Research Society (ESRS). The contents therefore only reflect the consensus of the panel members and this is not a statement of the European Sleep Research Society (ESRS).

CONSIDERATIONS

1. Currently available data show that the transition from ST to DST in spring is associated with transient negative effects on sleep, health and traffic accidents; steady-state effects have not been evaluated sufficiently (e.g., Manfredini et al., 2018; Carey et al., 2017; Harrison et al., 2013). Although most studies report negative effects, the magnitude of the effects varies between studies and effects are not entirely explained by physical effects of clock change (i.e., interactions with availability of daylight, ambient temperature, or stress due to commencing weekly activities). Whether the effects are transient or whether and for how long they persist is currently not clear due to a lack of a scientific evaluation of steady-state effects. Beyond the ST-DST change, studies indicate that the DST-ST transition during autumn is associated with positive or negligible effects.
2. Direct comparisons of DST vs. ST are limited and inherently confounded by seasonal effects on weather, temperature and daily light exposure. A study by Borisenkov and colleagues (2017), which retrospectively studied effects in children and adolescents in northern Russia (mostly >60° latitude), found that permanent DST compared to ST was associated with a 2-3% increase in the rate of symptoms of winter depression as assessed with the Seasonal Pattern Assessment Questionnaire

(Rosen et al., 1990). Further, the amount of social jetlag[1] (SJL) was higher during permanent DST vs. ST. In detail, during perennial DST SJL increased by ≈34 minutes on average (small to medium effect size [r = 0.2], although the clinical significance of this effect may be different), which resulted from get-up times on weekends being delayed by ≈34 minutes, and there was an overall increase from 53 to 70% of the study sample presenting with SJL >2h. The largest decrease in SJL and shift towards earlier get up times on weekends occurred at high latitude near the Arctic Circle during perennial ST compared to DST.

3. Effects of perennial DST or ST on the timing of sunrise and sunset relative to work/school hours vary substantially with longitude and latitude across Europe
    a. Hours of morning light before rise-time and school/work: days with sunrise before 7am would be reduced by an average of ≈76 days for European capitals under perennial DST compared to perennial ST (248 versus 172 days)
    b. Hours of evening light after office hours: days with sunset after 6pm would be reduced by an average of ≈70 days for European capitals under perennial ST compared to perennial DST (280 versus 210 days)
4. Effects of perennial DST vs. ST on biological timing and health
    a. Longitude data (i.e. whether we live in the east or west of a time zone) suggest that a later solar noon is associated with negative effects such as an increase in the relative risk for cancer and decreased life expectancy (Gu et al., 2017; Borisenkov et al., 2011). However, if these findings can be extrapolated to ST-DST, perennial DST would be associated with more negative effects than ST.
    b. Theoretical models indicate that a later solar noon (i.e., DST) will lead to a delay in biological timing relative to rise time due to less morning and more evening lightThis will possibly give rise to more difficulties waking up at required times (i.e., CBT and alertness minimum closer to wake-up time) and increase SJL, which has been found to correlate for example with health problems and lower performance at school (e.g., Parsons et al., 2015; Haraszti et al. 2014, Levandovski et al. 2011). However, the magnitude of the effects of a later solar noon seems strongly modulated by artificial light consumption with theoretical considerations suggesting that artificial light may even outweigh the effects of a shift in solar noon (Skeldon et al., 2017).

Beyond this, we would like to express that we think the survey of the EU on (abolishing) the two-yearly clock change, which resulted in the proposal of the European Commission to adopt perennial DST or ST, is problematic for several reasons:

- The results are far from representative: only <1% of EU's population responded, ≈75% German
- Timing and wording may have lead to a bias towards favouring perennial DST over perennial ST (For survey questions see here: https://ec.europa.eu/eusurvey/runner/2018-summertime-arrangements?surveylanguage=EN
    - Use of the terms "summertime" and "wintertime" (note though that in some languages such as German "Sommerzeit" [i.e., "summer time"] is the official and only term)
    - Consultation 4 July-16 August 2018, i.e. during summer

Finally, we encourage a broader discussion about the timing of the work/school hours and leisure time activities relative to the natural-light dark cycle in our societies, in which artificial light is so easily accessible.

[1] Social Jetlag (SJL) is the difference in sleep timing between free and work days using mid sleep time as marker of sleep timing (SJL = MS_{free}- MS_{work}). For example, if sleep duration is constant, a delay of sleep timing by 2 hours on free days will result in a SJL of 2 hours. SJL provides an estimate for the mismatch between social and biological timing.

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