Local and national governments around the world are currently considering the elimination of the annual switch to and from Daylight Saving Time (DST). As an international organization of scientists dedicated to studying circadian and other biological rhythms, the Society for Research on Biological Rhythms (SRBR) engaged experts in the field to write a Position Paper on the consequences of choosing to live on DST or Standard Time (ST). The authors take the position that, based on comparisons of large populations living in DST or ST or on western versus eastern edges of time zones, the advantages of permanent ST outweigh switching to DST annually or permanently. Four peer reviewers provided expert critiques of the initial submission, and the SRBR Executive Board approved the revised manuscript as a Position Paper to help educate the public in their evaluation of current legislative actions to end DST.

Why Should We Abolish Daylight Saving Time?

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Less than 200 years ago, humans organized their daily routines by the sun clock (set by the rotation of Earth), which was in synchrony with their body clock (set by our individual biological clock). Now, most of us live in cities, work mostly in buildings, use electric light at night, and organize our daily lives by a social clock (set by human societies) that is rarely in synch with the sun clock or the body clock. These new conditions challenge our health and can cause safety problems; these challenges become even worse under Daylight Saving Time (DST). In this article, we describe how the 3 clocks came to drift apart and how that can create problems.

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WHY IS LIGHT IMPORTANT FOR OUR HEALTH?

Living creatures have a body clock that creates daily rhythms. This body clock organizes our biology, such as when we eat and sleep, when we can run fastest, and when our brain works at its best (Young, 2000). The body clock must be made to match our 24-h environment. In a "natural day," the light of the sun and darkness at night are the main signals that adjust the timing of our body clock. This is true even within cities, where we experience less outdoor light during the day and more electric light during the night. Electric light can also adjust body clocks to match 24-h days, but natural daylight is usually 100 to 1000 times brighter than indoor light (Wright et al., 2013) and therefore more effective. We must recognize the important role of light in shaping our daily behavior and the important role of our body clock in maintaining our health and well-being.

WHY IS THE NATURAL DAY IMPORTANT?

The earth rotates toward the east. That is why the sun seems to travel from the east in the morning via its highest point near midday toward the west where it sets in the evening. Although we live according to the same clock time within a time zone (which we will call the *social clock*), our body clocks still receive the timing signal from the sun defined by its east-west path (sun clock). It takes the sun 4 min to cross each longitude from east to west. Longitudes are imaginary lines that run between the North and the South Pole and cut the earth into 360 even "apple slices." The zero line has been defined to go through Greenwich east of London in England. This means that the sun rises and sets 4 min later every longitude line as it "travels" to the west, taking 1 h across the 15 longitude lines that are generally 1 time zone. Since country or state lines do not exactly match longitude lines, the time zone of a specific place may not be the same as expected by the longitude lines. Some countries (like China) have combined neighboring time zones to make their time zones bigger, so that the sun needs even longer than 1 h to cross the time zone. We live according to the same social clock time within a time zone, but as long as we still can see the natural day (through windows or on our way to or from work or school), our body clocks still follow more or less the time of the sun clock defined by the sun's east-west path. Body clocks are later relative to the social clock in winter, when nights are longer with earlier sunsets and later sunrises (Hadlow et al., 2014; Hadlow et al., 2018; Hashizaki et al., 2018; Kantermann et al., 2007), and body clocks are earlier at the eastern edge of a time zone and become gradually later toward the western edge (Borisenkov, 2011; Hadlow et al., 2018; Randler, 2008; Roenneberg et al., 2007). Several studies found that the further west people live within a time zone, the more health problems they may experience and the shorter they live on average (Borisenkov, 2011; Gu et al., 2017; VoPham et al., 2018). The best explanation for these findings is that the difference between our social clock—set by humans—and our body clock—set by the sun—increases toward the western edges of time zones. Thus, when 2 people wake up at 0700 h for work, the body clock of the person in the eastern edge may be set to 0700 h, but that of the person on the western edge may be set to 0600 h, and the difference between the 2 clocks leads to health and safety problems.

WHAT IS DST?

Many decades ago, politicians introduced DST. DST commonly lasts from spring to autumn and changes the social clock so that we simply start the social day 1 h earlier relative to the sun clock. DST was thought to save energy because people would use less electric light in the evenings (Kotchen and Grant, 2011; Mirza and Bergland, 2011). Although this turned out not to be true (Aries and Newsham, 2008), DST is still kept to allow people to start work earlier by social clock time in summer. However, DST disrupts the relationship between the social and sun clocks. For example, New York's social clock closely matches the sun clock in winter during Standard Time: when the social clock says it is noon, it is very close to midday, the sun's highest point in the sky. During DST, however, New York's social clock shows noon when it is only 1100 h by the sun clock. People who have to get up at 0600 h by the sun clock in winter have to get up at 0500 h by the sun clock under DST, despite the social clock showing 0600 h. Essentially, they have to go to work in 1 time zone further to the east. This means that people in Chicago have to work during the office hours of New York, and people in Berlin have the office hours of St. Petersburg. Instead of seeing DST as working according to one time zone to the east, one can also think of it as people's body clocks being pushed further west within their time zone (or social clock). Since the body clock follows the sun clock, these changes can affect our health.

HOW DOES DST AFFECT OUR HEALTH?

There are good sides to DST, such as coming home earlier (by the sun clock) from school or work and having more hours of daylight during our free time after work. But DST also creates problems, which can be either short-term (acute) or long-term (chronic). The first days after the sudden switch to DST in spring cause acute effects including shorter sleep duration (Barnes and Wagner, 2009; Harrison, 2013), worse performance (Gaski and Sagarin, 2011), and worse health; heart attacks are, for example, higher during that time compared with other weeks (Janszky and Ljung, 2008; Manfredini et al., 2018), and there may be more traffic accidents (Carey and Sarma, 2017; Coren, 1996a, 1996b; Hicks et al., 1983; Lahti et al., 2010). The chronic effects may last throughout the months of DST because in many people, social clocks and body clocks remain set to different times, as explained in the previous section; the body clock does not adjust to DST social clock time even over months (Hadlow et al., 2014).

The chronic effects of DST have not been studied directly, but we know that DST increases the time difference between the social clock and the body clock (Borisenkov et al., 2017). More and more studies show that time differences between the social clock and the body clock challenge our health (Koopman et al., 2017; Mota et al., 2017; Parsons et al., 2015; Roenneberg et al., 2012; Rutters et al., 2014; Wong et al., 2015), are associated with decreased life expectancy (Borisenkov, 2011), shorten sleep (Borisenkov et al., 2017; Wittmann et al., 2006), cause mental (Foster et al., 2013; Levandovski et al., 2011) and cognitive problems (Díaz-Morales and Escribano, 2015; Haraszti et al., 2014), and contribute to the many sleep disturbances in our societies that are estimated to cost approximately 2% of the gross domestic product (Hafner et al., 2017). If we established DST throughout the year, the chronic effects would become more severe not only because we have to go to work an hour earlier for an additional 5 months every year but also because body clocks are usually later in winter than in summer with reference to the sun clock (Kantermann et al., 2007). The combination of DST and winter would therefore make the differences between body clocks and the social clock even worse and would negatively affect our health even more.

WHAT SHOULD WE DO? WHAT DO SCIENTISTS RECOMMEND?

The choice of DST is political and therefore can be changed. If we want to improve human health, we should not fight against our body clock, and therefore, we should abandon DST and return to Standard Time (which is when the sun clock time most closely matches the social clock time) throughout the year. This solution would fix both the acute and the chronic problems of DST. We therefore strongly support removing DST changes or removing permanent DST and having governing organizations choose permanent Standard Time for the health and safety of their citizens.

CONFLICT OF INTEREST STATEMENT

The authors have no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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