**Sleep patterns and related behaviors among male and female adolescents of the ultra-orthodox religious population in Israel, compared to secular adolescents**

• ***Author names and affiliations.*** Please clearly indicate the given name(s) and family name(s) of each author. Present the authors' affiliation addresses (where the actual work was done) below the names. Indicate all affiliations with a lower-case superscript letter immediately after the author's name and in front of the appropriate address. Provide the full postal address of each affiliation, including the country name and, if available, the e-mail address of each author.

• ***Corresponding author.*** Clearly indicate who will handle correspondence at all stages of refereeing and publication, also post-publication. **Ensure that the e-mail address is given and that contact details are kept up to date by the corresponding author.**

• ***Present/permanent address.*** If an author has moved since the work described in the article was done, or was visiting at the time, a 'Present address' (or 'Permanent address') may be indicated as a footnote to that author's name. The address at which the author actually did the work must be retained as the main, affiliation address. Superscript Arabic numerals are used for such footnotes.

**Abstract:**

Cumulative testimonials demonstrate that factors relating to lifestyle, technology and culture impact the duration and quality of sleep among adolescents. While many studies were dedicated to the manner by which the biological and environmental factors impact adolescent sleeping patterns, not much attention was directed to the role of culture in such patterns. Lifestyle in the ultra-orthodox world is traditional and conservative. The current study will examine the role that culture plays in molding sleep patterns.

**Method**: Using the snowball method, 178 male and female adolescents (13-17) were sampled in a comparative array. The sample consisted of 116 ultra-orthodox adolescents and 62 secular adolescents. The adolescents completed a questionnaire relating to adolescent sleep habits and related behaviors (School Sleep Habits Questionnaire – SSHS).

**Results**: Differences were found in sleep patterns among ultra-orthodox and secular adolescents. Compared to the secular sample, ultra-orthodox adolescents fell asleep faster and woke up earlier during the week and, on weekends, they went to sleep earlier, but slept less and suffered less from sleepiness, behavioral and mood disruptions (p≤0.05). In addition, gender was found to interact with religion.

**Conclusions and Recommendations:** Theoretically, it is important to determine the characteristics of sleep patterns, being the behavior most important to health and functionality, in a closed society in general and specifically in a religious society, and how cultural variability impacts such patterns or, in other words: How does culture contribute to molding adolescent sleep patterns. In practical terms, comparing the ultra-orthodox and secular lifestyle in terms of sleep patterns and disorders will help understand the interaction between the lifestyle and sleep patterns. This will increase awareness and introduce lifestyle characteristics as stressful or defensive mechanisms.

**Keywords:**

**Introduction**

Adolescence marks the transitional period between childhood and adulthood, during which adolescents experience biological, emotional and environmental changes, alongside changes related to sleep ([1](#_ENREF_1)). While many studies have been dedicated to the understanding of biological and environmental mechanisms underlying adolescent sleep patterns ([1-4](#_ENREF_1)), little attention has been directed to the role of culture in shaping such patterns ([5-7](#_ENREF_5)). The current study focuses on differences in sleep patterns and sleep-related behaviors among adolescents of two distinct cultures in the Israeli Jewish society: Ultra-Orthodox, and secular.

Adolescent sleep patterns in westernized cultures are well described, and are characterized by a tendency toward late bedtime, short nocturnal sleep time on school-nights, and substantial differences between sleep timing and duration on school-nights and non-school-nights ([2](#_ENREF_2),[3](#_ENREF_3),[8-11](#_ENREF_8)). On school-nights, adolescents tend to stay up late and wake up early, resulting in short sleep duration. On non-school-nights, they go to bed late, but tend to wake up late and extend their sleep duration by 2-3 hours ([9](#_ENREF_9),[12](#_ENREF_12),[13](#_ENREF_13)). These sleep patterns have been associated with reduced quality of life, daytime sleepiness and fatigue, mood impairments and daily behavioral problems, including poor academic performance ([7](#_ENREF_7),[14-17](#_ENREF_14)).

Adolescent sleep changes have been attributed to biological changes and to environmental and lifestyle factors ([3](#_ENREF_3)). Thus, ample evidence suggests that delayed bedtime is the outcome of a delay in the circadian sleep-wake cycle, dictated by the biological clock, and by slower daily accumulation of sleep pressure, reflecting the homeostatic sleep factor ([4](#_ENREF_4),[10](#_ENREF_10),[18](#_ENREF_18)). On the other hand, early school start times, as well as extracurricular activities (e.g., homework, sports) are examples of demands set forth by the social environment that are related to a decline in sleep duration during the school week ([2](#_ENREF_2),[3](#_ENREF_3),[13](#_ENREF_13)).

Studies of adolescent sleep patterns have also revealed sex differences, demonstrating that on weekends, girls wake up later and sleep longer than boys of the same age ([9](#_ENREF_9),[19](#_ENREF_19),[20](#_ENREF_20)). These differences are poorly understood, and have been attributed to earlier onset of puberty in girls compared to boys ([9](#_ENREF_9)). However, in a study that compared sleep patterns among Jewish and Arab adolescents in Israel ([21](#_ENREF_21)), girls went to bed 30 minutes earlier than boys, and slept one hour later on weekends; yet the difference in bedtimes between boys and girls was greater in Arab adolescents. These findings suggest that gender roles that are shaped by culture may moderate observed sleep patterns.

Interest in the cultural aspects of adolescent sleep patterns has increased in recent years ([5](#_ENREF_5" \o "Jenni, 2005 #18),[19](#_ENREF_19" \o "Olds, 2010 #115),[22](#_ENREF_22" \o "Tynjala, 1993 #159),[23](#_ENREF_23" \o "Biggs, 2010 #160)). In a seminal study, the World Health Organization (WHO) conducted a survey in 10 European countries and in Israel, and found that Israeli adolescents reported the shortest sleep durations and were among those who reported the latest bedtimes ([22](#_ENREF_22" \o "Tynjala, 1993 #159)). In a meta-analysis conducted among approximately 90,000 adolescents in 23 countries ([19](#_ENREF_19" \o "Olds, 2010 #115)), sleep duration was found to be longest in Australia and Europe and shortest in Asian countries. In these studies comparing different countries and continents, geographical, genetic, and socio-cultural factors may underlie differences in sleep patterns.

Other cross-cultural investigations examined differences in adolescent sleep patterns between different ethnic groups ([21](#_ENREF_21" \o "Shochat, 2013 #158),[24](#_ENREF_24" \o "Combs, 2016 #167)). In a study comparing self-reported sleep patterns in Jewish and Arab adolescents in Israel, bedtime was earlier and sleep latency was longer among Arab adolescents. Findings (among Arab adolescents) were interpreted as a conflict between traditional, culturally appropriate norms calling for early bedtime, and between the biological tendency toward a late bedtime, in adolescents living in a society undergoing transition to a westernized lifestyle ([21](#_ENREF_21" \o "Shochat, 2013 #158)). In a five year longitudinal study following sleep patterns in Hispanic and Caucasian children to young adolescents, Hispanic children had shorter sleep duration and later bedtime than that of Caucasians, based on parental reports ([24](#_ENREF_24" \o "Combs, 2016 #167)). Authors suggested that cultural and/or genetic factors may underlie the observed differences. Evidently, as comparisons between such ethnic groups involve distinct hereditary and cultural characteristics, it is impossible to tease out the contributions of biology and culture separately.

Growing awareness of the negative impact of poor sleep patterns on adolescent health and functioning ([7](#_ENREF_7" \o "Shochat, 2014 #27)) raises the need for assessing the socio-cultural context, and achieving a better understanding of the interplay between culture and biology in adolescent sleep patterns. The current study focuses on a comparison of adolescent sleep in two distinct Jewish cultures in Israel: the ultra-orthodox religious society, and the secular society.

The ultra-orthodox society, comprising approximately 11% of the population in Israel ([25](#_ENREF_25" \o "Zicherman, 2016 #170)), is a socio-cultural minority consisting of communities that apply a strict orthodox religious tradition ([26-28](#_ENREF_26" \o "Friedman, 1991 #169)). This society is characterized by large families, Torah study as a supreme value and fulfillment of religious commandments. Adolescent girls are required to help at home with the younger siblings, while boys attend early morning prayer, and Torah studies until late hours ([27](#_ENREF_27" \o "Zicherman, 2014 #171),[29](#_ENREF_29" \o "Layosh, 2014 #175)). Few studies have addressed health patterns in the ultra-orthodox Jewish society, and these demonstrate that it is ranked relatively low in the implementation of health promoting behaviors ([30](#_ENREF_30" \o "Freund, 2014 #174),[31](#_ENREF_31" \o "Teman, 2011 #176)). To the best of our knowledge, sleep patterns and disturbances have yet to be studied in this community.

The aim of this study was to examine differences in sleep patterns, sleepiness, mood, problem sleep behaviors and chronotype in Jewish ultra-orthodox and secular adolescents, male and female, in Israel. Our working hypothesis was that strictly structured and traditional ultra-orthodox lifestyle with distinct gender roles would be associated with more regular sleep patterns and with fewer sleep related problems, such as sleepiness and mood disturbance, compared to the secular, westernized lifestyle. Specifically, it was hypothesized that self-reported sleep patterns among ultra-orthodox adolescents are early and regular, both on school-nights and non-school-nights, as compared to secular adolescents, with no differences in sleep duration. It was further hypothesized that gender differences are prominent among the ultra-orthodox adolescents, so that sleep patterns are earlier and more regular among males than among females. Finally, we hypothesized that the ultra-orthodox adolescents, particularly males, would report lower levels of sleepiness, mood, and problem sleep behaviors, and would self-characterize themselves as early chronotypes. This comparison may contribute to understanding the manner in which culture and lifestyle influence sleep patterns that in turn, increase or reduce the risk of poor sleep patterns and associated outcomes. This understanding may guide treatment of sleep disorders based on cultural norms.

**Methods**

**Sample and population**: The study was conducted in the orthodox religious and secular population, referring (??) to male and female adolescents (13-17 years old). The subjects were enlisted using the snowball method.

**Inclusion and exclusion criteria:** The secular population consisted of adolescents raised in secular homes, attending governmental secular schools (not attending boarding schools) who sleep at home.The sample did not include adolescents attending alternative educational systems (i.e. anthroposophical education). Among the orthodox religious population, questionnaires were distributed in cities with large orthodox religious concentrations who conduct an orthodox religious lifestyle including fulfillment of religious commands. The study did not include adolescents attending boarding schools.

Within the orthodox religious population, subjects were enlisted by turning to friends, relatives and neighbors, similar to enlistment in the secular population, except that some of the questionnaires for this population were distributed to the adolescents by (via) e-mail.

**Tools: (1) Sleep Survey**: The study used a sleep questionnaire intended for adolescents (9-18 years old) called “School Sleep Habits Questionnaire – SSHS”. The questionnaire presents sleeping patterns and sleep related behaviors ([8](#_ENREF_8" \o "Wolfson, 1998 #33)). The questionnaire was translated into Hebrew ([13](#_ENREF_13" \o "Shochat, 2010 #68)) and it examines background variables, such as demographics (age, sex), weekday and weekend sleeping patterns (including bedtimes, sleep onset latency, wakeup times and overall sleep duration), daily performance measures relating to sleeping patterns: morning/evening type, mood and sleepiness during the day, questions about sleep habits and perceptions (for example: ‘Do you sleep in the afternoon?”, “Is your sleep enough?”). The questions about behavioral problems related to sleep include 10 items in different situations (i.e. being late to class for oversleeping, sleepiness at school), where higher ratings demonstrate a higher frequency of problematic behaviors. Questions about daytime sleepiness relate to 10 situations (i.e. during travel or studies), which are classified to levels of sleepiness, where higher ratings reflect increased sleepiness. One item was removed from the original scale – driving (because young adolescents do not drive). The alpha Cronbach level of reliability, according to the study translated to Hebrew and conducted in Israel is 0.75. All scales were consolidated into a single grade.

In the current study, alpha Cronbach reliability for sleepiness was 0.59, for behaviors – 0.71, for mood – 0.73 and for morning/evening types – 0.69.

**Religiousness questionnaire** – A filtering questionnaire examining the adolescents’ level of religiousness ([32](#_ENREF_32" \o ", 2009 #177)). This questionnaire was intended to sort the groups according to their level of religiousness and fulfillment of religious commands.

**Research Process**

The study was conducted upon receipt of approval from the Haifa University Ethics Committee as part of a thesis toward a graduate degree in nursing (Approval No. 151/13). Pursuant to the researcher’s contact with orthodox religious and secular families, and after explaining the study objectives and procedure, the parents were asked to sign an informed consent form for their adolescent children. This was followed by the distribution of questionnaires, mostly as hard copies and sometimes, among the secular society only, via e-mail. The researcher collected the questionnaire from the parents or directly from the adolescents.

**Statistics:** The examination of the differences in demographic variables and sleep variables regarding subjective perceptions applied 2 tests for categorical variables and t-tests for variables independent of age. Most tests were subject to Bonferroni corrections. The examination of differences in sleep patterns and related behaviors during weekdays and weekends by religious and gender groups utilized a bi-directional factorial array, MANOVA.

**Results**

**Sample Data**

The study was conducted in 2013-2014 among 116 ultra-orthodox (mean age: 15.62 ±1.16, 44 of which were boys) and 66 secular (mean age: 15.44 ±1.31, of which 33 were boys) adolescents.

Sleep Perceptions

Several differences were found among the group on questions relating to perceptions on sleep. As such, ~75% of the ultra-orthodox adolescents reported their sleeping duration as “as needed”, as compared to only ~40% of the secular adolescents. On the other hand, 25% of the ultra-orthodox adolescents reported that they sleep too little compared to ~60% of the secular adolescents. The study further found that 9.3% of the ultra-orthodox adolescents reported that they sleep well, compared to only ~70% of the secular adolescents (p≤0.007, following a Bonferroni correction). In addition, over 70% of the ultra-orthodox adolescents reported that they always or usually sleep enough, compared to ~45% of the secular adolescents and the ultra-orthodox adolescents reported more afternoon naps than the secular population (63% compared to 42%, respectively, p≤0.05). The following parameters showed no significant differences between the groups: sleep at home, number of nighttime awakenings and sleepiness.

**Differences in weekday and weekend sleep and related behavioral patterns based on religion and gender**

Table 1 and Figures 1, 2, 3 and 4 describe the findings of the multivariable variance analyses relating to the effect of religion, gender and religion/gender interaction, which were separately performed for sleep patterns (bedtime, waking time, sleep latency and total sleep duration) on schooldays and weekends.

**School day sleep patterns**

**The multivariate analysis for sleep patterns on schooldays** (Figure 1) revealed a main effect for religion (F(4,162)=7.205, p<0.001, eta²=0.151) and a main effect for the religion/gender interaction (F(4,162)=8.695, p<0.001, eta²=0.177). No main effect was found for gender.

**The univariate analysis** for bedtimes (Figure 1) found an interaction between religion and gender (F(1,165)=21.353, p<0.001, eta²=0.115). In terms of waking hour (Figure 2) a main effect was found for religion (F(1,165)=5.426, p=0.021, eta²=0.032) and in interaction was found between religion and gender (F(1,165)=16.616, p<0.001, eta²=0.091). No main effects were found for religion, gender and religion/gender interaction for the sleep duration variable (Figure 4).

**Weekend sleep patterns**

**The multivariate analysis for sleep patterns on weekends** revealed a main effect for religion (F(4,149)=34.226, p<0.001, eta²=0.48), gender (F(4,149)=4.149, p=0.003, eta²=0.100) religion/gender interaction (F(4,149)=8.720, p<0.001, eta²=0.190).

Regarding bedtime (Figure 1), a main effect was found for religion (F(1,152)=53.610, p<0.001, eta²=0.261), gender (F(1,152)=53.610, p<0.001, eta²=0.261) and religion/gender interaction (F(1,152)=16.402, p<0.001, eta²=0.097). Regarding waking hour (Figure 2), a main effect was found for religion (F(1,152)=121.771, p<0.001, eta²=0.445) and religion/gender interaction (F(1,152)=31.150, p<0.001, eta²=0.170) (See Figures 1, 2). Regarding minutes of sleep latency (Figure 3), a main effect was found for religion (F(1,152)=13.037, p<0.001, eta²=0.080). Regarding the number of sleep hours (Figure 4), a main effect was found for religion (F(1,152)=28.828, p<0.001, eta²=0.160), gender (F(1,152)=10.240, p=0.002, eta²=0.063) and religion/gender interaction (F(1,152)=9.419, p=0.003, eta²=0.058) (See Table 2).

**Figure 1**

**Figure** **2**

**Figure 3**

**Figure 4**

**Related behavioral patterns**

Table 3 describes additional behavior patterns related to daily behavior patterns (sleepiness, sleep-related behaviors, mood and day/night typicality).

**The multivariate analysis for daily behavior patterns** found a main effect for religion (F(4,167)=19.352, p<0.001, eta²=0.317) and religion/gender interaction (F(4,167)=5.010, p=0.001, eta²=0.107).

**The intergroup variability analysis** (see Table 3) for the sleepiness variable, found a main effect for religion/gender interaction (F(1,170)=5.398, p=0.021, eta²=0.031). Regarding sleep related behaviors, a main effect was found for religion (F(1,170)=19.533, p<0.001, eta²=0.103) and religion/gender interaction (F(1,170)=8.691, p=0.004, eta²=0.049). Regarding the mood variable, a main effect was found for religion (F(1,170)=10.880, p =0.001, eta²=0.060). Regarding the morning/night typicality variable, a main effect was found for religion (F(1,170)=69.448, P<0.001, eta²=0.290) and religion/gender interaction (F(1,170)=17.670, p<0.001, eta²=0.094).

**Table 3: Religion and Gender Differences in Related Behaviors**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Variables** | | **Ultra-Orthodox Avg. (STD)** | **Secular Avg. (STD)** | **Religion** | **Gender** | **Religion \* Gender** | **eta²** |
| Sleepiness | Boys | (0.41) 1.29 | (0.38) 1.53 | 2.793 | 0.020 | \*5.398 | 0.031 |
| Girls | (0.37) 1.42 | (0.62) 1.381 |
| Sleep-related behaviors | Boys | (0.36) 1.918 | (0.51) 2.436 | \*19.533 | 0.263 | \*8.691 | 0.103 |
| Girls | (0.39) 2.089 | (0.51) 2.193 | 0.049 |
| Mood | Boys | (0.39) 1.314 | (0.49) 1.644 | \*10.880 | 1.634 | 2.982 | 0.060 |
| Girls | (0.33) 1.511 | (0.47) 1.614 |
| Morning/ Night typicality | Boys | (0.38) 2.339 | (0.43) 2.606 | \*69.448 | 0.243 | \*17.670 | 0.290 |
| Girls | (2.24) 2.249 | (0.45) 2.761 | 0.094 |

p≤0.05\*

**Discussion**

This study conducted a general assessment of the differences in sleep characteristics and the report of sleep patterns and related behaviors between ultra-orthodox and secular adolescents aged 13-17. Several differences were found in the general assessment of sleep characteristics among ultra-orthodox and secular adolescents. Corresponding with the hypotheses, the duration and quality of sleep were found to be poorer among the secular adolescents as compared to the ultra-orthodox group. Among the ultra-orthodox adolescents, sleep was described as usually or always satisfactory, as opposed to secular adolescents, who reported low rates of satisfactory night sleep. It seems that the findings of the current study, as relating to subjective assessments of sleep quality among the secular adolescents strongly correlate with the findings of an American survey conducted by the National Sleep Foundation in 2011. The said survey demonstrated that 94% of the adolescents reported that they do not sleep enough and that it impacts their mood, and 59% reported that they wake up without feeling refreshed.

**Differences in weekday and weekend sleep patterns by religion and gender**

The discussion will focus on differences found for various sleep pattern parameters (sleep timing, sleep latency and sleep duration) and sleep related behaviors (sleepiness, mood, daily and typical behaviors) based on the research groups.

**Sleep Timing**

One of the most prominent trademarks of adolescence is adopting a later bedtime. Findings of the current study demonstrate that, in addition to physiological changes of sleep regulation ([10](#_ENREF_10)) that are gender dependent ([9](#_ENREF_9)), environmental and cultural factors also have a unique impact on the development of gender differences ([3](#_ENREF_3),[5](#_ENREF_5),[6](#_ENREF_6)). Thus the study found that, on weekdays and weekends, ultra-orthodox boys reported earlier sleep times (bedtimes and waking times) than the girls whereas, among the secular adolescents, girls reported earlier sleep times than the boys. In addition, sleep times among all ultra-orthodox adolescents were found to be earlier compared to the secular adolescents, where the average bedtime for ultra-orthodox adolescents was about 90 minutes earlier and the average waking time was three hours earlier than the secular adolescents.

It is interesting to note that, similar to the findings here, a study that compared the same measures among Jewish secular and Arab traditional adolescents also found an interaction whereby girls in the Arab population went to sleep earlier than the boys did, but no difference was found in this variable among the Jewish adolescents ([21](#_ENREF_21)). The reasoning for this was that, in traditional Arab society, girls are subject to a more authoritative upbringing manifested in supervision of their bedtime, whereas boys are treated in a more permissive manner. In the current study, it seems that the early bedtime among ultra-orthodox boys is related to their early rising for prayer, which begins early in the boys’ ultra-orthodox educational institutions as compared to those attended by the girls. In addition, prayers are also conducted on Saturday and a family meal is held as the prayer ends. On the other hand, the lifestyle of their secular peers is characterized by bedtimes according to the beginning of the school day during the week and by later sleep and waking times on the weekend in order for them to enjoy social encounters until late at night and to make up lost sleep hours ([13](#_ENREF_13),[33](#_ENREF_33)). These findings clearly demonstrate how culture, defined broadly as a product of social constructs and values, dictates sleep patterns among it its children and adolescents ([5](#_ENREF_5)).

**Sleep latency**

Among secular adolescents, sleep latency is double the time recorded among ultra-orthodox adolescents, both during the week and on weekends, regardless of gender. These findings can also be related to differences dictated by culture. Studies conducted in the western population found that maintaining a consistent evening routine among babies and young children, including a regular pattern of activities before bedtime, are related to rapidly and easily falling asleep ([34](#_ENREF_34),[35](#_ENREF_35)). The ultra-orthodox society conducts a traditional religious sleep ritual every night, where the child reads a bedtime prayer together with the parent. The bedtime ritual does not end in childhood, but goes on to adolescence and adulthood. This tradition may explain the difference in sleep latency between the two groups of adolescents seen in the current study. This is a topic worthy of further research.

**Sleep duration**

This study found differences in weekend sleep durations based on gender, religion and gender/religion interaction and found no such differences during the week. Thus, on weekends, ultra-orthodox boys slept less than all other research groups while the ultra-orthodox girls’ sleep duration was closer to that of the secular adolescents than to that of the ultra-orthodox boys. In practice, the ultra-orthodox boys’ shorter sleep duration was not significantly different during the week and on weekends. The lack of differences in sleep durations during the week may demonstrate that the biological need for sleep during adolescents is unrelated to culture and lifestyle. The same applies to the study that compared sleep among Jewish and Arab adolescents – no differences were found in sleep duration, neither during the week nor on weekends ([21](#_ENREF_21)).

However, it is important to note that the current study indeed found culture based differences to sleep duration on weekends. This comparison may illuminate the discussion of the meaning of extended sleep among adolescents on weekends. In western society, adolescents extend their sleep time by two to three hours during the weekend, as compared to schooldays ([36](#_ENREF_36)). Although it is a prominent feature described in many studies ([13](#_ENREF_13),[17](#_ENREF_17))(Carskadon et al., 2009), the phenomenon is not yet fully understood. Pioneer studies in the field, where the adolescents slept as much as they wanted to – as in the case among the secular population on weekends – the sleep duration reflects the optimal sleep duration ([37](#_ENREF_37)). However, this approach has recently been subject to criticism, claiming that optimal sleep duration should be measured against various functional metrics and that the existing testimonials demonstrate that the correlation is not necessarily linear. In other words, more sleep does not necessarily lead to better functional results ([17](#_ENREF_17),[38](#_ENREF_38)). Indeed, the current study provides evidence that actually abstaining from extended sleep during the weekend and retaining a regular sleep routine between the middle and end of the week – as evident among the ultra-orthodox boys – is related to better daily functionality, as presented below.

**Difference in daily behavior patterns between ultra-orthodox and secular adolescents**

**Daytime sleepiness and sleep related behavioral problems**

Fatigue and sleepiness are popular phenomena among normative adolescents ([11](#_ENREF_11)) and they were found to correlate, together with depression, with a quality of life impairment ([15](#_ENREF_15)). A comparative study conducted among children and adolescents in the U.S. and China, found that daytime sleepiness is prevalent in both cultures, but they were related to different reasons ([39](#_ENREF_39)). While daytime sleepiness in Chinese children was related to a short sleep duration, sleepiness in the U.S. was related to poor sleep quality. One can assume that these findings reflect different norms and values that impact sleepiness and reflect cultural differences between the populations.

The current study found an interaction between religion and gender as they impact daytime sleepiness. Daytime sleepiness was found to be lower among ultra-orthodox boys, as compared to ultra-orthodox girls, and lower among secular girls as compared to secular boys. This interaction can be explained by differences found in the sleep patterns described above. Thus, as observed among ultra-orthodox boys, maintaining early and regular sleep patterns throughout the entire week protects them against daytime sleepiness. This argument can be supported within the secular population, seeing that the secular girls maintain earlier sleep patterns than secular boys and they are less sleepy than they are. Thus, the research findings point to a mechanism by which lifestyle and culture mold sleep patterns that, in turn, impact daytime sleepiness in a gender dependent manner. In other words, the ultra-orthodox society dictates a lifestyle in which the boys (but not the girls) pray early every morning, a custom that requires strict adherence to regular sleep patterns that, in turn, promote reduced daily sleepiness. On the other hand, lifestyle in the secular society dictates a structured schedule in the middle of the week, but it is more permissive and flexible on weekends, thus they demonstrate irregular sleep patterns that, in turn, increase daytime sleepiness.

Similarly, a gender/religion interaction was found in daily sleep related behaviors. Indeed, the ultra-orthodox sector reported more problems among girls as compared to boys and, in the secular sector, more among boys as compared to girls. This finding is congruent with others described in sleep patterns and sleepiness, demonstrating once again that culture has a gender dependent impact on lifestyle that, in turn, molds sleep patterns and daytime sleep related behaviors. It is interesting to note that a study that examined and compared sleep hygiene among Italian and American adolescents found that sleep hygiene is a good predictor of sleep quality and that cultural differences derived of the differences in adolescent sleep hygiene ([40](#_ENREF_40)). One can assume that such cultural differences in sleep hygiene among ultra-orthodox and secular adolescents shall also manifest in sleep related behaviors during the day.

**Mood and Sleep**

Professional literature reports a strong interaction between adolescent sleep attributes and moods ([7](#_ENREF_7),[15](#_ENREF_15),[17](#_ENREF_17)). An American survey conducted in 2011 found that 94% of the youths reported insufficient sleep and stated that it impacts their mood ([41](#_ENREF_41)). An experimental study found that, after several days of sleep deprivation, adolescents tended to exhibit bad moods and a decline in their ability to regulate negative emotions ([42](#_ENREF_42)).

The current study found mood differences based only on religion. Ultra-orthodox adolescents suffered from mood impairment less than their secular peers did. This may be explained by the regular bedtime and good sleep hygiene observed within the ultra-orthodox population. Another possibility is that there is a cultural impact related to the spirituality of religion, which may impact the mood of ultra-orthodox adolescents. Ultra-orthodox children are raised to believe that everything that happens is for the best and when ultra-orthodox adolescents encounter changes in their lives, they overcome them through prayer and faith. A study that examined whether there is a correlation between spirituality and depression among adolescents found that spirituality might maintain lower levels of depressive symptoms among adolescent girls ([43](#_ENREF_43)). Another study related to religion and spirituality among adolescents coping with cancer, found that patients relied on their faith more than expected and reported that religion and spirituality helped them cope with the disease ([44](#_ENREF_44)). It is important to study the prevalence of religion among depressed adolescents in order to determine whether faith is indeed a shield against mood disorders characteristic of this age group.

**Morning/Evening Typicality**

Dramatic changes in sleep patterns are among the most prevalent trademarks of adolescence. These changes are manifested in a tendency to gradually delay bedtimes and a higher preference toward “night owl” behavior, which is related to biological factors, including changes in hormonal and neurobioligal factors responsible for regulating the biological clock and delaying the homeostatic mechanism of sleepiness ([2](#_ENREF_2),[4](#_ENREF_4),[10](#_ENREF_10),[11](#_ENREF_11),[45](#_ENREF_45)). However, there is evidence that the environment and culture also impact this typicality. For example, upon comparing sleep patterns and related behaviors in a survey of Jewish and Arab adolescents in Israel, the results show that Jewish adolescents report later bedtimes and a significant tendency toward “night owl” behavior as compared to Arab adolescents ([21](#_ENREF_21)). It is possible that this tendency within the secular Jewish population reflects the norms and lifestyle of western society, while the conservative and authoritative lifestyle of the Arab population may explain the tendency to maintain earlier bedtimes among Arab adolescents.

Contrary to expectations, the current study found an interaction between gender and religion. Boys in the ultra-orthodox sector reported “night owl” behavior more than girls did, while girls of the secular sector reported such behavior more than boys did. These findings are surprising, as there is a disparity between the early sleep patterns among ultra-orthodox boys and secular girls, and between their tendency to describe themselves as “night owls”, compared to ultra-orthodox girls and secular boys, respectively. A possible interpretation of these findings is that the subjective report reflects the difference between actual early rising and their natural tendency to delay their bedtime, as it is dictated by the biological clock. The typicality questionnaire deals with preferred times for performing various physical and mental tasks. Thus, for the ultra-orthodox boys, as they are required to rise early throughout the week, despite and as opposed to the biological adolescent tendency to rise later, they chose later times in which it is easiest for them to function based on their biological tendency. Perhaps this tendency is manifested because of the early bedtime that is forced upon them by their religious lifestyle.

Similarly, adolescent girls in secular society reported early bedtimes, but tended to report “night owl” behavior. This requires a different interpretative approach. Perhaps the disparity here reflects peer pressure and the desire for social acceptance, which dictate compliance with adolescent social norms including late night social activities, television at late hours, etc. Such interpretations, both for the ultra-orthodox boys and secular girls, are speculative in nature and require validation in additional studies.

**Research Limitations**

There are several limitations to this study. First, it applies the snowball method of sampling and not probability based sampling. This method was selected due to the worldview held by the ultra-orthodox society, part of which refuses to take part and even rejects scientific research. In light of the above, the results cannot be generalized to the entire ultra-orthodox population. In addition, the current study is a sectional study, thus it is impossible to evaluate causal relationship between the research variables. Finally, the findings were based on self-reporting, with no objective metrics. Future studies can improve findings validity by monitoring sleep patterns in both populations through actigraphy.

**Summary**

The religious lifestyle impacts sleep patterns, daytime sleepiness, daytime functioning, moods and morning/evening typicality in many different ways. In addition, gender is a mediating factor that is also related to lifestyle differences in each sector. Sleep quality was found to be better among the ultra-orthodox adolescents. In addition, sleep latency was shorter among the ultra-orthodox adolescents than among the secular adolescents. Bedtime studies found an interaction between religion and gender, whereby ultra-orthodox boys and secular girls reported earlier bedtimes, both during the week and on weekends, as compared to ultra-orthodox girls and secular boys. Regarding daytime sleep related behaviors, the study found that the mood was poorer among the secular adolescents and that daytime sleepiness and inappropriate sleep related daytime behaviors were more prevalent among ultra-orthodox girls and secular boys. On the other hand, reports of a tendency toward evening typicality was found more among ultra-orthodox boys and secular girls. The discussion proposed several interpretations to the manner by which lifestyle, being gender dependent in each culture, contributes to the development of sleep patterns that, in turn, characterize daily performance. It seems that the comparison to the ultra-orthodox population in this study enables a glance at the manner by which culture contributes to sleep patterns and related daily functioning among adolescents in Israel.

**Acknowledgements**

Collate acknowledgements in a separate section at the end of the article before the references and do not include them on the title page, as a footnote to the title or otherwise. List here those individuals who provided help during the research (e.g., providing language help, writing assistance or proof reading the article, etc.).

Grant support should be acknowledged in a separate paragraph and should include the full name of the granting agency and not exceed four typed lines. Pharmaceutical company or other industry support of any kind must be acknowledged. List only persons who have made substantive contributions. Acknowledge material from other publications and submit written permission from the owner of the copyright to reprint any portion or figure with the manuscript.

**References**

1. Carskadon MA, Acebo C, Jenni OG. Regulation of adolescent sleep: implications for behavior. *Ann N Y Acad Sci.* 2004;1021:276-291.

2. Carskadon MA, Wolfson AR, Acebo C, Tzischinsky O, Seifer R. Adolescent sleep patterns, circadian timing, and sleepiness at a transition to early school days. *Sleep.* 1998;21(8):871-881.

3. Crowley SJ, Acebo C, Carskadon MA. Sleep, circadian rhythms, and delayed phase in adolescence. *Sleep Med.* 2007;8(6):602-612.

4. Taylor DJ, Jenni OG, Acebo C, Carskadon MA. Sleep tendency during extended wakefulness: insights into adolescent sleep regulation and behavior. *J Sleep Res.* 2005;14(3):239-244.

5. Jenni OG, O'Connor BB. Children's sleep: an interplay between culture and biology. *Pediatrics.* 2005;115(1 Suppl):204-216.

6. Short MA, Gradisar M, Lack LC, et al. A cross-cultural comparison of sleep duration between US And Australian adolescents: the effect of school start time, parent-set bedtimes, and extracurricular load. *Health Educ Behav.* 2013;40(3):323-330.

7. Shochat T, Cohen-Zion M, Tzischinsky O. Functional consequences of inadequate sleep in adolescents: a systematic review. *Sleep Med Rev.* 2014;18(1):75-87.

8. Wolfson AR, Carskadon MA. Sleep schedules and daytime functioning in adolescents. *Child Dev.* 1998;69(4):875-887.

9. Laberge L, Petit D, Simard C, Vitaro F, Tremblay RE, Montplaisir J. Development of sleep patterns in early adolescence. *J Sleep Res.* 2001;10(1):59-67.

10. Hagenauer MH, Perryman JI, Lee TM, Carskadon MA. Adolescent changes in the homeostatic and circadian regulation of sleep. *Dev Neurosci.* 2009;31(4):276-284.

11. Gradisar M, Gardner G, Dohnt H. Recent worldwide sleep patterns and problems during adolescence: a review and meta-analysis of age, region, and sleep. *Sleep Med.* 2011;12(2):110-118.

12. Chung KF, Cheung MM. Sleep-wake patterns and sleep disturbance among Hong Kong Chinese adolescents. *Sleep.* 2008;31(2):185-194.

13. Shochat T, Flint-Bretler O, Tzischinsky O. Sleep patterns, electronic media exposure and daytime sleep-related behaviours among Israeli adolescents. *Acta Paediatr.* 2010;99(9):1396-1400.

14. Fallone G, Owens JA, Deane J. Sleepiness in children and adolescents: clinical implications. *Sleep Med Rev.* 2002;6(4):287-306.

15. Tzischinsky O, Shochat T. Eveningness, sleep patterns, daytime functioning, and quality of life in Israeli adolescents. *Chronobiol Int.* 2011;28(4):338-343.

16. Carskadon MA, Roth T. *Adolescent sleep needs and patterns. Research report and research guide.* Washington DC, USA: National Sleep Foundation;2012.

17. Shochat T, Barker DH, Sharkey KM, Van Reen E, Roane BM, Carskadon MA. An approach to understanding sleep and depressed mood in adolescents: Person-centered sleep classification. *Journal of Sleep Research.* 2017;in press.

18. Jenni OG, Achermann P, Carskadon MA. Homeostatic sleep regulation in adolescents. *Sleep.* 2005;28(11):1446-1454.

19. Olds T, Blunden S, Petkov J, Forchino F. The relationships between sex, age, geography and time in bed in adolescents: a meta-analysis of data from 23 countries. *Sleep Med Rev.* 2010;14(6):371-378.

20. Yang CK, Kim JK, Patel SR, Lee JH. Age-related changes in sleep/wake patterns among Korean teenagers. *Pediatrics.* 2005;115(1 Suppl):250-256.

21. Shochat T. Sleep patterns and daytime sleep-related behaviors in male and female Arab and Jewish adolescents in Israel. *Sleep and Biological Rhythms.* 2013;11(2):82-89.

22. Tynjala J, Kannas L, Valimaa R. How young Europeans sleep. *Health Educ Res.* 1993;8(1):69-80.

23. Biggs SN, Pizzorno VA, van den Heuvel CJ, Kennedy JD, Martin AJ, Lushington K. Differences in parental attitudes towards sleep and associations with sleep-wake patterns in Caucasian and Southeast Asian school-aged children in Australia. *Behav Sleep Med.* 2010;8(4):207-218.

24. Combs D, Goodwin JL, Quan SF, Morgan WJ, Parthasarathy S. Longitudinal differences in sleep duration in Hispanic and Caucasian children. *Sleep Med.* 2016;18:61-66.

25. Zicherman H. *[Strategic housing plan for the ultra-orthodox population 2016-2035].* Jerusalem, Israel: Ministry of Housing;2016.

26. Friedman M. *[The Haredi ultra-orthodox society: sources, trends and processes].* Jerusalem The Jerusalem Institute for Israel Studies; 1991.

27. Zicherman H. *[Black, blue and white: A journey into the Haredi community in Israel].* Tel Aviv, Israel: Yedioth Books; 2014.

28. Cahaner L, Yozgof-Orbach N, Sopher A. *[The haredim in Israel: : Space, society, community].* Haifa, Israel: Chaikin Chair for Geostrategy, Haifa University; 2012.

29. Layosh B. *[Women of the threshold : Orthodox women in front of a modern change].* Tel Aviv, Israel: Resling Publishers; 2014.

30. Freund A, Cohen M, Azaiza F. The doctor is just a messenger: beliefs of ultraorthodox Jewish women in regard to breast cancer and screening. *J Relig Health.* 2014;53(4):1075-1090.

31. Teman E, Ivry T, Bernhardt BA. Pregnancy as a proclamation of faith: Ultra-Orthodox Jewish women navigating the uncertainty of pregnancy and prenatal diagnosis. *Am J Med Genet A.* 2011;155A(1):69-80.

32. *The Social Survey 2009.* Jerusalem, Israel: Central Bureau of Statistics;2009.

33. O'Brien EM, Mindell JA. Sleep and risk-taking behavior in adolescents. *Behav Sleep Med.* 2005;3(3):113-133.

34. Sadeh A, Tikotzky L, Scher A. Parenting and infant sleep. *Sleep Med Rev.* 2010;14(2):89-96.

35. Mindell JA, Telofski LS, Wiegand B, Kurtz ES. A nightly bedtime routine: impact on sleep in young children and maternal mood. *Sleep.* 2009;32(5):599-606.

36. Garmy P, Nyberg P, Jakobsson U. Sleep and television and computer habits of Swedish school-age children. *J Sch Nurs.* 2012;28(6):469-476.

37. Carskadon MA, Harvey K, Duke P, Anders TF, Litt IF, Dement WC. Pubertal changes in daytime sleepiness. *Sleep.* 1980;2(4):453-460.

38. Matricciani L, Blunden S, Rigney G, Williams MT, Olds TS. Children's sleep needs: is there sufficient evidence to recommend optimal sleep for children? *Sleep.* 2013;36(4):527-534.

39. Liu X, Liu L, Owens JA, Kaplan DL. Sleep patterns and sleep problems among schoolchildren in the United States and China. *Pediatrics.* 2005;115(1 Suppl):241-249.

40. LeBourgeois MK, Giannotti F, Cortesi F, Wolfson AR, Harsh J. The relationship between reported sleep quality and sleep hygiene in Italian and American adolescents. *Pediatrics.* 2005;115(1 Suppl):257-265.

41. 2011 Sleep in America Poll – Technology Use and Sleep. *Sleep Health.* 2015;1(2):e10.

42. Baum KT, Desai A, Field J, Miller LE, Rausch J, Beebe DW. Sleep restriction worsens mood and emotion regulation in adolescents. *J Child Psychol Psychiatry.* 2014;55(2):180-190.

43. Perez JE, Little TD, Henrich CC. Spirituality and depressive symptoms in a school-based sample of adolescents: a longitudinal examination of mediated and moderated effects. *J Adolesc Health.* 2009;44(4):380-386.

44. Ragsdale JR, Hegner MA, Mueller M, Davies S. Identifying religious and/or spiritual perspectives of adolescents and young adults receiving blood and marrow transplants: a prospective qualitative study. *Biol Blood Marrow Transplant.* 2014;20(8):1242-1247.

45. Iglowstein I, Jenni OG, Molinari L, Largo RH. Sleep duration from infancy to adolescence: reference values and generational trends. *Pediatrics.* 2003;111(2):302-307.