“Social Jetlag” in Morning-Type College Students Living On Campus: Implications for Physical and Psychological Well-being

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Although on-campus residence allows easier access to campus facilities, existing studies showed mixed results regarding the relationship between campus residence and students’ well-being indicators, such as sleep behaviors and mood. There was also a lack of studies investigating the role of chronotype in the relationship between on-campus residence and well-being. In particular, the temporal relationships among these factors were unclear. Hence, this longitudinal study aims to fill in these gaps by first reporting the well-being (measured in terms of mood, sleep, and quality of life) among students living on and off campus across two academic semesters. We explored factors predicting students’ dropout in university residences. Although students living on campus differ in their chronotypes, activities in campus residence (if any) are mostly scheduled in the nighttime. We therefore tested if individual differences in chronotype interact with campus residence in affecting well-being. Our final sample consisted of 215 campus residents and 924 off-campus-living students from 10 different universities or colleges in Hong Kong or Macau. Their mean age was 20.2 years (SD = 2.3); 6.5% of the participants are female. Participants completed self-reported questionnaires online on their sleep duration, sleep quality, chronotype, mood, and physical and psychological quality of life. Across two academic semesters, we assessed if students living on and off campus differed in our well-being measures after we partialled out the effects of demographic information (including age, sex, family income, and parents’ education) and the well-being measures at baseline (T1). The results showed that, campus residents exhibited longer sleep duration, greater sleep efficiency, better sleep quality, and less feeling of stress than off-campus-living students. From one semester to the next, around 10% of campus residents did not continue to live on campus. Logistic regression showed that a morning type was the strongest factor predicting dropout from campus residence. Chronotype significantly moderated the effects of campus residence on participants’ physical and psychological quality of life. Although morning-type off-campus-living students have better well-being than their evening-type peers living off campus, morning-type campus residents had worse well-being than other campus residents and they were more likely to discontinue living on campus after one semester. Our findings bear practical significance to college management that morning-type campus residents are shown to be experiencing deteriorating well-being. The authorities may need to review and revise the room-allocation policy in campus residence in improving the well-being among campus residents.

Keywords: Chronotype, college student, dormitory, negative affect, quality of life, residential hall, sleep

INTRODUCTION

Evening chronotype, insufficient sleep, and poor sleep quality are prevalent among college students (Lund et al., 2010; Suen et al., 2008), and these characteristics have been shown to be associated with poor well-being (e.g., mood, self-esteem, and physical quality of life) in longitudinal studies (Fredrikson et al., 2004; Wong et al., 2013). Type of residence (e.g., campus versus off-campus residence) has also been reported to relate to some psychosocial outcomes, such as substance use (Jones et al., 1992) and negative affect (Dusselier et al., 2005). To date, the interplay of sleep quality, chronotype, and campus residence in affecting well-being remains to be determined.

Campus Residence and Well-being in College

Mixed findings have been reported regarding the relationship between campus residence and students’ well-being. Some studies showed that on-campus residence was associated with better well-being in college.
Sleep, Chronotype, and Well-being

Sleep and chronotype have been shown to predict physical and psychological well-being. The role of sleep has been highlighted in various health conditions, such as hypertension (Carskadon et al., 1994), weight change, and obesity (Magee & Hale, 2012). From a cognitive neuroscience perspective, poor sleep is detrimental to the functioning of the brain in regulating human's socioaffective functions (Vandekerckhove & Cluydts, 2010). For instance, Killgore et al. (2012) found that sufficient sleep is vital to the decision-making process, and that sleep-deprived individuals are more likely to make risky decisions. In longitudinal studies, insufficient sleep and poor sleep quality were found to predict poor well-being, such as low self-esteem, poor physical quality of life, as well as depression and anxiety symptoms (Fredriksen et al., 2004; Wong et al., 2013). Individual's chronotype has also been demonstrated to relate to well-being. For instance, evening-type is positively correlated with health-imparing behaviors, such as smoking, alcohol consumption, and time spent on computer games and television (Urban et al., 2011). Evening preference is also correlated with undesirable mental health conditions. For example, individuals with an evening preference reported depressed mood more than individuals with other circadian preferences (Wittmann et al., 2006), whereas morning preference was associated with higher physical and psychological quality of life (Lau et al., 2012). Wittmann and coworkers (2006) proposed that the effects of chronotype on well-being might be a consequence of the misalignment between chronotype (internal circadian clock) and social schedule (e.g., school/work schedule). The misalignment is referred to as “social jetlag.” They asserted that if individuals shift their sleep schedule under environmental demand (e.g., an evening-type person wakes up early for school), their sleep is likely to be affected. Their daytime functioning may then be impaired and compensatory strategies, such as use of cigarettes and caffeine may be adopted, which may further worsen their nighttime sleep, setting off a vicious cycle of their well-being. To our knowledge, no previous studies have addressed how the individual difference in circadian preference and campus residence as a social environment may interact in their effects on well-being.

The Current Study

The current study attempts to fill the literature gap in investigating the interaction between campus residence with chronotype in predicting well-being in college students. As campus residences in Hong Kong have activities mostly scheduled in the evening or even late at night, we expected that evening-type campus residents may adjust better than morning-type residents to the social schedule of the campus residence. In other words, in the context of campus residence, morning-type residents might suffer from social jetlag, characterized by poorer sleep and impaired well-being, which in turn might lead to dropping out from the residences. Specifically, we hypothesized that morning-type students living on campus would have worse well-being than campus residents with intermediate or evening types. In line with the general picture of chronotype’s effects on well-being as depicted in the literature, students living off-campus with a morning type would have better well-being than intermediate- or evening-type off-campus-living students. We also hypothesized that morning type would be a significant predictor of dropping out among campus residents given the
potential mismatch between chronotype and social schedule for these residents.

**MATERIALS AND METHODS**

**Participants**
By campus and online recruitment, we invited Chinese undergraduate students from 16 universities and colleges in Hong Kong and Macau to participate in the current study. Participants were excluded if they were doing a part-time degree or if they did not report their student status or type of residence in any time point. Of the 1253 participants who completed the measurements in Time 1 (T1), 1139 (90.2%) continued in Time 2 (T2).

**Design and Procedures**
The present study was part of a large-scale longitudinal, multi-wave panel study on the formation and transformation of beliefs, lifestyle, and well-being in Chinese. Only full-time college students from the large-scale study were included in the current study and the results of other sub-studies were reported elsewhere (e.g., Hui et al., 2011, Wong et al., 2013), which was approved by the University Human Research Ethics Committee for Non-Clinical Faculties prior to data collection. The research protocol complied with the Declaration of Helsinki as well as the international ethical standards for human research on biological rhythm (Portaluppi et al., 2010). Participants completed two online surveys in February to May 2010 (T1) and then in the next semester from September to December 2010 (T2). Measures on demographic information and chronotype were completed in T1 and the scales on sleep, mood, and quality of life in both T1 and T2. Written informed consent was obtained from participants at the start of each survey, and a brief feedback was given to each participant at the end of each survey. As a compensation for their time, the participants could opt for joining a lucky draw for cash coupons or having us make a donation to a designated charity organization for poverty reduction.

**Measurements**
All measurements were administered in Chinese language. The psychometric properties of the measurements are summarized in Table 1.

**Demographics**
Participants indicated their age, sex, family income, parents’ education level, student status, and type of residence. Their family income was assessed on a 6-point scale (1 = <$10,000; 2 = $10,000–$19,999; 6 = $20,000). For parent’s education level, participants responded on a 6-point scale (1 = preprimary education; 2 = primary education; 6 = postgraduate education). We then computed the mean score between the parents to represent parents’ education level. For student status, participants indicated whether they are graduates or current student of a full-time undergraduate program.

In this study, campus residents were those who lived on campus in both semesters and nonresidents were those living off campus in both semesters. Although previous studies (e.g., Jones et al., 1992) showed that students living alone off campus have very different health-related behaviors from those living off campus with family members, they were not included in the final sample.

**Sleep Behaviors**
The Pittsburgh Sleep Quality Index (PSQI) was used to assess an individual’s sleep quality over the past month (Buysse et al., 1989; Tsai et al., 2005). The PSQI measures multiple domains of sleep quality, including subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. The total score of PSQI ranges from 0 to 21 and Individuals with a PSQI total score greater than 5 are generally regarded as poor sleepers. The Sleep Timing Questionnaire (STQ) was used to assess individual’s habitual sleep-wake pattern (Mok et al., 2003). Participants reported their sleep duration in school days and holidays separately. Sleep debt was calculated by subtracting the hours of sleep in school days from holidays.

**Mood and Quality of Life**
The Depression Anxiety Stress Scale, DASS-21, was used to assess participants’ negative mood over the previous week (Henry & Crawford, 2005). There are seven items for each domain of depression, anxiety, and stress, and higher scores indicate more mood symptoms. The World Health Organization Quality of Life Measures

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**TABLE 1. Cronbach’s alphas and data collection points of all measures.**

<table>
<thead>
<tr>
<th>Measures</th>
<th>Cronbach’s α</th>
<th>Time 1</th>
<th>Time 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics*</td>
<td></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Sleep behaviors*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sleep Timing Questionnaire</td>
<td></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Pittsburgh Sleep Quality Index</td>
<td></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Quality of life</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>World Health Organization</td>
<td></td>
<td>Yes (0.64)</td>
<td>Yes (0.69)</td>
</tr>
<tr>
<td>Quality of Life—Physical Health</td>
<td></td>
<td>Yes (0.79)</td>
<td>Yes (0.81)</td>
</tr>
<tr>
<td>World Health Organization</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality of Life—Psychological Health</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mood</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression Anxiety Stress Scale</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td></td>
<td>Yes (0.86)</td>
<td>Yes (0.86)</td>
</tr>
<tr>
<td>Anxiety</td>
<td></td>
<td>Yes (0.78)</td>
<td>Yes (0.75)</td>
</tr>
<tr>
<td>Stress</td>
<td></td>
<td>Yes (0.82)</td>
<td>Yes (0.82)</td>
</tr>
<tr>
<td>Chronotype</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Composite Scale of Morningness</td>
<td></td>
<td>Yes (0.80)</td>
<td>No</td>
</tr>
</tbody>
</table>

*The Cronbach’s alphas of demographic measures, the sleep timing questionnaires, and the Pittsburgh Sleep Quality Index are not computed because the derived variables are measured by one or two items.
(WHOQOL-BREF) Hong Kong version was used to assess individual's satisfaction with their quality of life in the physical and psychological domains (Leung et al., 2003). Individual's physical quality of life is measured by seven items assessing their feeling of physical pain, need for medical treatment in daily life functioning, and their satisfaction with their sleep, capacity for work, ability to perform daily activity, ability to get around, and their energy level in their everyday life. Psychological quality of life is measured by another six items that assess their satisfaction with their body appearance, themselves as a whole, ability to concentrate, life meaningfulness, as well as how much they enjoy their life and how frequently they have negative feelings, such as depressed mood. Higher scores in the WHOQOL-BREF indicate better quality of life.

**Chronotype**

The Composite Scale of Morningness (CSM) was used to measure participants' chronotype (Porntipatkhan, 1998; Smith et al., 1988). The 13-item CSM has a total score from 13 to 55 and the higher end indicates inclination towards a morning type. The cutoff scores (40/41 and 22/23) were adopted from our previous work in differentiating morning, intermediate, and evening types, respectively (Wong et al., 2012).

**Statistical Methods**

Statistical analyses were performed on the Statistical Package for the Social Sciences (SPSS) version 16.0 (SPSS, Chicago, IL, USA) and a statistical significance level is determined by an alpha smaller than .05. Two (type of residence: on-campus residence versus off-campus residence) by two (time: T1 versus T2) mixed model of covariance (ANCOVA) was used to study if campus residents and off-campus-living students differed in sleep behaviors, mood, and physical and psychological quality of life across the two time points. Participants' demographic information (age, sex, family income, and parents' education level) were set as covariates.

Sequential regression analyses were used to test if chronotype interacted with campus residence in affecting well-being. Participants' demographics and well-being at baseline (T1) were entered in the first step, followed by participants' sleep behaviors, chronotype, and campus residence. Two interaction terms, campus residence × morning-type (versus non-morning-type, i.e., intermediate- and evening-type) and campus residence × evening-type (versus non-evening-type, i.e., intermediate- and morning-type), were created and entered in the third step in the model. The outcome variables are the mood and quality of life measures in T2.

Sequential logistic regression was used to determine the factors predicting dropout from campus residence. Campus residents' demographics (age, sex, family income, and parents' education) were entered in step 1.

<table>
<thead>
<tr>
<th>TABLE 2. Between-group comparisons on demographic information.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographic</td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td>Age</td>
</tr>
<tr>
<td>Sex (% male)</td>
</tr>
<tr>
<td>Parents' education</td>
</tr>
<tr>
<td>Family income</td>
</tr>
</tbody>
</table>

*p < 0.05; **p < 0.01; ***p < 0.001.

Step 2 included sleep behaviors (sleep duration in schooldays and holiday and the aforementioned sleep quality dimensions) and chronotype as predictors of the outcome variable, which was campus residence in T2 (1 = stay, 0 = dropout).

**RESULTS**

The final sample consisted of 215 campus residents (morning-type: n = 19; evening-type: n = 16) and 924 off-campus-living students (morning-type: n = 87; evening-type: n = 99) (Table 2). The mean age of the sample is 20.2 years (SD = 2.3) and 33.5% are males. The two groups do not significantly differ in sex ratio, χ²(1,1135) = 0.082, p > 0.05, whereas campus residents were significantly older, t(1132) = -4.207, p < 0.001, had lower family income, t(1045) = -3.633, p < 0.001, and their parents were more educated, t(1074) = 11.399, p < 0.001, than off-campus-living students.

**Sleep and Well-being Characteristics in On- Versus Off-Campus-Living Students Across Time**

Among all the sleep behaviors measured, campus residents had longer sleep duration in school days, F₁,190 = 12.213, p < 0.001, lower PSQI global score, F₁,190 = 4.042, p < 0.05, and higher habitual sleep efficiency, F₁,190 = 6.796, p < 0.01, than off-campus-living students across the two time points. Campus residents also reported less stress symptoms than off-campus-living students, F₁,189 = 4.108, p < 0.05, whereas the group differences on depressive and anxiety symptoms were not significant (p > 0.05). Students' sleep quality seemed to deteriorate from T1 to T2, as indicated by significant main effects of time on sleep disturbance, F₁,189 = 3.958, p < 0.05, and PSQI global score, F₁,189 = 4.270, p < 0.05. An ANCOVA with age, family income, and parents' education controlled revealed no group difference on chronotype, F₁,189 = 1.567, p > 0.05.

**Interaction Between Chronotype and Campus Residence in Predicting Well-being**

The model including the two interaction terms (campus residence × morning-type and campus residence × evening-type) significantly predicted physical, F₁,276 = 3.561, p < 0.05, R² = 0.372, and psychological, R² = 0.501, F₁,276 = 3.963, p < 0.05, quality of life (Table 3). For the model of physical quality of life,
TABLE 3. Prediction of T2 mood and quality of life by T1 demographic, mood/quality of life, sleep behaviors, chronotype, campus residence, and interaction between campus residence and chronotype.

<table>
<thead>
<tr>
<th>Models</th>
<th>Variables</th>
<th>Depression</th>
<th>Stress</th>
<th>Anxiety</th>
<th>Physical quality of life</th>
<th>Psychological quality of life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 (standardized coefficient, ( \beta ))</td>
<td>Age</td>
<td>0.007</td>
<td>0.053</td>
<td>0.039</td>
<td>-0.052</td>
<td>-0.012</td>
</tr>
<tr>
<td></td>
<td>Sex</td>
<td>-0.039</td>
<td>&lt;0.001</td>
<td>-0.001</td>
<td>0.006</td>
<td>0.029</td>
</tr>
<tr>
<td></td>
<td>Parents education</td>
<td>0.009</td>
<td>-0.022</td>
<td>0.004</td>
<td>0.060*</td>
<td>0.007</td>
</tr>
<tr>
<td></td>
<td>Family income</td>
<td>-0.059*</td>
<td>-0.027</td>
<td>-0.067*</td>
<td>0.032</td>
<td>0.052</td>
</tr>
<tr>
<td></td>
<td>Corresponding outcome measures at baseline (T1)</td>
<td>0.630***</td>
<td>0.623***</td>
<td>0.585***</td>
<td>0.585***</td>
<td>0.685***</td>
</tr>
<tr>
<td></td>
<td>( R^2 ) change of the model</td>
<td>0.391***</td>
<td>0.491***</td>
<td>0.362***</td>
<td>0.362***</td>
<td>0.499***</td>
</tr>
<tr>
<td>Step 2 (( \beta ))</td>
<td>Sleep efficiency</td>
<td>0.007</td>
<td>0.002</td>
<td>0.010</td>
<td>-0.032</td>
<td>0.005</td>
</tr>
<tr>
<td></td>
<td>Sleep duration (school)</td>
<td>-0.082*</td>
<td>-0.050</td>
<td>-0.105**</td>
<td>-0.001</td>
<td>0.039</td>
</tr>
<tr>
<td></td>
<td>Campus resident</td>
<td>-0.081*</td>
<td>-0.035</td>
<td>-0.077*</td>
<td>0.010</td>
<td>0.017</td>
</tr>
<tr>
<td></td>
<td>M-type (CSM&gt;29)</td>
<td>-0.020</td>
<td>-0.021</td>
<td>-0.021</td>
<td>0.052</td>
<td>0.051</td>
</tr>
<tr>
<td></td>
<td>E-type (CSM&lt;24)</td>
<td>-0.060</td>
<td>-0.018</td>
<td>0.009</td>
<td>-0.092**</td>
<td>-0.047</td>
</tr>
<tr>
<td></td>
<td>( R^2 ) change of the model</td>
<td>0.009</td>
<td>0.009</td>
<td>0.015**</td>
<td>0.000</td>
<td>0.005</td>
</tr>
<tr>
<td>Step 3 (( \beta ))</td>
<td>Campus resident (C) × M-type</td>
<td>0.068</td>
<td>0.001</td>
<td>-0.005</td>
<td>-0.084**</td>
<td>-0.081**</td>
</tr>
<tr>
<td></td>
<td>Campus resident (C) × E-type</td>
<td>0.039</td>
<td>0.015</td>
<td>0.006</td>
<td>0.014</td>
<td>0.003</td>
</tr>
<tr>
<td></td>
<td>( R^2 ) change of the model</td>
<td>0.003</td>
<td>0.000</td>
<td>0.000</td>
<td>0.006*</td>
<td>0.005*</td>
</tr>
</tbody>
</table>

Adjusted \( R^2 \) of the final model

\( M\)-type = morning type; \( E\)-type = evening type; sleep duration (school) = school duration in school days.

\( *p<0.05; \; **p<0.01; \; ***p<0.001. \)

![Figure 1](image1.png)

FIGURE 1. Effects of residence type and chronotype on sleep disturbance. \( *p<.05, \; **p<.01, \; ***p<.001. \)

![Figure 2](image2.png)

FIGURE 2. Effects of residence type and chronotype on sleep duration. \( *p<.05, \; **p<.01, \; ***p<.001. \)

morning-type was not a significant predictor (standardized coefficient \( \beta = 0.052, \; p>0.05) but campus residence × morning-type negatively predicted physical quality of life \( \beta = -0.084, \; p<0.01). \) In contrast, although evening-type significantly predicted lower physical quality of life \( \beta = -0.092, \; p<0.01), the effect of campus residence × evening-type was not significant \( p>0.05). \) In the model of psychological quality of life, only campus residence × morning-type was a significant predictor \( \beta = -0.081, \; p<0.01). \) The models including the interaction terms in predicting the three mood measures, depression, stress, and anxiety, were not significant, \( p>0.05). \)

To further elucidate the effects of chronotype and campus residence on well-being (T2), a one-way ANCOVA was performed among the six groups of students (morning-, intermediate-, and evening-type students living on and off campus) with age, family income, parents' education, and well-being at baseline (T1) controlled (Figures 1-6). The six groups of students differed significantly in multiple indicators of well-being, including physical, \( F_{5,403} = 2.934, \; p<0.05), \) and psychological, \( F_{5,406} = 2.465, \; p<0.05, \) quality of life, sleep disturbances, \( F_{5,774} = 3.159, \; p<0.01, \) school days sleep duration, \( F_{5,774} = 2.664, \; p<0.05), \) holiday sleep duration, \( F_{5,775} = 2.333, \; p<0.05, \) and sleep debt, \( F_{5,774} = 5.176, \; p<0.001). \)

From post hoc analyses (least significant difference (LSD)), morning-type campus residents had worse physical quality of life than off-campus students with a morning type (mean difference = 1.573, \( p<0.01) or intermediate type (mean difference = 1.242, \; p<0.05). \) Morning-type campus residents also reported less satisfaction with psychological quality of life than off-campus students with a morning (mean difference = 1.645, \; p<0.01) or intermediate (mean
FIGURE 3. Effects of residence type and chronotype on daily hours of sleep on holiday. *p<.05, **p<.01, ***p<.001.

FIGURE 4. Effects of residence type and chronotype on the hours of sleep debt experienced per week. *p<.05, **p<.01, ***p<.001.

FIGURE 5. Effects of residence type and chronotype on physical quality of life. *p<.05, **p<.01, ***p<.001.

FIGURE 6. Effects of residence type and chronotype on psychological quality of life. *p<.05, **p<.01, ***p<.001.

difference = 1.256, p<0.05) type. In terms of sleep behaviors, intermediate-type campus residents reported longer sleep duration in schooldays than off-campus students with an intermediate (mean difference = 0.279, p<0.05) or evening (mean difference = 0.514, p<0.01) type. Intermediate-type campus residents also had longer sleep duration in holidays than off-campus morning-type students (mean difference = 0.575, p<0.05). The significant differences in well-being and sleep behaviors among on-campus living students with different chronotypes as well as those living off campus with different chronotypes can be found in Figures 1–6.

Factors Predicting Dropping Out From Campus Residence
Out of the 331 campus residents participated in T1, 299 (90.3%) continued to live on campus in T2. All campus residents in T1 are included in this analysis. The final model with sleep behaviors (sleep quality dimensions and sleep duration in schooldays and holidays) and chronotype significantly predicted the probability of dropping out among the sample, $\chi^2(13) = 23.514, p<0.05$. Dropping out was significantly predicted by higher family income (unstandardized coefficient $\beta = 0.425$, SE = 0.154; odds ratio OR = 1.530, 95% confidence intervals CI = 1.132–2.088; p<0.01), greater parents’ education ($\beta = -0.436$, SE = 0.190; OR = 0.647, CI = 0.446–0.938; p<0.05), and morning-type ($\beta = 1.520$, SE = 0.637; OR = 4.574, CI = 1.312–15.947; p<0.05). Other sleep behaviors (including sleep duration on schooldays and sleep efficiency) and demographic factors (such as age and sex) did not significantly predict dropping out from campus residence (p>0.05).

DISCUSSION
The present study’s results showed that college students’ well-being in multiple domains was affected by
the interplay of their circadian clock (chronotype) and their place of residence. Morning-type campus residents and evening-type off-campus students were the groups with the worst well-being in terms of sleep behaviors and quality of life. Also, a morning preference is the strongest predictor of dropping out from campus residences.

The Interplay of Chronotype and Residence Type in College Students’ Well-being

Consistent with our hypothesis, the effect of campus residence on well-being was found to be dependent on individual differences in chronotype. We found that morning-type off-campus students had generally better sleep and quality of life than intermediate- and evening-type off-campus-living students, which echoed the results from many previous findings (Jankowski, 2012; Martin et al., 2012; Ottoni et al., 2012). However, we also found that the relationships between chronotype and well-being for students in campus residences were in the opposite direction to that for off-campus students. In other words, whereas a morning type is generally considered to be associated with good well-being, campus residents with a morning type are instead the group with poor well-being, indicated by their lower physical and psychological quality of life. Unlike their off-campus counterparts, on-campus morning-type residents did not report to have better sleep behaviors than on-campus evening- or intermediate-type residents. We contend that the interaction effect can be explained by the “social jetlag,” a construct proposed by Wittmann and coworkers (2006). As activities in campus residences are usually held after normal school hours in the nighttime, morning-type residents may have to shift their sleep schedule to accommodate the event timetable of the campus residences. Such shifting would disrupt nighttime sleep and subsequently impair their daytime functioning (Russo et al., 2007). In fact, our findings are in line with Adan and coworkers’ (2012) recent review that circadian typology (including sleep-wake cycle) and environmental factors are related and they could have important implication on multiple aspects of everyday life functioning (e.g., psychological well-being). An alternative interpretation of the results is that morning-type residents may refrain from participating in residence activities in the nighttime, which potentially causes alienation from other campus residents, leading to worsened social relationship and poor well-being. In fact, Dusselier and coworkers (2005) reported that conflicts among campus residents (e.g., about sleep schedule) are common. As we did not measure factors such as interpersonal relationships, sense of belonging to the residence, or attendance of residence’s activities, the reason behind the poor well-being of morning-type campus residents cannot be ascertained with our data. Future studies can further look into the mechanisms underlying the interaction between campus residence and chronotype in affecting the well-being in college students.

Evening-type campus residents did not report significantly better well-being than morning-type campus residents or evening-type students living off campus. Although we see a trend that evening-type campus residents tend to have better sleep behaviors than morning-type residents, the insignificant results may be explained in terms of our sample composition that we just had a small number of evening-type campus residents. Although we did not have a lot of evening-type campus residents, the chronotype distribution in our sample is consistent with previous studies on healthy population (Lau et al., 2012). Future studies with a sample consisting of more evening-type campus residents, e.g., students with a part-time job (Cavallera & Gludicli, 2008), may further provide insights on the interplay between chronotype and campus residence in the well-being among college students.

Predictors of Dropping Out in Campus Residences

One-tenth of the current campus-living sample discontinued living on campus in the second semester and our results indicated that a morning type was the strongest predictor of such dropping out. A potential explanation was that morning-type campus residents might suffer from social jetlag and leaving the campus residence was their coping strategy. What may be interesting to learn from future studies is if this group of morning-type students would have improved well-being after they left campus residence. Apart from a morning preference, students with a higher family income and those having more educated parents were also more likely to quit campus residence. A possible explanation was that students from more well-off families might have difficulties in adjusting to the living environment on campus, which was conceivably not as comfortable as their homes.

Limitation

Some careful considerations should be made before generalization of the results. First, there may be considerable variability of the physical setting or the culture of campus residences in different campuses. For example, some campus residences may have more activities scheduled in the nighttime, whereas others may only have minimal activities. For that reason, the relationship among chronotype and well-being may possibly differ for each campus residence. However, given that the sample of this study as made up fairly evenly of students from 10 universities/colleges in Hong Kong and Macau, the findings can be considered as representative of the general situation in campus residences. As a pioneering study looking into the interplay between campus residence and chronotype on well-being in college, our findings might have to be replicated on samples with different races or age. For instance, it has been suggested that some ethnic groups...
may benefit more from their experience in campus residences than others (Flowers, 2004).

Secondly, self-report data are subject to the problem of response bias. Chinese or Asian populations have been found to have higher tendencies to use the midpoint in self-reported scales than Caucasian samples (Chen et al., 1995). Accordingly, steps in mitigating this problem have been taken in the current research design: First, the current study used a longitudinal design in which the significant effects come from within-subject change over time, controlling for the time-invariant individual differences (e.g., response bias) (Farrington, 1991). Second, several major confounds, e.g., age, family income, and parents’ education, have been controlled in the analyses, which ensures that the significant effects on well-being are more likely to be attributed to the interplay of campus residence and chronotype but not individual demographic factors or their well-being at baseline (T1).

Conclusion
To the best knowledge of the authors, this is the first study demonstrating that (1) campus residence’s effect on well-being is dependent on individual’s chronotype; and (2) morning-type students are more likely to experience social jetlag. Which is accompanied by deteriorating nighttime sleep and compromised daytime function and quality of life both physically and psychologically. The authorities concerned should pay attention to the potential mismatch of circadian preference and activity schedule in campus residence for some students and the associated negative consequences on sleep and well-being. Possible ways to ameliorate the situation can be allowing students with similar chronotype to live in the same room; or dividing residence’s floors into “morning bird” and “night owl” floors that suit the needs of individuals with different sleep-wake patterns.

REFERENCES

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