Chronotype and Smartphone Use among Japanese Medical Students

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ABSTRACT
The authors investigated associations between smartphone use and chronotype. To 196 medical university students, they administered a set of self-reporting questionnaires designed to evaluate smartphone use and chronotype. Respondents were categorized into morning types and evening types: for females, the evening types scored higher for smartphone dependence; the authors also found greater duration of Web browsing service, in particular Twitter, in the evening types. No such correlation was found for male respondents. These findings provide evidence that, particularly for females, smartphone use and/or dependence may be related to chronotype.

Keywords: Chronotype, Dependence, Gender Difference, Medical Students, Smartphone

INTRODUCTION
Since mobile phones have become an established part of daily life, various social issues have arisen. Excessive use of or dependence, in particular, on mobile phones can affect mental and physical health status. In recent studies, we have found associations between mobile phone dependency and depression and a generally unhealthy lifestyle (Ezoe et al., 2009; Toda & Ezoe, 2013; Toda, Monden, Kubo, & Morimoto, 2006). Furthermore, previous studies on particular lifestyle factors have revealed associations between excessive mobile phone use and health-compromising behaviors, such as smoking or alcohol drinking (Koivusilta, Lintonen, & Rimpelä, 2006).

DOI: 10.4018/IJCBPL.2015040106
To the best of our knowledge, however, there have been no studies investigating associations between mobile phone use and chronotype.

Chronotype refers to preference for sleep-wake timing: for example, morning types go to bed, get up, and experience peak alertness and performance earlier in the day than do evening types (Kerkhof, 1985). It has been suggested that evening types, especially during adolescence, may be prone to daytime sleepiness and poor school achievement (Giannotti, Cortesi, Sebastiani, & Ottaviano, 2002). Furthermore, previous studies have reported that depressive symptoms are associated with eveningness (Drennan, Klauber, Kripke, & Goyette, 1991; Hirata et al., 2007). Thus, chronotype may contribute to the association between mobile phone dependency and depression. To further elucidate the health-effect implications of excessive mobile phone use, we thought that evaluation of chronotype was important.

Meanwhile, in recent years, smartphones have rapidly come into widespread use. At the end of 2013, the household penetration in Japan was 62.6%, up 52.9% in just three years since the end of 2010 (Ministry of Internal Affairs and Communications, 2014). Smartphones are more like tablet computers than mobile phones, and therefore may herald a radical change in the way mobile telecommunication are used. For example, the use of social networking service (SNS) websites as communication tools may eliminate boundary between e-mail and Web browsing. In the present study, we examined associations between smartphone use/dependence and chronotype, and also any gender differences in these associations.

MATERIALS AND METHODS

Participants

For the study, approved by the Ethics Committee of the Wakayama Medical University, we enrolled 196 medical university students. The students filled out a set of self-reporting questionnaires designed to evaluate smartphone use and chronotype. Statistical analysis was performed on data from 182 respondents (122 males, 60 females) who both possessed smartphones and properly completed all the questionnaire items. Mean (±SD) age for males was 21.7 ± 2.6 years and for females 21.0 ± 2.1 years.

Instruments

Smartphone dependence was evaluated using the Mobile Phone Dependence Questionnaire (MPDQ) (Toda, Monden, Kubo, & Morimoto, 2004, 2006), a self-rating questionnaire which consists of 20 items. Each response is scored on a Likert scale (0, 1, 2, 3). Likert scores for each item are then summed to provide a quantitative consolidated smartphone dependence score ranging from 0 to 60. Higher scores indicate greater dependence. In addition, we also investigated the use time of voice phone, e-mail, Web browsing, and the following online services on smartphones: game, Facebook, LINE, and Twitter. Chronotype was assessed using the Horne and Östberg Morningness–Eveningness Questionnaire (MEQ) (Horne & Östberg, 1976), a self-rating questionnaire which consists of 19 items with total score ranging from 16 to 86. Higher scores indicate greater morningness.

Statistical Analysis

Before statistical analysis, normal distribution was tested by Kolmogorov-Smirnov testing. Since some variables did not pass this test (use time of each service), relationships between MEQ