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Cyberbullying perpetration among undergraduates: evidence of the roles of chronotype and sleep quality

Kağan Kırcaburun\textsuperscript{a} and Şule Betül Tosuntaş\textsuperscript{b}

\textsuperscript{a}Faculty of Education, Department of Computer and Instructional Technology, Duzce University, Duzce, Turkey; \textsuperscript{b}Faculty of Education, Department of Educational Sciences, Eskişehir Osmangazi University, Eskişehir, Turkey

ABSTRACT
Cyberbullying is one of the important negative issues among adolescents and youngsters. Victims of cyberbullying perpetration have been reported to suffer many psychological and emotional problems that can lead them as far to suicide. The purpose of the present study was to investigate the associations of cyberbullying perpetration with gender, personality traits, chronotype, and sleep quality. Three hundred and fifty-three freshman and sophomore university students from Turkey (45.9\% (\(n = 162\)) female and 54.1\% (\(n = 191\)) male) completed a questionnaire that included Cyberbullying Scale, Big-5 Inventory, Composite Scale of Morningness, and Sleep Quality Scale. The most conspicuous result of the study was that chronotype and sleep quality were significant predictors of cyberbullying perpetration. Evening-type students had significantly higher scores on cyberbullying scale than neither-type students and morning-type students, and also neither-type students had higher scores on cyberbullying scale than morning-type students. Further, poorer sleep quality, being male, higher extraversion, higher neuroticism, and lower conscientiousness were related to higher cyberbullying perpetration.

1. Introduction
Cyberbullying has emerged and become prevalent among adolescents and youngsters with the development of Internet and technological communication tools. Belsey (2004), who is one of the pioneer researchers that had studied on the subject of cyberbullying, defined cyberbullying as “the use of information and communication technologies to support deliberate, repeated, and hostile behavior by an individual or group that is intended to harm others.” As distinct from traditional bullying, since perpetrators have the ability to disguise their true identity, cyberbullying has grown into a way of anger expression. Adolescents and teens that are not able to express themselves in daily social life choose to demonstrate their suppressed anger through virtual platforms and technological tools (Içellioğlu and Ozden 2014). In early studies, main focus of the researches were mostly prevalance of the cyberbullying behavior and demographic features of the participants (Aricak et al. 2008; Campbell...
However, in later studies, researchers have increasingly focused on the determination of negative psychological, emotional, and behavioral outcomes caused by cyberbullying perpetration. As a result of these studies, significant associations have been reported between cyberbullying victimization and depression (Munawar et al. 2014; Schenk and Fremouw 2012; Selkie et al. 2015), distress (Bauman and Baldasare 2015), anxiety (Munawar et al. 2014; Schenk and Fremouw 2012; Tomşa et al. 2013), anger, sadness, stress (Zalaquett and Chatters 2014), decreased self-esteem and self-worth, learning difficulties, impairment of concentration, drop in academic achievement, and increase in suicidal thoughts (Munawar et al. 2014; Schenk and Fremouw 2012; Schenk et al. 2013). In some extreme cases, adolescent and teen deaths by suicide have been reported, especially among female students (LeBlanc 2012).

Prevalence and negative effects of cyberbullying perpetration on victims have canalized researchers to identify the predictors of cyberbullying perpetration for possible prevention and intervention of this behavior. Researchers have been reporting various psychological, social, and emotional factors that predicted cyberbullying perpetration such as depression (Campbell et al. 2013), impaired psychosocial health (Wong et al. 2014), aggression, intraception (Dilmac 2009; Kokkinos et al. 2013), psychoticism (Ojedokun and Idemudia 2013; Ozden and Icellioglu 2014), lack of empathy (Brewer and Kerslake 2015; Doane et al. 2014), sentiment of vengeance and dislike toward peers, response to offensive remarks (Francisco et al. 2015; Schenk et al. 2013), previous cyberbullying victimization (Ak et al. 2015; Chapell et al. 2006; Kraft and Wang 2010; Xiao and Wong 2013; Zalaquett and Chatters 2014), unmotational, impulsive and irresponsible traits, problematic and excessive Internet use (Casas et al. 2013; Kircaburun and Baştug 2016; Kokkinos et al. 2014), motivation for social acceptance and endorsement of power (Xiao and Wong 2013), romantic revenge-abuse (Crosslin and Golman 2014; Schenk et al. 2013), violence tendency (Sari and Camadan 2016), and aggressive humor (Sari 2016).

Previous research has shown that cyberbullying perpetration has non-negligible negative influences on victims. Although numerous studies have been conducted to investigate the associated factors and predictors of it, influence of chronotype and sleep quality on cyberbullying perpetration have never been examined before. Additionally, despite the increased number of research in recent years, studies with university-student samples are still largely outnumbered compared to studies with secondary and high school students and further research is needed for understanding and preventing this behavior (Francisco et al. 2015).

1.1. Gender and cyberbullying perpetration

Effects of gender difference on cyberbullying behaviors have been looked through almost in every study. Among these researches, number of studies which have reported higher rates of cyberbullying perpetration among male students (Baldry et al. 2015; Bauman et al. 2013; Campbell et al. 2013; Chapell et al. 2006; Francisco et al. 2015; Kokkinos et al. 2014; Wong et al. 2014) were higher than the studies reported no significant difference regarding gender (Barlett 2015; Schenk et al. 2013; Tennant et al. 2015) and higher rates for females (Pettalia et al. 2013; Xiao and Wong 2013). Additionally, previous studies indicated that anxiety for possibility of being cyberbullied (Kircaburun and Baştug 2016), depression and suicidal thoughts due to cyberbullying victimization were significantly higher among female students (Bauman et al. 2013; Selkie et al. 2015). Studies conducted with Turkish university
students, despite the very small number of research, suggested that males had higher rates of cyberbullying perpetration as well (Aricak 2009; Fırat and Ayran 2016). Gender remains a significant control variable regarding cyberbullying perpetration.

1.2. Personality and cyberbullying perpetration

Personality is a combination of consistent elements that are both brought from birth and gained from influence of individual’s experiences. These elements distinguish one from others (Doğan 2012). Personality theorists have asserted various theoretical approaches in order to define personality. There are approximately 18,000 traits and hundreds of scales related to these traits in the literature (Costa and McCrae 2013). Digman (1990) recognized that this varied and heterotaxic personality literature could be explained in five main factors which are Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness. McCrae and John (1992) summarized the characteristics of these traits as; neurotic individuals tend to be anxious, short tempered, whiny, driven by emotions, unstable, and fragile. Extraverts are prone to be talkative, sociable, active, and passionate. As for agreeable ones, they are soft-hearted, reliable, generous, well-mannered individuals, and conscientiousness represents being conscientious, hard working, well organized, punctual, trustworthy, and ambitious. Lastly, individuals who are open to experience tend to be curious, imaginative, original, unique, and they tend to have a wide range of interest (McCrae and John 1992).

When the previous researches were examined, very few studies were obtained in the literature that investigated the effects of five-factor personality traits on cyberbullying perpetration. One of them is the study of Ojedokun and Idemudia (2013) which have reported positive associations of cyberbullying perpetration with extraversion and neuroticism among university students. In other study with high school students, Eroğlu (2014) found that among personality traits only extraversion was a significant positive predictor of cyberbullying perpetration. Different from those, Çelik et al. (2012) suggested that cyberbullying perpetration was related to extraversion, agreeableness, and conscientiousness negatively and it was related to neuroticism positively. Similar to Çelik et al. (2012), Kokkinos et al. (2013) also reported that conscientiousness was a negative predictor of cyberbullying perpetration, and cyberbullies and victims have received the highest scores in terms of emotional imbalance. Özden and İcilioğlu (2014) found that neuroticism was the most related personality dimension to cyberbullying and cybervictimization. Lastly, van Geel et al. (2017) reported that agreeableness was the only significant negative predictor of cyberbullying perpetration.

In the literature, there are no clear results on how personality affects the cyberbullying behaviors. Also, personality, especially conscientiousness, has strong correlation with chronotype (Demirhan et al. 2016).

1.3. Chronotype and cyberbullying perpetration

Circadian rhythm is the biological clock of the human body that regulates the sleep/wake cycle and the timing of mental and physiological peaks and bottoms in 24-h day. This diversity caused by one’s circadian rhythm is called chronotype (morningness/eveningness). Chronotype is an important individual difference that defines person’s mentally and physically active and passive times during the day. Individuals are categorized in three chronotypes which are morning types, neither types and evening types (Adan et al. 2012). While
morning types go to bed and get up earlier and prefer early morning hours to perform their physical and mental activities; evening-type individuals go to sleep and wake up mostly later hours and tend to do mental and physical activities late afternoon or evening hours (Randler 2008b).

Many studies have been conducted to understand the effect of chronotype in individuals’ lives. Some studies have reported positive associations of eveningness with depression (Hidalgo et al. 2009; Levandovski et al. 2011; Mecacci and Rocchetti 1998), psychopathy (Jonason et al. 2013), psychoticism (Mecacci and Rocchetti 1998), and hostility (Hsu et al. 2012; Randler and Vollmer 2013). Furthermore, in various studies, eveningness was found to be related positively to several bad habits and addictions, for instance, smoking (Randler 2008a), alcohol consumption (Adan 1994), computer game addiction (Vollmer et al. 2014), Internet addiction (Randler et al. 2014), Smartphone addiction (Randler et al. 2016), and problematic mobile phone use (Demirhan et al. 2016).

The present study is the first one ever noticed in literature that investigates the direct effect of chronotype on cyberbullying perpetration. However, previous studies have reported that some of the factors predicted cyberbullying perpetration were found to be related to a chronotype, as mentioned above. Moving from these indirect associations, chronotype, which has been related to many important negative effects on human life such as harmful behaviors and addictions, was expected to be associated with cyberbullying perpetration as well.

Studies conducted with university students have concluded that cyberbullying perpetration behavior occurred mostly in social networks, online gaming platforms, sms messages, emails, private, and public chat rooms (Faucher et al. 2014; Kopecký 2014).

1.4. Sleep quality and cyberbullying perpetration

Sleep quality was defined subjectively as feeling ready and energetic to start a new day short after waking up and it is one of the concepts that is deemed important nowadays (Aydin 2014). Regular good night sleep, as one of the fundamental needs for individuals, is accepted to be one of the most significant factors for health and quality of life (Ustün and Yücel 2011). However, due to the alterations in lifestyles, university students have been reported to get insufficient, irregular sleep and to have poor sleep quality (Aysan et al. 2014; Taylor and Bramoweth 2010). Previous studies indicated that poor sleep quality was related to psychological and emotional factors that were linked to cyberbullying perpetration such as depression (Orzech et al. 2011), mental health (Günaydın 2014), verbal aggression, and anger (Randler and Vollmer 2013). Dahlberg et al. (2005) examine depression under six items: Sadness; irritation, bad mood; hopelessness; changes in appetite; sleep; concentration problems in the past 30 days.

In a study using these six items, it was concluded that individuals who cyberbullied had higher depression scores (Wang et al. 2011). In this respect, sleep quality has an indirect effect through depression or similar mental problems on cyberbullying. Further, Krizan and Herlache (2016) argued that sleep disruptions may be one of the important contributors to aggression, intimate partner violence, and traditional bullying and cyberbullying perpetration. However, there are no studies whether sleep quality is directly related to cyberbullying.

Also, despite the number of studies investigated the effect of traditional school bullying/victimization on sleep disturbances and sleep quality of high school students and traditional
workplace bullying on the quality of sleep and sleep disturbances (Niedhammer et al. 2009; Zhou et al. 2015), since traditional bullying and cyberbullying are two different phenomenon, current study is the first one considers the effect of sleep quality on cyberbullying perpetration.

1.5. Research hypothesis

In the previous studies, there are many concepts found associated with cyberbullying. Since there are no theoretical models suitable for the research in the literature, the theoretical frame of this study was established by the way of indirect relations and inferences that existed in various researches. When the existing literature is examined, there are studies that determine the association between gender, personality, chronotype, and sleep quality are seen. It is thought that these related concepts may have been related to cyberbullying perpetration which is associated with similar physical, mental problems, and addictions. Starting from this point, research hypotheses and questions were formed. Particularly, based on the study of Francisco et al. (2015), we hypothesize that male students demonstrate cyberbullying perpetration more than females (H1). Based on the Ojedokun and Idemudia (2013), we also hypothesize that extraversion is positively related to cyberbullying perpetration (H3). Based on the study by Çelik et al. (2012), we further hypothesize that cyberbullying perpetration is related to agreeableness (H5) and conscientiousness (H4) negatively and to neuroticism (H2) positively, also it is not related to openness to experience. Finally we try to answer the following research questions: First, is chronotype related to cyberbullying perpetration? and second, is sleep quality related to cyberbullying perpetration?

2. Method

2.1. Participants

Participants of this cross-sectional survey study were, 45.9% (n = 162) female and 54.1% (n = 191) male, total of 353 students enrolled in a state university in Western region of Black sea, Turkey. Participants were chosen randomly among freshman and sophomore (second year) students from the faculty of education, management, and engineering. All participants have participated in this study voluntarily. Questionnaires of 34 students were not included to the analyses because they gave the same response for each item and they were believed to have responded dishonestly.

2.2. Measures

Cyberbullying Scale, Big-5 Inventory, Composite Scale of Morningness (CSM), Sleep Quality Scale (SQS), and personal information form included only one question regarding gender have been used as instruments for this study.

2.2.1. Cyberbullying scale

Cyberbullying Scale was developed by Uçanok et al. (2011) based on the inventory originally developed by Erdur-Baker and Kavşut (2007) and revised by Topcu (2008). Scale is consisted of two parts which are cyberbullying perpetration and cyberbullying victimization. For this
study, only cyberbullying perpetration part was used for data collection. Scale is composed of 26 items as four-point likert type scale in one factor. Participants are asked to consider the incidents happened in the last 60 days and choose between “never” (1), “once” (2), “2–3 times” (3), and “more than 3 times” (4). The lowest and highest scores can be received from the scale are 26 and 104. The internal consistency coefficient of the scale was .74 in this study. Scale have been used in several studies by researchers (Çelik et al. 2012; Kocaşahan 2012). “I started gossip/negative rumors about someone,” “I humiliated someone for no reason in an online forum,” “I sent threatening, embarrassing or hurtful text messages to someone via cell phone,” “I humiliated someone by using photomontaged images online,” and “I sent threatening, embarrassing or hurtful messages to someone via email” are some of the items from the scale. Higher scores obtained from the scale indicate higher level of cyberbullying perpetration.

2.2.2. **Big five inventory**

Big-5 Inventory is composed of five major personality dimensions which are neuroticism, agreeableness, openness to experience, conscientiousness, and extraversion. Each personality dimension is consisted of 2 items in five-point likert-type scale. The inventory was developed by Rammstedt and John (2007) and was adapted to Turkish by Horzum, Ayas, and Padir (forthcoming). Confirmatory factor analysis with the Turkish form indicated that inventory was a good fit ($\chi^2 = 278.43$, SD = 25, $\chi^2$/SD = 1.8, RMSEA = .062, GFI = .96, AGFI = .91, CFI = .98, NFI = .97, RFI = .94 IFI = .98, RMR = .035). Reported internal consistency value of each personality dimensions ranged between .81 and .89. The minimum and maximum scores could be received from each dimension is 2 and 10, respectively. The highest scored personality dimension is identified as the dominant personality trait of the participant. Original form of the inventory adapted to several languages and is used by researchers widely (Egan et al. 2016; Gallardo and Weiss 2016). Also, Turkish form of the inventory has been used in previous studies by various researchers (Kircaburun 2016; Padir 2015).

2.2.3. **Composite scale of morningness**

CSM was developed by Smith et al. (1989) and was adapted to Turkish by Önder et al. (2013). In the scale, there are totally 13 items consisting of three five-choice items and ten four-choice items. Possible minimum and maximum scores obtained from the scale are 13 and 55, respectively. Receiving higher scores from the scale indicates higher morningness. Goodness-of-fit indexes for the Turkish form of the scale was reported around acceptable and good values ($\chi^2$/df = 3.14, RMSEA = .066, SRMR = .053, CFI = .95, NFI = .93, NFI = .94, GFI = .94, AGFI = .92). The reported internal consistency coefficient for the Turkish version of CSM was .80. As for this study, it was .81. The scale is widely used by foreign and Turkish researchers in several studies and shows good psychometric properties (Caci et al. 2005; Demirhan et al. 2016; Randler 2008b; Randler et al. 2014).

2.2.4. **Sleep quality scale**

SQS was developed by Meijer and van den Wittenboer (2004) and was adapted to Turkish by Önder, Masal, Demirhan, Horzum, and Beşoluk (2016). Turkish form of the scale is composed of seven three-choice items, lowest and highest scores can be taken from the scale are 7 and 21, respectively. Since study of adaptation to Turkish was conducted with secondary school students, construct validity, and reliability analyses were utilized for the current study.
As a result of the exploratory and confirmatory factor analyses item 3 and 4 dropped from the scale due to the low factor loadings, regression weights and squared multiple correlation values. Goodness-of-fit values for the 5 item scale generated good fit ($\chi^2 = 8.69$, $SD = 4$, $\chi^2/SD = 2.17$, RMSEA = .055, GFI = .99, AGFI = .96, CFI = .99, NFI = .98, RFI = .94, IFI = .99, SRMR = .024). The internal consistency value for the current study was .72. Because 2 items were cast out, lowest and highest scores of the scale dropped to 5 and 15, respectively. Higher scores obtained on the scale assert higher sleep quality. Analyses indicated that the scale is valid and reliable for measuring the sleep quality levels of the university students.

2.3. Procedure

Necessary permissions for the research have been taken from the faculty administrations. All participants of the study have taken part voluntarily and anonymously. Since cyberbullying perpetration is a delicate subject, before the hand out of the questionnaires, willingness for participation and confidentiality were especially emphasized to make participants felt more comfortable in order to encourage them to fill out the questionnaires honestly. Data collection process lasted approximately one week. In this study, SPSS 23.0 was used to carry out the descriptive statistics, Pearson's correlation, and stepwise regression analyses. Further, skewness and kurtosis for normal distribution, collinearity diagnostics for multicollinearity and Durbin–Watson for independence of residuals were examined. Lastly, a one-way analysis of covariance (ANCOVA) was utilized to further examine the association between chronotype and cyberbullying. It was done by using the 10th/90th percentiles for determining morning-type, neither-type and evening-type groups and gender was included as a covariate.

3. Results

3.1. Descriptive statistics

Mean scores, standard deviations, skewness, and kurtosis values are presented in Table 1. Prior to correlation analysis, normality assumption was checked by examining the skewness and kurtosis values of the variables. Since skewness values were smaller than |3| and kurtosis values were smaller than |10| (Kline 2011), normal distribution was accepted. When the mean scores examined, it was observed that the cyberbullying score was below average ($M = 36.31$, $SD = 7.55$) and it may be expressed that cyberbullying perpetration levels of the participants were low. Mean score of the CSM suggested that majority of the study group was neither-type and slightly below average in favor to eveningness ($M = 32.71$, $SD = 6.63$). Also SQS scores was above average; in other words, sleep quality of the participants were around high levels.

<table>
<thead>
<tr>
<th>Variable</th>
<th>MEAN</th>
<th>SD</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyberbullying</td>
<td>36.31</td>
<td>7.55</td>
<td>1.20</td>
<td>1.31</td>
</tr>
<tr>
<td>Chronotype</td>
<td>32.71</td>
<td>6.63</td>
<td>−0.07</td>
<td>−0.58</td>
</tr>
<tr>
<td>Sleep quality</td>
<td>10.23</td>
<td>1.98</td>
<td>−0.36</td>
<td>0.16</td>
</tr>
<tr>
<td>Extraversion</td>
<td>7.27</td>
<td>1.82</td>
<td>−0.34</td>
<td>−0.26</td>
</tr>
<tr>
<td>Agreeableness</td>
<td>7.79</td>
<td>1.44</td>
<td>−0.48</td>
<td>0.21</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>7.53</td>
<td>1.60</td>
<td>−0.53</td>
<td>−0.26</td>
</tr>
<tr>
<td>Neuroticism</td>
<td>6.19</td>
<td>1.89</td>
<td>−0.01</td>
<td>−0.61</td>
</tr>
<tr>
<td>Openness to experience</td>
<td>6.79</td>
<td>1.71</td>
<td>−0.35</td>
<td>0.06</td>
</tr>
</tbody>
</table>
Lastly, regarding personality, agreeableness was the dominant trait \((M = 7.79, SD = 1.44)\) and neuroticism was the non-dominant trait among study group \((M = 6.19, SD = 1.89)\). In between, mean scores of conscientiousness \((M = 7.53, SD = 1.60)\), extraversion \((M = 7.27, SD = 1.82)\), and openness to experience \((M = 6.79, SD = 1.71)\) were in line, highest to lowest, respectively. Considering mean scores, it may be said that positive traits were more prevalent than negative ones among participants.

### 3.2. Pearson's correlation analysis

When the bivariate correlations between variables examined (Table 2), it was noticed that cyberbullying perpetration was negatively related to chronotype \((r = −.28, p < .01)\), sleep quality \((r = −.23, p < .01)\), conscientiousness \((r = −.14, p < .01)\), and it was positively related to extraversion \((r = .10, p < .05)\) and neuroticism \((r = .15, p < .01)\). In other saying, participants with higher morningness, higher sleep quality, more conscientiousness, less extraversion, and less neuroticism scored lower on cyberbullying perpetration. Also openness to experience \((r = −.01, p > .05)\) and agreeableness \((r = −.01, p > .05)\) were negatively correlated with cyberbullying perpetration; however those were not statistically significant. Chronotype was related positively with sleep quality \((r = .27, p < .01)\) and conscientiousness \((r = .16, p < .01)\) and it was related to neuroticism negatively \((r = −.19, p < .01)\). In other words, less conscientious neurotic students with poorer sleep quality scored higher on eveningness.

### 3.3. Stepwise regression analysis

Primarily, multicollinearity, independence of residuals and linearity of the variables were checked. Since variance inflation factor values were below 10 (varied between 1.02 and 1.14) and tolerance values were above .10 (ranged between .87 and .98), multicollinearity was not detected. Also, Durbin–Watson value (1.72), which is expected to be above 1 to secure the independence of residuals assumption, indicated that there was no autocorrelation (Kline 2011). In stepwise regression analysis, cyberbullying was dependent variable and gender, personality traits, chronotype, and sleep quality were independent variables.

As shown in Table 3, regression analyses were completed in six steps and total variance of cyberbullying perpetration explained by the final model was 19.4%. At step 1, gender was entered to equation and was significantly predicting the cyberbullying perpetration \((R^2 = .06, F_{(1,351)} = 21.70, p < .01)\). For step 2, five personality traits were inserted into the model as a block. Since agreeableness \((β = .01, p > .05)\) and openness to experience \((β = −.03, p > .05)\) were failed to comply the criteria of “probability of F to enter ≤.05”, they were Table 2. Pearson’s correlation coefficients among variables.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cyberbullying</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Chronotype</td>
<td>−.28**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Sleep quality</td>
<td>−.23**</td>
<td>.27**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Extraversion</td>
<td>.10*</td>
<td>−.05</td>
<td>.07</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Agreeableness</td>
<td>−.01</td>
<td>−.01</td>
<td>.04</td>
<td>.04</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Conscientiousness</td>
<td>−.14*</td>
<td>.16**</td>
<td>.14**</td>
<td>.29**</td>
<td>.13*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Neuroticism</td>
<td>.15**</td>
<td>−.19**</td>
<td>−.19**</td>
<td>−.09</td>
<td>−.14**</td>
<td>−.11*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Openness to experience</td>
<td>−.01</td>
<td>.03</td>
<td>−.04</td>
<td>.26**</td>
<td>.10</td>
<td>.22**</td>
<td>−.10</td>
<td></td>
</tr>
</tbody>
</table>

*p < .05; **p < .01.
excluded from the analysis (Table 4). Neuroticism ($\Delta R^2 = .033$, $F_{(2,350)} = 17.47$, $p < .01$), extraversion ($\Delta R^2 = .015$, $F_{(3,349)} = 13.74$, $p < .05$), and conscientiousness ($\Delta R^2 = .024$, $F_{(4,348)} = 12.95$, $p < .01$) were taken into equation on step 2, 3 and 4 as significant predictors of cyberbullying perpetration. Chronotype was entered into equation on the fifth step with a significant contribution on explaining the variance of cyberbullying perpetration ($\Delta R^2 = .049$, $F_{(5,347)} = 15.04$, $p < .01$). At final step, sleep quality entered into the equation and was significantly related to cyberbullying perpetration ($\Delta R^2 = .016$, $F_{(6,346)} = 13.87$, $p = .01$, $R^2 = .194$, Adjusted $R^2 = .180$). Variance explained by each of the variables in the final model with respect to highest to the lowest proportion was 6% by gender ($\beta = .25$, $p < .01$), 3.4% by chronotype ($\beta = -.20$, $p < .01$), 2% by extraversion ($\beta = -.15$, $p < .01$), 1.6% by sleep quality ($\beta = -.13$, $p = .01$), 1.3% by neuroticism ($\beta = -.12$, $p < .05$), and lastly 1.1% by conscientiousness ($\beta = -.11$, $p < .05$). In the analyses, it was observed that chronotype was the second highest predictor of cyberbullying perpetration following gender.

### 3.4. One-way ANCOVA

The ANCOVA put forward a significant influence for gender as a covariate on cyberbullying perpetration ($F_{(1,351)} = 21.70$; $p < .05$; $\eta^2 = .06$) and also chronotype had a significant effect on cyberbullying perpetration ($F_{(2,350)} = 9.54$; $p < .05$; $\eta^2 = .05$). Bonferroni post hoc test showed that evening-type students ($M = 39.73$, $SD = 8.21$) had significantly higher scores comparing to both neither-type ($M = 36.14$, $SD = 7.44$) and morning-type ($M = 32.79$, $SD = 8.32$) students.

<table>
<thead>
<tr>
<th>Model</th>
<th>B</th>
<th>SE</th>
<th>$\beta$</th>
<th>t</th>
<th>$sp^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 $R^2 = .058$; Adj $R^2 = .056$; $F_{(1,351)} = 21.70$; $p &lt; .01$</td>
<td>Gender</td>
<td>3.65</td>
<td>.78</td>
<td>.24</td>
<td>4.66**</td>
</tr>
<tr>
<td>Step 2 $R^2 = .091$; Adj $R^2 = .086$; $F_{(2,350)} = 17.47$; $p &lt; .01$</td>
<td>Neuroticism</td>
<td>.72</td>
<td>.20</td>
<td>.18</td>
<td>3.54**</td>
</tr>
<tr>
<td>Neuroticism</td>
<td>.77</td>
<td>.20</td>
<td>.19</td>
<td>3.78**</td>
<td></td>
</tr>
<tr>
<td>Step 3 $R^2 = .107$; Adj $R^2 = .098$; $F_{(3,349)} = 13.74$; $p &lt; .01$</td>
<td>Extraversion</td>
<td>.51</td>
<td>.21</td>
<td>.12</td>
<td>2.41*</td>
</tr>
<tr>
<td>Extraversion</td>
<td>.70</td>
<td>.22</td>
<td>.17</td>
<td>3.22**</td>
<td></td>
</tr>
<tr>
<td>Step 4 $R^2 = .130$; Adj $R^2 = .120$; $F_{(4,348)} = 12.95$; $p &lt; .01$</td>
<td>Conscientiousness</td>
<td>-.77</td>
<td>.25</td>
<td>-.16</td>
<td>-3.09**</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>-.58</td>
<td>.24</td>
<td>-.12</td>
<td>-2.36**</td>
<td></td>
</tr>
<tr>
<td>Step 5 $R^2 = .179$; Adj $R^2 = .166$; $F_{(5,347)} = 15.04$; $p &lt; .01$</td>
<td>Chronotype</td>
<td>-.26</td>
<td>.06</td>
<td>-.23</td>
<td>-4.53**</td>
</tr>
<tr>
<td>Chronotype</td>
<td>-.54</td>
<td>.24</td>
<td>-.11</td>
<td>-2.21**</td>
<td></td>
</tr>
<tr>
<td>Step 6 $R^2 = .194$; Adj $R^2 = .180$; $F_{(6,346)} = 13.87$; $p &lt; .01$</td>
<td>Sleep Quality</td>
<td>-.34</td>
<td>.16</td>
<td>-.20</td>
<td>-2.60**</td>
</tr>
</tbody>
</table>

Notes: $sp^2$; squared semi partial correlation.

* $p < .05$; ** $p < .01$. 

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Table 3. Stepwise regression analysis for cyberbullying.
students and also neither-type students had significantly higher scores than morning-type students.

**4. Discussion**

The present study aimed to investigate the influence of gender, personality, chronotype, and sleep quality on cyberbullying perpetration. In this study, it was found that cyberbullying perpetration was associated with gender, personality, chronotype, and sleep quality. As a result all hypotheses, except H5 were true. Most significant finding of this study was that students’ chronotype and sleep quality levels were negative predictors of cyberbullying perpetration. Evidence of the roles of chronotype and sleep quality on cyberbullying perpetration is presented to literature for the first time.

Gender was found to be a significant predictor of cyberbullying perpetration; male students were demonstrating cyberbullying perpetration more than females (H1). This result coincides with many studies (Arıcak 2009; Chapell et al. 2006; Francisco et al. 2015; Firat and Ayran 2016; Kokkinos et al. 2014), that was conducted with university students and contradicts with the ones suggested cyberbullying perpetration was not affected by gender (Schenk et al. 2013; Tennant et al. 2015) and with some others reported higher rates for females (Xiao and Wong 2013). In addition, a meta-analysis study which involving 39 research found that men were more likely to cyberbully than women (Sun et al. 2016). One of the reasons for this may be due to males were reported to be more addicted to Internet (Karadağ et al. 2015; Randler et al. 2014) and gaming (Karadağ et al. 2015; Vollmer et al. 2014) than females. Spending excessive time in Internet and gaming, which are among the platforms cyberbullying behaviors prevalently occur, may increase the probability of demonstrating cyberbullying perpetration behavior.

Further, one of another reason might be suggested that since male students have a more aggressive sense of humor than females (Martin et al. 2003) joking around could get out of control and lead into serious cyberbullying behavior. Also aggressive humor was reported to be one of the significant predictors of cyberbullying perpetration (Sari 2016).

Another possible explanation for this can be made by the affective and cognitive perspective. In general, females have higher scores on empathy and greater ability with non-verbal skills and so it seems that female students were demonstrating lesser cyberbullying perpetration than male students (Andrew et al. 2008; Faucher et al. 2014; Lougheed 2012). Also, some researchers have found that female and male students were differentiated about cyberbullying behavior. Females were targeting other females who they already knew; on the contrary, males were not targeting someone (Faucher et al. 2014; Jackson et al. 2013).

As for the association between personality and cyberbullying perpetration, findings of the current study suggested that neuroticism and extraversion were positive and conscientiousness was negative predictors of cyberbullying perpetration. Since very small number of studies was noticed that investigated the relationship between five-factor personality variables excluded from stepwise regression analysis.}

<table>
<thead>
<tr>
<th>Variable</th>
<th>β</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agreeableness</td>
<td>−.01</td>
<td>−.05</td>
<td>.96</td>
</tr>
<tr>
<td>Openness to Experience</td>
<td>−.03</td>
<td>−.56</td>
<td>.58</td>
</tr>
</tbody>
</table>
traits and cyberbullying perpetration, findings of this study is expected to contribute greatly to the present literature. In this study, students scored higher on neuroticism were perpetrating cyberbullying more than those who didn’t (H2). Contradictory results regarding neuroticism have been observed among previous studies. While findings of Çelik et al. (2012) and Ojedokun and Idemudia (2013) supported the result of this study, Eroğlu (2014) and Kokkinos et al. (2013) reported no significant relationship between neuroticism and cyberbullying perpetration. Neurotic individuals have negative traits such as being whiny, intolerant and short-tempered that may lead them to lesser real-life social relations and increased loneliness. Amichai-Hamburger and Ben-Artzi (2003) found that neuroticism was positively related to loneliness. Real life loneliness prompt individuals to spend more time online and to increased levels of virtual interactions (Ayas and Horzum 2013) which may lead them to higher rates of cyberbullying perpetration. Aside from that, Cheng et al. (2012) reported that neurotic university students were having poorer sleep quality. Students who have poor sleep quality are more prone to demonstrate negative emotions such as aggressiveness and anger which were positively linked to cyberbullying perpetration (Randler and Vollmer 2013). Studies show that personality is related to problematic Internet use (Amichai-Hamburger and Ben-Artzi 2003; Kraut et al. 1998; Odacı and Çelik 2013). And also problematic Internet use is one of the predictors of cyberbullying (Casas et al. 2013; Kircaburun and Baştug 2016; Kokkinos et al. 2014). In this sense, it may be said that personality has an indirect effect on cyberbullying through problematic Internet use.

Extraversion is another trait that was found to be related positively to cyberbullying perpetration (H3). As parallel to the present study, Eroğlu (2014) and Ojedokun and Idemudia (2013) also reported positive relations. Different from those, Kokkinos et al. (2013) found no relationship and Çelik et al. (2012) concluded negative association between extraversion and cyberbullying perpetration. Çelik et al. (2012) argued that extravert students are easy-going and spend less time online. However, extraverts tend to be talkative, sociable, active, and passionate (McCrae and John 1992). Therefore, it may be suggested that they will engage with more people than introverts both in real life and in virtual platforms, and this could expose them to increased possibility/risk of having problematic interactions with problematic individuals. Further, Demirhan et al. (2016) suggested that personality properties of extraverts were similar to evening-type individuals and extraversion was positive predictor of problematic mobile phone use. Since mobile phones are one of the tools that cyberbullying incidents happen, problematic mobile phone use could be expected to lead students to higher levels of cyberbullying perpetration. Conscientiousness, as hypothesized (H4), was predicting cyberbullying perpetration negatively. This result is supported by the findings of Çelik et al. (2012) and Kokkinos et al. (2013). Less conscientious individuals are prone to be unorganized and spontaneous; thereby they might prefer virtual relations and interactions over real-world social interactions (Randler et al. 2014) which could lead to increased risk for involvement in cyberbullying incidents. Additionally, negative association between conscientiousness and cyberbullying perpetration may be supported by the strong relationship between eveningness and lower conscientiousness which was reported by many researchers (Demirhan et al. 2016; Randler 2008b; Tonetti et al. 2009). Furthermore, Martin et al. (2003) found a significant negative relationship between conscientiousness and aggressive humor which was positively linked to cyberbullying perpetration (Sari 2016).

According to Eysenck’s theory of criminality and theory of antisocial behavior, neurotic and extravert individuals tend to show aggressive behavior (Eysenck and Eysenck 1975;
Eysenck and Eysenck 1964). On the other hand, traditional bullying characteristics are similar to cyber bullying at certain points (Kowalski et al. 2008). Meta-analysis studies on traditional bullying behaviors show that extravert and neurotic individuals are more prone to bullying behaviors (Mitsopoulou and Giovazolias 2015). A possible explanation for these results may be that neurotic individuals are generally anxious, depressed, and they give strong emotional reactions (Connolly and O’Moore 2003; Mitsopoulou and Giovazolias 2015). Also extravert individuals are impulsive and impatient, and behave without fear of the consequences of their behavior (Byrne 1994; Slee and Rigby 1993). It is known that extravert individuals tend to engage in virtual activities (Mehroof and Griffiths 2010), so as to seek for excitement, and that the individuals who seek for excitement act aggressively (Caprara et al. 2013; Dvorak et al. 2013). In this respect, it can be said that extravert individuals are more inclined to act aggressively on online games. Neurotic individuals may also be shown cyberbullying behaviors on various online games and social media platforms based on findings of problematic Internet use. Conscientious individuals can be said to prefer socializing in the real world and because of their more stable mental health they are avoiding problematic Internet use and various addictions such as computer, mobile phone, or Internet addiction and they do not show cyberbullying behaviors.

Agreeableness (H5) and openness to experience (H 6) were not significant predictors of cyberbullying perpetration. These findings are supported by the study of Eroğlu (2014). However, since less agreeable people tend to be critical, unforgiving, and unkind (McCrae and John 1992), they have a higher risk to have problematic relations both in real and virtual world interactions and as suggested by Çelik et al. (2012), they were expected to be involved in cyberbullying perpetration significantly higher than those who are more agreeable. Openness to experience and cyberbullying seem to be unrelated since openness to experience mostly expresses individuals’ attitude toward artistic, creative, new and unique events, and opportunities, it was expected not to be related to cyberbullying perpetration.

Most remarkable result of the study is that eveningness chronotype was positively related to cyberbullying perpetration. Previous studies suggested and indicated that chronotype should affect cyberbullying perpetration. For instance, Adan (1994) reported that evening-type individuals had higher levels of alcohol consumption and Selkie et al. (2015) indicated that alcohol consumption levels of college students were affecting involvement in cyberbullying perpetration significantly. These studies support the positive relation between eveningness and cyberbullying perpetration demonstrated in this study. Previous studies also showed that eveningness was positively related to computer game addiction, Internet addiction, and problematic mobile phone use (Demirhan et al. 2016; Randler et al. 2014; Vollmer et al. 2014). Also, Faucher et al. (2014) and Kopecký (2014) reported that the most prevalent platforms where cyberbullying perpetration has occurred among university students were social networks, emails, and text messages. Additionally, Kopecký (2014) suggested that cyberbullying perpetration among male university students was prevalently taking place in online gaming. Hence, one could express that higher eveningness leads students to spend much more time in platforms that cyberbullying takes place and therefore it increases the probability of involvement in such negative behaviors. Further, chronotype has several psychological and emotional influences on individuals. Previous studies indicated that eveningness was positively related to lower self-esteem, higher depression, hostility, psychopathy, and psychoticism (Hsu et al. 2012; Jonason et al. 2013; Randler 2011) which were linked to cyberbullying perpetration. Gau et al. (2007) and Randler (2008c) also reported
that individuals with higher eveningness were less satisfied with their lives and they were having more emotional and behavioral problems. It is not surprising that individuals show cyberbullying behaviors via online games, social media, or mobile phones when considering the relationship between eveningness and depression, emotional and behavioral problems, and technological dependencies. Besides, aggressive and antisocial behavior (DeYoung et al. 2007; Goldstein et al. 2007), neuroticism (Ishihara et al. 1987; Mecacci and Rocchetti 1998; Neubauer 1992), and extraversion (Adan 1992; Kerkhof 1985; Mecacci et al. 1986; Neubauer 1992) were reported to be associated with eveningness. Based on these associations, it may be stated that students, with several psychological and emotional problems related to eveningness as mentioned above, might unleash the suppressed anger and reflect their inner unrest and troubles in virtual and cyber platforms where they can behave anonymously. Also, they may be expected to attempt to make up their weaknesses and flaws they have in real life, and to feel powerful and satisfied by cyberbullying others. Also, different from evening-type individuals, morning types are upstanding and self-controlled, and tend to behave in a formal and proper manner in social situations, and they want to make a more positive impression on people (Díaz-Morales and Aparicio 2003; Díaz-Morales 2007). In the Jackson and Gerard (1996) study, it was concluded that morning types were more conscientious, they have higher self-esteem and internal locus of control than evening types.

Second most important finding of the study is that sleep quality was predicting cyber-bullying perpetration negatively. Students with lower sleep quality had higher scores on cyberbullying scale. Since it was indicated that irregular, inadequate, and lower quality sleep was prevalent especially among university students (Aysan et al. 2014), it was considered to be beneficial to investigate the influence of poor sleep quality on cyberbullying perpetration in university student sample. Juda et al. (2013) reported that lower sleep quality is also related to eveningness. Evening type students usually go to bed and get up late; however, since they need to wake up early for school in weekdays, this might lead them to lower sleep duration thereby poorer sleep quality. Poorer sleep quality was reported to have many negative psychological and emotional affects on students such as depression, mental health problems, verbal aggression, and anger (Orzech et al. 2011; Randler and Vollmer 2013; Regestein et al. 2010). As mentioned above, these problems have additive negative impacts on cyberbullying perpetration (Dilmac 2009). One could express that psychological and emotional problems related to poor sleep quality such as depression, aggression, and anger may be expected to affect students’ virtual behaviors and interactions negatively and lead them to cyberbullying perpetration.

The current study has some limitations. First, this study was conducted as cross-sectional design; thereby findings do not represent causality between variables. Second, the study was carried out with only freshman and sophomore students of faculty of education, management and engineering in Turkey. This limitation cannot be eliminated from research but necessary precautions were made. It was noted that all scales were valid and reliable. Then participants were informed that the data would be confidential in order to encourage them to fill out the scales honestly. Lastly, this study shown that total variance of cyberbullying perpetration explained by the final model was 19.4%. Therefore, unexplained variance may be result from different variables. Thus, results belong only to the sample of this research and more studies are needed in order to be able to generalize the findings of this study.

Despite its limitations, this study puts forward significant evidence regarding the association of cyberbullying perpetration with chronotype and sleep quality. Additionally, it
suggests further understanding to relationships between five-factor personality traits and cyberbullying perpetration. Lastly, it contributes to the limited literature by presenting further investigation of the influence of gender on cyberbullying perpetration among Turkish undergraduates. In conclusion, males, students with higher eveningness and poorer sleep quality; extravert, neurotic, and less conscientious students had higher scores on cyberbullying.

Disclosure statement
No potential conflict of interest was reported by the authors.

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