Study of the relationship between smartphone addiction and head and shoulder posture curvatures in adolescent individuals

Estudo da relação entre vício em smartphone e curvaturas da postura da cabeça e do ombro em indivíduos adolescentes

Üyesi Gürkan Tokgöz

Abstract

This study aims to investigate the relationship between smartphone addiction and head and shoulder posture curvatures in adolescents. The sample group consisted of a total of 408 participants, 284 male and 124 female students studying at the secondary level in Elazığ, while the population of the study consisted of adolescents between the ages of 14-17. Before the research, a voluntary consent form signed by their parents was obtained from the participants. "Smartphone Addiction Scale Short Form (SAS-SF)" and "Posturescreen" mobile applications were used as data collection tools. Independent-sample T-tests and One Way Anova tests were applied. In the statistical review of the obtained data. Pearson Correlation analysis was applied to determine the relationship between smartphone dependency level and posture curvatures. The data obtained from the participants were examined in terms of gender, age, daily phone usage time, and phone usage history variables. There were no significant differences in gender, age, and usage history variables. A significant difference was found between the groups using between 1-3 hours, 3-5 hours, and over 5 hours in the daily usage time variable. It has been determined that as the daily usage time increases, smartphone addiction and head and shoulder curvatures increase. A moderate positive relationship was found between smartphone addiction and head and shoulder posture curvatures. As the participants’ smartphone addiction increased, so did their head and shoulder curvatures. As a

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Orcid: https://orcid.org/0000-0002-6043-0278
A significant relationship was found between smartphone addiction and head and posture curvatures. The increase in smartphone addiction also increases posture curvatures. In addition, the increase in smartphone daily usage time has increased the level of addiction and posture curvatures.

**Keywords:** Smartphone. Addiction. Posture. Head. Shoulders.

**Resumo**
Este estudo tem como objetivo investigar a relação entre o vício em smartphones e as curvaturas das posturas da cabeça e do ombro em adolescentes. O grupo amostral consistia de um total de 408 participantes, 284 estudantes do sexo masculino e 124 do sexo feminino que estudavam no nível secundário em Elaziğ, enquanto a população do estudo consistia de adolescentes entre as idades de 14-17. Antes da pesquisa, um termo de consentimento voluntário assinado pelos pais foi obtido dos participantes. Os aplicativos móveis "Smartphone Addiction Scale Short Form (SAS-SF)" e "Posturescreen" foram usados como ferramentas de coleta de dados. Testes T de amostra independente e testes de Anova Unidirecional foram aplicados na revisão estatística dos dados obtidos. A análise de correlação de Pearson foi aplicada para determinar a relação entre o nível de dependência do smartphone e as curvaturas de postura. Os dados obtidos dos participantes foram analisados em termos de gênero, idade, tempo de uso diário do telefone e variáveis do histórico de uso do telefone. Não houve diferenças significativas nas variáveis de gênero, idade e histórico de uso. Uma diferença significativa foi encontrada entre os grupos usando entre 1-3 horas, 3-5 horas e mais de 5 horas na variável de tempo de uso diário. Foi determinado que, à medida que o tempo de uso diário aumenta, o vício em smartphones e as curvaturas da cabeça e do ombro aumentam. Foi encontrada uma relação positiva moderada entre o vício em smartphones e as curvaturas das posturas da cabeça e do ombro. À medida que o vício em smartphones dos participantes aumentava, também aumentavam as curvaturas da cabeça e do ombro. Como resultado, uma relação significativa foi encontrada entre vício em smartphones e curvaturas de cabeça e postura. O aumento do vício em smartphones também aumenta as curvaturas de postura. Além disso, o aumento no tempo de uso diário do smartphone aumentou o nível de dependência e curvaturas de postura.

Introduction

The usage of smartphones in our country and the world has increased considerably in recent years. The number of people using smartphones worldwide is stated to be approximately 3.5 billion (Namwongsa et al., 2018). Thanks to the applications available on smartphones, users can access many different areas of usage such as communication, gaming, and entertainment. The usage time of smartphones is gradually increasing for this reason. Research shows that with the increase in smartphone usage time, pain in the head and neck region and related complaints increase (Derakhshanrad et al., 2021). Postures that occur unwittingly during the long-term usage of smartphones can have harmful consequences on the posture structure. As a result, muscle pain is observed especially in the limbs such as the head, neck, shoulder, and arm, which are in the upper extremity group (Lee, 2016).

Due to the pandemic process experienced around the world, situations such as the closure of schools and the fact that people do not leave their homes have caused students to continue their lessons through computers or smartphones. This process has dramatically increased the rate of smartphone usage by students. In addition to educational activities, smartphones attract the attention of young individuals with the applications they offer and increase their addiction levels (Barğı and Güngörer, 2022). The most common physical problems caused by long-term internet usage by individuals in the developmental period are eye disorders and head and neck pain. The continuation of this condition for a long time causes permanent eye disorders and posture disorders (Ergüney, 2017).

Posture is the proper position of the body and the proper arrangement of the limbs. A good posture is defined as the balanced posture of the skeletal and muscular system, which allows the person to efficiently perform the movements in his daily life and protects the body against external influences and injuries (Akçam et al., 2020). In order for the posture structures of individuals to be healthy, body development during childhood and adolescence is highly effective (Eider et al., 2014). Since the body development during adolescence is very high, postural changes occur most often in this period (Murphy et al., 2004). During childhood and adolescence, situations such as spending a long time on the computer or at the table, carrying a heavy school bag for a long time, and spending a long time on the tablet and phone cause deterioration in the head, neck, shoulder and arm posture structure and bad posture formation (Berber et al., 2014).

In the researches, it is stated that the most complained type of pain as a result of long-term usage of smartphones, tablets, and computers is neck pain. As a result of researches, it is
seen that neck pain complaints have a prevalence between 20% and 70% (Alsalameh et al., 2019). It has also been determined that neck pain increases as the duration of usage of smartphones increases (Toh, 2019). 19% of long-term phone users reported experiencing muscle soreness in at least one body part (Eom et al., 2013). Long-term phone usage can harm the health of the spine over the years and users are not aware of these effects. Users should be made aware of the health problems that may occur for this reason and the necessary awareness should be created about this issue (Gupta, 2018). Many harmful features such as technological tools met at a young age and long-term unconscious usage of these tools, negative psychological development of individuals, deterioration of body structure, and excess weight have been identified (Mustafaoğlu et al., 2018). The extension of the usage time of the phones causes the head to be tilted forward, the rounded shoulder structure, and a hunched appearance (Janwantanakul et al., 2012).

As a result of the examination of the literature, the aim of the study was determined to examine the relationship between the level of smartphone addiction and head and shoulder posture curvatures in adolescent individuals.

**Method**

**2.1 Research Model**

In the research conducted to determine the relationship between the level of smartphone addiction and head and shoulder curvatures in adolescent individuals, the data were obtained by the quantitative research model. A descriptive research model was applied to determine the level of smartphone addiction and an experimental research model was applied to determine head and shoulder curvatures (Yazıcıoğlu and Erdoğan, 2004). The current research acted within the framework of the "Higher Education Institutions Scientific Research and Publication Ethics Directive". It was found ethically appropriate with the decision dated 09.10.2022-513246 of the Ethics Committee of Firat University Non-Interventional Research in the ethical review of the study.

**2.2 Universe Sample**

The population of the study consisted of secondary school students between the ages of 14-17. The sample group consisted of a total of 408 people, 284 male, and 124 female,
between the ages of 14-17, who had an experience of smartphone usage for at least 2 years, and who did not exercise regularly. Descriptive statistics of the participants such as age, gender, daily phone usage time, and smartphone usage history are given in Table 1.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>284</td>
<td>69,6</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>124</td>
<td>30,4</td>
</tr>
<tr>
<td>Age</td>
<td>14-15 Years</td>
<td>229</td>
<td>56,2</td>
</tr>
<tr>
<td></td>
<td>16-17 Years</td>
<td>178</td>
<td>43,8</td>
</tr>
<tr>
<td>Daily Smartphone Usage Time</td>
<td>1-3 Hours</td>
<td>118</td>
<td>28,9</td>
</tr>
<tr>
<td></td>
<td>3-5 Hours</td>
<td>137</td>
<td>33,6</td>
</tr>
<tr>
<td></td>
<td>Above 5 Hours</td>
<td>153</td>
<td>37,5</td>
</tr>
<tr>
<td>Smartphone Usage History</td>
<td>2-4 Years</td>
<td>147</td>
<td>36,0</td>
</tr>
<tr>
<td></td>
<td>4-6 Years</td>
<td>185</td>
<td>45,4</td>
</tr>
<tr>
<td></td>
<td>Over 6 Years</td>
<td>76</td>
<td>18,6</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>408</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 1. Descriptive statistics of participants
Source: Author

2.3 Data Collection Tools

2.3.1 Smartphone Addiction Scale Short Form

The smartphone addiction scale was developed by Kwon et al. (Kwon et al., 2013) and adapted to Turkish by Noyan et al. (Noyan et al., 2015). The 6-point Likert type scale consists of a total of 10 questions. There are no inverse-scoring items on the scale, which is a single sub-dimensional. A minimum of 10 and a maximum of 60 points are obtained in the scale scoring. Puan ortalamasının artması bağımlılık düzeyinin artması olarak yorumlanmaktadır.

2.3.2 Posture Analysis

Head and shoulder posture curvatures were determined using the "Posturescreen" mobile posture analysis program (Hopkins and Berry, 2014; Studnicska, 2018). Head and shoulder curvatures were determined by taking anterior and lateral bidirectional photographs of the participants. The standard posture position was accepted as zero, and as a result of the program analysis of the participants, the degree of closeness to zero in the head and shoulder postures was recorded in centimeters. The proximity of the degrees of curvature determined in the head and shoulders to zero was interpreted as proximity to the ideal posture. The photos taken for posture analysis were taken with the iPhone 11 device compatible with the mobile application fixed on a tripod.
2.4 Analysis of Data

Statistical analysis of the obtained data was performed with the SPSS program. The normality analysis of the data was evaluated by examining the skewness and kurtosis values. It was determined that the data showed a normal distribution are shown in Table 2. In the statistical analysis of the research data, the Independent-Sample t-test was used for age and gender variables, and the One Way Anova test was used for daily usage time and usage history variables. To determine the differences between the trio groups, Scheffe and Games-Howell values were examined according to the homogeneous distribution values of the data. Pearson Correlation test was applied to determine the relationship between smartphone usage level and posture curvatures. The significance level in the evaluation of statistical data was determined as p<0.05 in the study.

<table>
<thead>
<tr>
<th>Measured Values</th>
<th>n</th>
<th>X</th>
<th>SS</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAS-SF score</td>
<td>408</td>
<td>39.90</td>
<td>6.75</td>
<td>-0.05</td>
<td>-0.61</td>
</tr>
<tr>
<td>Front Head Measurement</td>
<td>408</td>
<td>0.94</td>
<td>0.20</td>
<td>-0.39</td>
<td>-0.72</td>
</tr>
<tr>
<td>Side Head Measurement</td>
<td>408</td>
<td>2.05</td>
<td>0.68</td>
<td>0.63</td>
<td>-0.11</td>
</tr>
<tr>
<td>Front Shoulder Measurement</td>
<td>408</td>
<td>1.16</td>
<td>0.37</td>
<td>0.84</td>
<td>0.08</td>
</tr>
<tr>
<td>Side Shoulder Measurement</td>
<td>408</td>
<td>3.18</td>
<td>1.09</td>
<td>0.63</td>
<td>-0.23</td>
</tr>
</tbody>
</table>

Table 2. Skewness Kurtosis Values of Data
Source: Author

<table>
<thead>
<tr>
<th>Measured Values</th>
<th>Variable Group</th>
<th>n</th>
<th>X</th>
<th>SS</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAS-SF score</td>
<td>Male</td>
<td>284</td>
<td>39.91</td>
<td>6.86</td>
<td>0.45</td>
<td>0.96</td>
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<tr>
<td></td>
<td>Female</td>
<td>124</td>
<td>39.87</td>
<td>6.51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front Head Measurement</td>
<td>Male</td>
<td>284</td>
<td>0.93</td>
<td>0.21</td>
<td>-1.62</td>
<td>0.30</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>124</td>
<td>0.96</td>
<td>0.16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Side Head Measurement</td>
<td>Male</td>
<td>284</td>
<td>2.02</td>
<td>0.70</td>
<td>-1.63</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>124</td>
<td>2.14</td>
<td>0.62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front Shoulder Measurement</td>
<td>Male</td>
<td>284</td>
<td>1.20</td>
<td>0.41</td>
<td>3.69</td>
<td>0.00*</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>124</td>
<td>1.06</td>
<td>0.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Side Shoulder Measurement</td>
<td>Male</td>
<td>284</td>
<td>3.22</td>
<td>1.13</td>
<td>1.25</td>
<td>0.21</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>124</td>
<td>3.07</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Examination of Data by Gender Variable
Source: Author

Findings
It was found that there was no statistically significant difference between male and female students in the comparison of the averages of smartphone addiction scale score when the table was examined, front head measurement, side head measurement, and side shoulder measurement values, while the mean of male students' measurement values in front shoulder measurement value was statistically significantly higher than female students.

<table>
<thead>
<tr>
<th>Measured Values</th>
<th>Variable Group</th>
<th>n</th>
<th>X</th>
<th>SS</th>
<th>t</th>
<th>p</th>
<th>Scheffe</th>
<th>Games-Howell</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAS-SF score</td>
<td>14-15 Years</td>
<td>229</td>
<td>40,41</td>
<td>6,71</td>
<td>1,66</td>
<td>0,09</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>16-17 Years</td>
<td>178</td>
<td>39,29</td>
<td>6,74</td>
<td>0,76</td>
<td>0,44</td>
<td></td>
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</tr>
<tr>
<td>Front Head Measurement</td>
<td>14-15 Years</td>
<td>229</td>
<td>0,95</td>
<td>0,20</td>
<td>0,76</td>
<td>0,44</td>
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</tr>
<tr>
<td></td>
<td>16-17 Years</td>
<td>178</td>
<td>0,93</td>
<td>0,19</td>
<td>0,76</td>
<td>0,44</td>
<td></td>
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</tr>
<tr>
<td>Side Head Measurement</td>
<td>14-15 Years</td>
<td>229</td>
<td>2,07</td>
<td>0,68</td>
<td>0,51</td>
<td>0,60</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>16-17 Years</td>
<td>178</td>
<td>2,04</td>
<td>0,69</td>
<td>0,51</td>
<td>0,60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front Shoulder Measurement</td>
<td>14-15 Years</td>
<td>229</td>
<td>1,18</td>
<td>0,38</td>
<td>1,24</td>
<td>0,21</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>16-17 Years</td>
<td>178</td>
<td>1,13</td>
<td>0,35</td>
<td>1,24</td>
<td>0,21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Side Shoulder Measurement</td>
<td>14-15 Years</td>
<td>229</td>
<td>3,27</td>
<td>1,13</td>
<td>1,82</td>
<td>0,06</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>16-17 Years</td>
<td>178</td>
<td>3,07</td>
<td>1,03</td>
<td>1,82</td>
<td>0,06</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4. Examining Data by Age Variable
Source: Author

In the statistical examination of the values measured in terms of age variable, the 14-15 years group and 16-17 years group were compared. When the table was examined, no statistically significant difference was determined in the comparison of the measured values. There were no significant differences between the 14-15 years group and the 16-17 years group in terms of the level of smartphone addiction and head and shoulder curvatures.
Study of the relationship between smartphone addiction and head and shoulder posture curvatures in adolescent individuals

A significant difference was found in all of the measured values in the comparison of the measurement averages according to the daily smartphone usage time. When the averages were examined, it was found that those with a daily usage time of more than 5 hours were the highest in all measured values, while those with 1-3 hours were lower than the average of other groups. In the examination of differences between groups, it was determined that there were significant differences between all three groups. It seems that the level of addiction has increased as the daily usage time of the smartphone has increased. It has been determined that individuals with more daily phone usage time have more head and shoulder curvatures.

<table>
<thead>
<tr>
<th>Measured Values</th>
<th>Variable Group</th>
<th>n</th>
<th>X</th>
<th>SS</th>
<th>F</th>
<th>p</th>
<th>Scheffe</th>
<th>Games-Howell</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front Shoulder Measurement</td>
<td>Btw 3-5 hours (b)</td>
<td>137</td>
<td>1,14</td>
<td>0,37</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Above 5 hours (c)</td>
<td>153</td>
<td>1,27</td>
<td>0,37</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Side Shoulder Measurement</td>
<td>Btw 1-3 hours (a)</td>
<td>118</td>
<td>2,76</td>
<td>0,81</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Btw 3-5 hours (b)</td>
<td>137</td>
<td>3,14</td>
<td>1,05</td>
<td>18,12</td>
<td>0,00*</td>
<td>a-b-c</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Above 5 hours (c)</td>
<td>153</td>
<td>3,53</td>
<td>1,20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5. Examining Data by Daily Usage Time Variable
Source: Author
Table 6. Examining Data by Usage History Variable
Source: Author

<table>
<thead>
<tr>
<th>Usage History</th>
<th>6-76</th>
<th>3.21</th>
<th>0.99</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>p</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the statistical examination of the data obtained according to the phone usage history of the participants, no significant differences were defined in the measured values. However, when the averages are examined, it is seen that the measurement averages of the group between 2-4 years are lower than the other two groups. In the measurements of head and shoulder curvatures, it was determined that the 2-4 years group had less head-shoulder curvature than the 4-6 years and over 6 years group.

Table 7. Investigation of the Relationship Between Smartphone Usage Level and Head and Shoulder Posture Curvatures
Source: Author

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Pearson Correlation (r)</th>
<th>SAS-SF score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front Head</td>
<td>0.52**</td>
<td>0.00</td>
</tr>
<tr>
<td>Side Head</td>
<td>0.50**</td>
<td>0.00</td>
</tr>
<tr>
<td>Front Shoulder</td>
<td>0.40**</td>
<td>0.00</td>
</tr>
<tr>
<td>Side Shoulder</td>
<td>0.50**</td>
<td>0.00</td>
</tr>
</tbody>
</table>

In the examination of the relationship between the smartphone addiction levels of the participants and the head-shoulder curvatures, a moderately significant positive relationship was found. As the level of dependence increased, head and shoulder curvatures increased in direct proportion.

Discussion and Conclusion

In the research conducted to examine the relationship between smartphone addiction levels and head and shoulder posture curvatures of adolescents, while there were no significant differences in the statistical examination of gender variable, age variable, and usage history variables, significant differences were found between the measurement averages in the daily usage time variable. It was found that the participants whose smartphone daily usage time increased significantly more than the smartphone addiction level and head-shoulder curvatures. In the examination of the relationship between smartphone addiction level and
head and shoulder curvatures, a moderate positive relationship was found. It was determined that those with high phone dependence had more head and shoulder curvatures.

The findings were compared with similar studies with the literature review. Parallel and contradictory researches has been found in the literature. Yılmaz (2020) in his research on the posture and head and neck pains of smartphone addiction in his research on university students, it was found that the head and neck pain was more in individuals with high smartphone addiction and that the posture structure was adversely affected. Jung et al. (2016), in their research on university students, divided students into two groups according to their daily phone usage time. The shoulder posture structures of those who used smartphones for 4 hours or more daily and those who used smartphones under 4 hours were compared and it was found that the shoulder postures of the group using smartphones over 4 hours daily were closer to the round shoulder structure. As a result of the research, they revealed that long-term smartphone usage causes rounded shoulder structure. Cochrane et al. (2019) examined the effects of 5 minutes of smartphone use on the neck, shoulder, and spinal cord in young individuals and found an increase in thoracic kyphosis, neck flexion, and shoulder curvatures. As a result, they stated that long-term usage of phones or tablets would cause pain in the waist, neck, and thoracic region. In his research on physical pain caused by smartphone addiction, Choi (2018) found that pain complaints increased in individuals with high smartphone addiction. Berolo et al. (2011) found that long-term holding devices in the hand lead to a long-term impairment of the upper extremity in their study investigating the symptoms of mobile devices in the musculoskeletal system. Ataş and Celik (2019) found that university students use smartphones for an average of 5 hours or more per day in their research. Alsalameh et al. (2019) examined the relationship between students' smartphone addiction and muscle pain and stated that more than 60% of the participants were smartphone-addicted and that these students experienced muscle pain. As a result of their research, they found a significant relationship between phone addiction and muscle pain. Özdinçler et al. (2019) examined the relationship between technology addiction and posture structures of school-age children and found no significant differences in age and gender variables. In the examination of the posture structure, they found a low level of significant relationship between the use of desktop computers and posture disorders, while they did not find a significant relationship between other technological devices and posture disorders. Tezel et al. (2021) investigated the effect of smartphone addiction on upper extremity posture structure, neck pain, and sleep duration in their research and found no significant differences.
As a result; A significant relationship was found between smartphone addiction and head and shoulder posture curvatures. The increase in daily smartphone usage time in adolescents increases both smartphone addiction and head and shoulder curvatures. Today, the increase in the use and accessibility of technological devices reduces the age of usage of devices such as smartphones or tablets. Long-term use of devices such as phones or tablets daily by individuals in the age of development damages the musculoskeletal system and is thought to cause pain and curvature, especially in the head and neck region.

- Restriction of smartphone usage by parents in developing individuals,
- Raising the awareness of young people to devote time to art, sports and cultural activities,
- Conducting information activities about the harms of long-term smartphone usage in schools,
- Parents of adolescents should also be informed about the subject

As a result of the research, it was determined suggestions that can be made.

References


Study of the relationship between smartphone addiction and head and shoulder posture curvatures in adolescent individuals


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