A Meta-analysis of the Relationship between Mobile Phone Addiction and Loneliness of College Students in China

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Abstract: This paper explored the overall relationship between mobile phone addiction and loneliness among Chinese college students based on the Mobile Phone Addiction Tendency Scale and UCLA Loneliness Scale, so as to find out and the factors affecting it. The meta-analysis involves a total of 14602 students extracted from 26 studies based on literature search. The results show that the correlation coefficient and 95% CI of mobile phone addiction was 0.275 (0.236-0.313), suggesting a moderate positive correlation. Regional culture, the ratio of male to female subjects had a moderating effect on the relationship between the two factors.

Introduction

Mobile phone addiction tendency, wherein an individual’s problematic behavior of mobile phone usage causes physical and psychological symptoms of discomfort¹, has been an important issue for college students in China, since the smartphone addiction rate among Chinese students is found to be 23% in a meta-analysis² Loneliness is a subjective psychological feeling or experience when an individual feels that there is a lack of satisfactory interpersonal relationship and his desire for communication is different from the actual level of it, often accompanied by bad emotional reactions such as social isolation, helplessness, depression and unbearable spiritual emptiness³. A large number of studies at home and abroad have shown that mobile phone addiction is closely related to loneliness in college students⁴-⁶. However, the conclusions of empirical studies are quite divergent, with some studies showing a low correlation between mobile phone addiction and loneliness, while some studies suggesting a moderate correlation. This study intends to comprehensively evaluate the correlation between mobile phone addiction and loneliness, and explore the moderators that affect the relationship between them.

Methods

1. Literature and Research Strategy. Studies published in English and Chinese were considered in this study. Studies in English were identified through Web of science, PubMed, EBSCO and Cochrane library database from their earliest available date to October 31st, 2019. Reports in Chinese were found through China National Knowledge Infrastructure (CNKI), Database of Chinese Scientific and Technical Periodicals (VIP), Chinese literature database (Wan fang). Key words (“phone” or “smartphone” or “cellphone” or “cellphone”) and (“addiction” or “dependence” or “problematic use” or “excessive use” or “overuse” or “abuse”) and (“loneliness” or “social isolation”) and (“adolescent” or “college” or “university” or “student”) were used in combination to retrieve the relevant literatures in all these databases. Moreover, we reviewed the reference lists from retrieved articles to search for further relevant studies.

2. Inclusion and Exclusion Criteria. The inclusion criteria was: (1) studies conducted in China; (2) the articles provided raw data including sample size, correlation coefficient r between mobile phone addiction and loneliness and its corresponding p value, or the relevant information could be calculated;
(3) the mobile phone addiction tendency scale for college students (MPATS) compiled by Xiong Jie and the UCLA loneliness scale compiled by Russell were used as research tools; (4) written in Chinese or English.

The exclusion criteria was: (1) raw data not available for retrieval; (2) repetitive reports (If data were duplicated in more than one study, we included the study with the largest number of cases.); (3) non-empirical study, such as observational studies, reviews, meta-analysis.

3. Data Extraction. To decide whether included or not, articles were identified by two independent reviewers using a standardized data extraction form designed by our group. Data with discrepancies in identification were discussed. If consensus was not achieved, the decision was made by a third reviewer. The following data were extracted from each study: the first author’s name, publication year, publication types, area where the study was performed, number of male and female, sample size, correlation coefficient $r$ and its corresponding $p$ value. At the same time, in order to access the methodological quality of the included articles, relevant data was collected according to the Practical Application of Clinical Evidence System created by Joanna Briggs institute (JBI PACES) for cross-sectional studies [7].

4. Statistical Analysis. (1) In this study, the correlation coefficient $r$ was taken as the effect size, and the original correlation coefficient was first converted to Fisher's $Z$ value to exclude the influence of different sample sizes, and then converted back to the correlation coefficient $r$ for analysis [8],[9]. And according to the suggestions of Lipsey and Wilson, when the effect size $r$ value is 0.10, 0.25 or 0.40, it means a low, medium or high correlation between the two [10]. (2) To assess the presence of publication bias statistically, funnel plot and Egger’s regression test were preformed where there were three or more studies. $p<0.05$ was considered representative of statistically significant publication bias. (3) Heterogeneity across studies was estimated using the Cochrane’s $Q$ statistic and $I^2$ test. Meta analysis was carried out by using random-effects or fixed effects model based on the pooled effect estimates in the presence ($p<0.1$ or $I^2\geq50\%$) or absence ($p>0.1$ or $I^2<50\%$) of heterogeneity [11]. (4) In order to better investigate possible reasons of between-study heterogeneity, Studies were categorized into subgroups [12]. (5) All analyses were performed using Comprehensive Meta-analysis 2.0.

Result

1. Study Selection and Study Characteristics. After carefully reading each article, 26 studies were eligible for the meta-analysis. A flow diagram of the study selection process is shown in Fig.1. All the selected studies presented original data on independent samples. A total of 14602 students were included from 27 studies. And the quality evaluation scores of all included studies are within the range of 11 ~ 20, indicating a high-quality study.
2. **Publication Bias Assessments and Heterogeneity Tests.** As shown in Fig. 2, the effect values of this study were distributed in the upper part of the funnel plot and evenly distributed on both sides of the center line, indicating that the possibility of publication bias in this study was low. Moreover, the Egger regression coefficient test showed that $t=1.670$ ($p>.05$), which also showed that there was no publication bias.

Heterogeneity test results showed that $Q=163.200$, $p<0.01$, $I^2=84.069\%$, indicating that there is significant heterogeneity between literatures. Therefore a random effect model should be adopted. Moreover, subgroup analysis and meta-regression should be conducted to find the source of heterogeneity.

3. **Meta-analysis Results.** The meta-analysis findings between mobile phone addiction and loneliness showed that the combined $r$ value is 0.275, suggesting a medium correlation between them.
Since the 95% CI was between 0.236 and 0.313, without 0, indicating a stable relationship between the two.

Since significant heterogeneity existed among these studies, we performed further subgroup analysis on publication types and area where the study was performed. The results (Table 1) showed that the difference between publication type groups was significant ($p<0.05$), while the difference between the geographical distribution groups was not statistically significant ($p>0.05$).

<table>
<thead>
<tr>
<th>Subgroup</th>
<th>k</th>
<th>Sample n</th>
<th>$r$ (95% CI)</th>
<th>$Q$</th>
<th>$P$</th>
<th>$I^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Journal article</td>
<td>21</td>
<td>11172</td>
<td>0.291 (0.259-0.323)</td>
<td>15.18</td>
<td>0.00</td>
<td>84.06</td>
</tr>
<tr>
<td>Academic dissertation</td>
<td>6</td>
<td>3430</td>
<td>0.225 (0.091-0.352)</td>
<td>4.486</td>
<td>0.21</td>
<td>84.91</td>
</tr>
<tr>
<td>Northeast</td>
<td>1</td>
<td>380</td>
<td>0.230 (0.132-0.323)</td>
<td>4.486</td>
<td>0.21</td>
<td>84.91</td>
</tr>
<tr>
<td>East</td>
<td>11</td>
<td>5836</td>
<td>0.293 (0.247-0.337)</td>
<td>4.486</td>
<td>0.21</td>
<td>84.91</td>
</tr>
<tr>
<td>midland</td>
<td>9</td>
<td>4914</td>
<td>0.259 (0.160-0.352)</td>
<td>4.486</td>
<td>0.21</td>
<td>84.91</td>
</tr>
<tr>
<td>West</td>
<td>4</td>
<td>2875</td>
<td>0.252 (0.166-0.334)</td>
<td>4.486</td>
<td>0.21</td>
<td>84.91</td>
</tr>
</tbody>
</table>

To explore the relationship between the correlation coefficient and the characteristics of the subjects, meta-regression was used to analyze and explain the heterogeneity. Univariate-analysis showed that the male-female ratio of the subjects was related to the correlation coefficient, whose regression coefficient was 0.035 ($p<0.05$), indicating that the higher the male-female ratio of the subjects was, the higher the corresponding $r$ value was. But the regression coefficient was small, so the effect on the result was relatively small.

In the sensitivity analysis, the included studies were deleted and included one by one to observe if there any significant difference on the heterogeneity and the change of the combined $r$ value of the remaining literatures. The results showed that the correlation coefficient after the removal was between 0.266-0.283, all within the 95%CI range of the main effect value, which meant no changes in the study results were found, indicating that the meta-analysis results of this study were stable.

4. Discussion. This study showed a moderate positive correlation between mobile phone addiction and loneliness. According to Maslow's hierarchy of needs theory, individuals will have emotional and belonging needs, on the basis of satisfying physiological and security needs. The loneliness measured by the UCLA loneliness scale is caused by the gap between the desire for social interaction and the actual level.

Influenced by a variety of reasons, some college students in the school may not have established a close relationship with others, or cannot meet the social demand, which would lead to isolation or lack of contact with others. Being not accepted was considered to be an experience of pain and loneliness to a certain extent, mobile phone could meet the needs of emotional communication, interpersonal, chances to show yourself, leisure, entertainment, support and compensation in the virtual space, which would reduce the anxiety caused by loneliness. Students with high loneliness tend to use a mobile phone for social existence, meet the social demand, eliminate or avoid loneliness to make up for the lack of social contact in real life, thus forming the dependence on mobile phone.

At the same time, mobile phone addiction can also affect the degree of loneliness of individuals. The higher the degree of mobile phone addiction is, the more likely individuals are to experience loneliness. College students with a tendency of mobile phone addiction are more likely to be addicted to the virtual world of mobile phones, unable to control the frequency of their use of mobile phones, and unable to finish their work and study, resulting in their disconnection from real life. Mobile phone addiction, to some extent, compresses individuals' real communication time, thus affecting their interpersonal relationship and causing their real interpersonal relationship trouble. This kind of bad...
interpersonal relationship will deepen their inner emptiness, and feel more and more lonely in real life. And this loneliness will make them more addicted to the virtual world, deepen his degree of mobile phone addiction, forming a vicious circle [19].

In the process of exploring the influencing factors of the degree of correlation between mobile phone addiction and loneliness in college students, this study controlled the influence of measure tools through inclusion criteria, and further excluded the moderating variable of geographical distribution in China through subgroup analysis. Therefore, the factors affecting the correlation between the two are the types of publication and the ratio of male to female subjects.

On one hand, the correlation between mobile phone addiction and loneliness of college students reported in the journal papers is significantly higher than that in the degree papers, and the correlation between the two in the journal papers is moderate, while the correlation between the two in the degree papers is only slight. First, the difference has to do with the rigor of paper reviews. Second, it is allowed that the results are not significant in the dissertation, while the journal will generally have a bias towards the research results reported, so there may be cases where the true relationship between variables is exaggerated for ease of publication. At the same time, from the perspective of quantity, the number of journal articles included in the study is much larger than that of academic papers, and the total sample size is also larger, which may also cause difference in the effect values of the two groups.

On the other hand, the results of meta-regression showed that gender could affect the degree of the correlation between mobile phone addiction and loneliness among college students, but the difference of correlation in different gender groups was small. In College, with a relatively equal and open environment, there is basically no difference between male and female students in socializing and using mobile phones. Therefore, college students of different genders will be addicted to mobile phones in order to relieve loneliness, or suffer from loneliness caused by mobile phone addiction with the same probability. Therefore, the regression coefficient of sex ratio is smaller, which indicates less influence on mobile phone addiction and loneliness.

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References


