

## Original article

# Associations of parental bonding and adolescent internet addiction symptoms with depression and anxiety in parents of adolescents with attention deficit/hyperactivity disorder

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Received: 07/19/2018 – Accepted: 02/18/2019

DOI: 10.1590/0101-60830000000190

## Abstract

**Objectives:** The aim of the present study was to evaluate the associations of parental bonding and adolescents' Internet addiction symptoms with depression and anxiety in parents of adolescents with attention deficit/hyperactivity disorder (ADHD). **Methods:** Parental depression and anxiety symptoms, parental bonding, and adolescents' Internet addiction symptoms were assessed in 46 parent-child dyads using the Center for Epidemiological Studies Depression Scale, State-Trait Anxiety Inventory, Parental Bonding Instrument (PBI), and Chen Internet Addiction Scale, respectively. Forward stepwise multiple regression analysis was used to examine the associations of parental bonding and adolescents' Internet addiction symptoms with parental depression and anxiety. **Results:** Low care/affection on the PBI was significantly associated with parental depression, and overprotection on the PBI and adolescents' Internet addiction were significantly associated with parental anxiety. **Discussion:** Parental bonding and adolescents' Internet addiction are related to depression and anxiety in parents of adolescents with ADHD.

Wong CK et al. / *Arch Clin Psychiatry*. 2019;46(2):40-3

**Keywords:** Adolescent, attention deficit/hyperactivity disorder (ADHD), depression, anxiety, Internet addiction, parental bonding.

## Introduction

A high proportion of parents of children with attention deficit/hyperactivity disorder (ADHD) suffer from depression<sup>1</sup> and anxiety<sup>2</sup>. Parental depression may compromise parental self-efficacy<sup>3</sup> and the quality of parent-child interactions<sup>4,5</sup>. Parental anxiety is also negatively associated with parental warmth and positive involvement in the lives of children with ADHD<sup>6</sup>. Parent-child conflicts may be exacerbated during the adolescence of children with ADHD<sup>7</sup>. Although adolescence is the period in which the individuals start to build up their independence from the original family<sup>8</sup>, parents are still one of major sources of support for adolescents. Parental depression and anxiety may compromise parents' ability and motivation to provide their children the assistance in managing ADHD-related difficulties. Thus, depression and anxiety in parents of adolescents with ADHD warrant clinical attention. Identification of the modifiable factors related to parental depression and anxiety may provide a basis from which to develop prevention and intervention strategies.

Adolescents with ADHD and their family members may encounter difficulties in supporting, interacting, and communicating with each other<sup>9</sup>; thus, parental bonding with children with ADHD may differ from that with children without ADHD. A study indicated that mothers of children with ADHD were less affectionate and more overprotective and controlling of their children than were mothers of control-group children<sup>9</sup>. Moreover, maternal depression correlates with a negative parenting style<sup>10</sup>. For example, a study revealed that maternal depression was significantly correlated with decreased maternal affection or care and increased maternal control in mothers of children with ADHD<sup>4</sup>. The association between parental bonding

and parental anxiety has been studied less than that between parental bonding and parental depression. Further research should be conducted regarding the potential associations between parental anxiety and various dimensions of parental bonding exhibited by parents of adolescents with ADHD.

According to ecological systems theory<sup>11</sup>, negative emotional states in parents and behavioral problems in children may be mutually influential. Internet addiction is one of the most common behavioral problems exhibited by children and adolescents, and this problem substantially and adversely affects children and adolescents' academic performance, physical and mental health, and interpersonal relationships<sup>12,13</sup>. A previous study on parent-child dyads revealed a significant association between parental depression and children's Internet addiction, whereas no associations between parental anxiety and children's Internet addiction were observed<sup>14</sup>. Adolescents diagnosed with ADHD are at a higher risk of Internet addiction than those without ADHD<sup>15</sup>. Thus, a hypothesis may be posed that Internet addiction in an adolescent with ADHD is significantly associated with depression and anxiety in parents of the adolescent. The potential association between Internet addiction in adolescents with ADHD and parental depression and anxiety warrants further study.

The aim of the present study was to evaluate the associations of parental bonding and adolescents' Internet addiction symptoms with depression and anxiety in parents of adolescents with ADHD. We hypothesized that parental bonding and adolescents' Internet addiction symptoms are significantly associated with parental depression and anxiety. We further hypothesized that various dimensions of parental bonding are associated with parental depression and anxiety.

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## Methods

### Participants

Adolescents aged 11-18 years who had been diagnosed with ADHD according to the diagnostic criteria in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5)<sup>16</sup> and their parents were recruited into this study between November 2017 and June 2018 from child and adolescent psychiatric outpatient clinics of medical centers in Kaohsiung, Taiwan. A children's psychiatrist conducted diagnostic interviews with the parents to confirm their children's diagnoses of ADHD according to the DSM-5 diagnostic criteria. Multiple data sources, including clinical observation of the adolescents' behavior and the parents' ratings of ADHD symptoms on the short version of the Swanson, Nolan, and Pelham, version IV scale – Chinese version<sup>17,18</sup>, were used to support diagnoses. Parents and adolescents with intellectual disability, schizophrenia, bipolar disorder, autism disorder, difficulties in communication, or any cognitive deficits that resulted in significant behavioral or emotional difficulties were excluded. In total, 54 parent-child dyads were invited into this study; 46 dyads (85.2%) agreed to participate. Research assistants were available to answer participants' questions if the participants experienced any problems in completing the questionnaires. Written informed consent was obtained from all participants prior to assessment. This study was approved by the Institutional Review Board of Kaohsiung Medical University Hospital.

### Measures

**Parental depression symptoms.** The Mandarin Chinese version<sup>19</sup> of The Center for Epidemiological Studies Depression Scale<sup>20</sup> comprises 20 items that assess the frequency of parental depressive symptoms. Respondents rate each item on a four-point Likert scale according to their experiences in the month before the questionnaire is administered. A higher score indicates more severe depression. The Cronbach's  $\alpha$  for this scale in the present study was .82. A previous study proposed that a cut-off point of 16 or more is generally accepted as indicative of a clinically significant level of depressive affect<sup>21</sup>. The present study used the cut-off of 16 to classified the participants with and without clinically significant depressive affect.

**Parental anxiety symptoms.** We used the 20 items from the self-administered State-Trait Anxiety Inventory (STAI-S) form Y to assess participants' anxiety symptoms at the time of the study<sup>22,23</sup>. The items were graded on a four-point Likert scale. Higher total STAI-S scores indicated more severe anxiety. Cronbach's  $\alpha$  for the STAI-S in the present study was .84. A total score on the STAI-S of 30 or higher suggests moderate anxiety<sup>23</sup>.

**Chinese version of the Parental Bonding Instrument.** The 25-item parent-reported Parental Bonding Instrument (PBI) measures parents' attitudes and behaviors toward their children in the few years preceding the assessment. Each item is rated on a four-point Likert scale. The PBI contains three principal dimensions: care/affection (12 items), overprotection (seven items), and authoritarianism (six items)<sup>24</sup>. A high score on the care/affection subscale reflects affection and warmth, whereas a low score indicates rejection or indifference. Overprotection reflects overprotective parenting and denial of adolescents' psychological autonomy. Finally, authoritarianism reflects the degree of authoritarian-quality parental control over their adolescents' behaviors<sup>25</sup>. The reliability and validity of the Chinese PBI have been described elsewhere<sup>26</sup>. The Cronbach's  $\alpha$  values of the subscales of parent-reported care/affection, overprotection, and authoritarianism were .78, .70, and .68, respectively.

**Chen Internet Addiction Scale.** We used the self-reported Chen Internet Addiction Scale (CIAS) to assess the severity of the adolescent's Internet addictions for the month preceding the assessment. The CIAS comprises 26 items rated on a four-point Likert scale for a total scaled score of 26 to 104<sup>27</sup>. A high total score indicates severe Internet addiction. Those whose total score was 64 or more were identified to have Internet addiction<sup>28</sup>.

**Adolescents' demographic and clinical factors.** The present study examined the variables of adolescents' age, sex, and the severities of parent-reported child ADHD and oppositional defiant disorder (ODD) symptoms. The 26-item SNAP-IV-Chinese version was used for assessing the core DSM-IV-derived ADHD subscales of inattention, hyperactivity/impulsivity, and ODD symptoms for the preceding month<sup>17,18</sup>. Each item in the SNAP-IV-Chinese version is rated on a four-point Likert scale. The Cronbach's  $\alpha$  values for the inattention, hyperactivity/impulsivity, and oppositional subscales in the present study were .84, .80, and .89, respectively.

**Parents' sociodemographic factors.** The present study examined the variables of each parent's age, sex, and years of education.

### Statistical analysis

Data analysis was performed using SPSS 22.0 statistical software (SPSS Inc., Chicago, IL, USA). We examined the associations of parenting styles on three dimensions of the PBI, adolescents' severity of Internet addiction, parent and adolescent's demographic characteristics and adolescents' ADHD symptom with parental depression and anxiety using forward stepwise multiple regression analysis. Only the variables significantly associated with parental depression or anxiety were retained in the final model. We checked multicollinearity using the variance inflation factor (VIF) value. We also checked the assumptions of the regression using a normal P-P plot. A two-tailed  $p$  value of less than .05 was considered statistically significant.

### Results

Table 1 presents the data for parents' and adolescents' demographics, parental depression and anxiety, parental bonding, and adolescents' Internet addiction and ADHD symptoms. In total, 38 mothers and 8 fathers of adolescents with ADHD [4 girls and 42 boys, mean age = 14.1 years, standard deviation (SD) = 1.9 years] participated into this study. Mean age and education duration of these parents were 39.6 (SD = 4.1) and 13.5 (SD = 2.8) years, respectively. The mean total score of CES-D was 13.9 (SD = 9.9). Eighteen (39.1%) participants had a total CES-D score of 16 or higher, indicating that they might have clinically significant depressive affect. The mean total score of STAI-S was 20.2 (SD = 9.4). Ten (21.7%) participants had a total STAI-S score of 30 or higher, indicating that they might have moderate anxiety. The mean total score of CIAS in adolescents was 49.1 (SD = 15.3). Six (13.0%) participants had a total CIAS score of 64 or higher, indicating that they might have Internet addiction.

The results of forward stepwise multiple regression analysis examining the associations of parental bonding and adolescents' Internet addiction symptoms are displayed in Table 2. The result of Model I indicated that lower care/affection on the PBI was significantly associated with more severe parental depression (Beta =  $-.286$ ,  $t = -2.089$ ,  $p = .043$ ). The value of VIF in Model I was 1.006, indicating that parental sex and care/affection on the PBI were not correlated with each other. Moreover, the result of Model II indicated higher overprotection on the PBI (Beta =  $.326$ ,  $t = 2.375$ ,  $p = .022$ ) and higher adolescent Internet addiction severity (Beta =  $.291$ ,  $t = 2.120$ ,  $p = .040$ ) were significantly associated with more severe parental anxiety. The value of VIF in Model II was 1.000, indicating that adolescent's Internet addiction severity and overprotection on the PBI were not correlated with each other. The normal P-P plot showed that normality has been met (Figure 1).

### Discussion

The present study determined that low care/affection and high overprotection on the PBI were significantly associated with parental depression and anxiety, respectively, in parents of adolescents with ADHD. Parental bonding is a factor of parent-child relationships that represents parents' attitudes and behaviors toward their children in

**Table 1.** Demographic data, parental depression and anxiety, parental bonding, and adolescents' Internet addiction and ADHD symptoms (*N* = 46)

	n (%)	Mean (SD)	Range
Parents			
Sex			
Female	38 (82.6)		
Male	8 (17.4)		
Age (years)		39.6 (4.1)	36-56
Education duration (years)		13.5 (2.8)	6-18
Adolescents			
Sex			
Girl	4 (8.7)		
Boy	42 (91.3)		
Age (years)		14.1 (1.9)	11-18
Parent's depression on the CES-D			
Having clinically significant depressive affect	18 (39.1)		
Parent's anxiety on the STAI			
Having moderate anxiety	10 (21.8)		
SNAP-IV symptoms of adolescents			
Inattention		13.7 (6.2)	2-25
Hyperactivity/impulsivity		8.3 (5.9)	0-26
Oppositional defiant		9.6 (5.5)	0-21
Adolescent's internet addiction severity on the CIAS			
Having Internet addiction	6 (13.0%)		
Parental bonding on the PBI			
Care/affection		38.7 (4.7)	29-48
Overprotection		13.2 (2.9)	7-19
Authoritarianism controlling		11.2 (2.7)	6-17

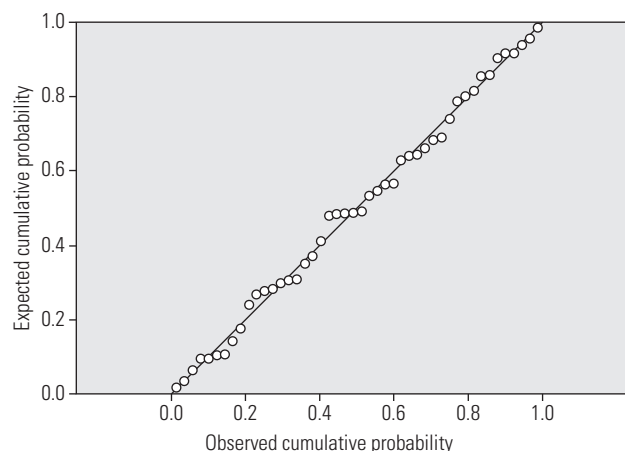
ADHD: attention deficit/hyperactivity disorder; CES-D: The Center for Epidemiological Studies Depression Scale; CIAS: Chen Internet Addiction Scale; PBI: Parental Bonding Instrument; SNAP-IV: short version of the Swanson, Nolan, and Pelham Version IV Scale-Chinese version; STAI: State-Trait Anxiety Inventory.

**Table 2.** Related factors of parents' depression and anxiety: forward stepwise multiple regression analysis

	Model I: Depression			Model II: Anxiety		
	Beta	<i>t</i>	<i>p</i>	Beta	<i>t</i>	<i>p</i>
Adolescent's Internet addiction severity				.291	2.120	.040
Parent's sex	-.319	-2.331	.024			
Care/affection on the PBI	-.286	-2.089	.043			
Overprotection on the PBI				.326	2.375	.022
F	5.295			5.030		
<i>p</i>	.009			.011		
Adjusted R <sup>2</sup>	.160			.152		

PBI: Parental Bonding Instrument.  
Dependent variable: anxiety

the early stages of children's development<sup>29</sup>. Depression limits parents' motivation and ability to express affection and warmth toward children with ADHD and also lowers parents' tolerance to children's ADHD-related uncooperativeness. Consequently, these parents with depression may exhibit rejection or indifference when interacting with their children. Low care/affection toward children with ADHD may increase difficulties in parent-child communication, thereby inciting depression in parents. Furthermore, overprotection reflects

**Figure 1.** Normal P-P Plot regression standardized residual.

overprotective parenting and denial of the adolescents' psychological autonomy<sup>25</sup>. Parents with anxiety that have children with ADHD may overprotect their children to prevent them from encountering real or imaginary danger. Compared with adolescents without ADHD, adolescents with ADHD exhibit significant functional impairment in psychological adjustment, work performance, and interpersonal relationships<sup>30,31</sup>. Parents who overprotect children with ADHD may be vulnerable to anxiety as a result of worries regarding the aforementioned challenges faced by the children. The cross-sectional research design of the present study limited the possibilities for analysis of the temporal relationships between styles of parental bonding and parental depression and anxiety. Further research should examine the reciprocal relationship between parental bonding and parental depression and anxiety in parents of adolescents with ADHD.

The present study determined that Internet addiction in adolescents with ADHD is significantly associated with parental anxiety. Analysis of 8,941 adolescents in a community revealed that family conflict and low family monitoring are associated with Internet addiction in the adolescents<sup>32</sup>. Research on adolescents with clinical diagnoses of ADHD also revealed that low satisfaction with family relationships is the strongest predictive factor of severe Internet-addiction symptoms<sup>33</sup>. Parental anxiety and adolescents' Internet-addiction problems may have been bidirectionally related. Internet addiction and consequences related to mental and physical health, social relationships, and academic achievement among adolescents may increase their parents' anxiety. In turn, parental anxiety may compromise parent-child relationships, especially for adolescents who are struggling to develop their self-concepts<sup>8</sup>.

Several limitations in our investigation require attention. First, the cross-sectional research design of this study limited the ability to draw conclusions regarding the causal relationships of parental depression and anxiety with parental bonding and adolescents' Internet addiction symptoms. Second, the data of parental depression and anxiety, parental bonding, and adolescents' ADHD and ODD symptoms were provided by the parents of adolescents with ADHD. The problem of shared-method variance may have resulted from use of a single information source; the potential influence of this problem on results requires careful consideration. Third, the participants were recruited from the outpatient clinics of medical centers. The results of this study may not be generalizable to parents of adolescents with ADHD who have never visited clinical units. Fourth, the present study applied the self-reported Chen Internet Addiction Scale to evaluate adolescents' severity of Internet addiction but not applied the diagnostic interview to determine adolescents' comorbid psychiatric diagnoses such as depressive and anxiety disorders and substance use disorder that may be associated with parental depression and anxiety.

## Conclusion

The present study revealed that low care/affection was significantly associated with parental depression, and that overprotection and adolescent Internet addiction were significantly associated with parental anxiety. Negative emotional states in parents may compromise their support for adolescents with ADHD; therefore, clinicians should routinely survey parents and children regarding parental bonding and adolescents' Internet addiction symptoms to establish foundational information and develop strategies for intervening in situations of parental depression and anxiety among parents of adolescents with ADHD.

## Funding

This study was supported by grant KMUH105-M507 from Kaohsiung Medical University Hospital.

## Competing interests

None declared.

## Ethical approval

This study was approved by the Institutional Review Board of Kaohsiung Medical University.

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## Erratum

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**Received:** 07/19/2018 – **Accepted:** 02/18/2019

DOI: 10.1590/0101-60830000000190

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DOI: 10.1590/0101-60830000000207

