



ORIGINAL ARTICLE

# Risks of Abnormal Internet Use Among Adolescents with Attention-deficit/Hyperactivity Disorder



Jun-Han Wu<sup>1</sup>, Yue-Cune Chang<sup>2</sup>, Ruu-Fen Tzang<sup>1, 3, 4\*</sup>

<sup>1</sup> Department of Psychiatry, Mackay Memorial Hospital, Taipei, Taiwan

<sup>2</sup> Department of Mathematics, Tamkang University, Taipei, Taiwan

<sup>3</sup> Department of Health Care Management, National Taipei University of Nursing and Health Sciences, Taipei, Taiwan

<sup>4</sup> Mackay Junior College of Medicine, Nursing, and Management, Taipei, Taiwan

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**Purpose:** This aim of the study is to investigate the risks among adolescents with attention-deficit/hyperactivity disorder (ADHD) who develop compulsive Internet use (CIU) and adolescents who do not develop CIU.

**Methods:** Seventy-eight adolescents with ADHD completed general demographic questionnaires that included information on body mass index, subtype, comorbidity, and behavioral problems. The family characteristics included information on parental ADHD diagnosis, psychiatric symptoms, and media exposure problems. The respondents were categorized as ADHD with CIU or ADHD with non-CIU, based on the Internet addiction cutoff point by the standardized measurements of the Chen Internet Addiction Scale.

**Results:** The results revealed 12.8% of the adolescents with ADHD had CIU. They were characterized by average height, tendency to withdraw, having a young father, and playing computer games for more than 1 hour daily.

**Conclusion:** More attention to ADHD adolescents with CIU is warranted. An early intervention program is suggested for their social withdrawal tendency.

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## 1. Introduction

During the past decade, the problems of compulsive internet use (CIU) have emerged around the world. The prevalence rate of CIU among adolescents varies and is 1.5–8.2% in the United States and Europe.<sup>1</sup> Many students have a CIU problem, but whether CIU is an independent behavior problem or a disease secondary to a psychiatric disorder is controversial.<sup>2</sup> In the *Diagnostic and Statistical Manual of Mental Disorders–5* (DSM-5) Section III, IAU is listed tentatively as Internet gaming disorder (IGD).<sup>3</sup> There has been tremendous interest in the association between CIU and various psychiatric problems such as emotional problems, depressive problems, hostility, impulsivity, and aggressive behavior.<sup>4–8</sup> Using meta-analysis, Ho et al<sup>9</sup> reported that CIU may be associated with ADHD in youths. In addition, growing evidence has recently

suggested the screen/Internet culture has a potential hazard impact toward developing children with ADHD, and results in the loss of time for other necessary development. However, very little attention has been specifically focused on the perspective of children with ADHD and their family. It is not very clear how the core symptoms of ADHD and oppositional–defiant disorder (ODD) interact with screen/Internet abuse.<sup>10</sup>

Empirical evidence shows family risks should be analyzed.<sup>11</sup> Chan et al<sup>12</sup> reported that if a family allows their adolescents with ADHD to play computer games more than 1 hour a day, their children could develop a CIU problem.<sup>12</sup> Furthermore, family characteristics or psychopathology, ADHD combined subtype, ODD, and male sex are risk factors that may increase symptom severity of ADHD and need to be further analyzed while exploring the underlying relationship between ADHD and CIU.<sup>13–15</sup>

The purpose of this study is to investigate how the following two types of risks influence the development of CIU in a psychiatric outpatient ADHD adolescent population: (1) early adolescent psychopathology [e.g., age, sex, body weight, body height, body mass index (BMI) value, subtype, comorbidity, school problems such as school performance and interpersonal relationship, nail biting,

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\* Corresponding author. Department of Psychiatry, Mackay Memorial Hospital, Number 92, Section 2, Zhong Shan North Road, Taipei 104, Taiwan.

E-mail: R.-F. Tzang <[rftzang@msa.hinet.net](mailto:rftzang@msa.hinet.net)>

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treatment adherence] and (2) external family or environmental risks (e.g., parental mental illness, family growth atmosphere). This study may help change clinician's concern into awareness about what kind of adolescent with ADHD and their family characteristics are associated with compulsive Internet overuse during clinical practice.

## 2. Methods

### 2.1. Participants and data collection

Seventy-eight consecutive families with an early adolescent with ADHD were recruited for this study from the child–adolescent psychiatric outpatient department of Mackay Memorial Hospital in Taipei, Taiwan. The ADHD diagnosis was confirmed by a board certified child psychiatrist through diagnostic interviews using the *Diagnostic and Statistical Manual of Mental Disorders-IV-TR* (DSM-IV) criteria.<sup>16</sup> Informed consent was obtained from all participants. Participants were excluded if the children had organic psychosis, autism, mental retardation, or neurological or systemic disease. Patients for this study were recruited from the outpatient unit of Mackay Memorial Hospital, which is a major medical center in Taipei, Taiwan. The hospital's Institutional Review Boards (IRB) approved the design of the study.

### 2.2. Methods

Children with ADHD and their parents filled out a designed demographic questionnaire using standardized measurements, which included the Chen Internet Addiction Scale for Internet addiction; the Swanson, Nolan, and Pelham, Version IV ADHD questionnaire (SNAP-IV) for ADHD symptoms; the Child Behavior Checklist (CBCL) for common child behavioral problems; the Adult ADHD Self-rating Scale (ASRS) to determine if the parent has ADHD; and Symptom Check List (SCL-90) for parental psychiatric symptoms. Demographic data collected on the children with ADHD included age, sex, ADHD subtypes, comorbid conditions, school performance, interpersonal relationships, family characteristics (e.g., father's age, mother's age, socio-economic status). Knowledge of ADHD, and marital discord were rated by choosing “yes” or “no” to the questions “whether they know what ADHD is”, and the parent's subjective feelings toward marriage (satisfied or not satisfied). Media exposure and computer-related behavior was assessed using eight “yes/no” questions administered by the clinical staff. These questions included the duration of Internet use ( $\geq 1$  hour or  $< 1$  hour), time spent watching TV ( $\geq 1$  hour or  $< 1$  hour), playing computer games ( $\geq 1$  hour or  $< 1$  hour), and playing Internet games ( $\geq 1$  hour or  $< 1$  hour).

### 2.3. Chen Internet Addiction Scale

The Chen Internet Addiction Scale (CIAS) is a self-reported questionnaire with good reliability and validity consisting of 26 questions on a four-point scale that assesses the five dimensions of Internet use-related problems: compulsive use, withdrawal, tolerance, interpersonal and health problems, and time management problems.<sup>17</sup> The internal reliability of the scale and the subscales in the original study ranged from 0.79 to 0.93. Higher CIAS scores indicated increased severity of Internet addiction. The CIAS yielded a good diagnostic accuracy of 89.6%. The screening cutoff point had high sensitivity (85.6%) and the diagnostic cutoff point had the highest diagnostic accuracy, and correctly classified 87.6% of participants.

### 2.4. Swanson, Nolan, and Pelham, Version IV questionnaire

The SNAP-IV questionnaire consists of the following items: inattention, hyperactivity/impulsivity, and oppositional symptoms. These items reflect the core symptoms of ADHD and oppositional–defiant disorder as defined in DSM-IV. The psychometric properties of SNAP-IV–Chinese in Taiwan has shown intraclass correlation coefficients for the three subscales of 0.59–0.72 for the parent form and 0.60–0.84 for the teacher form. All subscales of the parent and teacher forms provide an excellent internal consistency with a Cronbach  $\alpha$  greater than 0.88.<sup>18</sup>

### 2.5. Child Behavior Checklist

The CBCL is designed to obtain competencies and behavior problems of children aged 4–18 years. The questionnaires, which are completed by the parents, contain 118 items to assess specific behavioral and emotional problems. The CBCL was translated into Chinese via a two-stage translation process.<sup>19</sup> The internal consistency and 1-month test–retest reliability (all  $\alpha$  values and reliabilities  $> 0.6$ , except for thought problems) of this Chinese version is satisfactory for Taiwanese patients.<sup>20</sup> In the interest of parsimony, the present study only analyzed the following 10 scales: aggressive behaviors, attention problems, anxiety/depression, social problems, delinquent behaviors, somatic complaints, thought problems, withdrawal, internalization tendency, and externalization tendency.

### 2.6. Adult ADHD Self-rating Scale

The Adult ADHD Self-rating Scale (ASRS) symptom checklist has been developed in conjunction with the World Health Organization (WHO), and the workgroup on Adult ADHD that included Lenard Adler, Ronald C. Kessler, and Thomas Spencer.<sup>21</sup> It is a tool to help screen for ADHD in adult patients and is consistent with the DSM-IV criteria. A score of 0–16 indicates a person does not have ADHD; 17–23 indicates a person has ADHD; and 24 or above indicates severe ADHD.

### 2.7. Parental Symptoms

We measured the parents' self-reported symptoms on nine primary dimensions: somatization, obsessive-compulsive behavior, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoses. The Symptom Checklist-90-Revised (SCL-90-R) is a 90-item self-report system developed in the 1980s by Derogatis.<sup>22</sup> Three global indices were used: the Global Severity Index (GSI), Positive Symptom Total (PST), and Positive Symptom Distress Index (PSDI). The GSI is the average rating applied to all 90 items. The PST is derived by counting the number of items endorsed with a positive response. The PSDI is the average of only the items receiving a positive response. The SCL-90-R was translated into Chinese in 1982 and has good psychometric measurement reliability with a Cronbach  $\alpha$  coefficient range of 0.77–0.90. The Chinese version of this scale has been widely applied in psychiatric ADHD studies and in nonpsychiatric clinical studies in Taiwan.<sup>23,24</sup>

### 2.8. Statistical analyses

The Mann–Whitney *U* test was used to compare BMI value, CBCL, parents' ADHD score, and the parental symptom score (SCL-90). Fisher's exact test was used for categorical variables' comparisons. We used the Pearson coefficient to evaluate the correlation of the parental symptom score. Multivariate logistic stepwise regression

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