Associations of body weight perception and weight control behaviors with problematic internet use among Korean adolescents

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A R T I C L E   I N F O

A B S T R A C T

We examined the association of body mass index (BMI), body weight perception, and weight control behaviors with problematic Internet use in a nationwide sample of Korean adolescents. Cross-sectional data from the 2010 Korean Youth Risk Behavior Web-based Survey collected from 37,041 boys and 33,655 girls in middle- and high- schools (grades 7–12) were analyzed. Participants were classified into groups based on BMI (underweight, normal weight, overweight, and obese), body weight perception (underweight, normal weight, and overweight), and weight control behavior (no weight control behavior, appropriate weight control behavior, inappropriate weight control behavior). The risk of problematic Internet use was assessed with the Korean Internet Addiction Proneness Scale for Youth-Short Form. Both boys and girls with inappropriate weight control behavior were more likely to have problematic Internet use. Underweight, overweight, and obese boys and girls were more likely to have problematic Internet use. For both boys and girls, subjective perception of underweight and overweight were positively associated with problematic Internet use. Given the negative effect of inappropriate weight control behavior, special attention needs to be given to adolescents' inappropriate weight control behavior, and an educational intervention for adolescents to control their weight in healthy ways is needed.

1. Introduction

Internet use is very widespread in South Korea particularly among adolescents, well evidenced by a high level of computer and mobile device ownership (Mak et al., 2014). In spite of its potential advantages on education or communication, there are growing concerns about problematic Internet use. Problematic Internet use refers to an uncontrollable Internet use and related distress and functional deficits, which is also termed as pathological Internet use and Internet addiction (Shapira et al., 2000). It was found to be associated with a wide range of mental health problems, encompassing emotional disorders such as depression and anxiety (Dalbudak et al., 2013, 2014; Jang et al., 2008; Kim et al., 2006), a high level of stress (Yadav et al., 2013), sleep disturbance (Kim et al., 2010b), attention-deficit/hyper-activity disorder (Yen et al., 2007), obsessive-compulsive symptoms (Dalbudak et al., 2013; Jang et al., 2008), and impulse control disorder (Shapira et al., 2000). Some prospective studies further confirmed that problematic Internet use predicted the subsequent emotional difficulties (Ha et al., 2007; Lam and Peng, 2010). It suggests that problematic Internet use among adolescents may be an urgent mental health issue.

In addition to emotional difficulties, problematic Internet use seems to be related with body weight and the associated psychological or behavioral symptoms. According to the studies on the relationship between body weight and Internet use, adolescents with problematic Internet use were more likely to be obese or overweight (Berkey et al., 2008; Kautiainen et al., 2005; Matusitz and McCormick, 2012; Vandelanotte et al., 2009). It was also found that problematic Internet use was associated with body concerns, such as an overweight preoccupation (Hetzel-Riggin and Pritchard, 2011) or a body image avoidance (Rodgers et al., 2013). In line with, a disordered eating was suggested to be associated with problematic Internet use (Rodgers et al., 2013; Tao and Liu, 2009), although the result was rather inconsistent across the studies (Canan et al., 2014).

There are several potential explanations for the associations between body weight or body image and problematic Internet use. Some argued that an problematic Internet use lowered physical activity and the sedentary life style could cause weight gain and the associated symptoms (Matusitz and McCormick, 2012). It was also suggested that the repeated exposure to idealized body images via Internet social

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media might escalate a body image concern (Kim and Chock, 2015; Stice, 2002). In the opposite direction, the adolescents who are unsatisfied with body size might avoid face to face interactions in which they need to reveal their body shape and prefer online interactions (Hetzel-Riggin and Pritchard, 2011; Rodgers et al., 2013), thus becoming more susceptible to problematic Internet use.

This cross-sectional study investigated the associations between problematic Internet use and objective body size (i.e., body mass index), subjectively perceived body size, and weight control behavior in nationally representative sample of Korean adolescents. Considering the previous studies primarily focused on overweight problems (e.g., Canan et al., 2014) and dysfunctional eating behaviors such as anorexia nervosa (e.g., (Rodgers et al., 2013), we further examined the distinct effects of both under- and over-weight and both appropriate and inappropriate weight control behavior on problematic Internet use.

2. Materials and methods

2.1. Participants and procedures

We used cross-sectional data from the 2010 Korean Youth Risk Behavior Web-Based Survey (KYRBS). The KYRBS has been conducted annually by the Korea Centers for Disease Control and Prevention since 2005 to identify health behaviors with Korean adolescents from middle- and high-schools. The sample of middle- and high-school students representing the whole country was obtained using stratified multi-stage sampling. Students were surveyed anonymously during regular class time based on a self-filling web. KYRBS does not collect personal information such as name, school, phone number, address, or I.D. number. Among the 73,238 students who participated in the survey, the final sample included 70,696 students (37,041 boys and 33,655 girls, mean age 15.10 ± 1.75 years, range 12–18 years) who completed questionnaires on major predictor variables (i.e., weight and height, body weight perception, and weight control behavior). More detailed information about the sampling method and research process can be obtained elsewhere (Korea Centers for Disease Control and Prevention, 2010). The KYRBS was examined and approved by the institutional review board of Korea Centers for Disease Control and Prevention, and the KYRBS data is open and available to the public (Park, 2014).

2.2. Measurements

2.2.1. Predictor variables

Body max index (BMI) was calculated using the self-reported weight and height data. The following four BMI groups were generated in accordance with the 2007 youth growth chart's gender-age BMI criteria (Moon et al., 2008): 1) underweight (less than 5 percentile), 2) normal weight (5–84 percentile), 3) overweight (85–94 percentile) and, 4) obesity (more than 95 percentile or 25 BMI).

Body weight perception was assessed with the following question: "How do you think about your body shape?" The response options were 1) very underweight, 2) somewhat underweight, 3) normal weight, 4) somewhat overweight, and 5) very overweight. On the basis of the responses, the participants were classified into three groups: underweight (very underweight and somewhat underweight), normal, overweight (somewhat overweight and very overweight).

Weight control behavior was assessed with the following question: "Have you tried to control weight during the past 1 month?" Participants responded 'no' to this question were classified into the "no weight control behavior" group. Participants who responded "Yes" to this question were asked to choose weight control methods tried: 1) Regular exercise, 2) Reduction of food amount, 3) Herbal medicine, 4) Dietetic food, 5) Taking diet pills upon a doctor's prescription, 6) Taking diet pills without a doctor's prescription, 7) Fast (not eating for more than 24 h), 8) Laxative or diuretic drugs, 9) Vomiting after meals,

and 10) Eating only one kind of food (e.g., grapes, eggs, milk, etc.). Those who tried to reduce weight using at least one of the methods indicated in questions 6), 7), 8), 9), or 10) during the last 30 days were classified into the "inappropriate weight control behavior" group ("Ministry of Education, 2014), and those who did not tried methods 6), 7), 8), 9), and 10) were classified as the "appropriate weight control behavior" group.

2.2.2. Outcome variable

Problematic Internet use was measured with the Internet Addiction Proneness Scale for Youth–Short Form (KS scale) developed by the Korean National Information Society Agency (Kim et al., 2006). The KS scale is a 20-item self-report instrument administered to screen youth who are prone to problematic Internet use. Items are rated on a four-point Likert scale (1= never, 2= sometimes, 3= often, or 4= nearly always). It consists of six sub-factors: (1) disturbance of adaptive functioning, (2) addictive automatic thought, (3) withdrawal, (4) virtual interpersonal relationship, (5) deviant behavior, and (6) tolerance. The validity and reliability of the KS-scale was established for elementary school and junior and senior high school students, separately (Kim et al., 2006). The Cronbach's alpha score for the elementary school students was 0.887 and the Cronbach's alpha score for junior and senior high school students was 0.909. In the case of junior and senior high school students, Internet addiction was defined by a total score higher than 53 or the presence of all of the following: adaptive functioning scores higher than 17; withdrawal scores higher than 11; and tolerance scores higher than 13. Probable Internet addiction was defined by the presence of one of the following: a total score between 48 and 52, adaptive functioning scores higher than 15, withdrawal scores higher than 10, or tolerance scores higher than 12. In this study, both definite and probable Internet addicts were included in the problematic Internet-use group.

2.2.3. Covariates

Sociodemographic variables included gender, age, place of residence (name of city), and residential type (residence with family, with relatives, with friends, alone, dormitory, or residence in a facility), perceived family economic status, and perceived academic performance. Places of residence were classified into large city, small city, and rural area, and residential type was dichotomized as residence with vs. without family. Perceived family economic status and perceived academic achievement were assessed using a 5-point Likert scale (high, high-middle, middle, low-middle, and low) and further classified into three groups: high, middle(including high-middle, middle, and low-middle), and low.

The frequency of moderate-intensity physical activity (PA) was assessed with the following question: "In the last week, on how many days did you engage in 60 min or more of physical activity that increased your heart rate or breathing rate (e.g., cycling at a regular pace, carrying light loads, or playing doubles tennis)?" The frequency of vigorous-intensity PA was assessed with the following question: "In the last week, on how many days did you engage in 20 min or more of physical activity that was so vigorous it left you soaked with perspiration or breathless (e.g., digging, aerobics, heavy lifting, or fast cycling)?" The response options ranged from 1 (*none*) to 6 (*more than 5 days per week*). The two criteria used for classification as physically active were a) moderate activity at least 5 days per week, and b) vigorous activity at least 3 days per week (IPAQ Reserach Committee, 2005).

The level of sleep satisfaction was measured with the following question: "In the last week, how satisfactory was your sleep in terms of relieving your fatigue?" The response options were very satisfactory (1), satisfactory (2), average (3), unsatisfactory (4), and very unsatisfactory (5). On the basis of the responses, participants were classified into the following three groups: satisfactory (1–2), average (3), and unsatisfactory (4–5). The level of perceived stress was measured with the