Risk and Protective Factors of Internet Addiction: A Meta-Analysis of Empirical Studies in Korea

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Purpose: A meta-analysis of empirical studies performed in Korea was conducted to systematically investigate the associations between the indices of Internet addiction (IA) and psychosocial variables. **Materials and Methods:** Systematic literature searches were carried out using the Korean Studies Information Service System, Research Information Sharing Service, Science Direct, Google Scholar, and references in review articles. The key words were Internet addiction, (Internet) game addiction, and pathological, problematic, and excessive Internet use. Only original research papers using Korean samples published from 1999 to 2012 and officially reviewed by peers were included for analysis. Ninety-five studies meeting the inclusion criteria were identified. **Results:** The magnitude of the overall effect size of the intrapersonal variables associated with internet addiction was significantly higher than that of interpersonal variables. Specifically, IA demonstrated a medium to strong association with "escape from self" and "self-identity" as self-related variables. "Attention problem", "self-control", and "emotional regulation" as control and regulation-relation variables; "addiction and absorption traits" as temperament variables; "anger" and "aggression" as emotion and mood and variables; "negative stress coping" as coping variables were also associated with comparably larger effect sizes. Contrary to our expectation, the magnitude of the correlations between relational ability and quality, parental relationships and family functionality, and IA were found to be small. The strength of the association between IA and the risk and protective factors was found to be higher in younger age groups. **Conclusion:** The findings highlight a need for closer examination of psychosocial factors, especially intrapersonal variables when assessing high-risk individuals and designing intervention strategies for both general IA and Internet game addiction.

Key Words: Internet addiction, meta-analysis, risk factors, protective factors, psychological variables

INTRODUCTION

The prevalence of Internet addiction in Korea is markedly high, ranging from 4.9% to 10.7%.[1,2] Within recent decades, Internet addiction has emerged as a serious public health issue in Korea. Thus, there is an urgent need to gain a comprehensive un-

derstanding of this phenomenon and to develop effective strategies for both prevention and intervention. Effective prevention and intervention requires a conceptual model that connects risk and protection factors, mediating processes, and maladaptive behaviors. To date, a number of risk and protective factors that contribute to the development and maintenance of Internet addiction have been identified. Despite a growing number of empirical investigations, theoretical models of Internet addiction have been slow to develop. Some attempts[3-6] have been made to explain Internet addiction by appealing to either intrapersonal or interpersonal perspectives: the intrapersonal perspective focuses on the individual's internal characteristics, such as temperament, self-esteem, negative emotions, etc.; while the interpersonal perspective emphasizes social support, peers, and parent-child relationships.[7] Davis,[8] one of the first proponents of theoretical models, assumed that maladaptive cognitions (e.g., rumination, self-doubt, and negative self-appraisal) play a central role in pathological Internet use. There has also been a focus on intrapersonal characteristics (e.g., vulnerability) as factors in Internet addiction. For example, several studies[9-14] have argued that people who experience low self-esteem or identity problems may become addicted to the Internet because they use it as a means to compensate for deficits in those areas. Some researchers have explored whether negative emotions such as depression,[15-18] anxiety,[18] loneliness,[19-21] and aggression/hostility[22-24] have a significant role in the development of Internet addictions. There is strong evidence that symptoms of depression are strongly associated with Internet addiction, and that individuals who have increased levels of depression are more susceptible to becoming addicted to the Internet.[15-18] In addition, several studies have reported positive associations between personality characteristics and temperament (e.g., introversion[25] and impulsivity/sensation seeking[26-29]) and Internet addiction. Control problems related to attention problem[24,30] and self-regulation[31] may be important variables as well.

By contrast, other researchers have explained Internet addiction in terms of interpersonal difficulties. From this perspective, the online space functions as a substitute for an unmet need for an actual relationship. In other words, the online space provides a rewarding sense of belonging, warmth, and well-being. Moreover, research has indicated that interpersonal problems such as social anxiety/shyness[19,24,32] and poor social competence[23,32-34] are positively correlated with Internet addiction. In fact, Internet addicts exhibit higher rates of conflict with their parents,[35] report dysfunctional communication with their parents, and experience higher levels of familial conflict[1,36] than non-addicts. Thus, the interpersonal perspective highlights the roles of family dynamics, interpersonal factors, and developmental factors in the explanation of an adolescent's Internet addiction.

Although a number of studies have examined the features that make participants more vulnerable to developing an Internet addiction, these studies have not included a comprehensive list of the characteristics that could contribute to Internet addiction. In addition, not all of the potentially relevant psychosocial characteristics can be identified or incorporated into a single study. The establishment of a basic theoretical framework for the examination of the relative contributions of the psychosocial antecedent factors that predict Internet addiction requires an empirical synthesis of the literature. Thus, the present study aimed to document the relative strengths of the associations between Internet addition and various psychosocial variables via meta-analytic techniques. In particular, given the high volume of research that has been conducted on this topic in Korea, it will be valuable to have more broad-based quantitative estimates of the effect sizes associated with the various possible risks and protective factors of Internet addiction. It may be particularly worthwhile to analyze the results of empirical studies that have been conducted in Korea and have not had exposure in international journals. The present study also addressed the extent that intrapersonal and interpersonal variables contribute to Internet addiction. In the field of substance abuse, researchers have already used an integrated framework that includes both of these variables to explain substance-use behaviors.[37] However, no attempt has been made to compare intrapersonal variables with interpersonal variables in Internet addiction. Thus, the present study aimed to investigate the magnitude of the effect sizes of intrapersonal and interpersonal variables therein.

The final purpose of this study was to examine the effects of a moderator on associations between psychosocial variables related to Internet addition. With respect to psychosocial factors, there are several sources of variability: one example is related to the individual's age; research has not yet determined whether differences between psychosocial variables are related to age. However, there is some evidence that under similar levels of Internet usage (in terms of exposure, intensity, or duration), younger individuals may be more vulnerable to the negative consequences of Internet addiction than adults.[29] Furthermore, when individuals be-

gin to use Internet games at younger ages, they tend to show a higher rate of dependency on those games. Thus, in the current study, we examined whether there is a similar effect of age on the associations between psychosocial variables and Internet addiction.

Next, we examined whether the overall associations differ according to subtype of Internet addiction, specifically general Internet addiction versus Internet-game addiction. While Internet addiction is a broad concept that includes Internet chatting, shopping, and information searching, Internet-game addiction is associated with the compulsive playing of online games.[38] Internet-game addiction has received a relatively higher degree of media and academic attention than other types of Internet addiction because of the violent, destructive, and cruel content of many of the games and the increasing number of case reports of Internet-game copycat crimes in Korea. In addition, Internet addiction measures (including those for Internet-game addiction) are sometimes organized to suit a specific purpose or a specific population.[39] Therefore, it is both necessary and important to identify the distinctive factors that are associated with the Internet-game addiction subtype.

The primary aim of this meta-analysis is to evaluate the risk and protective factors associated with Internet addiction and to determine which of these factors are the most strongly correlated with Internet addiction in Korean subjects. Comparison between the intrapersonal and interpersonal variables on the magnitude of the effect size is also of major interest. The results of this analysis may promote better understanding of the characteristics of Internet addiction and may contribute to the development of effective treatment strategies. Second, potential moderators of the relationship between these psychosocial variables and Internet addiction are considered. Age was chosen as a sample-level moderator because of the implications for younger individuals and suggestions in the literature that there may be important differences in psychosocial factors related to age.[40] Finally, the subtype of addiction was chosen as a study-level moderator because there are different subtypes of Internet addiction. Differences in the strength of the associations according to age or the subtype of Internet addiction will have implications for understanding the age-specific (e.g., children versus adolescents versus adults) or medium-specific (e.g., general Internet addiction versus Internet-game addiction) correlates of Internet addiction. An increased understanding of these variables will enable interventions to be tailored to the needs of a specific population.

MATERIALS AND METHODS

Literature search

Two methods were used to locate studies for the meta-analysis. First, data from 1999 to 2012 were located by literature searches using the following databases: Korean Studies Information Service System, Research Information Sharing Service, Science Direct, and Google Scholar. The year 1999 was chosen as the starting year for the search because that is when active empirical inquiry into the psychological factors affecting Internet addiction first began. Although the clinical features of the behavioral problems related to Internet use have been described using diverse terminology (e.g., "Internet addiction,"[41] "pathological internet use,"[42] and "problematic Internet use"[43]), there is general acknowledgement among researchers that there are four components involved: 1) compulsive use, which often associated with a loss of a sense of time, or a neglect of basic drives; 2) withdrawal, which is indicated by anxiety-like symptoms, elevated irritability, anger and physical protestations, and depression when forced to discontinue or decrease Internet usage; 3) tolerance that necessitates the need for better equipment, more software, or more usage hours; and 4) negative repercussions, which includes arguments, lying, poor achievement, social isolation, and fatigue.[43,44] In this study, the terms "Internet addiction" and "pathological Internet use" are used interchangeably to denote the phenomena of compulsive Internet use, withdrawal, tolerance, and impaired social and psychological functioning. Therefore, the following key words were entered into the search databases separately and in combination: *Internet addiction, game addiction, pathological Internet use, problematic Internet use, excessive Internet use,* and *Internet game addiction*. Second, the references of the retrieved articles and book chapters were manually searched. Additional searches for unpublished studies were not conducted.

Inclusion and exclusion criteria

All the retrieved studies were screened according to five inclusion criteria: 1) an original, published research paper that has undergone peer review (selection of methodologically valid studies that have been confirmed through the peer-review process is crucial in increasing the reliability of the interpretation of meta-analytic results, despite any concern regarding publication biases); 2) the study participants ranged in age from 7 (elementary school students) to 60 (adults)

years; 3) the presence of at least one psychosocial factor for Internet addiction (either risk or protective); 4) use of an acceptable definition of Internet addiction (i.e., either using adapted DSM-IV criteria for pathological gambling or substance abuse, or employing a cutoff point on a psychometrically standardized Internet addiction rating scale); and 5) the inclusion of enough information (e.g., correlation, t-value, n, F-value, *p*-value) to permit a calculation of effect size. When any of this information was missing, the study was excluded. Master's theses and doctoral dissertations were not included unless they were published in academic journals and underwent peer review.

Among the 163 studies originally identified from the literature search, 68 were excluded due to failure to meet the inclusion criteria. Articles were excluded because they were reviews of already published research and not new empirical studies (n=6), included preschool children (n=6), did not include any psychosocial factors for Internet addiction (n=34), did not use a psychometrically standardized Internet addiction measure (n=2), did not present the statistical estimates necessary for calculating effect sizes (n=17), or were not available (n=3). In total, 95 studies met the criteria for inclusion in the meta-analysis, of which 54 (56.8%) were related to Internet addiction, 41 (43.2%) were related to game addiction, 89 (93.6%) were published in a Korean journal, and 6 (6.4%) were published in an international journal.

Coding of study variables
Studies were initially identified and coded by the first author. For reliability, five Master's-level psychology graduate students independently coded each article. Discrepancies were resolved by consensus between the first author and the five students. The kappa coefficient between the initial and subsequent coding was 0.64–1.00.

Key variables and sub-variables
In total, 47 variables were retrieved from the 95 studies. A coding frame was used to categorize these variables into nine key variables that were based on the categorization of previous studies.[45,46] However, self-related variables were further sub-divided into self, emotion, temperament, and control/regulation-related variables. Among the nine key variables, six variables (self, emotion, control/regulation, temperament/personality, stress coping, and school functioning) were designated as "intrapersonal variables" and the remaining three (relational ability/quality, parent relationship, and family functioning) were designated as "inter-

personal variables," in accordance with previous studies.[7,37]

At the final step, all the variables were classified as either a risk or protective factor. Risk factors were defined as variables that were associated with an increased risk of Internet addiction.[47] Thus, the direction of the correlation between the risk factors and pathological Internet use was positive. By contrast, protective factors were defined as variables that prevent or reduce vulnerability of the development of Internet addiction.[47] Thus, the direction of the correlation between the protective factors and pathological Internet use was negative.

The nine broad categories (key variables) of risk and protective factors included in the meta-analysis were 1) self-related, 2) emotion/mood-related, 3) control/regulation-related, 4) temperament/character related, 5) stress/coping, 6) school functioning, 7) relational ability/quality, 8) parent relationship, and 9) family functioning.

Measures
The measures of Internet addiction varied across the studies. Because the Internet Addiction Test (IAT) was the first validated instrument to assess Internet addiction and it has been translated and validated using a Korean sample, it has been used widely in Korea; 49 studies in our meta-analysis used it. Given that many different screening instruments have been developed and validated in Korea over the last decade, we also included studies that used new measures, such as the K-scale and the Internet Addiction Scale for Korean Adolescents. Young's IAT,[42] the K-scale,[48] and Lee, et al.'s[49] scale for measuring the behavioral symptoms of adult pathological internet use were included as measures of Internet addiction. The game addiction measures were relatively diverse and included the game addiction version of the IAT, the game addiction version of the K-scale, the Internet Game Addiction Scale,[50] the Internet Addiction Scale for Korean Adolescents,[51] the Maladaptive Game Use Scale,[52] Pathological Online Game Use Scale,[31] the Internet Addiction Index,[53] and the child version of the K-Scale.[54] Variability in the measurement of Internet addiction across studies makes it necessary to determine whether these different measures can be reliably combined. Fortunately, accumulated evidence suggests that these measures are highly correlated with those widely used. The substantial associations found between the Internet addiction measures used by our included studies suggest that the current study's dependent variables are likely to be reliable. In addition, the reliability of the Korean version of the Internet addiction

measures was greater than r=0.72.[31,43,49-53] This is important because low reliability would have reduced the strength of the correlations between the psychosocial variables and Internet addiction, thereby undermining the validity of the accumulated findings across studies.

Moderators

Sample-level and study-level characteristics were examined as potential moderators of the association between psychological factors and internet addiction.

Age

Age was represented as a categorical moderator at three levels: 1) children 7–12 years old (i.e., elementary school students); 2) adolescents 13–18 years old (i.e., middle and high school students); and 3) adults 19 years or older (i.e., university/college and above).

Type of addiction

Internet addiction type was coded as either general Internet addiction or Internet-game addiction.

Meta-analytic procedures

Effect sizes

The measure used for effect size was the weighted average of the sample correlation, the r statistic (range=-1.0–1.0). When not directly presented, correlations or t statistics were calculated from other statistics using methods suggested by Rosenthal.[55] Computation of an average correlation requires transformation of that correlation from each relevant hypothesis into Fisher's z and the weighting of this value by the sample size. In this way, correlations based on larger samples receive greater weight than those based on smaller samples. The average z value is then back-transformed to give r_+.[56] Similarly, a 95% confidence interval (CI) was computed for the population z value that was then transformed to a 95% CI for the average correlation. No outliers were removed prior to conducting the meta-analysis to avoid any potential overcorrection of sampling errors.

Homogeneity analysis

Homogeneity analyses were conducted using the chi-square statistic[57] to determine whether the variation found among the correlations was the result of chance. The degrees of freedom for the chi-square test are k-1, where k is the number of independent correlations. An insignificant chi-square

value indicates that the correlations are homogeneous and the average weighted effect size, r_+, represents the population effect size. In this case, estimates from a fixed-effects model were used. By contrast, a significant chi-square value indicates that the correlations are heterogeneous and a random-effects model can be used. Thus, we used a random effects model that calculated the error term on the basis of both within- and between-study variability and assumed that the individual studies originated from different populations with varying effect sizes.[58] By contrast, a fixed effects model assumes a common underlying effect for each study.[58] In sum, when homogeneity could be assumed, estimates from a fixed-effects model were used; when homogeneity was rejected, the estimates from a random-effects model were used and an additional analysis was conducted.

Moderator analysis

The effect-size homogeneity was evaluated using the Q_{within} (Q_w) statistic.[56] When the hypothesis of homogeneity was rejected, moderators were examined to explain the heterogeneity among the effect sizes. We tested the study- and sample-level moderator variables using Comprehensive Meta-Analysis (Version 2) with a mixed-effects model and a p=0.05 level of significance for the $Q_{between}$ (Q_b) statistic.

The effect sizes were gauged based on the guidelines by Cohen:[59] small (r=0.10), medium (r=0.30), and large (r=0.50).

RESULTS

Study characteristics

Table 1 summarizes the studies' characteristics. Overall, 95 studies yielded 445 effect sizes, with the sample size for each study ranging from 61 to 6499 ($median$=476). The aggregate number of individuals sampled was 59283. Approximately equal numbers of studies presented only risk-factor outcomes (12.5%) or only protective-factor outcomes (16%), whereas the remaining studies presented both types of outcomes (71.5%). All the studies were published in journals and utilized a cross-sectional design. In addition, all the studies reported participant samples of mixed socioeconomic status, and most used a normal school-based sample (95.8%). A majority of the studies (n=79, 83.2%) also presented effect sizes separately for both sexes, although some (n=16, 16.9%) presented the effect size for only boys (n=11, 11.6%) or girls (n=5, 5.7%). Outcome effect sizes were assessed for sever-

Table 1. Summary of Studies Included in the Meta-Analysis (n=95)

Study	n	Sample type*	Age[†]	Gender[‡]	Type	Addiction Measure[§] (cronbach's α)	Source[∥]
Hong (1999)[75]	992	1	4	3	Internet	1 (0.74)	1
Lee and Kwon (2001)[76]	189	1	3	3	Game	4 (0.80)	1
Kim and Cho (2002)[77]	650	1	5	3	Internet	1 (0.90)	1
Oh and Woo (2005)[78]	450	1	1	3	Game	7 (0.85)	1
Kim and Kim (2003)[79]	111	1	2	3	Internet	1 (0.91)	1
Bang and Cho (2003)[80]	719	1	7	3	Game	4 (0.83)	1
Byeon, et al. (2003)[81]	226	1	4	3	Internet	2 (0.95)	1
Lee (2003)[82]	739	1	1	3	Game	4 (0.90)	1
Lee (2003)[83]	388	1	5	3	Game	4 (0.91)	1
Jo and Bang (2003)[84]	223	1	7	3	Game	4 (n.a.)	1
Kwon and Kim (2004)[85]	601	1	1	3	Game	4 (0.86)	1
Ryu, et al. (2004)[86]	1670	1	3	3	Internet	1 (0.92)	1
Lee (2004)[87]	505	1	1	1	Game	4 (0.91)	1
Lee and Chang (2004)[88]	700	1	4	3	Game	4 (0.91)	1
Kang (2005)[89]	592	1	4	3	Internet	1 (n. a.)	1
Kim and Chong (2005)[90]	642	1	1	1	Internet	1 (0.91)	1
Yoon and Lee (2005)[91]	360	1	2	2	Game	4 (0.92)	1
Lee and Jeong (2005)[92]	272	1	1	3	Game	4 (0.90)	1
Lim, et al. (2005)[93]	550	1	5	3	Internet	1 (0.88)	1
Jang (2005)[94]	476	1	2	2	Game	6 (0.92)	1
Ha and Lee (2005)[95]	235	1	5	3	Internet	1 (0.93)	1
Kwon (2005)[96]	1279	1	2	3	Game	4 (0.93)	1
Kim and Boo (2007)[97]	950	1	5	3	Game	4 (0.91)	1
Jeon and Seo (2006)[98]	452	1	5	3	Internet	1 (0.88)	1
Yoon and Park (2006)[99]	1328	1	1	3	Internet	1 (0.91)	1
Lee and Chae (2006)[100]	150	1	3	1	Game	4 (0.82)	1
Lee, et al. (2012)[101]	259	1	3	1	Internet	1 (0.90)	1
Jeon (2006)[102]	104	1	4	3	Internet	1 (0.87)	1
Kim, et al. (2007)[103]	761	2	5	3	Internet	1 (0.93)	1
Kim, et al. (2007)[104]	659	1	1	3	Internet	1 (0.66)	1
Kim, et al. (2007)[105]	990	1	1	3	Internet	2 (0.93)	1
Kim, et al. (2007)[106]	357	1	2	1	Game	1 (0.78–0.87)	1
Suh and Lee (2007)[107]	350	1	4	3	Internet	1 (0.92)	1
Shin, et al. (2007)[108]	334	1	1	1	Game	3 (0.93)	1
Oh (2007)[109]	405	1	3	3	Internet	1 (0.92)	1
Jang and Lee (2007)[110]	754	1	1	3	Game	6 (0.92)	1
Joo (2007)[111]	428	1	2	3	Game	4 (0.81)	1
Han and Kim (2007)[112]	230	1	4	3	Game	4 (0.90)	1
Kang (2008)[113]	255	1	1	3	Internet	1 (0.89)	1
Kweon and Kweon (2008)[114]	746	1	1	3	Game	5 (0.92)	1
Kim (2008)[115]	297	1	2	3	Internet	1 (0.89)	1
Boo and Kweon (2008)[116]	612	1	2	3	Game	4 (0.90)	1
Son (2008)[117]	777	1	2	3	Game	3 (0.93)	1
Han and Ahn (2008)[118]	518	1	6	1	Internet	2 (0.90–0.94)	1
Kwon and Lee (2009)[119]	251	1	2	2	Internet	2 (0.98)	1
Kim (2009)[120]	1060	1	5	3	Internet	1 (0.82)	1
Kim (2009)[121]	226	4	8	3	Internet	2 (0.93)	1
Kim and Kim (2009)[122]	739	1	1	3	Internet	2 (0.92)	1
Nam (2009)[123]	453	1	4	3	Internet	2 (0.87)	1
Park, et al. (2009)[124]	950	1	5	3	Internet	2 (0.95)	1
Park and Kim (2009)[125]	484	1	3	1	Internet	2 (0.94)	1

Table 1. Continued

Study	n	Sample type*	Age[†]	Gender[‡]	Type	Addiction Measure[§] (cronbach's α)	Source[‖]
Park (2009)[126]	304	1	2	3	Internet	1 (0.80)	1
Baek (2009)[127]	668	1	1	1	Game	3 (0.94)	2
Shin, et al. (2009)[128]	524	1	5	2	Game	9 (0.87)	1
Ahn, et al. (2009)[129]	677	1	2	3	Internet	2 (0.95)	1
Yoon and Nam (2009)[130]	2495	1	6	3	Internet	1 (0.89)	1
Lee, et al. (2009)[131]	404	1	1	3	Game	4 (0.92)	1
Pyo and Rhh (2009)[132]	570	1	5	2	Internet	2 (0.89)	1
Han and Wang (2009)[133]	622	1	5	3	Game	5 (0.95)	2
Kang and Lee (2010)[134]	930	1	2	1	Game	7 (0.92)	1
Kwon and Jang (2010)[135]	186	3	1	3	Internet	2 (0.98)	1
Kwon (2010)[136]	2197	1	5	3	Game	3 (0.93)	1
Kim (2010)[137]	272	1	3	3	Internet	2 (0.92)	1
Kim and Kim (2010)[138]	292	1	4	3	Internet	1 (0.90)	1
Kim, et al. (2010)[139]	750	1	4	3	Internet	2 (0.93)	1
Seo and Lim (2010)[140]	119	1	1	3	Game	11 (0.87)	2
Song (2010)[141]	825	1	2	3	Game	5 (0.95)	1
Shin and Lee (2010)[142]	400	1	2	3	Internet	2 (0.95)	1
Lee and Han (2010)[143]	61	1	2	3	Internet	2 (n. a.)	1
Jang (2010)[144]	167	2	5	3	Internet	2 (0.85)	2
Cho and Jang (2010)[145]	454	1	5	3	Game	5 (0.96)	1
Cho and Lim (2010)[146]	612	1	5	3	Game	4 (0.92)	1
Choi and Moon (2010)[147]	316	1	1	3	Game	5 (0.72–0.88)	1
Choi and An (2010)[148]	313	1	5	3	Game	6 (0.94)	1
Kwon and Jung (2011)[149]	133	1	2	1	Game	5 (0.85)	1
Kim and Chang (2011)[150]	470	1	4	3	Internet	1 (0.90)	1
Kim, et al. (2011)[151]	175	1	1	3	Internet	2 (0.90)	1
Kim, et al. (2011)[152]	709	1	5	3	Game	4 (0.94)	1
So, et al. (2011)[153]	203	1	5	3	Internet	1 (0.91)	1
Yang and Jo (2011)[154]	580	1	1	3	Internet	2 (0.88)	1
Lee, et al. (2011)[155]	203	1	5	3	Internet	2 (0.91)	1
Chang, et al. (2011)[156]	331	1	4	3	Internet	3 (0.91)	1
Cho (2011)[157]	6499	1	5	3	Internet	2 (0.80–0.89)	1
Jo (2011)[158]	597	1	1	3	Internet	1 (0.91)	1
Kim and Ha (2011)[159]	242	1	4	3	Internet	1, 2 (0.86)	1
Choi, et al. (2011)[160]	283	1	5	3	Internet	2 (0.94)	1
Hwang and Park (2011)[53]	300	1	4	3	Game	10 (0.81)	1
Kim (2012)[161]	606	1	2	3	Game	8 (0.95)	1
Yun, et al. (2012)[162]	71	1	2	3	Game	5 (0.96)	1
Park, et al. (2008)[1]	903	1	5	3	Internet	1 (0.88)	1
Yoo, et al. (2004)[163]	535	1	1	3	Internet	1 (0.92)	2, 3
Ha, et al. (2007)[15]	452	1	3	3	Internet	1 (0.92)	1
Kim, et al. (2006)[17]	1573	1	3	3	Internet	1 (0.80)	1
Kwon, et al. (2011)[3]	1136	1	2	3	Game	4 (0.80)	1
Seo, et al. (2009)[4]	676	1	2	3	Internet	2 (0.93)	1

*Sample type: 1, school-based; 2, community-based; 3, psychiatric-based; 4, probation center-based, random sample.
[†]Age: 1, elementary student; 2, middle school student; 3, high school student; 4, above university/college student; 5, middle and high school student; 6, above high school student; 7, elementary to high school student; 8, above middle school student.
[‡]Gender: 1, male only; 2, female only; 3, female and male.
[§]Addiction measure: 1, Internet Addiction Test (IAT[42]); 2, the K-scale[48]; 3, Internet Game Addiction Diagnostic Scale[49]; 4, game addiction version of the IAT[42]; 5, game addiction version of the K-scale[48]; 6, the Internet Game Addiction Scale[50]; 7, the Internet Addiction Scale for Korean Adolescent[51]; 8, the Maladaptive Game Use Scale[52]; 9, the Pathological Online Game Use scale[31]; 10, the Internet Addiction Index[53]; 11, the child version of the K-Scale (2011)[54].
[‖]Source of information: 1, self; 2, parent; and 3, teacher.

al age groups: elementary school students (n=23, 24.2%), middle school students (n=21, 22.16%), high school students (n=9, 9.5%), and adults (n=14, 14.7%). Some studies utilized mixed samples: 23 (24.72%) examined subjects from middle and high school, and 5 (5.7%) used an alternative sample type. The 15 effect sizes from these latter five were excluded from the age moderator analysis. Various Internet addiction severity measures were used across the studies. Young's IAT was used in 49 studies (Internet addiction: 29 studies; game addiction: 20 studies) and the K-Scale was used in 30 studies (Internet addiction: 23 studies, game addiction: 7 studies). A number of other measures were used in the 16 remaining studies. All the studies relied on self-report, except for five that were based on parent and teacher reports.

Overall estimates

The magnitude of the overall effect size for risk factors associated with Internet addiction was $r=0.26$ [$CI_{95}=0.24, 0.27$, $Q_w (189)=2133.45$, $p<0.001$] and that for the protective factors was $r=-0.20$ [$CI_{95}=-0.22, -0.19$, $Q_w (254)=2608.72$, $p<0.001$]. The effect size ($r=0.26$) for the risk factors was significantly higher than that ($r=0.20$) for the protective factors [$Q_b (1)=1266.10$, $p<0.001$], although both are considered small to medium based on Cohen's guidelines. On the other hand, the correlation between Internet addiction and the risk factors showed heterogeneity, as indicated by the Q test. The presence of significant heterogeneity indicates that one should be careful when generalizing the results of a fixed-effects model. When using the random-effects model, the effects of all moderators, including the sub-variables Internet-addiction type and age, were significant, and the indicators of both the risk and protective factors yielded a significant within-class effect. Thus, an additional analysis

was conducted for correlation coefficients for the intrapersonal versus interpersonal variables.

Intrapersonal vs. interpersonal variables

Table 2 shows the comparative effect sizes for intrapersonal and interpersonal variables and both risk and protective factors. For risk variables, the magnitude of the overall effect size for intrapersonal variables ($r=0.28$) associated with Internet addiction approached the medium level and was significantly higher than that for the interpersonal variables [$r=0.21$, $Q_b (1)=12.82$, $p<0.001$]. This result was consistent with that for the protective factors; the effect size for the intrapersonal variables ($r=-0.22$) related to protective factors was also higher than that for interpersonal variables [$r=-0.18$, $Q_b (1)=6.65$, $p<0.01$], although both were far below the medium level.

All of the indicators yielded a significant within-classes effect, so an additional analysis of the weighted average correlation of the key variables was conducted. In addition, as a result of the Q test for homogeneity, a further subset analysis on the 47 sub-variables was conducted.

Risk factor estimates

Table 3 presents the average corrected effect-size statistics for the nine key variables related to risk factors for Internet addiction.

Among the intrapersonal variables, the self-related variables were the strongest risk factors for Internet addiction, with effect sizes in Cohen's medium range.[59] The effect sizes for the self-variables showed significant variance [$Q_w (12)=58.30$, $p<0.001$]. A key outcome in the additional analysis of the self-related variables revealed that the "escape from self" variable was the strongest risk factor ($r=0.42$) and showed homogeneous effects. The "attention problem" vari-

Table 2. Comparison of Effect Sizes between Intrapersonal and Interpersonal Variables of Risk and Protective Factors

	k_s	R	95% CI	$Q_w (df)$	$Q_b (df)$
Risk factors					
Intrapersonal variables	120	0.28	[0.26, 0.30]	1131.04 (119)[†]	12.82 (1)[†]
Interpersonal variables	70	0.21	[0.18, 0.24]	674.74 (68)[†]	
Total	190	0.26	[0.24, 0.27]	2133.45[†]	
Protective factors					
Intrapersonal variables	119	-0.22	[-0.25, -0.20]	1680.63 (118)[†]	6.65 (1)*
Interpersonal variables	136	-0.18	[-0.20, -0.16]	902.13 (135)[†]	
Total	255	-0.20	[-0.22, -0.19]	2608.72[†]	

CI, confidence interval.
*$p<0.01$.
[†]$p<0.001$.

Table 3. Weighted Average Correlations and Homogeneity Analysis for the Risk Factors

Risk factors	k_s	R	95% CI	Q_w (df)	Q_b (df)
Intrapersonal variables					
Self	18	0.31	[0.28, 0.34]	58.30 (12)‡	224.00 (4)‡
(Virtual) self-efficacy	5	0.17	[0.07, 0.26]	27.06 (4)‡	
(Virtual) self-esteem	1	0.22	[0.09, 0.34]	-	
Escape from self	7	0.42	[0.38, 0.46]	19.15 (6)	
Self-discrepancy	4	0.19	[0.12, 0.26]	12.09 (3)†	
Masking	1	0.23	[0.11, 0.34]	-	
Emotion/mood	66	0.27	[0.25, 0.30]	513.12 (63)‡	35.64 (2)‡
Depression/anxiety	43	0.26	[0.23, 0.29]	270.75 (42)‡	
Anger/aggression	19	0.34	[0.28, 0.40]	228.43 (18)‡	
Loneliness	4	0.20	[0.03, 0.35]	13.93 (3)†	
Control/regulation	3	0.30	[0.22, 0.38]	4.51 (2)	-
Attention problems	3	0.30	[0.22, 0.38]	4.51 (2)	
Temperament/character	28	0.28	[0.23, 0.33]	267.72 (25)‡	6.87 (1)†
Impulsive/novelty seeking	22	0.28	[0.23, 0.33]	240.84 (21)‡	
Addictive/absorption	3	0.30	[0.12, 0.47]	18.72 (2)‡	
Harm avoidant/dependent	3	0.28	[0.17, 0.39]	8.16 (2)*	
Stress coping	5	0.27	[0.23, 0.31]	9.28 (4)	-
Negative stress coping	5	0.27	[0.23, 0.31]	9.28 (4)	
Interpersonal variables					
Relational ability/quality	24	0.17	[0.13, 0.20]	89.44 (19)‡	41.21 (4)‡
Social anxiety/avoidance	10	0.21	[0.15, 0.26]	34.59 (9)‡	
Problematic peer relationships	9	0.27	[0.19, 0.37]	49.10 (8)‡	
Unstable peer attachments	2	0.15	[0.13, 0.30]	3.95 (1)*	
(Virtual) social efficacy	1	0.06	[0.01, 0.12]	-	
(Virtual) social presence	2	0.17	[0.05, 0.29]	1.80 (1)	
Parent relationship	39	0.20	[0.16, 0.23]	445.06 (35)‡	23.62 (3)‡
Negative parenting attitude	14	0.21	[0.14, 0.27]	135.50 (11)‡	4.40 (2)
Unspecified	8	0.20	[0.18, 0.23]	126.79 (7)‡	
Mother	3	0.18	[0.13, 0.24]	4.05 (2)†	
Father	3	0.25	[0.20, 0.31]	4.66 (2)†	
Dysfunctional communication	15	0.27	[0.20, 0.34]	271.54 (13)‡	0.21 (1)
Mother	9	0.27	[0.18, 0.37]	163.69 (8)‡	
Father	6	0.27	[0.15, 0.38]	107.85 (5)‡	
Parental Internet use control	8	0.13	[0.06, 0.20]	33.37 (7)‡	
Unstable parent attachment	2	0.09	[-0.05, 0.22]	0.05 (1)	
Family functioning	7	0.22	[0.10, 0.33]	64.51 (6)‡	-
Family conflict/discord	7	0.22	[0.10, 0.33]	64.51 (6)‡	

CI, confidence interval.
*$p<0.05$.
†$p<0.01$.
‡$p<0.001$.

able in the control/regulation-variables category was also a strong risk factor ($r=0.30$). The variables temperament, emotion/mood, and stress/coping all had similar effect sizes that ranged from 0.27 to 0.28. The effect size for the addictive/absorption trait ($r=0.30$) was the strongest risk factor among the temperament/character variables. The effect sizes for impulsive/novelty seeking ($r=0.28$) and the depen-

dent/harm-avoidant ($r=0.28$) traits were also significant. The effect sizes for the emotion/mood key variables varied significantly [Q_w (63)=513.12, $p<0.001$]. The subset analysis for these variables indicated the highest effect size for the anger/aggression trait ($r=0.34$). Thus, anger/aggression is the most important risk factor in this group. The effect sizes for the variables in the depression/anxiety category

(r=0.26) also approached significance, with the exception of the loneliness variable (r=0.20). For the stress/coping variables, the negative stress coping trait (r=0.27) was significant.

The effect sizes for the interpersonal variables of relational ability/quality (r=0.17), parent relationship (r=0.20), and family functioning (r=0.22) were small and ranged from 0.17 to 0.22. Thus, these effect sizes were smaller than those of the intrapersonal variables. However, a detailed examination of the relational ability/quality key variables revealed that the problematic peer relationship variable had relatively significant small-to-medium effect sizes (r=0.27). Within the parent relationship set, the effect size for the dysfunctional communication variable approached significance (r=0.27), and the unstable parent attachment variable was the least associated with Internet addiction (r=0.09).

Protective factor estimates
The weighted average correlations and homogeneity analysis for the protective factors for the intrapersonal and interpersonal variables are presented in Table 4. The average corrected correlation for the protective factor of Internet addiction was r=-0.20 [CI95=-0.22, -0.19, Q (254)=2608.13, p<0.001], which is relatively smaller than that for the risk factors (Table 2). For the intrapersonal variables and similar to the results for risk factors, control/regulation (r=-0.33) was significant and the most important protective factor against Internet addiction. The effects of the other protective factors were small, with r=-0.11, -0.11, and -0.14 for emotion/mood, stress/coping, and temperament/character, respectively. Because there was a high degree of variability across the eight key variables, an additional subset analysis was conducted. For the control/regulation-related key variables, the estimates for emotional regulation (r=-0.38) and self-control (r=-0.31) exceeded the medium value. Among the self-variables, self-identity (r=-0.36) was the strongest protective factor against Internet addiction, indicating a substantially larger effect size than that of self-esteem (r=-0.19) and self-efficacy [r=-0.19; Q (2)=20.19, p<0.001]. In addition, the effect size for school adjustment within the school functioning variable was -0.33, indicating a strong association.

The magnitude of the effect size for the interpersonal variables relational ability/quality (r=0.17), parent relationship (r=-0.21), and family functioning (r=-0.17) as protective factors was small-to-medium. According to the subset analysis for the relational ability/quality variables, the effect siz-

es for sociability, social support, peer attachment and social efficacy respectively were -0.19, -0.15, -0.20, and -0.15, respectively, and did not significantly differ in magnitude [Q (3)=1.99, n.s.]. For the parent relationship variables, the effect size for parental supervision (r=-0.27) was quite strong (but is based on only three studies), compared to those for stable parental attachment (r=-0.22), positive parenting attitude (r=-0.18), and functional communication [r=-0.20; (Q (2)=6.51, p<0.05].

Effects of sample and study characteristics
We investigated whether the effect sizes associated with the risk and protective factors shown in Table 5 and 6 differed depending on the characteristics for which studies had been coded (i.e., whether these characteristics operated as moderator variables).

Sample-level moderator

Age
A detailed examination of the risk-factor effect sizes by age group is shown in Table 5. First, the effect sizes for the intrapersonal risk variables among elementary school students, middle and high school students, and college students and above were significantly associated with stronger effect sizes than those for children of younger ages [r=0.32 vs. 0.26, vs. 0.29; Q_b (2)=6.97, p<0.05]. Specifically, temperament/character (r=0.35 vs. 0.24, vs. 0.32), Q_b (2)= 10.91, p<0.05, and stress coping (r=0.31 vs. 0.26, vs. none), Q_b (1)=5.03, p<0.05, were significantly higher among elementary school students. Interestingly, there was a similar and strong effect size of temperament/character for the younger and adult age groups than the adolescent group. Nevertheless, there were no significant age differences in the association of interpersonal variables with Internet addiction in general, (r=0.24 vs. 0.19, vs. 0.17), Q_b (2)=3.25, n.s., although the effect size for parent relationship was significantly higher in the children age group than the other two (r=0.25 vs. 0.16, vs. 0.09), Q_b (2)=12.63, p<0.01.

Second, most of the effect sizes for the protective factors did vary with age, except for the parent relationship variable (r=-0.23 vs. -0.19, vs. -0.13), Q_b (2)=5.24, n.s., the family functioning variable (r=none vs. -0.19, vs. -0.07), Q_b (1)=1.15, n.s., and the school adjustment variable (r=-0.26 vs. -0.22, vs. none), Q_b (1)=0.22, n.s. Specifically, the intrapersonal protective factors that were significantly associated with stronger effect sizes for the younger age group were

self (r=-0.33 vs. -0.18, vs. -0.20), Q_b (2)=21.28, p<0.001, and control/regulation (r=-0.41 vs. -0.26, vs. -0.26), Q_b (2)=13.38, p<0.001, temperament (r=-0.42 vs. -0.18, vs. none),

Q_b (1)=25.08, p<0.001. Meanwhile, the effect size of stress/coping (r=-0.12 vs. -0.15, vs. -0.02), Q_b (2)=11.31, p<0.01, as a protective factor was significantly larger for adoles-

Table 4. Weighted Average Correlations and Homogeneity Analysis for the Protective Factors

Protective factors	k	r	95% CI	Q_w (df)	Q_b (df)
Intrapersonal variables					
Self	42	-0.20	[-0.25, -0.16]	633.56 (41)[‡]	20.19 (2)[‡]
Self-identity	4	-0.36	[-0.39, -0.32]	6.89 (3)	
Self-esteem	29	-0.19	[-0.25, -0.12]	470.76 (28)[‡]	
Self-efficacy	9	-0.19	[-0.26, -0.11]	62.97 (8)[‡]	
Emotion	2	-0.11	[-0.19, -0.02]	0.67 (1)	
Satisfaction/well-being	2	-0.11	[-0.19, -0.02]	0.67 (1)	
Control/regulation	30	-0.33	[-0.38, -0.27]	410.57 (28)[‡]	1.14
Self-control	28	-0.31	[-0.37, -0.25]	405.99 (27)[‡]	
Emotional regulation	2	-0.38	[-0.49, -0.26]	4.58 (1)*	
Temperament/character	10	-0.14	[-0.18, -0.09]	29.99 (7)[‡]	37.09 (2)[‡]
Positive characteristics/personality	8	-0.25	[-0.22, -0.15]	29.99 (7)[‡]	
Reward dependence	1	-0.04	[-0.13, 0.05]	-	
Persistence	1	-0.03	[-0.12, 0.06]	-	
Stress coping	18	-0.11	[-0.13, -0.09]	24.87 (15)*	35.10 (2)[‡]
Positive stress coping	9	-0.07	[-0.10, -0.04]	13.07 (8)	
Problem-solving ability	7	-0.20	[-0.25, -0.16]	11.71 (6)*	
Leisure activity/satisfaction	2	-0.10	[-0.12, -0.08]	0.11 (1)	
School Functioning	17	-0.26	[-0.34, -0.18]	168.17 (15)[‡]	22.22 (1)[‡]
School adjustment	4	-0.33	[-0.44, -0.22]	11.41 (3)[†]	
Academic efficacy	13	-0.20	[-0.31, -0.09]	156.75 (12)[‡]	
Interpersonal variables					
Relational ability/quality	65	-0.17	[-0.18, -0.15]	210.96 (61)[‡]	10.61 (3)*
Sociability	18	-0.19	[-0.22, -0.15]	63.90 (17)[‡]	
Social support	35	-0.15	[-0.18, -0.12]	111.68 (40)[‡]	1.99 (3)
Unspecified	10	-0.15	[-0.22, -0.08]	50.19 (9)[‡]	
Teacher	7	-0.15	[-0.22, -0.09]	22.72 (6)[†]	
Parent	9	-0.16	[-0.22, -0.11]	20.29 (8)*	
Peer	9	-0.14	[-0.18, -0.11]	14.58 (8)	
Peer attachment	2	-0.20	[-0.26, -0.14]	0.60 (1)	
Social efficacy	10	-0.15	[-0.22, -0.08]	37.01 (9)	
Parent relationship	57	-0.21	[-0.21, -0.16]	150.18 (44)[‡]	6.51 (2)*
Stable parent attachment	6	-0.22	[-0.27, -0.18]	9.35 (5)*	
Positive parenting attitude	14	-0.18	[-0.27, -0.08]	72.97 (11)[‡]	3.45 (2)
Unspecified	10	-0.19	[-0.23, -0.12]	104.81 (6)[‡]	
Mother	2	-0.18	[-0.26, -0.11]	5.68 (1)*	
Father	2	-0.15	[-0.32, -0.03]	-	
Functional communication	34	-0.20	[-0.22, -0.17]	135.45 (31)[‡]	2.16 (2)
Unspecified	19	-0.20	[-0.25, -0.14]	114.98 (18)[‡]	
Father	9	-0.20	[-0.24, -0.16]	15.60 (8)*	
Mother	6	-0.20	[-0.24, -0.17]	4.88 (5)	
Parental supervision	3	-0.27	[-0.34, -0.20]	7.36 (2)*	
Family functioning	14	-0.17	[-0.26, -0.07]	290.94 (13)[‡]	-
Family cohesiveness/intimacy	14	-0.17	[-0.26, -0.07]	290.94 (13)[‡]	

CI, confidence interval.
*p<0.05.
[†]p<0.01.
[‡]p<0.001.

Table 5. The Moderation Effect of Age on Effect Sizes of Risk and Protective Factors

	Elementary school student				Middle & high school student				Above college student				Q_b
	k	r	95% CI	Q_w	k	r	95% CI	Q_w	k	r	95% CI	Q_w	
Risk factors													
1§	2	0.36	[0.22, 0.49]	7.53†	11	0.21	[0.16, 0.35]	244.10‡	5	0.27	[0.20, 0.34]	17.35‡	1.51
2	17	0.31	[0.24, 0.37]	136.99‡	36	0.27	[0.23, 0.30]	315.41‡	11	0.29	[0.23, 0.35]	36.20‡	1.63
3	3	0.30	[0.22, 0.38]	4.51	-	-	-	-	-	-	-	-	-
4	8	0.35	[0.29, 0.41]	33.09‡	15	0.24	[0.17, 0.30]	126.50‡	4	0.32	[0.20, 0.43]	18.89‡	10.91*
5	3	0.31	[0.25, 0.36]	0.73	2	0.26	[0.06, 0.45]	3.52					5.03*
Intra total	33	0.32	[0.28, 0.36]	189.05‡	64	0.26	[0.23, 0.29]	735.93‡	20	0.29	[0.25, 0.33]	76.63‡	6.97*
7	8	0.22	[0.16, 0.85]	21.45†	10	0.23	[0.15, 0.31]	69.19‡	6	0.19	[0.09, 0.29]	30.02	0.34
8	19	0.25	[0.19, 0.30]	198.02‡	15	0.16	[0.12, 0.21]	121.15‡	2	0.09	[-0.05, 0.22]	0.05	12.63†
9	2	0.16	[0.08, 0.23]	1.35	4	0.19	[0.02, 0.35]	47.94‡	-	-	-	-	10.53
Intra total	29	0.24	[0.20, 0.28]	218.90‡	29	0.19	[0.15, 0.23]	309.70‡	8	0.17	[0.08, 0.26]	31.30‡	3.25
Total	62	0.28	[0.25, 0.31]	495.17‡	93	0.24	[0.21, 0.26]	1272.96‡	28	0.25	[0.21, 0.29]	171.38‡	5.64
Protective factors													
1	7	-0.33	[-0.37, -0.28]	16.62*	20	-0.18	[-0.22, -0.13]	117.28‡	13	-0.20	[-0.27, -0.13]	94.13‡	21.28‡
2	-	-	-	-	2	-0.11	[-0.19, -0.02]	0.67	-	-	-	-	-
3	10	-0.41	[-0.48, -0.39]	82.65‡	14	-0.26	[-0.33, -0.18]	169.96‡	5	-0.26	[-0.39, -0.12]	53.72‡	13.38‡
4	2	-0.42	[-0.47, -0.37]	0.08	8	-0.18	[-0.24, -0.11]	30.64‡	-	-	-	-	25.80‡
5	4	-0.12	[-0.17, -0.07]	3.62	12	-0.15	[-0.19, -0.10]	45.97‡	2	-0.02	[-0.08, 0.04]	0.00	11.31†
6	5	-0.26	[-0.35, -0.17]	16.02†	12	-0.22	[-0.35, -0.09]	165.25‡	-	-	-	-	0.22
Intra total	28	-0.32	[-0.37, -0.27]	258.47‡	68	-0.19	[-0.22, -0.16]	605.46‡	20	-0.20	[-0.26, -0.14]	185.50‡	19.73‡
7	19	-0.19	[-0.22, -0.16]	41.00‡	38	-0.15	[-0.18, -0.13]	128.71‡	7	-0.15	[-0.21, -0.08]	23.13‡	16.06†
8	24	-0.23	[-0.26, -0.19]	123.86‡	27	-0.19	[-0.22, -0.15]	122.28‡	4	-0.13	[-0.24, -0.02]	13.32†	5.24
9	-	-	-	-	11	-0.19	[-0.24, -0.15]	30.12†	1	-0.07	[-0.28, -0.06]	0.00	1.15
Intra total	43	-0.21	[-0.24, -0.19]	174.08‡	76	-0.17	[-0.19, -0.15]	289.73‡	12	-0.14	[-0.19, -0.09]	38.46‡	8.89*
Total	71	-0.25	[-0.28, -0.23]	-17.39	144	-0.18	[-0.20, -0.16]	896.85‡	32	-0.18	[-0.22, -0.14]	226.57‡	20.28‡

CI, confidence interval.
* $p<0.05$.
† $p<0.01$.
‡ $p<0.001$.
§1, self; 2, emotion; 3, control/regulation; 4, temperament; 5, stress/coping; 6, school adjustment; 7, relational ability/quality; 8, parent relationship; 9, family functioning; Intra, intrapersonal variables; Inter, interpersonal variables.

Table 6. The Moderation Effect of Type of Addiction on Effect Sizes of Risk and Protective Factors

	Internet addiction				Game addiction				Q_b
	k_s	R	95% CI	Q_w	k_s	r	95% CI	Q_w	
Risk factors									
1[§]	9	0.25	[0.15, 0.35]	155.14[‡]	9	0.29	[0.21, 0.37]	127.09[‡]	0.30
2	42	0.27	[0.23, 0.30]	331.90[‡]	24	0.31	[0.26, 0.35]	208.23[‡]	1.66
3	1	0.34	[0.26, 0.41]	-	2	0.28	[0.15, 0.40]	3.19	1.32
4	15	0.28	[0.22, 0.34]	114.27[‡]	13	0.28	[0.21, 0.35]	143.00[‡]	0.01
5	1	0.38	[0.18, 0.55]	-	4	0.27	[0.20, 0.34]	7.90*	1.14
Intra total	68	0.26	[0.23, 0.29]	612.72[‡]	52	0.30	[0.27, 0.34]	493.21[‡]	3.12
7	14	0.21	[0.15, 0.28]	100.86[‡]	10	0.23	[0.17, 0.28]	27.34[†]	0.08
8	25	0.23	[0.18, 0.28]	384.17[‡]	14	0.19	[0.14, 0.24]	76.60[‡]	1.07
9	5	0.25	[0.11, 0.38]	45.41[‡]	2	0.13	[-0.08, 0.33]	4.80*	0.98
Inter total	44	0.23	[0.18, 0.27]	380.56[‡]	26	0.18	[0.15, 0.22]	178.76[‡]	2.30
Total	112	0.25	[0.23, 0.27]	1120.66[‡]	78	0.26	[0.24, 0.29]	969.39[‡]	0.68
Protective factors									
1	27	-0.18	[-0.22, -0.14]	197.23[‡]	15	-0.25	[-0.32, -0.22]	92.25[‡]	3.35
2	-	-	-	-	2	-0.11	[-0.19, -0.02]	0.67	-
3	15	-0.29	[-0.38, -0.20]	265.63[‡]	15	-0.33	[-0.40, -0.26]	136.95[‡]	0.49
4	7	-0.17	[-0.25, -0.09]	27.72[‡]	3	-0.29	[-0.34, -0.25]	20.91[‡]	1.79
5	10	-0.09	[-0.13, -0.06]	22.93[†]	8	-0.19	[-0.25, -0.12]	20.46[†]	7.01[†]
6	6	-0.31	[-0.52, -0.06]	155.73[‡]	11	-0.20	[-0.27, -0.13]	34.57[†]	0.09
Intra total	65	-0.20	[-0.24, -0.16]	760.50	54	-0.26	[-0.29, -0.22]	556.39[‡]	4.09*
7	29	-0.15	[-0.18, -0.12]	133.77[‡]	36	-0.18	[-0.21, -0.16]	80.92[†]	3.09
8	35	-0.21	[-0.24, -0.17]	234.43[‡]	22	-0.19	[-0.21, -0.16]	55.83[‡]	0.85
9	10	-0.15	[-0.27, 0.02]	259.97[‡]	4	-0.20	[-0.25, -0.14]	3.87	0.45
Intra total	74	-0.17	[-0.19, -0.15]	373.83[‡]	62	-0.20	[-0.22, -0.18]	373.83[‡]	3.46
Total	139	-0.19	[-0.21, -0.16]	1896.93[‡]	116	-0.22	[-0.24, -0.20]	616.27[‡]	3.83

CI, confidence interval.
*$p<0.05$.
[†]$p<0.01$.
[‡]$p<0.001$.
[§]1, self; 2, emotion; 3, control/regulation; 4, temperament; 5, stress/coping; 6, school adjustment; 7, relational ability/quality; 8, parent relationship; 9, family functioning; Intra, intrapersonal variables; Inter, interpersonal variables.

cents than for any other age group.

On the other hand, relational ability/quality ($r=-0.19$ vs. -0.15, vs. -0.15), Q_b (1)=16.06, $p<0.01$, was the only interpersonal variable that showed significant differences among the age groups.

Study-level moderators

Internet addiction type
A detailed examination of the risk-factor effect sizes by study-level moderator is shown in Table 6. It is important to note that almost all the effect sizes for the risk factors did not vary according to the subtype of Internet addiction. Similarly, those for the protective factors did not vary by subtype. However, there was one exception: the stress/coping variable was significantly associated with a stronger effect size

for the Internet-game addiction measure ($r=-0.09$ vs. -0.19), Q_b (1)=7.01, $p<0.01$. The proposed effect of the measure type on the psychosocial factors of Internet addiction was not supported.

DISCUSSION

The present study sought to quantify the relationships between psychosocial factors and Internet addiction in Korean participants. The present meta-analysis included results from 95 articles and involved combined sample sizes that ranged from 61 to 6499 subjects, with 59283 in total. This large sample can provide a considerable empirical basis for determining the strongest risk and protective factors of Internet addiction.

The most noteworthy finding of the meta-analyses was that intrapersonal variables had medium-to-strong average correlations with Internet addiction, whereas interpersonal variables had small-to-medium average correlations. In addition, intrapersonal variables were statistically shown to have larger effects on Internet addiction than interpersonal variables. This indicates that Internet addiction in Korea is more strongly associated with intrapersonal stress and vulnerable traits than with interpersonal difficulties. In other words, incompetence or difficulties in dealing with developmental challenges such as real self-ideal self-discrepancy are more likely to predispose certain individuals to overuse and become addicted to the Internet rather than difficulties in dealing with interpersonal conflicts. It is likely that people become easily susceptible to Internet addiction when they suffer from distress and negative emotions associated with intrapersonal difficulties. This suggests that high-risk individuals can be identified by assessing intrapersonal vulnerabilities in developmental stages and can be prevented through therapeutic methods that target inner vulnerabilities.

The interpersonal variables for relational ability/quality, parent relationship, and family functioning were all below the medium level, contrary to prior studies that indicated interpersonal variables are critical factors in Internet addiction.[19,23,24,32-37] In particular, Korean researchers[60,61] have paid particular attention to the parent-child relationship as a strong predictor of Internet addiction because Korean parents' authoritarian style of child-rearing and lack of communication, influenced by Confucianism, have been discussed as a contributing factor to other adolescent behavioral problems. However, our meta-analysis demonstrated that the effect of interpersonal variables on Internet addiction is smaller than expected.

Each of the eight sub-intrapersonal variables among the risk and protective factors had effect sizes that can be characterized as medium to strong ($r \geq 0.30$) according to Cohen's guidelines.[59] First, as stated above, the "escape from self" variable appeared to have a homogeneous effect on addiction, and that effect was larger than that of the other self-related variables. This suggests that the tendency to "escape from the self" is a major factor in accounting for Internet addiction. Adolescence has been described as a period in which identity formation is a central developmental task. Achieving a sense of personal autonomy and an identity that is separate from the family is often distressful. Thus, adolescents who suffer from a great deal of distress when faced with a reality that does not meet their high expectations or ideals[3,62] could rigidly rely on the Internet in an attempt to eliminate their dissatisfaction or distress. Moreover, youths strive to find their authentic self by trying out different potential self-identities and by breaking their social inhibitions through use of the Internet. The Internet can be an inexpensive way of experimenting with various sides of the potential self and moving past the apprehension with the unidentified self. Thus, immediate reinforcement from an easily accessible space may make users preoccupied with receiving transient satisfaction from the virtual self, which may in turn lead to Internet addiction.[63] This may be a particularly important mechanism for Korean children and adolescents. Korean youngsters have been shown to be afflicted with an ideal-real self-discrepancy that arises from high expectations that are focused on academic success and the resulting negative self-evaluation and mood.[3]

Moreover, the greatest magnitude of negative effect size among the self-variables was for "self-identity," which indicates that awareness of one's unique identity functions as a strong protective factor against Internet addiction. Thus, youngsters who suffer from an identity crisis should be given more attention, whereas therapists and educators should focus on early prevention and intervention by promoting self-identity achievement.

Second, control/regulation-related variables also had stronger effect sizes than any other variables. Specifically, the magnitudes of the negative effects of both emotional regulation and self-control were stronger than the medium level as protective factors for these variables, whereas the average correlation for attention problems approached the medium size as risk factors. This suggests that increased self-control enables people to reasonably control their use of the Internet, thereby preventing its addictive potential. These results are also consistent with other findings indicating that Internet addicts are weaker at controlling their behaviors, impulses, or emotions than average Internet users.[9,61] In this regard, enhancing an individual's level of self-control should be considered as one essential intervention strategy. This may be related to the result that emotion clarity/regulation as a protective factor also showed a stronger effect size than any other variable. Emotional regulation is used to denote the various skills required for monitoring and managing one's experiences and expressions of, and responses to, emotions.[64] Thus, poor self-regulators may turn to the avoidant medium of the Internet. This avoidant coping strategy leads them into being trapped in a vicious circle of expo-

sure to a negative emotional state, which in turn leads to repetitive Internet use. Attentional control problems as a risk factor for Internet addiction also seems to be connected to the issue of self-control. Previous studies have suggested that poor neurocognitive skills in children with attention problems is an independent risk factor for substance-related disorders.[65] This is also true for youngsters with an Internet addiction. Children with an attention control problem may show deficiencies in strategic flexibility, planning, working memory, and the self-monitoring of behavior,[67,68] which may interfere with their effective control and regulation in terms of their Internet use.

Third, these results show that an individual's temperament and character are two of the major determinants in becoming addicted to the Internet. All of the obsessive/absorption, novelty seeking/impulsivity, and harm avoidant/dependent traits were shown to be important risk factors for Internet addiction. This was an expected result because novelty-seeking and obsessive traits are well-known risk factors for both substance addiction[69,70] and Internet addiction.[27,29] It is notable that a high level of the harm-avoidant/dependent trait has been suggested as another important risk factor by Korean researchers, and it has been shown to have a relatively higher effect on Internet addiction than other factors. This may indicate that users who have sensitive temperaments and a low threshold for external stimuli are more likely to become addicted to the Internet than other users in Korea.

Fourth, negative stress coping was associated with a large effect size. Specifically, non-addicted Internet users more frequently took part in various stress-releasing activities such as attendance at leisure or club activities, compared to their addicted counterparts.[71,72] In addition, adolescents appeared to be more vulnerable when they had fewer diverse stress coping strategies and, thus, inflexibly used the Internet as a means of stress release. Therefore, it is important to provide education about Internet addiction that encourages students to engage in alternative leisure activities and to develop alternative means stress reduction.

Finally, among the emotion/mood variables, anger/aggression appeared to have a substantial impact on Internet addiction, despite its heterogeneity. Anger/aggression has been shown to be associated primarily with substance addiction;[73] meanwhile, it has also been shown to be predictive of Internet addiction.[22,23] A possible explanation for the effect of negative emotions on Internet addiction is that the Internet can be used as an easily accessible alternative method to defuse

negative emotional states such as repressed anger, aggression, and hostility. This may be, at least in part, because the Internet is the only way to release latent aggressive impulses that are not acceptable in society but can be expressed in the online world.[74] The resultant temporarily "unplugged" emotional state becomes rewarding in itself, and, unfortunately, results in users becoming addicted to the medium.

The findings of this study are summarized as follows. First, the major factors accounting for Internet addiction were distress from identity struggles and a negative mood. These factors were also associated with a lack of a coping strategy that led the addicted individual to an avoidant method of stress management. That is, online activities allowed the individual to escape from self-dissatisfaction, relieve emotional distress, and deal with stress. Second, the next strongest risk factor was difficulty with control/regulation, including poor attention control, self-control, and emotional regulation. Third, the last set of psychosocial variables associated with Internet addiction comprised temperaments, such as the individual's impulsivity/novelty seeking, obsessive/absorption, and harm avoidant/dependent traits.

This meta-analysis showed that demographic characteristics may moderate the relationship between risk and protective factors and Internet addiction. The proposed effect of age on the psychosocial factors was partly supported: the associations for younger children were significantly higher than those for adolescents and adults for the intrapersonal variables. This is consistent with the notion that young people may be more vulnerable to the addictive aspects of the Internet than adults,[74] and that they may be more readily influenced by internal conditions because they are still experiencing brain development. By contrast, for the college-student group, temperament was the only variable that exceeded a medium effect size. This suggests that the tendency toward Internet addiction in adults is somewhat innate and habitually formed. Thus, it may be that adults do not become addicted to the Internet because they are vulnerable to psychosocial causes, but rather because they have a genetic predisposition toward addiction. In other words, it may be that younger people who are experiencing psychosocial distress are more likely to turn to the Internet use as an escape from reality, whereas older people who experience temperamental vulnerabilities are more likely to become addicted to Internet activities.

Within interpersonal variables as risk factors, we found that a parent/child relationship problem was more strongly correlated with Internet addiction among elementary school

students than it was for any other age group. This can be explained as follows. Losing a good relationship with a parent may be much more stressful and risky for individuals in their prepubescent years than during puberty or adulthood because young children have not yet completely separated from their parents psychologically or physically. In other words, at this age, they are still significantly influenced by their parents. Thus, a parental relationship problem could be a greater risk factor for Internet addiction among elementary school children than older children.

The hypothesis that there would be differences in psychosocial variables related to Internet addiction subtype was not supported. Some prior studies have distinguished game addiction from Internet addiction, focusing particularly on the destructive or violent aspects of online games and the psychological causes of game addiction. However, the results of this study suggest that game addiction and Internet addiction may be associated with similar psychological factors. These findings support the perspective that Internet addiction and game addiction may be distinctive expressions of the same underlying vulnerability. Whether other, more powerful, psychosocial factors are associated with game addiction in particular remains an open question. However, taking into consideration that quite a large number of studies were included in this review, that they are different manifestations of the same underlying process merits further attention. Furthermore, the similarity in the psychological profiles for each subtype has intervention implications. First, to be maximally effective, treatments for these problem behaviors may need to focus on the general Internet-use pattern rather than on specific Internet activities. Second, the comorbidity of psychological issues such as negative emotions, interpersonal problems, and self-related difficulties suggests that Internet-game addiction and general Internet addiction have common underlying etiologies and consequences. Regardless of the debate regarding the conceptualization of these problem behaviors, these findings clearly indicate that individuals classified as Internet-game addicts and Internet addicts may require similar assistance in enhancing their psychological functioning.

This study has several limitations. First, the direction of the relation between the psychosocial variables and Internet addiction is hard to determine due to the use of a cross-sectional research design. In order to determine causality, prospective research to ascertain whether psychosocial variables are symptomatic of Internet addiction or whether Internet addiction is symptomatic of psychosocial problems is necessary.

The implementation of analytical methods that can test causal relationships, rather than merely examining the degree of associations, is recommended so that antecedents and consequences of Internet addiction can be clearly differentiated.[39] Second, as we have indicated, some of the current analyses suffered from a relatively small number of available studies. As the research literature on the association between psychosocial factors and Internet addiction continues to develop, future meta-analyses will be able to replicate and extend the present findings to lend more confidence in our conclusions, particularly for the relevant moderator variables. Finally, because the present meta-analysis included only Korean studies, future meta-analytic reviews that include data from international participants should be conducted. It will then be possible to compare the psychosocial causes of Internet addiction in a way that reflects cultural differences.

Despite these limitations, the results of this study have several suggestions and implications. First, this is the first meta-analytic study to be primarily concerned with the psychosocial correlates of Internet addiction and with identifying the features that either increase or decrease an individual's risk of developing an addiction. Second, while previous studies investigating the associations between psychosocial factors and Internet addiction have rarely analyzed the comparative effects of intrapersonal and interpersonal variables, the present meta-analytic study revealed that intrapersonal variables have a greater contribution than interpersonal variables. Thus, intrapersonal problems must be seriously considered when developing strategies to prevent Internet addiction and in planning educational programs for Koreans who are addicted to the Internet. In addition, high-risk individuals can be identified via an assessment of psychological traits (e.g., temperamental vulnerabilities) so that further methods of protection from Internet addiction can be developed. Further, these findings have some additional implications regarding the most appropriate types of treatment and prevention programs. For example, such programs should aim to improve the psychological factors related to self-identity problems and negative emotions as well as influence changes in Internet use. Finally, the present study contributes to the field by taking a step toward understanding the psychosocial factors through which vulnerable people develop an Internet addiction. Although confined to Koreans, the results of this study are expected to provide the basic data for developing a better theoretical overview of Internet addiction.

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