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Associations between child maltreatment, PTSD, and internet addiction among Taiwanese students



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ABSTRACT

This study examines (1) the associations between multiple types of child maltreatment and Internet addiction, and (2) the mediating effects of post-traumatic stress disorder (PTSD) on these associations. We collected data from a national proportionately stratified random sample of 6233 fourth-grade students in Taiwan in 2014. We conducted bivariate correlations and sets of multiple regression analyses to examine the associations between multiple types of maltreatment (5 types in total) and Internet addiction, and to identify the mediating role of PTSD. The results reveal that being male and experiencing abuse (psychological neglect, physical neglect, paternal physical violence, sexual violence) were associated with increased risk among children of developing PTSD and Internet addiction. Moreover, PTSD mediated the associations between multiple types of maltreatment (except maternal physical violence) and Internet addiction. This study demonstrates (1) the effects of multiple types of maltreatment on the PTSD and Internet addiction of children and (2) the importance of early prevention and intervention in addressing related public-health concerns.

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1. Introduction

1.1. Child maltreatment and internet addiction

As Internet technology makes constant advances, it broadens and strengthens our daily-life conveniences. Inevitably, it also changes our lifestyles; we become increasingly reliant on the Internet. Internet use has become routine among children as well as adults; indeed, it is telling that many parents pacify their young children with the aid of iPads and cellphones. However, emerging from among the myriad benefits of Internet use are new forms of

behavioral problems, and one of the most pressing is Internet addiction, which is the inability of people to control their Internet use—an inability that can eventually lead to psychological, social, academic, and vocational problems (Davis, 2001; Young & Rogers, 1998). In Europe from 2009 to 2010, the overall prevalence of Internet addiction was 4.4%, and it was higher among males than females (5.2% versus 3.8%) (Durkee et al., 2012). The prevalence rate for having five or more symptoms of Internet addiction among adolescents in Hong Kong in 2005 was 6.7% (Fu, Chan, Wong, & Yip, 2010), and 13.7% among college students in Taiwan in 1998 (Chou & Hsiao, 2000).

Child maltreatment is one of the important predictors for behavioral problems such as Internet addiction. The definitions of three key terms will prove useful in this context. *Neglect* is defined as the failure of parents to meet their children's basic needs and proper level of care, *physical maltreatment* as intentional bodily injury visited upon children by parents or other caretakers, and *sexual maltreatment* as adults' use of a child for sexual stimulation

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(American Psychological Association Committee on Professional Practice and Standards, 1998). Research on maltreatment has emphasized physical and sexual violence, often to the exclusion of neglect (Stith et al., 2009). However, child psychological and physical neglect is more prevalent than physical and sexual violence, and can be extraordinarily harmful to child development (Shin, Miller, & Teicher, 2013). Therefore, we have included multiple types of maltreatment in the model underpinning the current study.

Research on child maltreatment has documented the associations between maltreatment and substance addictions (Evren, Kural, & Cakmak, 2006) and behavioral addictions such as gambling (Hodgins et al., 2010). However, little is known about the associations between maltreatment and a new form of addictive behavior—Internet addiction. Only one study examined the relationships between child maltreatment and problematic Internet use among college students (Yates, Gregor, & Haviland, 2012). Although preliminary studies suggested that harsh parenting, family conflict, and violence were associated with problematic Internet use (Park, Kim, & Cho, 2008; Wolak, Mitchell, & Finkelhor, 2003; Xiuqin et al., 2010), little is known about the relationships between multiple types of child maltreatment and Internet addiction, and the pathway or mechanism of the relationships. At the same time, research applying direct-effects models to the topic of Internet addiction has documented the prevalence, negative outcomes, and causal aspects of this form of addiction in relation to Internet usage, personality, and family factors (Chen, Chen, & Gau, 2015; Ko, Yen, Yen, Chen, & Chen, 2012; Servidio, 2014; Young & de Abreu, 2010). However, little is known about the mechanisms underlying—and the pathways leading to—Internet addiction, particularly where such knowledge would rest on the rigorous use of mediation-effects models. Kardefelt-Winther (2014) proposed the notion of compensatory internet use to address how online activities may compensate for psychological problems and encouraged further research to explore the mediation and interaction effects in the context of Internet addiction. The current study is the first to examine how different types of maltreatment affect students' Internet addiction, and how post-traumatic stress disorder (PTSD) affects the pathways leading to Internet addiction where Internet use serves as a coping strategy.

1.2. Child maltreatment, PTSD, and negative outcomes

Child maltreatment has been linked to PTSD and problem behaviors. Children who experience physical or sexual violence run an increased risk of having PTSD (Vranceanu, Hobfoll, & Johnson, 2007), mental health problems (e.g., depression, anxiety, suicidal tendencies), and substance dependence across adolescence and adulthood (Fergusson, Boden, & Harwood, 2008; Teicher, Samson, Polcari, & McGreenery, 2006; Thornberry, Henry, Ireland, & Smith, 2010). Among Taiwanese college students, Shen (2009) identified several long-term associations stemming from childhood physical maltreatment and interparental violence to later PTSD and behavioral problems. Longitudinal studies also reveal that child neglect is positively associated with internalizing problems (Bolger & Patterson, 2001). Neglected children are at greater risk of aggression and juvenile drug and alcohol offenses later in life (Chen, Propp, deLara, & Corvo, 2011; Kotch et al., 2008; Shin et al., 2013), and child physical abuse has been linked to problem drinking and illicit drug use (Fang et al., 2015; Shin et al., 2013).

1.3. PTSD and internet addiction

Individuals who suffered from PTSD may use adaptive or maladaptive strategies to cope. One coping strategy is avoidance,

whereby individuals attempt to avoid a stressor or their reaction to it. Victims of violence use avoidance to avoid or reduce negative affect (Littleton, Horsley, John, & Nelson, 2007). They withdraw from others and block or distance themselves from their own feelings and thoughts regarding the stressor (Snyder & Pulvers, 2001). Although avoidance strategies may temperately reduce psychological distress, they can become maladaptive if individuals overly rely on them (Snyder & Pulvers, 2001) and can perhaps develop into an addiction. According to the self-medication hypothesis (Cappell & Greeley, 1987), people who experience abuse may use substances to reduce and escape from the intrusive symptoms of PTSD (Hruska & Delahanty, 2012). Similarly, Internet addiction can be recognized as a maladaptive avoidance coping strategy: children who experience neglect or violence may bury themselves in the cyber world, thereby attempting to avoid—rather than cope with—PTSD.

In fact, both Internet addiction and substance dependence can be recognized as addictive behavioral-problem syndromes. They share such similar characteristics as excessive use, withdrawal symptoms, growing tolerance, immobilizing preoccupations, and functional impairment (Beard & Wolf, 2001; Hall & Parsons, 2001; Leung, 2004). In addition, they have similar family risk factors. For example, higher parent-adolescent conflict and lower family function and monitoring are associated with a higher risk of Internet addiction among adolescents (Yen, Yen, Chen, Chen, & Ko, 2007). In sum, these findings imply that the associations and pathways between maltreatment and substance use might be similar to the associations and pathways between maltreatment and Internet addiction.

Research on addictive behaviors has directly linked childhood sexual abuse and overall childhood trauma to alcohol-use disorder and PTSD-avoidance symptoms (Müller et al., 2015). The study by Müller et al. (2015) has also found that PTSD avoidance mediates the relationships between childhood trauma and alcohol-use disorder. In other words, child maltreatment has been linked to PTSD symptoms, which in turn, can lead to substance dependence. Therefore, drawing on the findings about this pathway from child maltreatment to substance dependence, the current study examines the pathway from child maltreatment to Internet addiction.

In sum, the current study extends previous research by examining the associations among multiple forms of maltreatment (psychological and physical neglect, paternal physical violence, maternal physical violence, and sexual violence) and PTSD and Internet addiction (as exhibited by school-age children). Our primary hypothesis comprises two parts: (1) the more maltreatment a child experiences, the higher the level of PTSD symptoms and Internet addiction the child will exhibit, and (2) there are mediating effects of PTSD on the associations between multiple types of maltreatment and Internet addiction.

2. Method

This study is a part of the Longitudinal Study of Children's and Adolescents' Family and Social Experiences (LSCAFSE). The Institutional Review Board of the National Taiwan University Hospital declared that the LSCAFSE was consistent with the protection of the rights and welfare of human subjects.

2.1. Participants

We conducted this study in the 2014 spring semester with fourth-grade students. We stratified the sample by geographical locations across Taiwan (19 counties or cities in total) and randomly selected the districts to increase representation. Of the invited elementary schools, approximately 49% schools ($n = 314$) agreed to

participate, and the final sample of this study consisted of 6233 fourth-grade students (50.3% boys) who had parental consent and whose data were valid.

2.2. Procedure

Before administering the questionnaires, trained research assistants explained the research purpose and procedures to students and emphasized the voluntary and confidential nature of the research. The assistants also informed students of their right to withdraw from participation at any time. Self-report questionnaires were distributed to consenting students in group sessions scheduled for a period during or outside of regular class hours.

2.3. Measures

The questionnaire was first sent to a group of 7 experts for content validity examination (4 child development scholars, 1 sociologist, 1 clinical social worker, 1 statistician) before the measures were administered to pilot-study participants ($n = 726$). The LSCAFSE research team modified some measures according to (1) suggestions from scholars and other experts, and (2) the results of the pilot study's internal consistency analysis and principal component analysis. Psychometrics of these measures were examined again after formal data were collected.

2.3.1. Psychological and physical neglect

We used three modified Neglect Scale items of the ISPCAN Child Abuse Screening Tool Children's Version (ICAST-C (Zolotor et al., 2009) to define psychological neglect, and four modified items to define physical neglect in the past year. Participants used a 5-point scale (0 = never, 1 = seldom, 2 = sometimes, 3 = very often, and 4 = always) to rate the frequency of parental psychological neglect, and used a 5-point scale (0 = never, 1 = 1–2 times, 2 = 3–5 times, 3 = 6–10 times, and 4 = more than 10 times) to rate frequency of physical neglect by their parents. Higher scores indicated more severe child neglect. The reliability of the original study's ICAST-C Neglect Scale was calculated with a Cronbach's alpha of .83, demonstrating strong internal consistency.

2.3.2. Physical violence

To define parental physical violence, we used seven modified Physical Assault Scale items of the Childhood Experiences of Violence Questionnaire (CEVQ) (Walsh, MacMillan, Trocmé, Jamieson, & Boyle, 2008) and the Longitudinal Studies of Child Abuse and Neglect (LONGSCAN) (Runyan et al., 1998). Participants used a 5-point scale (from 1 = never to 5 = more than 10 times) to rate the frequency of paternal and maternal physical violence for the seven items in the past year. The physical violence scale demonstrated strong internal consistency ($\alpha = .88$).

2.3.3. Sexual violence

We used two modified Sexual Abuse Scale items of the CEVQ (Walsh et al., 2008) to define sexual abuse. Participants used a 5-point scale (from 1 = never to 5 = more than 10 times) to rate the frequency of sexual violence for the two items in the past year. The original study reported the two-week test–retest reliability of the CEVQ by using ICCs, ranging from .76 to .92 for all scaled items.

2.3.4. PTSD

The Chinese version of the UCLA PTSD Reaction Index for DSM-IV measures symptoms associated with traumatic experiences (Chen, Lin, Tseng, & Wu, 2002; Steinberg, Brymer, Decker, & Pynoos, 2004). Participants used a 5-point Likert scale (from 0 = “none of the time” to 4 = “most of the time”) to rate the

frequency of experiencing each symptom during the previous month. In order to reduce the length of time needed for completion of the questionnaires, we deleted 5 items (items 11, 14, 20, 21, 22) from the original scale according to the factor-analysis results from the pilot study; therefore, the current study involves only 17 items. The adolescent version of the Chinese PTSD scale has been validated for children in the fourth grade (Chen et al., 2002). We determined the PTSD score by computing the means of all 17 responses. Higher scores reflect greater posttraumatic-symptom severity. The PTSD Scale exhibited strong reliability for the present sample ($\alpha = .89$).

2.3.5. Internet addiction

We adapted items from the Chinese Internet Addiction Scale (CIAS) (Chen, Weng, Su, Wu, & Yang, 2003) to measure Internet addiction. The subscale of the current study contains 10 items covering 2 domains: core symptoms and related problems. Core symptoms comprise compulsion symptoms, withdrawal symptoms, and tolerance. Related problems comprise interpersonal problems, health problems, and time-management problems. Items were rated on a 5-point scale anchored by 1 (very not true) to 5 (very true). The scores were internally consistent ($\alpha = .88$).

3. Results

Among different types of child maltreatment in the current study, psychological neglect was the most prevalent (69%), followed by physical neglect (66.5%), paternal physical abuse (15%), maternal physical abuse (14.7%), and sexual violence (9.2%). Table 1 contains bivariate correlations and means for the major variables in this study. All correlations between the model variables were statistically significant and in the expected directions. We performed Harman's single-factor test to ensure that common method variance is not an issue here (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). To test the mediating effect of PTSD on the association between parental maltreatment and child Internet addiction, we performed a series of multiple regression analyses. According to Baron and Kenny (1986), the following four steps should be present to establish mediation: (1) a significant effect of parental maltreatment on Internet addiction; (2) a significant effect of parental maltreatment on PTSD; (3) an association between PTSD and Internet addiction when parental maltreatment is controlled for; and (4) a reduction of the effect of parental maltreatment on Internet addiction when PTSD is entered into the model. A Sobel test provides support for partial mediation (Sobel, 1982).

As shown in Table 2, boys were more likely than girls to have high levels of Internet addiction ($\beta = .13, p < .001$). When we divided the data into two gender groups, we found gender differences in the relationships between paternal physical violence and Internet addiction. The more paternal physical violence a girl experienced, the more likely she was to experience Internet addiction ($\beta = .07, p < .01$). Interestingly, boys exhibited no corresponding statistically significant association. After gender was controlled for, PTSD was found to mediate the associations between the four following types of child maltreatment and Internet addiction.

First, psychological neglect was positively associated with Internet addiction (see equation (1) in Table 2, $\beta = .17, p < .001$) and with PTSD (see equation (2) in Table 2, $\beta = .22, p < .001$). After PTSD was added to the model, psychological neglect significantly predicted Internet addiction with a reduction in the coefficient (see equation (3) in Table 2; $\beta = .12, p < .001$). The Sobel test supported our finding that PTSD partially mediated the effect of psychological neglect on Internet addiction ($Z = 14.06, p < .001$).

Second, physical neglect was positively associated with Internet

Table 1
Univariate and bivariate statistics for all variables (n = 6233).

Variables	1	2	3	4	5	6	7	8
1. Psychological Neglect	–							
2. Physical Neglect	.38**	–						
3. Paternal Physical Violence	.26**	.32**	–					
4. Maternal Physical Violence	.28**	.32**	.62**	–				
5. Sexual Violence	.15**	.24**	.38**	.38**	–			
6. PTSD	.31**	.24**	.27**	.27**	.20**	–		
7. Internet Addiction	.25**	.23**	.19**	.18**	.20**	.32**	–	
8. Child Gender	.02	.10**	.13**	.08**	.10**	.01	.16**	–
Mean	1.93	1.22	.41	.38	.19	1.14	1.82	

Note. Gender was dummy coded such that 0 = female and 1 = male. Parental maltreatment comprises psychological neglect, physical neglect, and sexual violence. PTSD = post-traumatic stress disorder. * $p < .05$. ** $p < .01$.

Table 2
Testing the mediating effects of PTSD on internet addiction (n = 6233).

Predictors	Step 1 (criterion: Internet addiction)			Step 2 (criterion: PTSD)			Step 3 (criterion: Internet addiction)		
	B	SEB	β	B	SEB	β	B	SEB	β
Psychological Neglect	.14	.01	.17***	.17	.01	.22***	.10	.01	.12***
Physical Neglect	.05	.01	.11***	.04	.01	.08***	.04	.01	.09***
Paternal Physical Violence	.03	.01	.04*	.07	.01	.10***	.01	.01	.01
Maternal Physical Violence	.02	.01	.02	.07	.01	.10***	-.00	.01	-.00
Sexual Violence	.10	.01	.11***	.07	.01	.08***	.08	.01	.09***
Child Gender	.20	.02	.13***	-.07	.02	-.05***	.22	.02	.14***
PTSD							.25	.01	.24***

Note. Each column is a regression equation that predicts the criterion at the top of the column. Gender was dummy coded such that 0 = female and 1 = male. Parental maltreatment comprises psychological neglect, physical neglect, and sexual violence. PTSD = post-traumatic stress disorder. * $p < .05$. *** $p < .001$.

addiction ($\beta = .11, p < .001$) and with PTSD ($\beta = .08, p < .001$). After PTSD was added to the model, physical neglect still significantly predicted Internet addiction with a reduction in the coefficient ($\beta = .09, p < .001$). The Sobel test supported our finding that PTSD partially mediated the effect of physical neglect on Internet addiction ($Z = 3.95, p < .001$).

Third, paternal physical violence was positively associated with Internet addiction ($\beta = .04, p < .05$) and with PTSD ($\beta = .10, p < .001$). After PTSD was added to the model, the association between physical violence and Internet addiction became insignificant ($\beta = .01, n.s.$). This finding indicates that PTSD fully mediated the effect of paternal physical violence on Internet addiction. However, maternal physical violence did not predict IA, although such violence was linked to PTSD.

Finally, sexual violence was positively associated with Internet addiction ($\beta = .11, p < .001$) and with PTSD ($\beta = .08, p < .001$). After PTSD was added to the model, sexual violence still significantly predicted Internet addiction with a reduction in the coefficient ($\beta = .09, p < .001$). The Sobel test supported our finding that PTSD partially mediated the effect of sexual violence on Internet addiction ($Z = 6.74, p < .001$). In sum, multiple regression analyses supported the hypotheses that children would report higher levels of PTSD and Internet addiction when experiencing multiple types of maltreatment (with the exception of maternal physical violence), and the same analyses identified the mediating effects of PTSD on the associations between maltreatment and Internet addiction.

4. Discussion

The present study is the first national epidemiologic study to comprehensively examine the associations between multiple types of child maltreatment and Internet addiction among children in Taiwan. We identified main effects of psychological neglect, physical neglect, paternal physical violence, and sexual violence on

Internet addiction. Furthermore, mediating effects of PTSD were found between multiple types of maltreatment and Internet addiction. The results of the current study support and extend earlier work insofar as the current study has found associations between child maltreatment and not only psychological problems but also behavioral problems. In the present study, children who experienced maltreatment in the past year were more likely than their peers to have relatively high levels of PTSD and Internet addiction.

It is important to understand how such maltreatment can affect mechanisms leading to Internet addiction. Children exposed to maltreatment may experience PTSD and then tend to bury themselves in the cyber world to avoid or reduce negative affect and PTSD symptoms. Similar to substance use (Hruska & Delahanty, 2012), Internet addiction can be a maladaptive form of avoidance coping strategies and a self-medicating behavior. Another explanation is that perhaps neglect and abuse can weaken children's trust in parents and others in the real world and can strengthen children's temptation to cope with PTSD by means of alternative Internet-based social networks. In turn, the children find that they are increasingly reliant on maladaptive coping strategies such as pathological Internet use. Neglect and abuse could also reduce children's access to effective support, leaving them alone to deal with significant psychological distress, in turn bolstering their reliance on Internet addiction as a coping tool.

Because Internet addiction and substance dependence share similar characteristics and family risk factors (Beard & Wolf, 2001; Yen et al., 2007), the association between maltreatment and substance abuse might be similar to the association between maltreatment and Internet addiction. Such similarities might also emerge between the two associations' respective underlying mechanisms. Children who experience abuse and neglect are more likely to engage in later illicit substance use and alcohol dependence (Teicher et al., 2006; White & Widom, 2008). Also, our study

consistently found associations between child maltreatment and Internet addiction. Similar to other research findings (Ullman, Relyea, Peter-Hagene, & Vasquez, 2013) on how PTSD mediates the association between interpersonal trauma (including sexual abuse) and substance use, the findings of our current study suggest that PTSD mediates the association between multiple types of child maltreatment and Internet addiction.

Unexpectedly, although maternal physical violence predicted PTSD in our study, such violence did not predict Internet addiction; by contrast, paternal physical violence predicted both PTSD and Internet addiction. These results imply that, in general, the effects of maternal versus paternal physical violence work differently on children's risk for developing Internet addiction. Moretti and Craig (2013) found no direct association between paternal abuse and depressive symptoms, whereas maternal abuse was associated with adolescents' reports of depressive symptoms. Moretti further argued that the effects of maternal maltreatment may be a function of the roles that mothers play as primary caregivers and attachment figures. We argue that perhaps mothers are primary sources of emotional support (Rosenthal & Kobak, 2010), so a given mother who subjects her children to physical violence may somehow also provide them with emotional support; the support might buffer the effects of maternal physical violence on Internet addiction.

Clinical implications can be drawn from the current study. First, when school-age children appear to exhibit withdrawal or aggressive behaviors and perform poorly at school, educators and clinicians can assess not only behaviors but also psychological states and family interactions. Children exposed to family violence or neglect are more likely than their peers to experience psychological distress and behavioral problems, and one behavioral problem (e.g., Internet addiction) can lead to another (e.g., withdrawal behavior); in such cases, intervention can perhaps effectively address the initial problem and, hence, stem the emergence of the subsequent problem. Moreover, Internet addiction might serve as a maladaptive coping strategy for children who suffered from abuse and PTSD. Therefore, intervention for Internet addiction can be more effective if it focuses on not only the behavior itself but also the underlying risk factors, such as maltreatment and PTSD. Second, prevention of multiple types of child maltreatment is critical to combating children's psychological, social, and behavioral problems. Especially helpful in this regard are parent-intervention programs, which can help parents not only understand and regulate their frustration when disciplining their children but also recognize the importance of infusing a sense of security in parent–child relationships.

Several limitations may compromise our conclusions. First, our findings are limited because we relied entirely on single-source data collection (i.e., children's self-report measures) to assess maltreatment, PTSD, and Internet addiction. Second, because we have collected only the first wave of data so far, our cross-sectional design impeded the inferences we drew about causal links among the study variables. Third, there may be significant covariates not controlled by this study. Finally, future studies would do well to address information about different facets of Internet addiction in order to examine their prevalence and their associations with different types of maltreatment.

Despite these limitations, an important strength of the present study is our decision to include multiple types of maltreatment as risk factors. We were, thus, able to examine their unique effects on Internet addiction (an oft-overlooked topic) and to explore possible mechanisms underlying the effects. Moreover, while much previous Internet addiction research used college samples, we pitched down to middle childhood to investigate the early onset of Internet addiction and family and psychological risk factors underlying Internet addiction. Finally, our use of a large sample size with a

stratified random sampling design has honed our representation and generalization of the issues at hand.

In sum, we have concluded that multiple types of maltreatment constitute important factors in predicting PTSD and Internet addiction in middle childhood. Sets of regression models reflect the mediating effects of PTSD on the association between maltreatment and Internet addiction, and support the assertion that maltreatment is an important predictor of Internet addiction risk.

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