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# The relationship between parenting styles and adolescent problematic Internet use: A three-level meta-analysis

Journal of Behavioral Addictions

12 (2023) 3, 652–669

DOI:

10.1556/2006.2023.00043

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Received: March 2, 2023 • Revised manuscript received: June 1, 2023; July 17, 2023 • Accepted: July 22, 2023  
Published online: September 19, 2023

## REVIEW ARTICLE



### ABSTRACT

*Background and aims:* Problematic Internet use (PIU) has become a global public health problem. It has been suggested that parenting style is associated with adolescent PIU. However, the evidence in favor of this view is mixed. Based on the PRISMA method, the present study employed three-level meta-analysis approach to investigate the relationship between these two variables and further explore potential moderators. *Methods:* After a systematic search for published articles, 35 studies were included, reporting 171 effect sizes ( $N = 40,587$ ). *Results:* The results showed that positive parenting styles were significantly negatively related to PIU. This association was moderated by gender, age, publication year, and measurements of PIU, but was not by culture and measurements of parenting styles. Negative parenting styles were significantly positively related to PIU, which was moderated by publication year, culture, and sub-types of negative parenting, but not by gender, age, and measurements of both parenting styles and PIU. In addition, the correlation of PIU with negative parenting styles was stronger than that with positive parenting styles. *Discussion and Conclusions:* The present results demonstrated that parenting styles, especially punitive parenting styles, should be attached to more important when treating adolescent PIU.

### KEYWORDS

parenting styles, problematic internet use, meta-analysis, adolescent, moderator variables

## INTRODUCTION

The rapid development of internet technology makes it easy for adolescents to use it anytime and anywhere. The possible impact of PIU on adolescents' social development has elicited public concern. Previous studies have indicated that PIU may lead to many adverse consequences in adolescents, such as anxiety and depression (Hu, Mei, & Gao, 2020; Ko et al., 2014; Seki, Hamazaki, Natori, & Inadera, 2019), sleep problems (Alimoradi et al., 2019; Chen & Gau, 2016), and academic burnout (Wan, Yu, Yan, & Huang, 2020). There seems to be a strong link between parenting styles and adolescent PIU among many related factors, which is supported by a range of studies (e.g., Cetinkaya, 2019; Dogan, Bozgeyikli, & Bozdas, 2015; Lukavská, Vacek, & Gabhelík, 2020; Sun & Wilkinson, 2020). However, the evidence in favor of this view is mixed due to the differences in sample characteristics, publication characteristics, and measurements in previous studies.

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Therefore, several meta-analyses have examined the association between parenting styles and PIU (Li, Lei, & Tian, 2018; Li, Ran, Zhang, & Hu, 2019; Lukavská, Hrabec, Lukavský, Demetrovics, & Király, 2022; Wei et al., 2017), which is related to the fact that meta-analysis can more effectively evaluate the consistency of independent study results (Siddaway, Wood, & Hedges, 2019). However, these meta-analyses applied the traditional meta-analysis approach, which may fail to address the inter-dependency of effect sizes (Assink & Wibbelink, 2016). For instance, as the measurements of parenting style include several dimensions, several effect sizes regarding the correlations between parenting style dimensions and PIU could be computed in one study (Li et al., 2018). In this case, the effect sizes stemming from the same study are not independent (Cheung, 2014), and the association between parenting style dimensions and PIU may be exaggerated (Assink & Wibbelink, 2016). Additionally, several other limitations need to be addressed. First, these meta-analyses have been conducted in a single or similar cultural context, resulting in a lack of cross-cultural comparisons (Li, 2019; Li et al., 2018; Wei et al., 2017). Second, most meta-analyses included clinical samples with diagnosed internet addiction. Their findings may not be generalizable to general adolescents (Li, 2019; Li et al., 2018; Lukavská et al., 2022; Wei et al., 2017). Third, previous meta-analyses only comprised studies that used a specific measurement of parenting styles. For example, Wei et al. (2017) and Li et al. (2018) only included studies using the Egná Minnen Beträffande Uppfostran (EMBU; Perris, Jacobsson, Linndström, Knorrning, & Perris, 1980), inevitably causing the loss of research data using other parenting style scales. Fourth, previous research explored a limited set of moderator variables (e.g., gender, age, and measurements) and did not consider publication year and culture (Pan, Chiu, & Lin, 2020; Tamis-Lemond et al., 2010; Wong, Konishi, & Kong, 2020). In sum, a three-level meta-analysis is more apt to elaborate on the relationship between parenting styles and adolescent PIU.

### Conceptualization and measurement of parenting styles and PIU

Parenting style refers to the ways that parents display to achieve their parenting goals, which reflects parents' attitudes toward child rearing (Darling & Steinberg, 1993). Traditionally, positive and negative parenting styles are distinguished (Lei, Ran, Zhang, Mi, & Chen, 2020; Van Leeuwen & Vermulst, 2004). Positive parenting styles are defined as warm and close parent-child relationships, such as authoritative parenting, favoring siblings, favoring subjects, and positive involvement (Galambos, Barker, & Almeida, 2003). On the contrary, negative parenting styles are characterized by sternness or spoiling children, such as authoritarian parenting, punitive, over-protection, and rejection (Baumrind, 1971; Perris et al., 1980). Pan, Gauvain, and Schwartz (2013) have suggested that both positive and negative parenting styles are valid predictors of adolescent social adjustment. In the literature, parenting styles are

generally measured from these two perspectives. Some researchers focused on the broad and stable behavioral child bearing habits of parents. Robinson, Mandlco, Olsen, and Hart (1995) developed the Parenting Style and Dimension Questionnaire (PSDQ), including authoritative, authoritarian, and permissive parenting styles. Other researchers addressed specific parenting behaviors of parents in raising their children (Lee, Daniels, & Kissinger, 2006). A widely used scale was the EMBU scale developed by Perris et al. (1980), which included the following dimensions: abusive, depriving, punitive, shaming, rejecting, overprotective, overinvolved, tolerant, affectionate, performance-oriented, guilt-engendering, stimulating, favoring siblings, and favoring subjects.

There is still no consensus on the terminology of PIU or its definition. Various terms have been performed to describe PIU, including Internet addiction, Internet dependence, compulsive Internet use, and pathological Internet use, as reflected in a series of empirical studies and systematic reviews (Ciarrochi et al., 2016; Davis, 2001; Lavoie, Dufour, Berbiche, Therriault, & Lane, 2023; Lukavská et al., 2022; Shapira, Goldsmith, Keck, Khosla, & McElroy, 2000; Spada, 2014). In general, these terms are considered to be synonymous. PIU, as a non-substance-related or behavioral addiction, is mainly defined as a maladaptive pattern of Internet use (Laconi, Rodgers, & Chabrol, 2014). It is characterized by excessive and uncontrollable internet use, which may lead to adverse life consequences, specifically psychological, physical, emotional, and social dysfunctions (Boniel-Nissim & Sasson, 2018; Young, 1998). According to the ACE model (Accessibility, Control, and Escape) developed by Young, Pistner, O Mara, and Buchanan (1999), the Internet can help individuals escape negative emotions or circumstances, ultimately increasing the possibility of addictive behaviors. Although PIU is not yet a recognized disorder, it is an often-used term to refer to problematic use and symptoms consistent with problem gambling and gaming (Shapira et al., 2000). It should be noted that the potential of the PIU to bring about considerable psychological harm has been highlighted. Numerous studies have shown that PIU is associated with intensive negative outcomes, such as the impairment of functional connections related to emotional cognitive control and social brain networks (Arató et al., 2023), self-injurious behavior, loneliness, hyperactivity, depressive symptoms, anxiety problems, social phobia sleep disturbances, reduced scholastic achievement, low self-esteem, poor family function, and less life satisfaction (Arrivillaga, Rey, & Extremera, 2020; Blinka, Stašek, Šablaturová, Ševčíková, & Husarova, 2023; Ciarrochi et al., 2016; Derbyshire et al., 2013; El Asam, Samara, & Terry, 2019; Ko et al., 2008; Lavoie et al., 2023; Stead & Bibby, 2017). Davis (2001) has defined two distinct types of PIU based on a theoretical cognitive and behavioral model, including generalized PIU and specific PIU. More specifically, generalized PIU highlights a wide range of Internet-based activities, while specific PIU encompasses every specific online behavior (e.g., gaming disorder, problematic smartphone use, and problematic social networking sites)



(Laconi, Tricard, & Chabrol, 2015; Lukavská et al., 2022). Some scholars have suggested that generalized PIU and specific PIU be considered separately due to the subtle potential differences between these online activities (Fineberg et al., 2018; Laconi et al., 2015). In sum, generalized PIU is the focus of this study. Three scales have been widely used to measure PIU: the 8-item *Internet Addiction Diagnostic Questionnaire* (s-IAT) developed by Young (1998), the 20-item *Internet Addiction Test* (IAT) adapted from the s-IAT according to the criterion of gambling addiction (Young, 1998), and the 26-item *Chinese Internet Addiction Scale* (CIAS) developed by Chen, Weng, Su, Wu, and Yang (2003).

### The association between parenting styles and adolescent PIU

Three theoretical models from different perspectives consistently described the close relationship between parenting styles and adolescent PIU. The cognitive-behavioral model suggests that an adverse family environment is crucial for the development of PIU (Davis, 2001). More precisely, children who have experienced negative environments (e.g., parental rejection) were more likely to have maladaptive cognitions and troubled interpersonal relationships (Li, Ran, & Zhang, 2019). Due to self-cognitive biases, these children may not be able to engage in quality relationships and therefore tend to seek compensation via PIU (Gao et al., 2019). Moreover, according to the self-determination theory (Deci & Ryan, 2000), the satisfaction of innate psychological needs promotes children's healthy growth processes. Children opt for other approaches to fulfill them when their basic needs are not satisfied. In particular, the basic psychological needs of children can be satisfied quite well with positive parenting styles, so they do not need to engage in compensatory behaviors such as excessive use of the internet (Li, Zhou, Zhao, Wang, & Sun, 2016; Ye, Wen, Yang, & Ren, 2013). Instead, children with negative parenting styles do not have their needs for competence, autonomy, and connectedness adequately met, which may lead them to search for substitute products via the Internet, perhaps ultimately resulting in PIU (Li et al., 2016; Yi, Yang, & Ye, 2016). Equally important, the attachment theory notes that parenting style is a significant source for adolescents' attachment (Bowlby, 1988). Adolescents are more likely to form an insecure parent-child attachment with negative parenting styles (Deng, Fang, Wu, Zhang, & Liu, 2013), which leads to poorer self-regulation (Padykula & Conklin, 2010), and finally become more vulnerable to PIU (Deng et al., 2013).

However, empirical studies on the relationship between parenting style and adolescent PIU are inconsistent (Li, Li, & Newman, 2013; Liu & Li, 2017; Yaffe & Seroussi, 2019). Adolescents reporting positive parenting styles (e.g., warmth, caring, and non-rejection of parents, authoritative child-rearing practices) are less likely to develop problematic psychosocial behaviors (Yaffe & Seroussi, 2019; Zhang, Li, & Li, 2015), while negative parenting styles (e.g., strict parental attitude, punitive, laissez-faire) are antecedent factors of PIU

(Sun & Wilkinson, 2020; Yaffe & Seroussi, 2019; Ye et al., 2013; Zhang et al., 2015). However, inconsistent results suggest that this association is not robust. For example, Li, Li et al. (2007) found that PIU was positively correlated with parental emotional warmth, while other researchers reported opposite results (Li et al., 2012; Zhang, Bai, Jiang, Yang, & Zhou, 2019). Similarly, inconsistent findings have been reported regarding the associations between behavioral/psychological control, dimensions of parenting style, and PIU. For instance, some researchers have shown that parental behavioral control is negatively correlated with adolescent PIU, while parental psychological control is positively correlated (Lai, Wang, Wang, Zhang, & Yang, 2014; Shek, Zhu, & Ma, 2018; Song et al., 2014). However, the positive relationship between behavioral control and PIU among adolescents was not obtained in the study of Li, Li, and Newman (2013). Given that the inconsistent results and the limitations of previous meta-analyses, a three-level meta-analysis was conducted to examine the correlation between parenting styles (positive and negative) and PIU among general adolescents.

### Impact of moderator variables

**Gender.** Gender may affect an individual's susceptibility to media effects (Valkenburg & Peter, 2013). Specifically, boys are more vulnerable to PIU than girls because they exhibit lower levels of inhibitory control (Beyens, Valkenburg, & Piotrowski, 2018; Su, Han, Jin, Yan, & Potenza, 2019). Parents may adopt different parenting styles for boys and girls. For instance, boys receive less family supervision (Lukavská et al., 2020; Yu & Shek, 2013). Li and Zhou (2009) have found that parents exert more control over boys, which may increase the risk of PIU. Regarding girls' PIU, parental neglect, and material rewards have aggravating effects. Therefore, gender may be a potential moderator on the link between parenting styles and PIU among adolescents.

**Age.** Ample evidence indicates that age may be another potential moderator. Personality theory proposes that older adolescents are better able to manage their behavior and develop more self-discipline and conscientiousness than younger (Vecchione, Alessandri, Barbaranelli, & Caprara, 2012), which can reduce PIU (Tóth-Király, Morin, Hietajrvi, & Salmela-Aro, 2021). Moreover, older adolescents are likely to experience more democratic parenting styles. Group socialization theory suggests that young people are less likely to develop PIU because they usually live with their parents in early childhood and are more supervised (Harris, 1995). Hence, age may moderate the association between parenting style and PIU.

**Culture.** Due to the apparent discrepancy between Eastern and Western cultures (Chen & Farruggia, 2002; Hsu, 1981), it is essential to identify the strength of the association between the two variables in different cultural contexts (Chen & Farruggia, 2002). Western culture is typically characterized by individualism and advocates individual autonomy



and independence, while Eastern culture is represented by collectivism and attaches more importance to social connection and group harmony (Cheng, Rizkallah, & Narizhnaya, 2020; Yang, 2009). This may lead to a different understanding of similar parenting styles (Chao, 2001; Leung, Lau, & Lam, 1998). Further, the impact of parenting styles on adolescent PIU may differ in different cultural contexts (Chen, Fu, & Yau, 2019; Sun, 2012; Tamis-Lemond et al., 2010; Wong et al., 2020). Therefore, culture may have a moderating effect on the link between parenting style and adolescent PIU.

**Publication year.** Assink and Wibbelink (2016) emphasized that the correlation between two variables may fluctuate along with social development. According to the China Internet Network Information Center (CINNOC) (2021), internet accessibility among adolescents has increased with social development, from 54.5% in 2009 to 94.9% in 2020. Furthermore, meta-analyses by Pan et al. (2020) and Shao et al. (2018) have revealed that the prevalence rate of PIU increased with time, which implies a stronger correlation between parenting style and PIU in recent years. Therefore, publication year may moderate the association between parenting style and PIU.

**Measurements.** Although most measurements of PIU were compiled according to addictive behavior criteria, there were still differences in their dimensions, content, number of items, and scoring methods. Except for widely used scales, most scales' psychometric attributes have not been evaluated more than three times (Laconi et al., 2014). Similarly, the different effects of measurements of parenting style should also be taken into account. From a different research perspective, the measurements of parenting style may vary. For example, the PSDQ focuses on fixed behavioral patterns (Robinson et al., 1995), while EMBU focuses on the specific behaviors of parents in the process of raising children (Perris et al., 1980). Therefore, measurements may moderate the association between parenting style and adolescent PIU.

**Sub-types of positive and negative parenting.** Different parenting styles have different influences on the youth's risks and problems (e.g., PIU) (Cheung, Yue, & Wong, 2015; Huang et al., 2010), especially negative parenting. This is because the concept of different negative parenting styles is highly heterogeneous. For example, permissive parenting reflects insufficient control, while authoritarian parenting indicates excessive control. Many empirical studies have revealed the differences in parenting patterns on PIU (e.g., Cheung et al., 2015; Dong et al., 2010; Yu et al., 2015; Zhang et al., 2019). More specifically, Cheung et al. (2015) have found that permissive parenting exists stronger predictive power for PIU than authoritarian parenting. Dong et al. (2010) have suggested that punitive parenting has a greater impact on adolescent PIU than over-protection and rejection. Consequently, sub-types of positive and negative parenting may be a potential moderator on the association between parenting style and adolescent PIU.

## The current study

The present three meta-analyses were first intended to clarify the mixed findings mentioned in the literature above by examining the relationship between parenting style and PIU. Specifically, separate meta-analyses were conducted for each of the two patterns of parenting styles (positive and negative) to obtain a more practical result. Whether or not there is a significant association between parenting styles and adolescent PIU may depend on moderating factors. Thus, the second goal was to investigate the contribution of moderating variables such as gender, age, culture, publication year, measures of parenting style and PIU, and sub-types of positive and negative parenting to the relationship between these two variables.

## METHOD

The present three-level meta-analysis was conducted by the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) (Moher, Liberati, Tetzlaff, & Altman, 2009; Yap & Jorm, 2015). Regrettably, the protocol of this meta-analysis has not been preregistered at the International Prospective Register for Systematic Reviews (PROSPERO).

### Data sources and study selection

Based on the PRISMA statement (Moher et al., 2009; Yap & Jorm, 2015), quantitative research literature published from January 2000 to September 2020 through multiple online databases was searched. The database involves CNKI (China National Knowledge Infrastructure), China Wanfang Data Knowledge Service Platform, VIP Database for Chinese Technical Periodicals, ScienceDirect, Springer Link, Web of Science, PsycArticles, and PsycINFO. The keywords included: "parenting styles", "parenting rearing styles", "parenting", "internet addiction", "problematic internet use", "excessive internet use", "compulsive internet use", "impulsive internet use", and "pathological internet use". (Web of Science example: (TS= ("parenting styles" OR "rearing styles" OR "parenting")) AND (TS= ("internet addiction" OR "problematic internet use" OR "excessive internet use" OR "compulsive internet use" OR "impulsive internet use" OR "pathological internet use"))). We also checked the references listed in the included studies and added missing papers using Google Scholar.

Studies were eligible for inclusion if they: (a) examined parenting style; (b) investigated problematic Internet use (only including studies on the Internet in general); (c) reported the correlation coefficient  $r$  as effect size indicator, or  $t$ ,  $F$ ,  $\chi^2$ ,  $\beta$  (These indices can be converted to  $r$ . Card, 2012; Peterson & Brown, 2005). (d) published in Chinese and English; (e) involved a nonclinical sample with a mean age between 12 and 19 years old; (f) published in peer-reviewed journals; and (g) were cross-sectional or longitudinal studies. Moreover, studies were excluded if they: (a) were review or



meta-analysis articles; (b) examined specific PIU (e.g., problematic smartphone use, gaming disorder); (c) weren't peer-reviewed, such as dissertations and conference proceedings. As shown in Fig. 1, a total of 35 relevant studies remained for analysis.

### Coding of studies

The coding scheme was listed as follows: (a) First author name and publication year; (b) Sample size; (c) Gender (the percentage of males); (d) Age (junior high school students, senior high school students, or mixed group); (e) Culture (Eastern culture for East and Southeast Asian countries; Western culture for others); (f) Publication year; (g) Measurements of parenting styles (EMBU, PBI, Others); (h) Measurements of PIU (IAT, S-IAT, CIAS, others); (i) Number of effect sizes (positive and negative parenting styles). (j) The main findings of each study. The coding was done independently by the first and second authors. The interrater reliability was  $K = 0.94$ , which can be considered good.

### Data analysis

The current meta-analysis used correlation coefficient  $r$  as the indicator of effect size. Regarding studies that did not report the correlation coefficient  $r$  between parenting styles and PIU, but reported the  $t$ ,  $F$ ,  $\chi^2$ ,  $\beta$  values, we used formulas to convert these values into  $r$  values (Card, 2012; Peterson & Brown, 2005). All the correlation coefficients were transformed into Fisher's  $z$ -values to conduct analysis, and then converted back into  $r$ -values.

Since papers with significant results were more likely to be accepted and published, the effect size in meta-analysis might be overestimated and thus lead to publication bias (Franco, Malhotra, & Simonovits, 2014). Therefore, the Comprehensive Meta-analysis 3.3 (CMA 3.3) was used to conduct a Funnel plot, Rosenthal's fail-safe  $N$ , and Egger's

regression to test whether there was publication bias (Borenstein, Hedges, Higgins, & Rothstein, 2009). Finally, the trim-and-fill algorithm by Duval and Tweedie (2000) was used to check the bias problem when the publication bias was present.

Additionally, R (Version 3.3.2) with the metafor package was used to perform the three-level meta-analysis (Viechtbauer, 2010), applying the random effects model (Borenstein et al., 2009). Codes for the meta-analysis in this study were based on suggestions of Assink and Wibbelink (2016). Two independent three-level meta-analysis models were formed for positive and negative parenting styles respectively (Lei et al., 2020). Then we carried out one-tailed log-likelihood ratio tests to examine whether the variance between effect sizes (level 2) and the variance between studies (level 3) was significant. Finally, moderating effect tests were conducted to identify the source of heterogeneity (Gao, Assink, Cipriani, & Lin, 2017).

### Ethics

This manuscript does not contain any studies with human participants or animals performed by any of the authors. This study was performed in line with the Helsinki Declaration.

## RESULTS

### Study characteristics

The meta-analysis of parenting styles and PIU included 35 studies (16 Chinese studies, 19 English studies;  $N = 40,587$ ), reporting together 171 effect sizes. The number of effect sizes of association between positive parenting styles and PIU was 51 (29.82%; 34,232 participants) and that of negative parenting styles and PIU was 120 (70.18%; 35,764 participants). The number of effect sizes in one study ranged

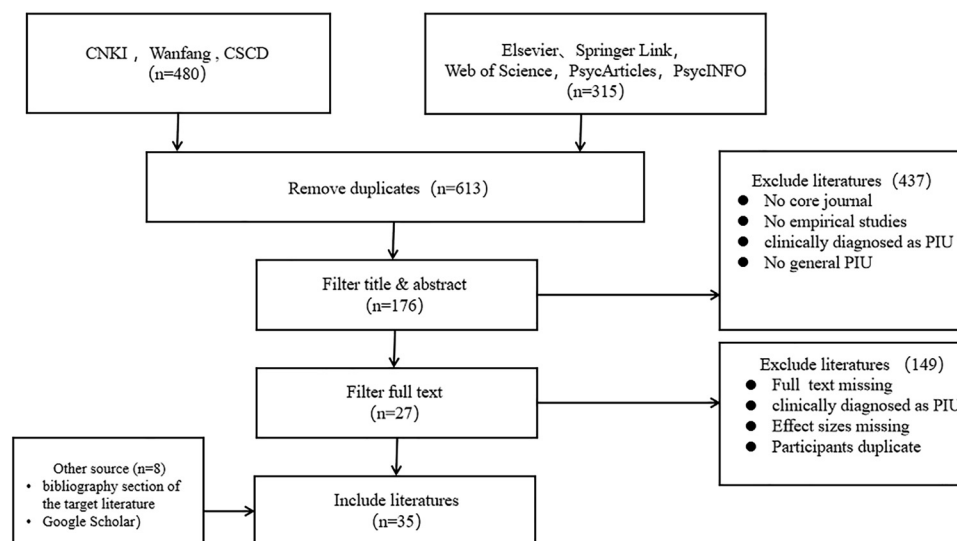


Fig. 1. Flow chart of the search procedure



from 1 to 16. The sample sizes ranged from 94 to 4,705. In the positive parenting styles model, the details of moderator variables were listed as follows. Gender: 49 effect sizes; Adolescents' age: *junior high school students* (13 effect sizes), *senior high school students* (8 effect sizes), *mixed group* (30 effect sizes); Culture: *Eastern culture* (44 effect sizes), *Western culture* (7 effect sizes); Publication year: 51 effect sizes; Measurements of parenting styles: *EMBU* (15 effect sizes), *PBI* (5 effect sizes), *Others* (31 effect sizes); Measurements of PIU: *s-IAT* (13 effect sizes), *IAT* (14 effect sizes), *CIAS* (13 effect sizes), *Others* (11 effect sizes); Sub-types of positive parenting: *warmth* (16 effect sizes), *authoritative* (4 effect sizes), *others* (31 effect sizes). In the negative parenting styles model, the details of moderator variables were listed as follows. Gender: 111 effect sizes; Adolescents' age: *junior high school students* (40 effect sizes), *senior high school students* (20 effect sizes), *mixed group* (60 effect sizes); Culture: *Eastern culture* (110 effect sizes), *Western culture* (10 effect sizes); Publication year: 120 effect sizes; Measurements of parenting styles: *EMBU* (73 effect sizes), *PBI* (5 effect sizes), *Others* (42 effect sizes); Measurements of PIU: *s-IAT* (27 effect sizes), *IAT* (29 effect sizes), *CIAS* (20 effect sizes), *Others* (44 effect sizes); Sub-types of negative parenting: *punitive* (18 effect sizes), *authoritarian* (7 effect sizes), *rejection* (20 effect sizes), *over-protection* (21 effect sizes), *permissive* (18 effect sizes), *others* (36 effect sizes). More details are shown in Table 1.

### Publication bias

Funnel plot, Rosenthal's fail-safe  $N$ , and Egger's tests were used to test the publication bias of the current study. As shown in Figs 2 and 3, the two funnel plots were highly symmetrical. The effect sizes of the correlation coefficients between parenting styles (positive and negative) and PIU were equally distributed around the mean, suggesting no evidence of publication bias. Quantitatively, Rosenthal's fail-safe  $N$  of the positive parenting styles and PIU is 2,126 and that of the negative parenting styles and PIU is 9,404, both of which were much greater than the critical value of  $5k + 10$  ( $k$  = number of effect size), indicating that the results of our study were stable and less likely to be overturned (Rosenthal, 1979). Egger's tests indicated that the publication bias in positive parenting styles and PIU should be ignored since the  $p$ -value of this test exceeded 0.05 ( $CI = (-1.900, 1.814)$ ,  $t = 0.046$ ,  $p = 0.963$ ). The publication bias in negative parenting styles and PIU can also be ignored ( $CI = (-0.695, 1.926)$ ,  $t = 0.046$ ,  $p = 0.354$ ).

### Overall relation between parenting styles and adolescent PIU

The overall relation between parenting styles and adolescent PIU was analyzed using a random-effects model. As demonstrated in Table 2, the mean  $r$  between positive parenting styles and adolescent PIU was  $-0.142$  ( $p < 0.001$ ), and that between negative parenting styles and adolescent PIU was  $0.202$  ( $p < 0.001$ ). The association between negative parenting styles and PIU was stronger than that with

positive parenting styles. In addition, the within-study variance (Level 2) and between-study variance (Level 3) were significant, meaning that a moderating analysis was necessary to determine whether the strength of the association between parenting style and adolescent PIU was influenced by potential moderators.

### Moderating effects for the relation between parenting styles and adolescent PIU

The moderating results of the five moderators between positive parenting styles and adolescents PIU are shown in Table 3. The present study obtained a significant moderating effect of age ( $F = 4.905$ ,  $p < 0.05$ ), publication year ( $F = 4.249$ ,  $p < 0.05$ ), measurement of PIU ( $F = 7.823$ ,  $p < 0.001$ ), and gender ( $F = 4.615$ ,  $p < 0.05$ ), but failed to detect the moderating effect of culture ( $F = 1.104$ ,  $p = 0.299$ ), measurement of parenting styles ( $F = 2.412$ ,  $p = 0.100$ ), and sub-types of positive parenting ( $F = 2.258$ ,  $p = 0.116$ ). More specifically, for age, the correlation in the junior group ( $r = -0.195$ ) was significantly higher than that in the senior group ( $r = -0.058$ ) and mixed group ( $r = -0.138$ ). For publication year, a stronger correlation between positive parenting and adolescent PIU was found in studies published in recent years ( $r = -0.136$ ). For measurements of PIU, studies using *s-IAT* ( $r = -0.221$ ) showed the highest correlation results, followed by other scales ( $r = -0.111$ ), *CIAS* ( $r = -0.098$ ), and *IAT* ( $r = -0.094$ ). For gender, samples including more males resulted in a higher correlation between positive parenting styles and PIU ( $r = -0.138$ ).

The moderating results of the five moderators between negative parenting styles and adolescents PIU are demonstrated in Table 4. The present study showed a significant moderating effect of culture ( $F = 17.662$ ,  $p < 0.001$ ), publication year ( $F = 5.293$ ,  $p < 0.05$ ), and sub-types of negative parenting ( $F = 14.910$ ,  $p < 0.001$ ), but failed to detect the moderating effect of age ( $F = 1.038$ ,  $p = 0.357$ ), measurement of parenting styles ( $F = 0.352$ ,  $p = 0.704$ ), measurement of PIU ( $F = 1.117$ ,  $p = 0.345$ ), and gender ( $F = 0.025$ ,  $p = 0.874$ ). The correlation between negative parenting styles and PIU in Western culture ( $r = 0.335$ ) was stronger than that in Eastern ( $r = 0.177$ ). For publication year, studies published in recent years resulted in a higher correlation between negative parenting styles and adolescent PIU ( $r = 0.189$ ). For sub-types of negative parenting, adolescent PIU was more strongly associated with parents' use of the punitive style ( $r = 0.252$ ) than with their use of the permissive style ( $r = 0.139$ ).

## DISCUSSION

Empirical studies have repeatedly shown that there is an important association between parenting styles and adolescent PIU (Li, Li, & Newman, 2013; Yaffe & Seroussi, 2019). However, the evidence in favor of this view is mixed. The three-level meta-analysis involving 171 effect sizes from 35 studies to reveal the link between parenting

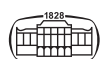


Table 1. Characteristics of included studies in the meta-analysis

Study ID	N	Gender	Age	Culture	Measurements		k		Findings (the correlation coefficient <i>r</i> of parenting styles and PIU)
					Parenting styles	PIU	positive	negative	
Cetinkaya (2019)	356	0.42	S	W	Others	IAT	2	2	Father's psychological control (0.31)/behavioral control (−0.09) Mother's psychological control (0.412)/behavioral control (−0.075)
Cheung et al. (2015)	929	0.47	Both	E	Others	IAT	1	2	Permissive (0.054)/authoritarian (0.156)/flexible (−0.056)
Cheung et al. (2015)	842	0.49	Both	E	Others	IAT	1	2	Permissive (0.079)/authoritarian (0.256)/flexible (−0.154)
Ding et al. (2017)	747	0.51	J	E	Others	s-IAT	1	0	Perceived parental monitoring (−0.23)
Dogan et al. (2015)	419	0.43	Both	W	Others	IAT	1	2	Democratic (−0.08)/protective-demanding (0.45)/authoritarian (0.436)
Dong et al. (2010)	733	0.52	S	E	EMBU	IAT	0	7	Mother's over-protection (0.14)/rejection (0.087)/punitive (0.097) Father's over-protection (0.094)/rejection (0.099)/punitive (0.104)/over-involved (0.131)
Hsieh et al. (2020)	231	0.86	Both	E	PBI	CIAS	1	1	Parental care (−0.2)/parental indifference (0.16)
Huang et al. (2006)	1,263	0.57	S	E	EMBU	IAT	1	0	Mother's warmth (0.109)
Lai et al. (2014)	688	0.50	Both	E	Others	IAT	1	1	Parent's psychological control (0.18)/behavioral control (−0.09)
Lang, Jia, Li, Su, and Zhao (2008)	94	0.72	J	E	EMBU	s-IAT	2	9	Father's warmth (−0.402)/punitive (0.316)/over-involved (0.175)/permissive (0.057)/rejection (0.298)/over-protection (0.06) Mother's warmth (−0.25)/over-protection (0.263)/rejection (0.32)/punitive (0.291)/permissive (0.302) Strictness (−0.15)/involved (−0.07)
Leung and Lee (2012)	718	0.44	Both	E	Others	IAT	2	0	Strictness (−0.15)/involved (−0.07)
Li, Wang, Li, and Wang (2007)	612	0.50	Both	E	EMBU	CIAS	2	9	Father's warmth (−0.081)/punitive (0.172)/over-involved (0.112)/permissive (0.058)/rejection (0.204)/over-protection (0.149) Mother's warmth (−0.052)/over-protection (0.208)/rejection (0.218)/punitive (0.216)/permissive (0.109)
Li and Zhou (2009)	966	0.54	Both	E	Others	CIAS	8	8	Father's involved (−0.062)/monitoring (−0.111)/rules (−0.05)/material rewarding (−0.004)/discipline (0.086)/harsh punitive (0.159)/ignoring (0.086)/inconsistent discipline (0.003) Mother's involved (−0.059)/monitoring (−0.148)/rules (−0.06)/material rewarding (0.026)/discipline (0.074)/harsh punitive (0.139)/ignoring (0.105)/inconsistent discipline (0.0003)
Li et al. (2012)	2,383	0.53	J	E	EMBU	Others	2	9	Father's warmth (−0.145)/punitive (0.21)/over-involved (0.166)/permissive (0.019)/rejection (0.223)/over-protection (0.154) Mother's warmth (−0.096)/over-protection (0.178)/rejection (0.146)/punitive (0.222)/permissive (0.03)

(continued)



Table 1. Continued

Study ID	N	Gender	Age	Culture	Measurements		k		Findings (the correlation coefficient <i>r</i> of parenting styles and PIU)
					Parenting styles	PIU	positive	negative	
Li et al. (2013)	694	–	J	E	Others	s-IAT	0	5	Solicitation (0.03)/restriction (–0.06)/ Guilt induction (0.12)/love withdrawal (0.2)/authority assertion (0.09)
Li et al. (2013)	660	0.45	Both	E	Others	IAT	0	1	Mother's psychological control (0.25)
Li et al. (2019)	3,084	0.48	Both	E	EMBU	Others	0	6	Father's rejection (0.345)/punitive (0.342)/over-involved (0.253) Mother's rejection (0.35)/punitive (0.335)/over-involved (0.21) Parent's monitoring (–0.18)
Lin et al. (2009)	1,289	0.52	Both	E	Others	s-IAT	1	0	Mother's care (–0.179)/over-protection (0.145)
Lin and Gau (2013)	2,731	0.52	S	E	PBI	Others	2	2	Father's care (–0.133)/over-protection (0.102)
Liu and Li (2017)	2,758	0.46	J	E	Others	s-IAT	1	2	Authoritative (–0.21)/authoritarian (0.29)/permissive (0.27)
Sebre et al. (2020)	305	0.40	Both	W	Others	Others	1	2	Positive parenting (–0.06)/harsh parenting (0.12)/inconsistent parenting (0.25)
Shek et al. (2018)	3,328	0.52	J	E	Others	s-IAT	2	2	Father's psychological control (0.1)/ behavioral control (–0.24) Mother's psychological control (0.15)/ behavioral control (–0.16)
Shen et al. (2012)	1,233	0.49	Both	E	Others	CIAS	2	2	Father's psychological control (0.176)/ behavioral control (–0.146) Mother's psychological control (0.191)/ behavioral control (–0.119)
Siomos et al. (2012)	1,128	0.50	Both	W	PBI	s-IAT	2	2	Mother's care (–0.356)/over-protection (0.318) Father's care (–0.269)/over-protection (0.29)
Song et al. (2014)	703	0.50	Both	E	Others	s-IAT	1	1	Parent's psychological control (0.28)/ behavioral control (–0.09)
Wang and Qi (2017)	828	0.58	Both	E	Others	Others	0	1	Harsh parenting (0.17)
Oh (2003)	450	0.53	Both	E	Others	IAT	1	0	Parent's support (–0.212)
Xi and Zhang (2005)	455	0.46	J	E	EMBU	IAT	2	7	Father's warmth (–0.068)/punitive (0.208)/over-involved (0.094)/rejection (0.232)/over-protection (0.149) Mother's warmth (–0.058)/over- protection (0.166)/rejection (0.178)/ punitive (0.168)
Yaffe and Seroussi (2019)	180	1.00	Both	W	Others	IAT	1	2	Authoritative (–0.37)/authoritarian (0.58)/permissive (0.11)
Ye et al. (2013)	1,312	0.50	J	E	Others	s-IAT	1	2	Authoritative (–0.2)/authoritarian (0.29)/permissive (0.24)
Yu et al. (2012)	186	–	Both	E	EMBU	Others	2	9	Father's warmth (–0.092)/punitive (0.229)/over-involved (0.203)/ permissive (0.323)/rejection (0.243)/ over-protection (0.239) Mother's warmth (–0.077)/over- protection (0.25)/rejection (0.32)/ punitive (0.299)/permissive (0.222)
Yu et al. (2013)	525	0.70	S	E	Others	IAT	1	3	Warmth (–0.078)/hostility (0.078)/ indifference (0.171)/rejection (0.103)

(continued)





Table 1. Continued

Study ID	N	Gender	Age	Culture	Measurements		k		Findings (the correlation coefficient <i>r</i> of parenting styles and PIU)
					Parenting styles	PIU	positive	negative	
Yu (2015)	253	0.53	Both	E	EMBU	Others	2	9	Father's warmth (−0.142)/punitive (0.081)/over-involved (0.186)/permissive (0.082)/rejection (0.131)/over-protection (0.115) Mother's warmth (−0.173)/over-protection (0.184)/rejection (0.262)/punitive (0.15)/permissive (0.051)
Zhang et al. (2009)	4,705	0.52	S	E	EMBU	Others	2	6	Father's rejection (0.155)/warmth (−0.071)/over-protection (0.095)/permissive (0.031) Mother's rejection (0.159)/warmth (−0.051)/over-protection (0.123)/permissive (0.059)
Zhang et al. (2015)	660	0.45	J	E	Others	s-IAT	1	2	Authoritative (−0.19)/authoritarian (0.25)/permissive (0.29)
Zhang et al. (2019)	1783	0.53	J	E	EMBU	s-IAT	1	2	Parent's rejection (0.26)/warmth (−0.27)/over-protection (0.17)

Note. *N* = number of participants; *k* = number of effect sizes; Gender = Ratio of males; PIU = problematic Internet use; For age: J = junior high school students, S = senior high school students, Both = junior and senior high school students; For Culture: E = Eastern culture, W = Western culture; For measurements of parenting styles: EMBU = Egna Minnen Beträffande Uppfostran (my memories of upbringing), PBI = Parenting Bonding Scale, Others included GPBS = Ghent Parental Behavior Scale, PSDQ = The Parenting Styles and Dimensions Questionnaire, WPC = Parenting Control Scale, HDS = Harsh Discipline Scale, APQ = Alabama Parenting Questionnaire, PAS = Parental Attitude Scale, PPM = Perceived Parental Monitoring, PAQ = Parental Authority Questionnaire, PCSQS = The Parent-Child Subsystem Quality Scale, PM = Patterson self-made scale, and PARQ = Parental Acceptance-Rejection Questionnaire; For measurements of PIU: s-IAT = Internet Addiction Test-Short Version, IAT = Internet Addiction Test, CIAS = Chinese Internet addiction scale, Others included APIUS = Adolescent Pathological Internet Use Scale, PIUS = Problematic Internet Use Scale, CIUS = Compulsive Internet Use Scale, and YBOCS-IU = Yale-Brown Obsessive Compulsive Scale for Internet use.

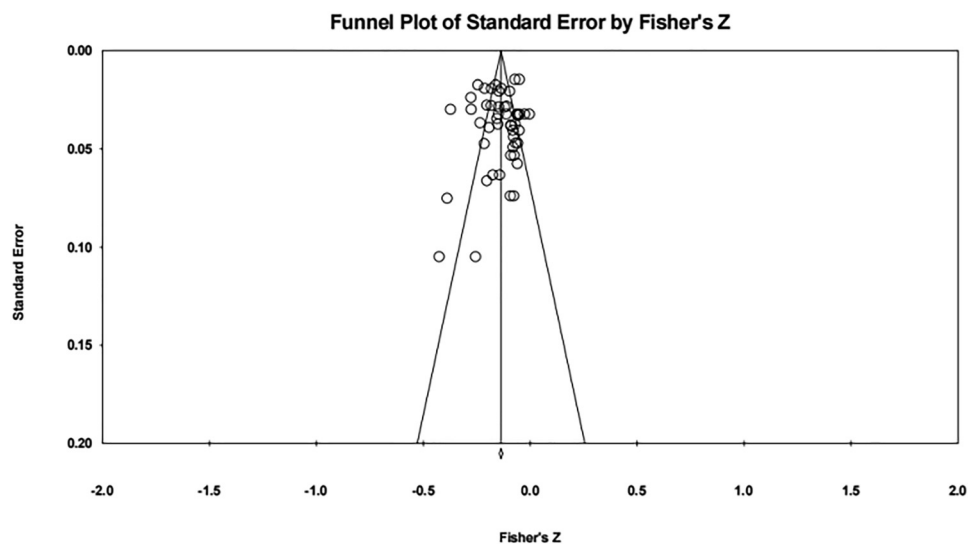


Fig. 2. Funnel plot of effect sizes of correlations between positive parenting style and PIU

styles and adolescent PIU. The current study found that positive parenting styles were significantly negatively correlated with PIU, which was moderated by gender, age, publication year, and measurements of PIU. The negative parenting style was positively correlated with PIU, which

was moderated by publication year, culture, and sub-types of negative parenting. In addition, the correlation coefficient between negative parenting styles and PIU was greater than that between positive parenting styles and PIU.



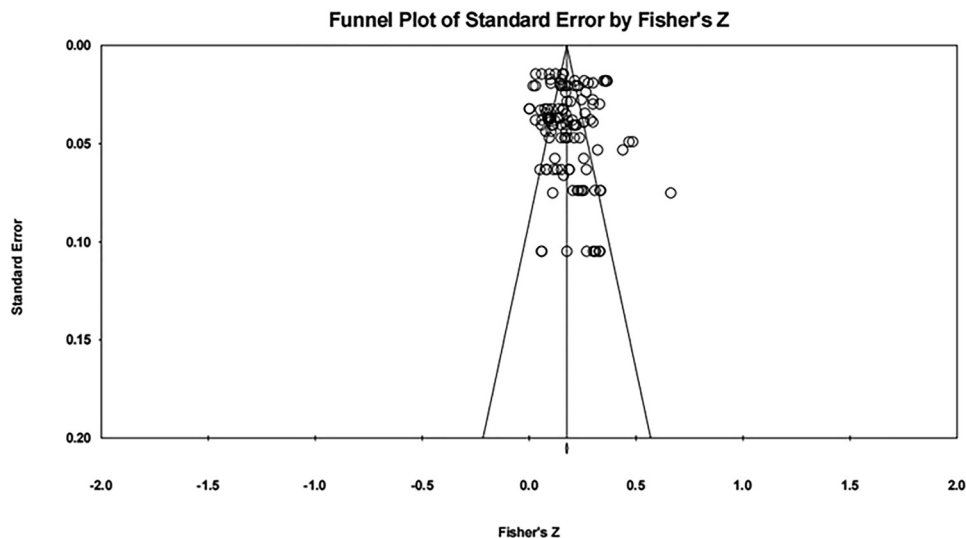


Fig. 3. Funnel plot of effect sizes of correlations between negative parenting style and PIU

Table 2. Random effect model analysis of parenting style and adolescent PIU

Parenting style	<i>k</i>	Fisher's <i>Z</i> (SE)	95% <i>CI</i>	<i>t</i>	<i>r</i>	Level 1 (%)	Level 2 variance Level 2 (%)	Level 3 variance Level 3 (%)
Positive	51	−0.143 (0.017)	−0.177; −0.109	−8.451***	−0.142	10.012	0.001*** 14.797	0.007*** 75.191
Negative	120	0.205 (0.017)	0.171; 0.239	11.930***	0.202	7.708	0.003*** 27.480	0.007*** 64.812

Note. *k* = number of effect sizes; Fisher's *z* = Mean effect size; SE = standard error; 95% *CI* = 95% confidence interval; Level 1 = sampling variance of observed effect sizes; Levels 2 variance = variance between effect sizes extracted from the same study; Levels 3 variance = variance between studies.

\*\*\**p* < 0.001.

### Overall association between parenting styles and adolescent PIU

Consistent with previous studies (Li, 2019; Li et al., 2018; Lukavská et al., 2022; Wei et al., 2017), this meta-analysis confirmed a significant relationship between parenting style and PIU. More specifically, we found a moderate negative relationship between positive parenting styles and PIU as well as a moderate positive relationship between negative parenting styles and PIU. This implies that, as an environmental factor, parenting styles can be associated with PIU (Bronfenbrenner & Ceci, 1994). This finding echoes the self-determination theory, which proposes that positive parenting styles help adolescents establish positive, warm, and close relationships. Such may satisfy children's basic psychological needs and further reduce their risk of PIU (Deci & Ryan, 2000; Zhang et al., 2019). However, children raised in an adverse family atmosphere (e.g., excessive control, punitive, and emotional indifference) may be more vulnerable to PIU (Gao et al., 2019; Yaffe & Seroussi, 2019; Zhang, Wang, Luo, Zeng, & Cui, 2020).

One of the most important aspects to emphasize is that adolescents' risk perception of Internet use may be a key to preventing them from developing PIU (Smith, Gradisar, King, & Short, 2017; Spina et al., 2021). More importantly,

the parenting style affects adolescents' perception of Internet use to some extent. In other words, parents should inform adolescents about the risks of sharing personal information, connecting with virtual friends, participating in dangerous competitions, or facing age-inappropriate content before they get exposed to the web (Spina et al., 2021). This may be even more evident in positive parenting. One possible reason is that parents who are good at using positive parenting styles are more likely to gain the trust of their children, which in part helps regularly monitor their children's Internet use to prevent excessive use. Additionally, an active mediation strategy promotes adolescents' critical thinking, including discussing their online activities and explaining the advantages and disadvantages of online activities, thereby improving adolescents' risk awareness of Internet use (Dedkova & Mýlek, 2022). In contrast, parents with controlling and authoritarian parenting behaviors ignore adolescents' ability to actively perceive risk. At the same time, such parents are less likely to use encouraging ways and active mediation strategies to raise their children's awareness of Internet risks. Over time, adolescents are more likely to seek compensation via excessive use of the Internet.

Moreover, the correlation coefficient between negative parenting styles and PIU was stronger than that between

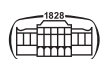


Table 3. Results of categorical and continuous moderators for the association between positive parenting styles and PIU

Moderators	<i>k</i>	Fisher's Z (95% CI)	$\beta$ (95% CI)	Mean <i>r</i>	<i>F</i>	<i>p</i>	level 2 variance	level 3 variance
a Ratio of males	49	-0.139 (-0.173; -0.105) <sup>***</sup>	-0.334 (-0.647; -0.021) <sup>*</sup>	-0.138	4.615	<0.05	0.001 <sup>***</sup>	0.006 <sup>***</sup>
b Age								
<i>S</i>	8	-0.058 (-0.129; 0.013)	0.081 (-0.001; 0.163)	-0.058	4.905	<0.05	0.001 <sup>***</sup>	0.005 <sup>***</sup>
<i>J</i>	13	-0.197 (-0.251; -0.142) <sup>***</sup>	-0.139 (-0.228; -0.049) <sup>**</sup>	-0.195				
Mixed	30	-0.139 (-0.180; -0.098) <sup>***</sup>	-0.081 (-0.163; 0.001)	-0.138				
c Culture								
<i>E</i>	44	-0.135 (-0.171; -0.100) <sup>***</sup>	0.049 (-0.045; 0.144)	-0.134	1.104	0.299	0.001 <sup>***</sup>	0.006 <sup>***</sup>
<i>W</i>	7	-0.185 (-0.272; -0.097) <sup>***</sup>	-0.049 (-0.144; 0.045)	-0.183				
d Publication year	51	-0.137 (-0.169; -0.106) <sup>***</sup>	-0.008 (-0.015; -0.000) <sup>*</sup>	-0.136	4.249	<0.05	0.001 <sup>***</sup>	0.005 <sup>***</sup>
e Measurements of parenting styles								
EMBU	15	-0.108 (-0.165; -0.051) <sup>***</sup>	0.036 (-0.033; 0.106)	-0.108	2.412	0.100	0.001 <sup>***</sup>	0.005 <sup>***</sup>
PBI	5	-0.231 (-0.329; -0.133) <sup>***</sup>	-0.123 (-0.237; -0.010) <sup>*</sup>	-0.227				
Others	31	-0.144 (-0.184; -0.104) <sup>***</sup>	-0.036 (-0.106; 0.033)	-0.143				
f Measurements of PIU								
<i>s-IAT</i>	13	-0.225 (-0.268; -0.182) <sup>***</sup>	-0.114 (-0.182; -0.046) <sup>**</sup>	-0.221	7.823	<0.001	0.002 <sup>***</sup>	0.002 <sup>***</sup>
IAT	14	-0.094 (-0.137; -0.051) <sup>***</sup>	0.131 (0.070; 0.192) <sup>***</sup>	-0.094				
CIAS	13	-0.098 (-0.160; 0.036)	0.127 (0.052; 0.202) <sup>**</sup>	-0.098				
Others	11	-0.111 (-0.163; -0.058) <sup>***</sup>	0.114 (0.046; 0.182) <sup>**</sup>	-0.111				
g Sub-types of positive parenting								
Warmth	16	-0.130 (-0.189; -0.071) <sup>***</sup>		-0.129	2.258	0.116	0.001 <sup>***</sup>	0.006 <sup>***</sup>
Authoritative	4	-0.235 (-0.328; -0.142) <sup>***</sup>	-0.105 (-0.216; 0.005)	-0.231				
Others	31	-0.130 (-0.172; -0.088) <sup>***</sup>	-0.000 (-0.073; 0.072)	-0.129				

Note. 95% CI = 95% confidence interval;  $\beta$  = estimated regression coefficient; *r* = mean effect size expressed as a Pearson's correlation; Levels 2 variance = variance between effect sizes extracted from the same study; Levels 3 variance = variance between studies; PIU = problematic Internet use; For age: *S* = senior high school students, *J* = junior high school students, Mixed = junior and senior high school students; For Culture: *E* = Eastern culture, *W* = Western culture; For measurements of parenting styles: EMBU = Egna Minnen Beträffande Uppfostran (my memories of upbringing), PBI = Parenting Bonding Scale; For measurements of PIU: *s-IAT* = Internet Addiction Test-Short Version, IAT = Internet Addiction Test, CIAS = Chinese Internet addiction scale.

\**p* < 0.05, \*\**p* < 0.01, \*\*\**p* < 0.001.

positive parenting styles and PIU, which is in line with the findings of Yu, Chen, and Chen (2012) and Dogan et al. (2015). This finding suggests that negative parenting style was a more salient risk factor compared to the protective effect of positive parenting styles, exerting greater detrimental impacts on PIU. Negative parenting styles may lead adolescents to seek self-fulfillment and social interaction through the Internet, increasing the possibility of PIU (Li et al., 2016; Yi et al., 2016). There are two reasons. On the one hand, researchers have suggested that PIU development follows a "positive acceleration model", showing that the possibility of PIU is greater than each risk factor (e.g., internet's risk characteristics, negative parenting styles) present alone when risk factors are concurrent (Li et al., 2016). On the other hand, although positive parenting can reduce PIU to some extent, it is not enough to eliminate the negative effects of negative parenting, making negative parenting a greater risk factor for PIU (Li et al., 2016).

### Explaining heterogeneity with moderators

**Age.** Age significantly moderates the relationship between positive parenting style and adolescent PIU. More

specifically, the associations among junior high school students were stronger than those between senior students and the mixed group. In other words, younger adolescents benefit more from positive parenting than older adolescents. One possible reason is that younger are more vulnerable to PIU because their control systems are not fully developed (Zhai, Feng, Zhang, Liu, & Wang, 2018). Thus, to protect them from PIU, parents are more willing to use warm and democratic ways to communicate with their children. Furthermore, studies have revealed that positive parenting style exerts a particularly significant influence on PIU among 15–16 years old teenagers (Wang, He, Liu, Shou, & Zeng, 2006). On the other hand, both group socialization theory and the big five personality model suggest that younger adolescents spend more time with their parents, and parents provide more supervision and support to their children (Harris, 1995; Vecchione et al., 2012). This avoids inducing PIU to some extent. However, age had no significant moderating effect on the relationship between negative parenting and adolescent PIU.

**Culture.** Another notable finding is that culture was a significant moderator of the association between negative parenting styles and adolescent PIU. Specifically, the



Table 4. Results of categorical and continuous moderators for the association between negative parenting styles and PIU

Moderator	<i>k</i>	Fisher's <i>Z</i> (95% CI)	$\beta$ (95% CI)	Mean <i>r</i>	<i>F</i>	<i>p</i>	level 2 variance	level 3 variance
a Ratio of males	111	0.201 (0.165; 0.238)***	0.024 (−0.280; 0.329)	0.198	0.025	0.874	0.003***	0.007***
b Age								
<i>S</i>	20	0.158 (0.079; 0.236)***	−0.065 (−0.156; 0.026)	0.157	1.038	0.357	0.003***	0.007***
<i>J</i>	40	0.199 (0.140; 0.257)***	0.041 (−0.057; 0.139)	0.196				
Mixed	60	0.223 (0.178; 0.268)***	0.065 (−0.026; 0.156)	0.219				
c Culture								
<i>E</i>	110	0.179 (0.149; 0.208)***	−0.169 (−0.249; −0.090)***	0.177	17.662	<0.001	0.003***	0.004***
<i>W</i>	10	0.348 (0.274; 0.422)***	0.169 (0.090; 0.249)***	0.335				
d Publication year	120	0.191 (0.158; 0.224)***	0.009 (0.001; 0.017)*	0.189	5.293	<0.05	0.003***	0.006***
e Measurements of parenting styles								
EMBU	73	0.186 (0.131; 0.242)***	−0.030 (−0.102; 0.041)	0.184	0.352	0.704	0.003***	0.007***
PBI	5	0.204 (0.089; 0.320)***	0.018 (−0.110; 0.146)	0.201				
Others	42	0.217 (0.171; 0.262)***	0.030 (−0.041; 0.102)	0.214				
f Measurements of PIU								
<i>s-IAT</i>	27	0.229 (0.168; 0.289)***	0.069 (−0.013; 0.151)	0.225	1.117	0.345	0.003***	0.006***
IAT	29	0.225 (0.166; 0.284)***	−0.004 (−0.088; 0.081)	0.221				
CIAS	20	0.144 (0.054; 0.234)***	−0.085 (−0.194; 0.023)	0.143				
Others	44	0.184 (0.122; 0.245)***	−0.045 (−0.131; 0.041)	0.182				
g Sub-types of negative parenting								
Punitive	18	0.258 (0.215; 0.301)***		0.252	14.910	<0.001	0.001***	0.008***
Authoritarian	7	0.245 (0.187; 0.302)***	−0.013 (−0.072; 0.045)	0.240				
Rejection	20	0.259 (0.218; 0.301)***	0.001 (−0.032; 0.034)	0.253				
Over-protection	21	0.221 (0.179; 0.263)***	−0.037 (−0.072; −0.002)*	0.217				
Permissive	18	0.140 (0.098; 0.183)***	−0.118 (−0.156; −0.079)***	0.139				
Others	36	0.188 (0.149; 0.227)***	−0.070 (−0.103; −0.036)***	0.186				

Note. 95% CI = 95% confidence interval;  $\beta$  = estimated regression coefficient; *r* = mean effect size expressed as a Pearson's correlation; Levels 2 variance = variance between effect sizes extracted from the same study; Levels 3 variance = variance between studies; PIU = problematic Internet use; For age: *S* = senior high school students, *J* = junior high school students, Mixed = junior and senior high school students; For Culture: *E* = Eastern culture, *W* = Western culture; For measurements of parenting styles: EMBU = Egna Minnen Beträffande Uppfostran (my memories of upbringing), PBI = Parenting Bonding Scale; For measurements of PIU: *s-IAT* = Internet Addiction Test-Short Version, IAT = Internet Addiction Test, CIAS = Chinese Internet addiction scale.

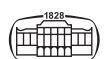
\**p* < 0.05, \*\*\**p* < 0.001.

correlation was stronger in Western cultures. Chao (2001) suggested that parents from Eastern cultures prefer authoritarian parenting (a typical negative parenting style), but their children tend to regard “discipline” as a positive behavior. However, authoritarian parenting is considered detrimental to adolescent development in Western culture (Tamis-Lemond et al., 2010). This cultural difference in the understanding of authoritarian parenting may be attributed to the stronger correlation between negative parenting styles and PIU in Western cultures. However, it should be noted that culture did not moderate the association between positive parenting styles and adolescent PIU. This may indicate that positive parenting styles can be beneficial to the development of autonomy in both Eastern and Western cultures (Yaffe & Seroussi, 2019).

**Publication year.** The present study confirmed that the link between parenting style and adolescent PIU was moderated by publication year. In other words, PIU was more strongly associated with parenting styles in studies published in recent years. Owing to the rapid development of science and technology, the Internet has become more available in recent

years. Meanwhile, as the rate of adolescents' PIU increases, so does the association between parenting style and adolescent PIU (Pan et al., 2020; Shao et al., 2018). These results may also indicate that researchers have begun to pay more attention to the impact of parenting styles on adolescent PIU in recent years, which has promoted research in this field.

**Measurement.** As for the measurements, the meta-analysis revealed that the association between positive parenting styles and adolescent PIU was moderated by the measurement of PIU but not by the measurement of parenting style. More specifically, studies using *s-IAT* showed the strongest correlation, followed by those using CIAS and IAT. This is consistent with a previous meta-analysis showing that the correlation between two variables varies according to the number of measurement dimensions (Cheng, Wang, Sigeron, & Chau, 2019), as *s-IAT* is a single-dimension tool while the other tools are multi-dimensional. Regarding the measurement of parenting style, the meta-analysis divided the subgroups by scale use frequency. The subgroups of the study, EMBU, and PBI were all focused on parents' specific



parenting behaviors while the relationship between the two variables may be more affected by different research perspectives of the scales. Nevertheless, contrary to our hypothesis, the association between negative parenting styles and PIU did not differ in strength through measurements of both parenting styles and PIU. This observation may be because adolescents' negative developmental outcomes are more closely related to negative parenting styles, and this relationship is less susceptible to other factors (Li, Ran, et al., 2019).

**Gender.** Additionally, the present study found that gender moderated the association between positive parenting styles and PIU. More specifically, the association between these two variables was larger in males than in females. This result implied that positive parenting styles might be more beneficial for males. This is consistent with previous empirical research results (Cheung et al., 2015). Given that some studies have suggested that male adolescents are consistently found to be more prone to PIU than female adolescents (Siomos et al., 2012; Yaffe & Seroussi, 2019), because males tend to engage in more addictive and problematic internet activities (e.g., playing online games, internet gambling) (Musetti, Terrone, & Schimmenti, 2018). Cheung et al. (2015) have suggested a combination of flexible and authoritarian parenting styles to reduce the risk of addiction in males. Nevertheless, gender was found to be a non-significant moderator of the association between negative parenting styles and PIU. This may be because negative parenting, a destructive parenting pattern, affects PIU equally in males and females.

**Sub-types of positive and negative parenting.** The results suggested that the association between negative parenting styles and adolescent PIU was moderated by sub-types of negative parenting. Specifically, adolescent PIU was more strongly associated with parents' use of the punitive style than with their use of the permissive style. Punitive parents may use high regulation, perhaps even corporal punishment, while permissive parents tend to provide low regulation with a "laissez-faire" attitude (Zhang et al., 2015). It's obvious that children suffer severe harm both physically and psychologically faced with punitive parenting, which makes adolescents more prone to negative emotions (Huang et al., 2010). Further, the compensatory internet use model has pointed out that negative life situations (i.e., punitive parenting) are more likely to give rise to a motivation to go online to alleviate negative feelings and pressure, triggering PIU in the long run (Kardefelt-Winther, 2014). On the other hand, some studies have indicated that greater punitiveness was associated with enhanced risk for PIU, because it leads to adolescent alienation from parents and family (Huang et al., 2010; Li, Garland, & Howard, 2014). We found no moderating effect of positive parenting sub-types.

## LIMITATIONS AND IMPLICATIONS

Several limitations and implications need to be considered. We only examined the moderating effects of gender, age,

cultural background, publication year, and measurement. Other background characteristics that have strong relations with parenting styles and PIU (e.g., parents' education level and socioeconomic status) were not included in our study as they were rarely reported in the literature (Zhang, 2016). To better understand the relationship between parenting styles and PIU, future research could provide more specific background information. Another limitation of this study is that the current study investigated the association between parenting styles and general PIU behaviors. However, considering the heterogeneity of internet use, PIU has different specific PIU behaviors (e.g., online game addiction, social networking addiction, etc.). Future research could potentially specific relations and mechanisms. Finally, an additional limitation was that the study failed to reveal causal links between relevant variables since the included studies were all cross-sectional designs. Future empirical studies should consider the longitudinal design and examine the trend of the relationship between parenting styles and PIU over time.

## CONCLUSION

Despite the limitations, the study used the three-level meta-analysis to add to the evidence for the relationship between parenting style and PIU. Specifically, positive parenting style was significantly negatively correlated with adolescent PIU, while negative parenting style was significantly positively correlated with adolescent PIU. Further, the correlation coefficient between negative parenting styles and PIU was higher than that between positive parenting styles. The moderator analysis revealed that age, gender, culture, publication year, and measurements of PIU could play a moderator role, but measurements of parenting style did not. Overall, understanding the relationship between parenting style and PIU could have implications for the prevention of PIU. That is, positive parenting style is the protective factor of adolescent PIU, while negative parenting style is the risk factor of adolescent PIU, especially punitive parenting. Parents should use more positive parenting and less negative parenting to prevent adolescent PIU.

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**Funding sources:** This study was supported by Late-Stage Funding of Philosophy and Social Science Research Project by the Ministry of Education (grant number 20JHQ090).

**Authors' contribution:** Study concept and design: XN, JL and JW. Analysis and interpretation of data: NX and JL. Critical revision of the manuscript: DK, DR, HW and JW. All authors had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

**Conflict of interest:** There are no conflicts of interest to declare. Daniel King is an associate editor of the Journal of Behavioral Addictions.



*Acknowledgements:* We would like to thank all of the participants who dedicated their time to completing this study.

## SUPPLEMENTARY DATA

Supplementary data to this article can be found online at <https://doi.org/10.1556/2006.2023.00043>.

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