



The associations of adolescent problematic internet use with parenting: A meta-analysis

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ARTICLE INFO

Keywords:

Problematic Internet Use
Gaming Disorder
Problematic Smartphone Use
Parenting
Parental Control
Parental Warmth
Parental Mediation

ABSTRACT

Problematic internet use (PIU) has adverse effects on adolescent health. Parenting may play an important role in the prevention of this condition, but the associations between PIU and parental behavior are unknown. This meta-analysis examined the associations between adolescent PIU and general and media-specific parenting. Studies were obtained using searches in scientific databases and using references identified from bibliographies. Searches covered English written journal articles, master's theses, and doctoral dissertations from the year each database started until April 2022. Studies were included if they (a) measured PIU, (b) measured parenting, (c) used data obtained from children or adolescents, and (d) reported a valid analysis. Two coders decided whether each study met the required criteria. Data were pooled using a random effects model. We found weak negative associations between PIU and general parenting, namely, warmth ($r = -0.17$, $[-0.13, -0.20]$, $k = 24$, $N = 58401$), control ($r = -0.10$, $[-0.01, -0.18]$, $k = 10$, $N = 12199$), and authoritative parenting ($r = -0.12$, $[-0.02, -0.21]$, $k = 8$, $N = 5431$), but the associations between PIU and media-specific parenting, namely, active mediation ($r = -0.02$, $[-0.07, 0.02]$, $k = 11$, $N = 30545$) and restrictive mediation ($r = 0.01$, $[-0.10, 0.11]$, $k = 16$, $N = 36997$), were non-significant. In older adolescents, the association between restrictive mediation and PIU was significant but positive. Media parenting has only weak association with PIU and thus restrictions should be used cautiously, especially in older adolescents. Additional prospective studies on parenting and specific PIU activities are needed.

1. Introduction

The problematic use of screens in children and adolescents is receiving increasing attention. Unlike early studies on the use of screens that were focused predominantly on TV, current research on problematic (addictive) screen use predominantly targets the internet (Browne et al., 2021; Tran et al., 2020). The use of the internet has globally risen over the last decade (Kuss & Billieux, 2017). Therefore, it is necessary to pay attention to the risks related to its use (Király et al., 2020), which seem to be especially prevalent in adolescents (Kuss et al., 2014). In pursuit of preventing adolescent problematic internet use (PIU), researchers have tried to identify various factors associated with it. Parenting—the sum of practices that parents are using to promote

desirable outcomes in their child—is one of the most prevalent among the examined factors. This is not surprising given that parenting, namely parental responsiveness and strictness (control), has previously been confirmed to affect other forms of adolescent risk or harmful behaviors (González-Cámara et al., 2019).

It is important to distinguish between two concepts of parenting: (1) general parenting, which reflects general parenting practices and the overall relationship between parents and their child, and (2) specific parenting, which reflects parental regulation efforts related to a specific area of the child's behavior—e.g., use of screens/media.

In the context of (problematic) screen/media use, the effect of media-specific parenting on the extent of children's (problematic) media use has been analyzed with inconclusive results (Collier et al., 2016; Fam

Abbreviations: PIU, problematic internet use; GD, gaming disorder; PSU, problematic smartphone use; GPW, general parental warmth; GPC, general parental control; GAP, general authoritative parenting; AM, active mediation; RM, restrictive mediation.

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<https://doi.org/10.1016/j.addbeh.2022.107423>

Received 8 January 2022; Received in revised form 3 July 2022; Accepted 4 July 2022

Available online 6 July 2022

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et al., 2022; Jago et al., 2013; Nielsen et al., 2019). To the best of our knowledge, no literature review or meta-analysis focusing on the relationship between general parenting (warmth and control) and PIU has been published to date. The lack of knowledge on the relationships between parenting on adolescent PIU may pose a problem. Parents are important regulators of online media consumption in children and adolescents because online media are widely available (or even penetrative) and their consumption in children cannot be regulated legislatively as opposed to addictive substances (e.g., alcohol, tobacco, drugs) or activities (e.g., gambling) for which age limits are often applied. Therefore, we need to understand the role of parents in child and adolescent PIU in order to promote and strengthen the preventative efforts of parents. It should be noted that the excessive/addictive use of online media is only one aspect of the use that would benefit from the effective parental regulation; other aspects include at-risk internet use (e.g., self-disclosing behavior, sexting) and cyber-aggression (e.g., cyber-bullying, cyber-victimization) (Fineberg et al., 2018) but these were beyond the scope of this study.

2. Problematic internet use

PIU, sometimes referred to as *Internet Addiction* or *Excessive Internet Use*, can be broadly defined as the inability to inhibit online activities despite their negative consequences (Kuss et al., 2014). PIU has recently been proposed as an umbrella term for various potentially problematic (addictive) behaviors related to the use of the internet, namely, gaming, gambling, shopping, pornography viewing, social networking and 'cyberchondria' (Fineberg et al., 2018). It has been demonstrated that PIU have been associated with marked functional impairment and decreased quality of life (Fineberg et al., 2018). Although scholars currently recommend analyzing various online activities separately (Fineberg et al., 2018), there is still a large body of studies assessing problematic use related to the internet in general (Browne et al., 2021).

2.1. General parenting

General parenting affects many child/adolescent risk behaviors, e.g., drug use, antisocial, aggressive or delinquent behavior, academic performance, self-esteem, self-efficacy, depression, anxiety and others (González-Cámara et al., 2019). Most studies concerning general parenting in the context of adolescent risk behavior are based on the theory of Baumrind (Baumrind, 1971, 1978, 1991, 2016), which presumes two distinct (orthogonal) components of parenting: (1) *parental warmth*, akin to responsiveness or supportiveness, which refers to "the extent to which parents intentionally foster individuality, self-regulation, and self-assertion by being attuned, supportive, and acquiescent to children's special needs and demands" (Baumrind, 1991, p. 62); and (2) *parental control*, akin to demandingness or strictness, which refers to the extent to which parents desire "children to become integrated into the family whole, by their maturity demands, supervision, disciplinary efforts and willingness to confront the child who disobeys" (Baumrind, 1991, pp. 61–62). Combinations of low/high levels of parental warmth and control also allow to distinguish four general parenting styles: authoritative (high warmth, high control), authoritarian (low warmth, high control), permissive/indulgent (high warmth, low control), and neglectful (low warmth, low control). Authoritative parenting is considered to be the most beneficial for the majority of adolescent outcomes, including substance use and other risk behaviors (Hosokawa & Katsura, 2019).

There is a wide consensus among scholars on how to conceptualize parental warmth, but the same cannot be said for parental control (González-Cámara et al., 2019). Most studies follow Baumrind's conceptualization of parental *behavioral* control, as described above, but alternative concepts have also been introduced, e.g., *psychological* control, which reflects intrusive and manipulative parenting practices, such as guilt induction and love withdrawal (Barber, 1996). It seems that a

good parent–child relationship, often reflected by children/parents as parental warmth, is associated with a lower risk of PIU. Negative associations between parental warmth/care and PIU has been found in general population studies (Bleakley et al., 2016; Casaló & Escario, 2019; Dong et al., 2019; Shek et al., 2018, 2019; Shi et al., 2017; Siomos et al., 2012; Xu et al., 2014) as well as in a study using adolescents with clinically diagnosed PIU (Xiuqin et al., 2010). In case of (behavioral) parental control, most studies found small negative associations between control and PIU (Cetinkaya, 2019; Li et al., 2013; Shek et al., 2018, 2019). The combination of parental warmth and control, i.e., authoritative parenting, seems to substantially decrease the probability of adolescent PIU, especially when adopted by both parents - Lukavská et al. (2020) found the prevalence of PIU symptomatology in adolescents with authoritative parents to be 3%, which was less than half compared to the 8% prevalence in the whole sample. Contrary, the highest prevalence of PIU was found for children with authoritarian mothers, i.e., those who display high levels of control and low levels of warmth, and with neglectful fathers, i.e., those who display low levels of both control and warmth. This suggested that the interplay between warmth and control in parenting is complex and may work differently for mothers and fathers.

2.2. Internet/Media-specific parenting

The concept of internet/media-specific parenting is grounded in media consumption research, which developed in the context of increasing television consumption in children during the second half of the last century. Parenting practices focused on media consumption are often called 'parental mediation' (Livingstone & Helsper, 2008). Scholars usually distinguish between 'active' and 'restrictive' mediation. *Active mediation* originally reflected the extent to which parents discussed the content of media with their child (Austin, 1993) but has been broadened to reflect the general level of communication about media and shared experiences of media use between parents and children (Koning et al., 2018). *Restrictive mediation* mostly reflects parental practices of developing and implying regulative rules over the child's media use (Kalmus et al., 2015; Koning et al., 2018; Livingstone & Helsper, 2008). Active and restrictive mediation are considered to be two distinct but not mutually exclusive strategies toward children's regulation of media use. It has been shown that restrictive mediation is weakly but significantly associated with decreased media time (Collier et al., 2016; Fam et al., 2022) and with the decreased consumption of potentially harmful content (violence, pornography) on TV (Livingstone & Helsper, 2008). Active mediation has been shown to reduce the amount of violent content watched on TV (Nathanson & Cantor, 2000; Ruh Linder & Werner, 2012) but the effects on media time are inconsistent – a weak negative association (Fam et al., 2022) or no association (Collier et al., 2016). Studies assessing relationships between parental mediation and PIU have yielded inconsistent results (Nielsen et al., 2019).

Compared to general parenting for which many frequently used measuring tools are available (González-Cámara et al., 2019), there is a large heterogeneity in the measurement of parental mediation (active and restrictive mediation). Many instruments were derived from EU Kids Online survey (Livingstone et al., 2011) or adapted from television-focused research (Fam et al., 2022). In many studies, self-constructed instruments have been used without previous validation. This is understandable given the need to rapidly develop new measures to assess the emerging/changing phenomena in the field of media and communication studies.

2.3. Present study

Based on the above, the goal of this meta-analytic study was to estimate the pooled associations between problematic internet use and general parental factors (warmth, control, authoritative parenting) and

internet/media-specific parenting (active and restrictive mediation). We presumed that several variables could moderate the proposed relationships. (i) It has been shown that the intensity (frequency) of parenting practices changes over time. Warmth and control were found to decrease during young adolescence in both Europe and Asia (Chen et al., 2000; Lukavská et al., 2020). The same decrease has been observed for media parenting (Beyens et al., 2019). Therefore, we assumed that parenting might have different effects on younger and older adolescents. (ii) Population samples from different continents show differences in PIU prevalence (Cheng & Li, 2014). Moreover, it has been shown that there are region/culture-based differences in parenting and its outcomes. For instance, it has been argued that parenting is perceived differently in Western and Eastern cultures, e.g., Eastern-based constructs of parenting often do not distinguish between warmth and control as distinct dimensions, and it is common for Eastern parents to rate high in both (Shapka & Law, 2013). Therefore, we assumed the effects of parenting to be moderated by the home continent of the studied population. (iii) Different effects of both general and media-specific parenting have been previously found for girls and boys (Casaló & Escario, 2019; Koning et al., 2018) and thus we assumed adolescent gender to moderate the relationships between parenting and PIU.

3. Methods

This review was conducted in accordance with the preferred reporting guidelines for systematic reviews and meta-analyses – PRISMA 2020 (Page et al., 2021). The review protocol used in this study was not previously registered.

3.1. Search strategies

A systematic search was carried out in February 2020 and updated in April 2022 on the Web of Science (WoS), Scopus, PubMed and Google Scholar databases using the combination of keywords for parenting and keywords for screen/internet use. The syntax for the search formulas for each database are shown in Table 1. Originally, we were focused on general parenting but decided to broaden the scope also to studies on media-specific parenting (“parental mediation”) that were found during the search. We also identified other studies on media-specific parenting using references in the papers being searched. In contrast, we initially searched broadly for any screen use but decided to narrow the scope to problematic use only after the first scan of sources emerging in the search. Searches covered journal articles, master’s theses, and doctoral dissertations from the year each database started until April 2022. The search was limited to articles written in English.

3.2. Variables included in the meta-analysis

3.2.1. PIU

Among studies focusing on parenting and problematic use of screens (excluding watching television), the most prevalent studies were those on problematic internet use in general (general PIU). Other specific outcomes that have been analyzed in the context of parenting, i.e., gaming disorder (GD) and problematic smartphone use (PSU), are also at least partially related to the internet. Gaming disorder usually concerns online gaming rather than offline gaming. Problematic smartphone use (PSU) is a concept derived from PIU but limited (or broadened) to the use of smartphones instead of the use of the internet, i.e., excessive and uncontrollable use of a smartphone that has negative consequences for the user. Recent studies suggested that PSU overlaps with problematic use of social media (Marino et al., 2021). Therefore, in the present study, we considered GD and PSU to be specific cases of PIU.

3.2.2. Parenting

Five parenting-related variables were assessed: warmth, control, authoritative parenting, active mediation, and restrictive mediation.

Table 1
Searching formulas.

Database	Searching Formula
Web of Science	TS=(“parent* control*” OR “parent* regulat*” OR “parenting style*”) AND (TS/TITLE-ABS-KEY=(“screen” OR “screen-time” OR “gaming” OR “game” OR “Internet” OR “video” OR “YouTube” OR “social networks” OR “Facebook” OR “Instagram” OR “Twitter” OR “electronic device” OR “smartphone” OR “phone” OR “tablet” OR “console”))
Scopus	TITLE-ABS-KEY (“parental control” OR “parental regulation” OR “parenting style” OR “parenting styles”) AND (“screen” OR “screen-time” OR “gaming” OR “game” OR “Internet” OR “video” OR “YouTube” OR “social networks” OR “Facebook” OR “Instagram” OR “Twitter” OR “electronic device” OR “smartphone” OR “phone” OR “tablet” OR “console”)
PubMed	((“parental control”[Title/Abstract]) OR “parental regulation”[Title/Abstract]) OR “parenting style”[Title/Abstract]) AND (((((((((((((((“screen”[Title/Abstract]) OR “screen-time”[Title/Abstract]) OR “online”[Title/Abstract]) OR “gaming”[Title/Abstract]) OR “game”[Title/Abstract]) OR “Internet”[Title/Abstract]) OR “video”[Title/Abstract]) OR “YouTube”[Title/Abstract]) OR “social networks”[Title/Abstract]) OR “Facebook”[Title/Abstract]) OR “Instagram”[Title/Abstract]) OR “Twitter”[Title/Abstract]) OR “electronic device”[Title/Abstract]) OR “smartphone”[Title/Abstract]) OR “phone”[Title/Abstract]) OR “tablet”[Title/Abstract]) OR “console”[Title/Abstract])
Google Scholar	Formula A (Title): screen, OR screen-time, OR gaming, OR game, OR Internet, OR video, OR YouTube, OR social OR networks, OR Facebook, OR Instagram, OR Twitter, OR smartphone, OR phone, OR tablet, OR console AND “parental control” Formula B (Title): screen, OR screen-time, OR gaming, OR game, OR Internet, OR video, OR YouTube, OR social OR networks, OR Facebook, OR Instagram, OR Twitter, OR smartphone, OR phone, OR tablet, OR console AND “parental regulation” Formula C (Title): screen, OR screen-time, OR gaming, OR game, OR Internet, OR video, OR YouTube, OR social OR networks, OR Facebook, OR Instagram, OR Twitter, OR smartphone, OR phone, OR tablet, OR console AND “parenting style”

Note. TS = topic search, ABS = abstract search, KEY = keywords search.

Other previously identified forms of parental mediation, such as co-viewing/co-using, no mediation and monitoring, were not analyzed. It should be noted that within this meta-analysis, we limited the concept of control to *behavioral parental control* (see Theoretical background).

3.2.3. Moderators

Age of the target population. Most studies eligible for this meta-analysis were found to be conducted with samples with a relatively broad age range, however, it was possible to differentiate studies with children and/or young adolescents (<14 years) and those with older adolescents (greater than 14 years). Therefore, three categories were established: young, old, and mixed.

Home continent of the studied population. There were relatively few studies conducted in Europe, the Middle East, America and Australia; therefore, we were forced to merge studies coming from these areas into one group (“non-Asian”) in moderation analyses.

Specific PIU outcome (general PIU, GD, or PSU) could be assessed only in the case of some predictors (namely, warmth, active and restrictive mediation) due to low number of studies on GD and PSU.

Child/adolescent gender could not be assessed because only a minority of studies presented separate analyses for boys and girls. Also, the proportion of females in samples were similar across studies except only three studies with predominantly male samples. *The gender of a parent* has been disregarded in most studies, which disabled us from including it as a moderator.

Most studies in our dataset utilized cross-sectional data. Only a few studies were longitudinal, i.e., provided the analysis of the relationship

between parenting and PIU while controlling for baseline PIU. Therefore, it was not possible to assess the study design (cross-sectional versus longitudinal/prospective) as a moderator. We used coefficients controlled for baseline PIU from these studies.

3.3. Inclusion and Exclusion criteria

To be included in this meta-analysis, the articles had to meet four criteria. (a) The study needed to measure PIU (including studies on the internet in general and studies on problematic use of social networks, (internet) gaming disorder, problematic use of smartphones). The measurement of PIU had to be based on relevant diagnostic criteria (e.g., loss of control, preoccupation, withdrawal, conflicts) and sufficient reliability. We did not include studies on risky internet use (e.g., sexting) and cyber-bullying, as these conditions are quite different in nature from the excessive/addictive use of the internet. (b) The study needed to measure or manipulate parenting (at least one of warmth, control, authoritative parenting, active mediation, restrictive mediation) with a valid instrument. Studies using only simplistic measurement of parenting (e.g., “Is the parental control you perceive low, average, or high?” to measure control or “Is your relationship with your mother good or bad?” to measure warmth) were excluded. (c) The study needed to use data obtained from children or adolescents. (d) There must have been a zero-order correlation coefficient, partial correlation coefficient, beta coefficient, odds ratio, log rate ratio, or a *t* test value. Two coders independently decided whether each study met the required criteria. In case of disagreements, these were discussed until a consensus was reached.

Of the 134 reports initially assessed, forty were included in the quantitative synthesis (see Fig. 1), representing 91,312 total participants. A more detailed view of the studies within the meta-analysis can be found in Table 2. Not all studies provided data on all assessed parenting variables: 22 studies (with a total of 58,401 participants) included warmth, 10 studies (12,199 participants) included control, 8 studies (5,431 participants) included authoritative parenting, 10 studies (30,545 participants) included active mediation, and 15 studies (36,997

participants) included restrictive mediation. A few reports reported separate analyses for various sub-samples based on gender (Casaló & Escario, 2019) or region (Cheung et al., 2015; Cui et al., 2018) and one report reported two different studies (van den Eijnden et al., 2010).

3.4. Coding of studies

Two researchers independently coded the retained studies. Seven variables were coded: (a) type(s) of parenting, (b) who reported parenting (child or parent), (c) type(s) of PIU assessed, (d) who reported PIU (child or parent), (e) age of the examined population, (f) home continent of the population, and (g) design of the study (Table 2). Coders then came to 100% consensus on all coding by returning to studies and discussing any coding differences.

3.5. Risk of bias

Risk of bias assessment was based on ROBUST (Nudelman & Otto, 2020) which specified 8 criteria relevant for survey studies. Each study could reach 0 to 8 points where 0 is the lowest quality (not meeting any criteria) and thus high risk of bias; and 8 is the highest quality (meeting all criteria) and low risk of bias. Two researchers independently assessed the studies. Disagreements occurred in the case of four studies (one point difference in all cases). These disagreements were resolved by discussion with the inclusion of a third researcher. Scores of included studies ranged from 3 to 7 (Table 2). Studies mostly failed to report the proportion of excluded participants (or the proportion was higher than 20%) and procedures related to data management (number of missing values, outliers, and invalid responses). All studies measured PIU with valid instruments and only five studies did not report sufficient reliability of parenting measurement. All studies had a sufficient sample size and all studies except one reported basic sociodemographic characteristics of the sample (for details see Supplementary Table S1).

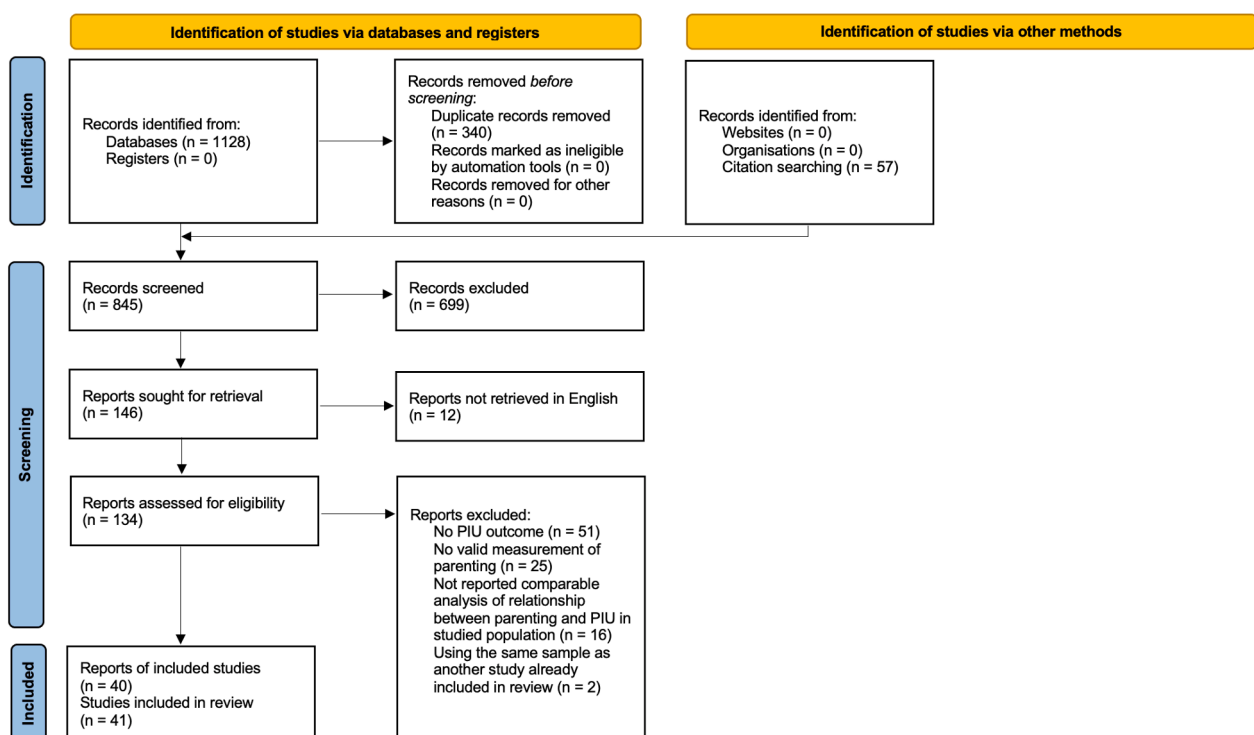


Fig. 1. Prisma flowchart of sources.

Table 2
Sample Size, Parenting Type, Outcomes, and Selected Moderators for Included Studies.

Study	Parenting	Parenting reported by	Outcome	Age	Continent	Proportion of females	Risk of Bias ¹	N
Areshthanab et al., 2021	GPS	Parent	GD	Y	Middle East	50%	6	657
Bae, 2015	GPC, GPW	Child	PSU	Y	Asia	48%	5	2376
Benrazavi et al., 2015	RM, AM	Parent	GD	O	Asia	46%	3	296
Bleakley et al., 2016	GPC, GPW	Child	PIU	Y-O	North America	49%	5	595
Bulanik Koc et al., 2020 ⁺	GPC, GPW	Child	GD	Y-O	Middle East	0%	5	100
Casaló & Escario, 2019	GPW	Child	PIU	O	Europe	51%	5	28,331
Cetinkaya, 2019	GPC	Child	PIU	O	Middle East	58%	4	356
Cui et al., 2018	GPW, AM, RM	Child	GD	O	Asia	49%	6	3109
Faltýnková et al., 2020	GPW, GPC	Child	PIU	Y-O	Europe	49%	6	2547
Hefner et al., 2019	RM, AM	Parent	PSU	Y	Europe	48%	6	496
Gan et al., 2021	GPW	Child	GD	Y	Asia	54%	5	1041
Chandrima et al., 2020	RM, AM	Child	PIU	Y-O	Asia	53%	5	350
Chang et al., 2015	GPW, RM, AM	Child	PIU	Y-O	Asia	52%	5	1864
Chen et al., 2015	GPW, GAP	Parent	PIU	Y	Asia	50%	4	1153
Chen et al., 2020	GPW	Child	GD	O	Asia	56%	6	357
Cheng, 2019	GPC	Child	GD	Y-O	Asia	41%	6	466
Cheung et al., 2015	GAP	Child	PIU	O	Asia	55%	7	1771
Choo et al., 2015*	GPW, RM	Child	PIU	Y	Asia	27%	5	2457
Kalaitzaki & Birtchnell, 2014	GAP	Child	PIU	O	Europe	48%	4	757
Kalmus et al., 2015	RM, AM	Parent	PIU	Y-O	Europe	50%	5	18,709
Koning et al., 2018	RM, AM	Child	GD, PIU	Y	Europe	49%	4	544
Lee, 2013	RM	Parent	PIU	Y-O	Asia	48%	6	566
Lee & Kim, 2021 [#]	GPW, RM, AM	Child	PSU	Y	Asia	55%	5	184
Leung & Lee, 2012	GPC, GPW	Child	PIU	Y-O	Asia	56%	5	718
Li et al., 2013	GPC	Child	PIU	Y-O	Asia	55%	4	694
Lian et al., 2016	GPW	Child	PSU	O	Asia	44%	4	742
Lin & Gau, 2013	GPW	Child	PIU	O	Asia	48%	4	2731
Lukavská et al., 2020	GPC, GPW	Child	PIU	O	Europe	51%	6	1019
Maftai & Enea, 2020	GPS	Parent	GD	Y	Europe	53%	5	139
Ni et al., 2017	GPW	Child	PIU	O	Asia	47%	5	501
Setiawati et al., 2021	GPS	Child	PIU	Y-O	Asia	61%	4	114
Shek et al., 2018	GPC, GPW	Child	PIU	Y	Asia	48%	7	3328
Siomos et al., 2012	GPW	Child	PIU	Y-O	Europe	48%	4	1199
Su et al., 2018	GPW, RM	Child	GD	Y-O	Asia	45%	5	1490
van den Eijnden et al., 2010	RM, AM	Child	PIU	Y-O	Europe	49%	5	4483
van den Eijnden et al., 2010*	RM, AM	Child	PIU	Y-O	Europe	68%	3	510
Venkatesh et al., 2019	GPW, RM	Child (GPW), Parent (RM)	PIU	Y-O	Asia	52%	5	776
Wu et al., 2016	RM	Child	PIU	Y-O	Asia	60%	4	1163
Yaffe & Seroussi, 2019	GAP	Child	PIU	Y-O	Middle East	0%	3	180
Zhang et al., 2015	GAP	Child	PIU	Y	Asia	55%	5	660
Zhang et al., 2019	GPW	Child	PIU	Y-O	Asia	47%	6	1783

*the study provided a prospective analysis of relationship between parenting and PIU (controlled for baseline PIU).

⁺the study compared clinically diagnosed population with the intact controls.

[#]only children with their own smartphones were included in the study; only maternal parenting was assessed.

¹Risk of bias was based on 8 criteria: Sampling frame, Participant recruitment, Exclusion rate, Sample size, Sample characteristics, Measurement validity, Setting, and Data management. Higher score meant higher quality, i.e., the lower risk of bias.

GPC = general parental control, GPW = general parental warmth, GAP = general authoritative parenting, RM = restrictive mediation, AM = active mediation; PIU = problematic internet use, GD = gaming disorder, PSU = problematic smartphone use; Y = sample consisted of children or younger adolescents (up to 14 years of age), O = sample consisted of older adolescents (older than 14 years), Y-O = sample consisted of both younger and older children/adolescents.

Note. Outcome in all included studies was reported by a child.

3.6. Computation of effect sizes

The results were analyzed in R (R Core Team, 2020) using the *metafor* package (Viechtbauer, 2010). All effect sizes were converted to the Pearson correlation coefficient (*r*). For studies where correlation coefficients were not available but standardized regression coefficients were present (*k* = 10), we used the imputation formula: $r = \beta + 0.05\lambda$ ($\lambda = 1$ for $\beta \geq 0$, $\lambda = 0$ otherwise; all $|\beta| < 0.5$) (Peterson & Brown, 2005). Odds ratios (*k* = 3) were transformed to correlations using standard procedures for effect-size conversions (Borenstein et al., 2021). For studies reporting multiple outcomes (e.g., maternal and paternal reports), we averaged the outcomes on Fisher's *z* scale.

3.7. Statistical analyses

We performed five separate analyses, one for each measure (warmth, control, authoritative parenting, active mediation, and restrictive mediation). The analyses were conducted using a random effects model with the DerSimonian-Laird estimator. The correlation coefficients were

analyzed on Fisher's *z* scale, and we report the back-transformed estimates (denoted as *r*). Heterogeneity was assessed using the *Q*-test, we also report I^2 (relative amount of heterogeneity), τ^2 (absolute amount of heterogeneity) and prediction intervals of the summary estimates to provide additional information. We inspected the influence of individual studies using leave-one-out method and used Cook's distance, DFFITS and DFBETAS values to detect potential outliers (relying on default settings of the *influence* function of *metafor* package). If outliers were found, we also report summary estimates after excluding the outlier studies. The small study bias was analyzed using rank correlation test and Egger's regression test and neither method found significant violation of symmetry. We performed the trim and fill procedure with side based on the results of the Egger's regression test to account for potential publication bias. The analysis suggested that there were no missing studies. We estimated the power of our study using *metapower* package. Assuming expected effect size $r = 0.20$, ten studies with 200 participants each large heterogeneity of $I^2 = 0.90$ (estimated from (Collier et al., 2016)), the power of random-effects model was $1 - \beta = 0.794$.

In each analysis, we evaluated the categorical moderator effects of

age (young/old/mixed), continent (Asia/non-Asian), and outcome measure (PIU, GD, PSU). Groups of effect sizes with fewer than five studies were analyzed but should be interpreted with caution. The moderator analysis is reported mainly for exploratory purposes and to stimulate further research. The study was designed to detect finer differences and the statistical power for categorical moderator analysis was low ($1 - \beta = 0.292$ for 2 groups of $r_1 = 0.00$ and $r_2 = 0.20$).

Data used for all analyses and analytic code are available from the authors upon request. No automation tools were used in the process of searching, screening, or coding the studies.

4. Results

4.1. General parental warmth

The pooled correlation between warmth and PIU ($k = 24$) has been established to be $r = -0.17$ (95% CI [-0.20, -0.13], $p < .001$), suggesting that warmth has a small negative association with PIU. The prediction interval (95% PI [-0.32, -0.02]) indicates that the association between PIU and warmth is as low as -0.32 in some populations but close to zero (-0.02) in others. The total heterogeneity was as high as $I^2 = 92.54\%$ ($Q(23) = 308.40$, $p < .01$; $\tau^2 = 0.01$), and the associations reported by studies ranged between -0.38 and 0.02 (Fig. 2). After removing one detected outlier (continental sample of Cui et al., 2018), the overall association between warmth and PIU changed negligibly ($r = -0.16$; 95% CI [-0.19, -0.13], $p < .001$).

Moderation analyses. For the effects of presumed moderators, three analyses were conducted, the first concerning the sample age, the second concerning the home continent of the studied population and the third concerning the specific type of PIU outcome and all of them were found to be significant (Table 3). The mixed sample studies reported the largest association ($r = -0.21$) followed by studies with younger children/adolescents ($r = -0.16$) and studies with older adolescents ($r = -0.13$). Assessing home continent of population, non-Asian studies reported the largest association ($r = -0.19$), followed by Asian studies ($r = -0.16$). The largest association was found for GD ($r = -0.20$), followed by general PIU studies ($r = -0.18$) and PSU studies ($r = -0.06$).

4.2. General parental control

The pooled correlation between control and PIU ($k = 10$) was established to be $r = -0.10$ (95% CI [-0.18, -0.01], $p = .022$), suggesting that control has a very small negative association with PIU. The PI [-0.35, 0.16] indicates that the association between PIU and control is as low as -0.35 in some populations, but smaller and positive in others. The total heterogeneity was as high as $I^2 = 94.55\%$ ($Q(9) = 165.23$, $p < .01$; $\tau^2 = 0.02$), and the effects reported by studies ranged between -0.29 and 0.26 (Fig. 3). After removing one detected outlier (Cheng, 2019), the overall association between control and PIU became pronounced ($r = -0.14$; 95% CI [-0.20, -0.07], $p < .001$). It should be noted that the outlying GD study by Cheng (2019) was focused on a specific title – Pokémon GO – which might be the reason for its very different results ($r = 0.26$).

Moderation analyses. For the effects of presumed moderators, two analyses were conducted, first concerning the sample age and the second concerning the home continent of the studied population and none of them was found to be significant (Table 3). The moderation analysis concerning PIU outcome was not conducted because there was only two studies measuring GD and one study measuring PSU.

4.3. General authoritative parenting style

The pooled correlation between authoritative parenting and PIU ($k = 8$) was $r = -0.12$ (95% CI [-0.21, -0.02], $p = .016$), suggesting that authoritative parenting has a small negative association with PIU. The PI [-0.37, 0.14] indicates that the association between PIU and authoritative parenting is as low as -0.37 in some populations, but smaller and positive in others. The total heterogeneity was as high as $I^2 = 88.43\%$ ($Q(7) = 60.50$, $p < .01$; $\tau^2 = 0.02$), and the effects reported by studies ranged between -0.39 and .12 (Fig. 4). Given the small number of studies, analyses of moderators were not possible. After removing two detected outliers (Areshtanab et al., 2021; Yaffe & Seroussi, 2019), the pooled correlation between authoritative parenting and PIU changed negligibly ($r = -0.11$, 95% CI [-0.18, -0.05], $p < .001$).

Moderation analyses. Two moderators were analyzed – age and the home continent of studied population – and neither were found to be significant (Table 3). However, similar patterns were found as in case of parental warmth – the largest associations were reported by studies with

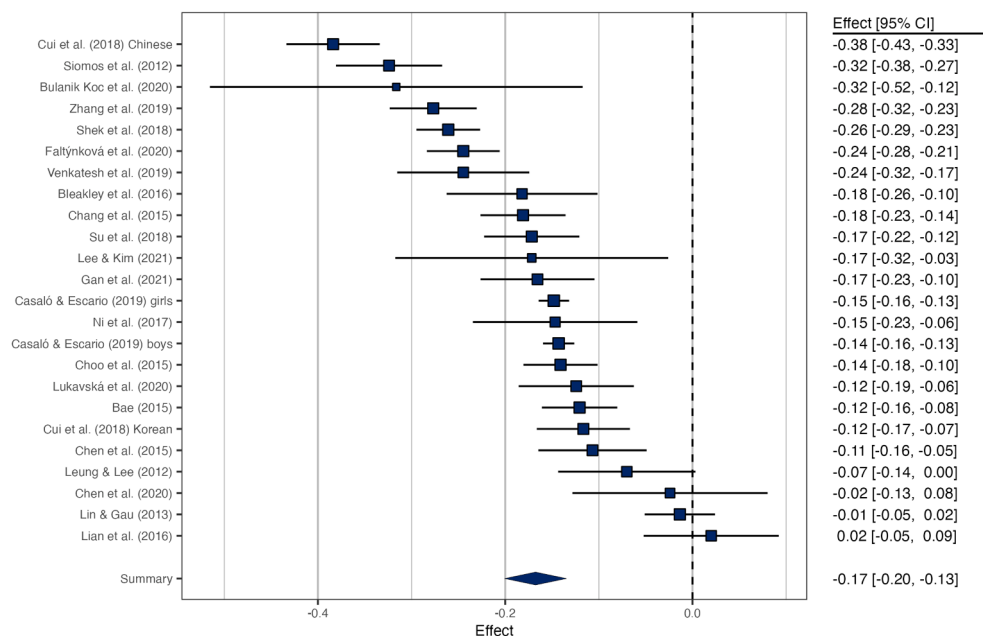


Fig. 2. The Effects of General Parental Warmth on Problematic Internet Use.

Table 3
Subgroup analyses of effects between general parenting and PIU.

Moderators	General parental warmth				General parental control				General authoritative parenting			
	k	N	r [95% CI]	p	k	N	r [95% CI]	p	k	N	r [95% CI]	p
Age			Q(3) = 112.93, p < .01, I ² = 91.47%				Q(3) = 5.58, p = .13, I ² = 94.74%				Q(3) = 6.06, p = .11, I ² = 91.47%	
Up to 14 years old	6	10539	-.16 [-.22, -.10]	<.001	2	5704	-.18 [-.37, .01]	.19	3	2609	-.11 [-.28, .05]	.18
More than 14 years old	9	36790	-.12 [-.18, -.07]	<.001	2	1375	-.04 [-.24, .16]	.72	3	2528	-.08 [-.23, .08]	.35
Mixed	9	11072	-.22 [-.27, -.17]	<.001	5	5120	-.08 [-.21, .04]	.06	2	294	-.21 [-.43, .01]	.07
Home Continent			Q(2) = 90.10, p < .01, I ² = 92.86%				Q(2) = 4.65, p = .10, I ² = 95.01%				Q(2) = 5.36, p = .07, I ² = 89.49%	
Asia	17	24610	-.15 [-.20, -.11]	<.001	5	7582	-.07 [-.19, .06]	.28	4	3584	-.09 [-.24, .05]	.19
Europe/America/Middle East	7	33791	-.20 [-.27, -.14]	<.001	5	4617	-.12 [-.25, .01]	.06	4	1733	-.14 [-.28, .00]	.06
Outcome			Q(3) = 99.73, p < .01, I ² = 92.69%				-				-	
General PIU	14	49002	-.18 [-.22, -.13]	<.001	7	-	-	-	6	-	-	-
GD	7	6097	-.18 [-.25, -.12]	<.001	2	-	-	-	2	-	-	-
PSU	3	3302	-.08 [-.18, .02]	.11	1	-	-	-	0	-	-	-

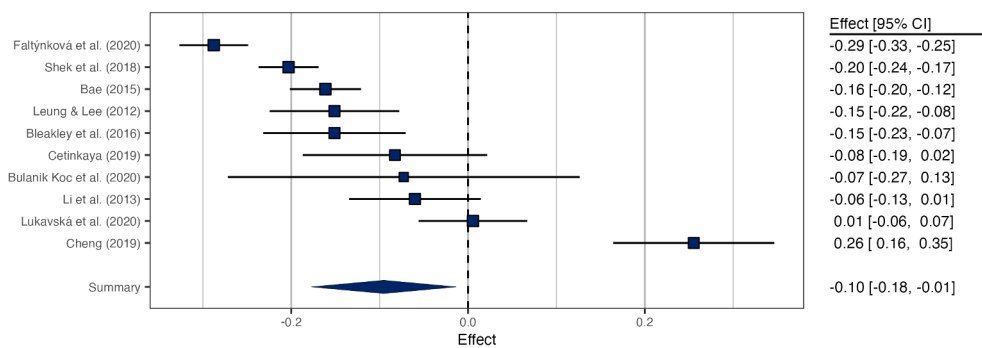


Fig. 3. The Effects of General Parental Control on Problematic Internet Use.

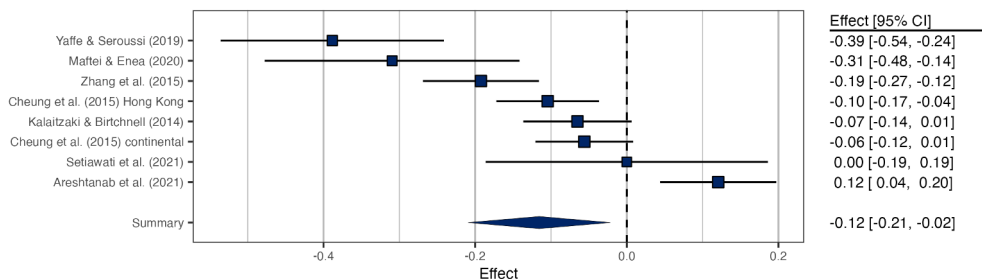


Fig. 4. The Effects of General Authoritative Parenting on Problematic Internet Use.

mixed age samples and by studies conducted outside of Asia.

4.4. Active mediation

The pooled correlation between active mediation and PIU ($k = 11$) was close to zero: $r = -0.02$ (95% CI [-0.07, 0.02], $p = .345$), suggesting

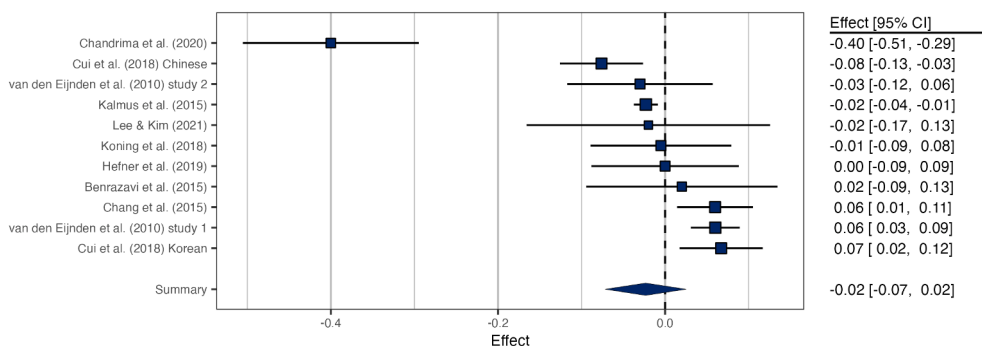


Fig. 5. The Effects of Active Mediation on Problematic Internet Use.

that active mediation has an inconsistent association with PIU. The PI [-0.17, 0.13] indicates that the association between PIU and active mediation is small in general and scientists may observe negative association in some populations, but positive in others. The total heterogeneity was as high as $I^2 = 91.29\%$ ($Q(10) = 103.34, p < .01; \tau^2 = 0.01$), and the effects reported by studies ranged between -0.40 and 0.07 (Fig. 5). Removing one detected outlier (Chandrima et al., 2020) had only negligible effect ($r = 0.01, 95\% \text{ CI } [-0.03, 0.05], p = .642$).

Moderation analyses. The analyses concerning age of sample, the home continent of the study population, and PIU outcome were conducted, and none was found to be significant (Table 4). The pooled associations were close to zero in case of studies with younger adolescents ($r = -0.01$) and older adolescents ($r = 0.00$), and mixed samples ($r = -0.05$). Reported associations were similar in studies from Asia ($r = -0.05$) and those from Europe ($r = 0.00$). Similar associations were found for general PIU ($r = -0.05$) and GD ($r = 0.00$).

4.5. Restrictive mediation

The pooled correlation between restrictive mediation and PIU ($k = 16$) was $r = 0.01$ ($95\% \text{ CI } [-0.10, 0.11], p = .905$), suggesting that restrictive mediation has an inconsistent association with PIU. The PI [-0.41, 0.42] indicates that the association between PIU and restrictive mediation varies wildly across populations and is as low as -0.41 in some populations and as high as 0.42 in others. The total heterogeneity was as high as $I^2 = 98.68\%$ ($Q(15) = 1137.01, p < .01; \tau^2 = 0.04$), and the effects reported by studies ranged between -0.51 and 0.37 (Fig. 6). No outlier was detected in this analysis.

Moderation analyses. For the effects of presumed moderators, three analyses were conducted, concerning the sample age, the home continent of the studied population and the specific type of PIU outcome. The age moderator has been found to be statistically significant (Table 4). The largest (and opposite than expected) association was found in studies with older adolescents ($r = 0.25$). In studies with younger children/adolescents the pooled association was also positive but smaller ($r = 0.03$), and the negative association was found in studies using mixed samples ($r = -0.08$). Studies conducted in Asia and Europe showed similar associations ($r = 0.00$ in Asia; and $r = 0.03$ in Europe). Regarding the different PIU outcomes, GD studies reported a small positive association ($r = 0.16$) and studies on general PIU reported a small negative association ($r = -0.08$).

5. Discussion

We assessed the associations between PIU and five parental factors (warmth, control, authoritative parenting, active mediation, and restrictive mediation). In case of all analyses, we found high overall heterogeneity between studies. The heterogeneity was higher in the case

of media-specific parenting (active and restrictive mediation) than in the case of general parenting (warmth, control, and authoritative parenting). The pooled associations between PIU and media-specific parenting were close to zero, while the overall associations between general parenting and PIU were small and negative. This suggested that general parental warmth has a small negative association with PIU and based on prediction intervals we can expect predominantly negative associations of varying strength. Less consistent association was found in case of general parental control and authoritative parenting, in which most studies are expected to find negative association but in some populations a positive association may also emerge. The association between media-specific parenting and PIU is unclear and based on prediction intervals we can expect that the associations can be negative in some populations and positive in others. We analyzed the effect of three moderators: age of the studied population, the home continent of the studied population and the specific outcome (general PIU, GD, and PSU). In case of all moderators, the number of studies was rather low resulting into underpowered analyses. Therefore, the moderation analyses are rather to promote future studies to pay attention to some possible moderators. In case of parental warmth, studies with mixed (young and old children/adolescents) samples reported stronger pooled association than studies with either old or young samples. In case of restrictive mediation, the strongest effect was found for older adolescents, however, the effect was opposite than expected—a positive association between restrictive mediation and PIU. There were not very pronounced differences between samples from Asia and from elsewhere. For the different PIU outcomes, the overall moderation analysis was significant in the case of warmth—the effect of warmth was smallest on PSU. Interestingly, we found positive association between restrictive mediation and GD, and negative association between restrictive mediation and PIU but the moderation analysis was not significant.

The high heterogeneity might be partially explained by the inconsistent measurement of parenting factors. This is especially true for media-specific parenting, where we found great variability in measurement tools. Each study included in our meta-analysis used its own instrument for measuring active and restrictive mediation. These instruments varied in the number of items and sometimes they slightly differed on the conceptual level (e.g., sometimes restrictive mediation included both monitoring and restrictive rules, sometimes only rules, etc.). There was a relative consistency in measurement of PIU. All instruments that have been used in included studies were based on diagnostic criteria (symptoms) common in the field of addictive behaviors such as loss of control over use, preoccupation with the activity, presence of conflicts over the use with close persons etc. It should be noted that few studies used cut-off scores to distinguish between problematic and non-problematic use (Chang et al., 2015; Chen et al., 2015; Wu et al., 2016), but most studies used scores from PIU scales as continuous variables. One study compared clinically diagnosed patients with intact

Table 4
Subgroup analyses of effects between media parenting and PIU.

Moderators	Active mediation				Restrictive mediation			
	k	N	r [95% CI]	p	k	N	r [95% CI]	p
Age	Q(3) = 1.56, p = .67, I ² = 92.25%				Q(3) = 8.48, p = .04, I ² = 97.82%			
Up to 14 years old	3	1224	-.01 [-.12, .10]	0.9	4	3681	.03 [-.14, .20]	0.74
More than 14 years old	3	3405	.00 [-.10, .10]	0.97	3	3405	.25 [.05, .44]	0.01
Mixed	5	25916	-.05 [-.13, .03]	0.21	9	29911	-.08 [-.19, .03]	0.15
Home Continent	Q(2) = 1.70, p = .43, I ² = 91.29%				Q(2) = 0.11, p = .95, I ² = 98.47%			
Asia	6		-.05 [-.12, .02]	0.19	11		-.00 [-.13, .12]	0.94
Europe/America/Middle East	5		.00 [-.08, .08]	0.96	5		.03 [-.16, .22]	0.75
Outcome	Q(2) = 1.50, p = .47, I ² = 94.19%				Q(2) = 5.52, p = .06, I ² = 98.33%			
General PIU	5		-.05 [-.13, .03]	0.22	8		-.08 [-.21, .04]	0.19
GD	3		.00 [-.10, .11]	0.97	5		.16 [-.00, .31]	0.05
PSU	2		-		2		-	

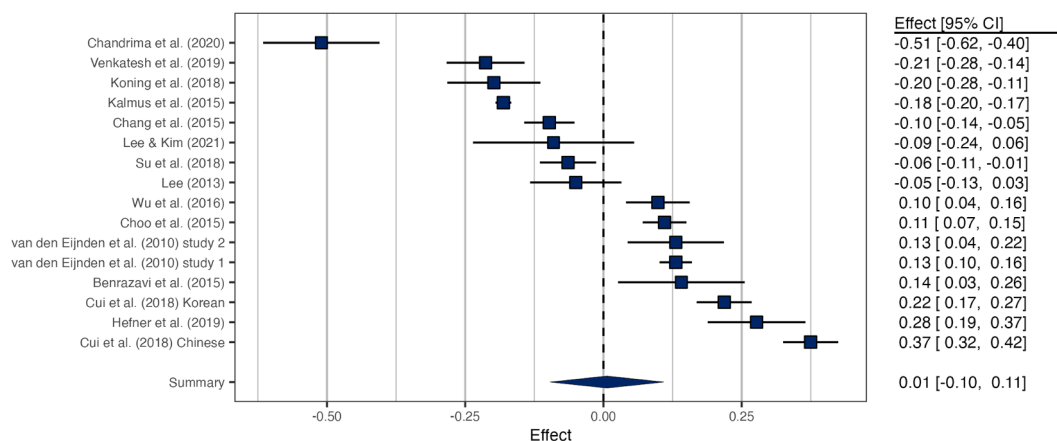


Fig. 6. The Effects of Restrictive Mediation on Problematic Internet Use.

controls (Bulanik Koc et al., 2020).

The small negative overall association between *general parenting* (warmth, control and authoritative parenting) and PIU is consistent with previously reported effects of general parenting on other similar forms of adolescent risky behaviors, e.g., substance use (González-Cámara et al., 2019). Moreover, warmth and authoritative parenting were also found to be negatively associated with adolescent cyber-bullying, another internet-related risk (Elsaesser et al., 2017). Nevertheless this association has to be interpreted with care because some studies have suggested that the association between general parenting and PIU could be partially or fully mediated through self-control (Li et al., 2013), self-esteem (Dong et al., 2019), or self-consciousness (Zhang et al., 2019). The near-zero association between *media-specific parenting* (active and restrictive mediation) is also consistent with previous overview studies. Collier et al. (2016) found only weak association between media parenting and the extent of media use (screen time), Nielsen et al. (2019) concluded that the associations between PIU and active and restrictive mediation are inconsistent, and Fam et al. (2022) found the small negative associations between media parenting and screen time but not with problem media use.

The positive association between restrictive mediation and GD and in studies with older adolescents are important and unexpected findings. Studies on restrictive mediation and also one study on general parental control (Cheng, 2019) showed a positive association between these practices and GD. In contrast, the same types of parenting (restrictive mediation and general parental control) showed a negative pooled association with general PIU. This suggested that parenting might work differently for gaming than for other online activities. Previously it has been found that displaying symptoms of GD seems to elicit ineffective restrictive parental responses, which may further increase problematic involvement in gaming (Koning et al., 2018). More longitudinal studies are needed to better understand these bidirectional relationships between parenting and PIU/GD. Previous research also suggested that the effectiveness of restrictive parenting differed based on gender. Restrictive mediation showed to be especially ineffective for preventing PIU in boys (Koning et al., 2018). This might be associated with the higher prevalence of GD among boys, compared to girls (King et al., 2019), and further emphasized that gaming might require a specific parenting strategy. In addition, the effectiveness of restrictive parenting is age-related. It seems to work worse for older adolescents for which the significant positive association between restrictive mediation and PIU was found. This is consistent with the recent meta-analysis showing that the restrictive mediation has significant negative association with media use only in children and merged samples but not in adolescent samples (Fam et al., 2022). To conclude, restrictive mediation is the parental approach with the largest heterogeneity and the most ambivalent effect, which is reflected in very wide prediction interval containing moderate

associations in both directions. While restrictive mediation may work to reduce screen time in children and young adolescents, it may be counter-effective for preventing GD and for older adolescents. This is the important finding that should be transmitted to parents which rely heavily on restrictive approach (Domoff et al., 2019). Parents might need to accommodate their parenting strategy based on the age, gender, and the specific screen/media activity of their child. Future research on the restrictive practices of parents is needed to improve our understanding of how restrictive mediation works in case of older adolescents and in case that GD symptoms are present. These studies should (i) adopt a prospective design, (ii) use well-established reliable and valid measurement instruments, (iii) pay attention to differences between mothers and fathers (and sons and daughters), (iv) differentiate between younger and older children/adolescents, and (v) focus on specific online activities (technological addictions), as it seems that e.g. gaming may require a different parental approach than other online activities.

5.1. Limitations

The study has some limitations. We narrowed our search to papers written in English, which could have led to omitting some studies, especially from Asia. On the other hand, Asian studies accounted for more than 60% of the studies examined herein. We did not contact the authors of the included studies for other unpublished data on the subject; however, we performed the trim and fill procedure to account for potential publication bias, which showed that there were probably no missing studies. The analysis was not controlled for the risk of bias in studies (e.g., the quality of sampling, the quality of measurement tools), but the risk of bias assessment was conducted, and the homogeneity of studies was found to be high in this respect with most studies showing the average quality. We did not distinguish between studies using parental and child reports of parenting due to low number of studies using parental report ($k = 8$). In some categories, there were relatively small number of studies available (e.g., only eight in case of general authoritative parenting), which weakened the generalizability of the results. More importantly, the number of studies was not high enough to have acceptable power for the analyses of moderators. Most studies assessed PIU in general, but our analyses suggested that various online activities differed in their associations with parenting and probably in many more aspects. Some technological addictions, e.g., problematic pornography use, were not represented at all, therefore we suggest that future studies investigate the associations between parenting and specific PIU activities.

6. Conclusions

General parenting (warmth, control, authoritative parenting) has a

weak negative association with PIU. In contrast, media-specific parenting—i.e., parenting strategies focused specifically on the regulation of the internet use of children—has a close to zero association with PIU. This shows the necessity to conduct more studies that would identify effective media/internet-specific parenting strategies for the prevention of children/adolescent PIU.

Availability of data and material: Data are available upon request.

Funding/Support: Katerina Lukavská and Ondrej Hrabec were supported by the Czech Science Foundation, grant no. 21-31474S and the Charles University (PROGRES Q06). Jiri Lukavský was supported by RVO68081740 grant from Czech Academy of Sciences. Zsolt Demetrovics's contribution was supported by the Hungarian National Research, Development and Innovation Office (KKP126835; K128614, ELTE Thematic Excellence Programme 2020, KP2020-IKA-05). Orsolya Király was supported by the János Bolyai Research Scholarship of the Hungarian Academy of Sciences and by the ÚNKP-21-5 New National Excellence Program of the Ministry for Innovation and Technology from the source of the National Research, Development and Innovation Fund.

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: ELTE Eötvös Loránd University receives funding from the Szerencsejáték Ltd. to maintain a telephone helpline service for problematic gambling. Dr. Demetrovics has also been involved in research on responsible gambling funded by Szerencsejáték Ltd. and the Gambling Supervision Board and provided educational materials for the Szerencsejáték Ltd's responsible gambling program. The University of Gibraltar receives funding from the Gibraltar Gambling Care Foundation. However, these funding aren't related to this study and the funding institution had no role in the study design or the collection, analysis, and interpretation of the data, writing the manuscript, or the decision to submit the paper for publication. Other authors have no conflicts of interest to disclose.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.addbeh.2022.107423>.

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