



The influence of maternal and paternal phubbing on adolescents' problematic gaming: A two-wave mediation model

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ARTICLE INFO

Handling Editor: Min Jou

Keywords:

Parental phubbing
Parental indifference
Problematic gaming
Adolescents
Two-wave mediation model

ABSTRACT

Cross-sectional studies from Eastern Asia have indicated a positive association between parental phubbing (snubbing via smartphones) and adolescent problematic gaming (PG). Longitudinal research is needed to evaluate the specific impact of maternal and paternal phubbing on adolescent PG in Europe. This study used a two-wave longitudinal design (with a six-month time interval) to test a theoretical model in which maternal and paternal phubbing at Wave 1 (W1) predicted adolescent PG at Wave 2 (W2), with maternal and paternal indifference (W2) as mediators. Gender differences in the hypothesized associations were also explored. Data were collected in Italy via online surveys, and the sample comprised 557 adolescent gamers ($M_{\text{age}} = 15.62 \pm 1.54$; 69% males). The mediation model was tested using path analysis, and multi-group comparisons were performed. The results showed that parental phubbing (W1) increased parental indifference (W2) in both mothers and fathers. Maternal phubbing (W1) indirectly predicted adolescent PG (W2) via increased maternal indifference (W2) in both males and females, whereas paternal phubbing (W1) directly and indirectly predicted adolescent PG (W2) via paternal indifference (W2) only in females. Parents and adolescents should be aware of the potentially detrimental effects associated with the dysfunctional use of digital technology.

1. Introduction

For most adolescents, playing video games is a pleasurable activity that allows for socialization (Carras et al., 2017) and identity exploration (Borca et al., 2015). Nonetheless, some young users can develop dysfunctional gaming behaviors associated with adverse outcomes, including emotional distress, conflicting relationships, and academic difficulties (Bender et al., 2020). Based on mounting international evidence, the most severe gaming patterns causing psychosocial impairment have been officially recognized as diagnostic entities labelled Internet gaming disorder (IGD) (APA, 2022; WHO, 2019). This condition is characterized by addiction-like symptoms experienced over 12 months, including (i) impaired control (e.g., duration and frequency of gaming), (ii) increased priority given to gaming, and (iii) continued use despite adverse consequences in daily life (WHO, 2019). However, given that the debate about the diagnostic criteria for IGD is still ongoing (Castro-Calvo et al., 2021), we will refer to the less restrictive term “problematic gaming” (PG), consistent with previous research

(Colasante et al., 2022; Nielsen et al., 2020).

To better understand PG among adolescents, previous research has examined several risk and protective factors and highlighted the critical role of parental and family-related aspects in influencing problematic patterns (Bussone et al., 2020). Indeed, the quality of parental behaviors can significantly impact adolescent adjustment (Steinberg, 2017).

While many studies have analyzed parental media regulation strategies (Lukavská et al., 2022) and traditional relational-emotional factors, such as parenting style and attachment (Nielsen et al., 2020) in association with adolescent PG, little attention has been drawn to the possible contribution of parental overuse of digital technology, such as smartphones (Shen et al., 2022). According to modern ecological systems theory (Johnson & Pupilampu, 2008; Navarro & Tudge, 2022), studying environmental influences on adolescent adjustment should incorporate the non-negligible use and impact of digital technologies, as they constitute an integral part of individual and family daily life. In this regard, a recent systematic review on the effects of information and communication technology (ICT) on family relationships (Tammisalo &

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Rotkirch, 2022) has shown that parental use of personal devices was mostly negatively associated with the quality of parenting and the well-being of family members. Notably, an important shortcoming evidenced by this review (Tammisalo & Rotkirch, 2022) is that research in this area is primarily cross-sectional; thus, there is an urgent need for longitudinal studies disentangling the potential relationship-interfering aspects and negative outcomes associated with the dysfunctional use of ICT in the family. In line with this, a phenomenon that has received increased attention in recent years is parental phubbing (Chotpitayasunondh & Douglas, 2016), which refers to parental behaviors characterized by an excessive engagement with smartphones during social interactions with the offsprings which may hinder adolescent functioning (Niu et al., 2020). To the best of our knowledge, however, the available literature on parental phubbing and adolescent PG is limited, since it only includes few studies conducted in the Eastern countries which used cross-sectional designs and investigated parental contributions as a unique construct (Shen et al., 2022; Xie et al., 2021; Zhou et al., 2022). To expand previous literature, the present study aimed at providing novel and more robust evidence, contextualized in a different geographic area, by investigating the possible and distinct contributions of maternal and paternal phubbing to adolescent PG and by exploring the psychological mechanisms involved in this relationship through a two-wave longitudinal study carried out in Europe, specifically in Italy. By addressing these gaps, this research may not only contribute to expand the understanding of the causal links between certain maternal and paternal factors and adolescent PG, but also provide useful information that may be used for the implementation of prevention programs tackling the high rates of PG risk among European adolescents (Colasante et al., 2022).

1.1. Parental phubbing and adolescent problematic gaming

The term “phubbing” is a portmanteau word of “phone” and “snubbing” and refers to a widespread and observable phenomenon whereby individuals concentrate on their smartphones in social settings without paying sufficient attention to others (Chotpitayasunondh & Douglas, 2016). Specifically, parental phubbing occurs during everyday parent-adolescent interactions and may lead to negative interpersonal and psychological consequences in youth (Liu et al., 2021). Prior research has found that parental phubbing can increase the risk of depression in adolescents (Bai et al., 2020; Xiao & Zheng, 2022) and the tendency of adolescents to perpetrate cyberbullying (Wang, Wang, et al., 2022). Furthermore, a growing number of studies has examined the association between parental phubbing and problematic adolescent use of digital technology. Much of this research has focused on the link between parental phubbing and adolescent problematic smartphone use (e.g., Geng et al., 2021; Zhang et al., 2021), whereas only a few studies to date have considered the relationship between parental phubbing and adolescent PG (Shen et al., 2022; Xie et al., 2021; Zhou et al., 2022). For example, a study by Zhou et al. (2022) provided initial evidence for the direct association between parental phubbing and Internet gaming addiction and further evidenced the mediating effect of increased parent-adolescent conflict.

Drawing from previous research, the association between parental phubbing and the development of problematic technology-related behaviors in youth, such as PG, can be conceptualized using social learning theory (SLT) (Bandura, 1971). According to the SLT, the primary means by which children and adolescents learn to behave is by observing others around them. Thus, living with a parent who is heavily engaged with digital devices daily may convey the idea that such technology-related behaviors are normative (Niu et al., 2020), which may reinforce adolescents' motivation to imitate them using technology (e.g., playing video games) and may progressively lead to the formation of maladaptive gaming habits (Shen et al., 2022). Notably, the fact that one's smartphone is the most commonly used device for gaming worldwide (Statista, 2021) may further corroborate this hypothesis.

1.2. The mediating role of parental indifference

For adolescents, parents constitute one of the most important sources of meaning and social support (Pinquart, 2016). Consequently, when the attentional resources of parents are reduced, as in the case of parental phubbing, adolescents may perceive a decrease in the quality of and satisfaction with the parent-adolescent relationship (Liu et al., 2021) and increased social disconnection from their parents (Pancani et al., 2020). As posited by expectancy violation theory (Burgoon, 1993), individuals involved in face-to-face interactions often expect their partners to focus their full attention on them. When this expectation is violated, they may perceive indifference or exclusion from others, which can be harmful and trigger various negative emotions. A cross-sectional study by Xie and Xie (2020) indicated that parental phubbing increased adolescent depression through higher parental rejection, which was associated with lower relatedness need satisfaction. However, the transversal nature of this study did not allow to infer causation, thus it remains unclear whether the specific behavior of parental phubbing, occurring as a visible interruption in the immediate parent-adolescent interaction, can also predict a more generalized and stable perception of parental rejection – more precisely, of parental *indifference* - which, in turn, can lead to higher adolescent maladjustment. Indeed, despite most of the available studies in the developmental and social psychology literature have examined the role of parental rejection, including those in the field of adolescent PG (Throuvala, Janikian et al., 2019; Zhu & Chen, 2021), we suggest that research investigating the phenomenon of parental phubbing should rather focus on parental indifference/neglect (hereafter referred to as parental indifference), which is only one of the different subdimensions included in the broader construct of parental rejection, as conceptualized in the Parental Acceptance and Rejection Theory (Rohner et al., 2012; Rohner & Khaleque, 2005). This specification is necessary, since it is fundamental to acknowledge that parental rejection, as a general and overarching construct, is considered more detrimental than parental indifference, because it entails a variety of physically and psychologically hurtful behaviors, such as parental coldness (e.g., lack of hugs and praises, lack of nice things to say) and parental hostility (e.g., hits, kicks, curses, cruel things to say). Parental indifference, instead, specifically refers to both parental physical and, more importantly, to parental psychological unavailability, which is not visible, but can be experienced by adolescents as parental failures to attend their emotional needs (Rohner et al., 2012). Based on this, parental indifference has been found to heighten adolescents' vulnerability to psychological and behavioral problems (Khaleque, 2015). Coherently, a study involving Italian mother-adolescent dyads provided initial evidence of the positive association between maternal indifference and adolescent PG, according to the reports of both informants (Pivetta et al., 2023). However, to the best of our knowledge, longitudinal research testing the causal relationship between parental phubbing behaviors and parental indifference is missing. This aspect is a noteworthy research target, since it is important to understand whether parental phubbing, beyond being deleterious in the short term, may also have a negative impact on the quality of parenting over time, for instance by determining a long-lasting increase in parental indifference, thus serving as a critical risk factor for adolescent PG.

Moreover, the indirect association between parental phubbing and adolescent PG via the mediating role of parental indifference can be conceptualized through the lens of the compensatory internet use theory (CIUT) (Kardefelt-Winther, 2014). According to this theory, individuals who experience negative emotions arising from everyday life circumstances, such as after being phubbed by their parents, may engage in online behaviors (e.g., playing video games) as a coping strategy that can lead, in some cases, to the development of dysfunctional patterns of use. Thus, adolescent PG may result from adolescents' attempts to alleviate the negative affect associated with an increased perception of parental indifference over time (Shen et al., 2022). Considering this evidence, the present study explored the potential mediating role of

parental indifference to better understand the relationship between parental phubbing and adolescent PG.

1.3. The crossover effect between parental behaviors

The present study not only distinguished between maternal and paternal behaviors, but also examined their potential crossover effect, whereby, although distinct, parents can mutually influence each other within the same family environment (Emery, 2014). As shown by previous research based on family systems theory (Breux et al., 2016; White & Klein, 2002), the psychological symptoms or behavioral problems of one parent may not only have a detrimental impact on his/her own relationship with the offsprings, but may also negatively affect the emotion socialization practices enacted by the other parent, since they may place strain on him/her to provide compensatory supportive reactions, ultimately undermining his/her own psychological resources. Consistent with this, similar interparental effects have been documented by Wang, Mao, Liu et al. (2022) in a study testing the reciprocal associations between maternal/paternal phubbing and lower quality of maternal/paternal communication with their adolescent, which were all positively related to adolescent's depressive symptoms. Indeed, beyond implying the mutual influence between parental behaviors, the crossover effect may constitute a relevant mechanism possibly increasing the risk for adolescent maladjustment. As evidenced by Wu et al. (2022), the phubbing behavior of one parent may be sufficient to eventually disrupt the behaviors of both parents, further lowering the quality of parental care and increasing adolescents' vulnerability to psychological and behavioral problems, including PG.

1.4. Aims and hypotheses of the study

To our knowledge, existing studies on parental phubbing and adolescent PG (Shen et al., 2022; Xie et al., 2021; Zhou et al., 2022) have all been conducted involving Chinese youths, using a cross-sectional design and measuring parental phubbing as a unique construct. Thus, the present study aimed to expand current knowledge in three ways. First, we investigated the association between parental phubbing and adolescent PG in Europe, specifically among Italian adolescents. As indicated by Stevens et al. (2021), despite Eastern Asian countries exhibiting higher prevalence rates of gaming-related problems and IGD, this condition constitutes a public health issue worldwide. Thus, cross-cultural research expanding current knowledge is necessary. Second, a two-wave longitudinal study was conducted to examine the direct and indirect effects of parental phubbing on adolescent PG over time. Since longitudinal research allows the repeated measurement of the same variables over time, it is fundamental to test the direction and magnitude of causal relationships and observe the stability of effects over time, providing more robust empirical evidence than cross-sectional studies (Menard, 2002). Third, since parental phubbing occurs in a specific one-to-one interaction (e.g., between the adolescent and one specific parent), as indicated by Pancani et al. (2020), we

assessed the specific impact of maternal and paternal phubbing on adolescent PG. This aligns with previous research that distinguished maternal and paternal phubbing in association with other adverse adolescent outcomes (e.g., Geng et al., 2021; Wu et al., 2022). We also differentiated between maternal and paternal indifference, in line with extant literature on parental rejection suggesting separate but equal consideration of the contribution of both parents to adolescent adjustment (Miranda et al., 2016). Accordingly, as shown in Fig. 1, we tested a theoretical model in which the following hypotheses were proposed:

- Hp1a Maternal phubbing at Wave 1 (W1) will positively predict adolescent PG at Wave 2 (W2).
- Hp1b Paternal phubbing at W1 will positively predict adolescent PG at W2.
- Hp2a Maternal phubbing at W1 will positively predict maternal indifference at W2.
- Hp2b Paternal phubbing at W1 will positively predict paternal indifference at W2.
- Hp3a Maternal indifference at W2 will be positively associated with adolescent PG at W2.
- Hp3b Paternal indifference at W2 will be positively associated with adolescent PG at W2.
- Hp4a Maternal indifference at W2 will mediate the relationship between maternal phubbing at W1 and adolescent PG at W2.
- Hp4b Paternal indifference at W2 will mediate the relationship between paternal phubbing at W1 and adolescent PG at W2.

Furthermore, to test the crossover effect between parental behaviors, in the first part of our mediation analyses, we compared the hypothesized mediation model, which included two reciprocal paths between maternal and paternal behaviors (see Fig. 1), with an alternative model in which these two paths were removed. Accordingly, we developed the following exploratory hypotheses.

- Hp5a Maternal phubbing at W1 will positively predict paternal indifference at W2.
- Hp5b Paternal phubbing at W1 will positively predict maternal indifference at W2.
- Hp6a Maternal indifference at W2 will mediate the relationship between paternal phubbing at W1 and adolescent PG at W2.
- Hp6b Paternal indifference at W2 will mediate the relationship between maternal phubbing at W1 and adolescent PG at W2.

In addition, existing research has shown mixed findings regarding the effects of parental phubbing according to the gender of adolescents. For instance, Xie et al. (2019) showed that male adolescents who had been phubbed by their parents were at a higher risk of developing deviant peer relationships and mobile phone addiction than female adolescents. Conversely, two other studies revealed that female adolescents were more likely to interpret the effects of parental phubbing as detrimental than males in terms of lower parent-adolescent

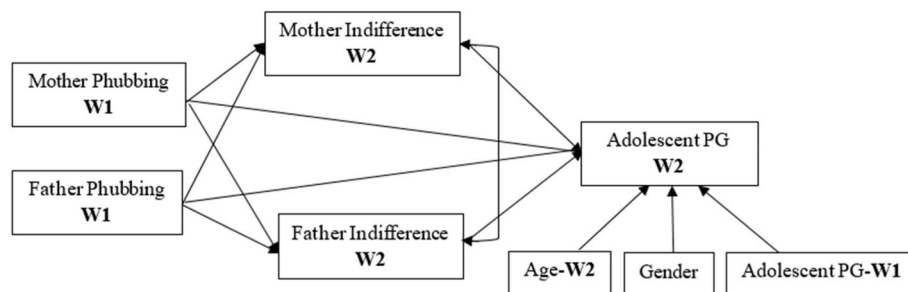


Fig. 1. The Hypothesized Mediation Model.
Note. PG = Problematic Gaming.

communication (Wang, Mao, Liu et al., 2022) and increased maternal rejection (Wu et al., 2022). Hence, one further explorative aim of this study was to examine potential gender differences in the patterns of association between maternal and paternal phubbing and adolescent PG, as specified in the hypothesized model (see Fig. 1).

2. Method

2.1. Procedure

A two-wave longitudinal study with a six-month time interval was conducted in 10 Italian high schools. Following authorization by the school principals, W1 data collection occurred between October and November 2021, and W2 between April and May 2022. After parental informed consent and adolescent assent (or active informed consent for participants older than 18) were obtained, participants were invited to complete a series of online questionnaires administered via the platform Qualtrics®, which were identical in the two measurement occasions. Data collection took place at school, under the supervision of the researchers and their assistants, and lasted approximately 35 min. To allow for the matching of the responses between the two waves, participants were asked to create an “identifying code.” Confidentiality was guaranteed. The study was conducted in accordance with the Declaration of Helsinki and was approved by the Ethics Committee for Psychological Research of the University of Padova (protocol number = 4331). This study was part of a larger project investigating adolescents’ PG and parental influences with multiple research objectives; other data not analyzed in this study have been presented elsewhere (Canale et al., 2023; Pivetta et al., 2023).

2.2. Participants

In W1, $n = 1281$ adolescents completed the online survey and $n = 1269$ in W2. However, due to the lack of correspondence between identifying codes provided by adolescents at the two measurement occasions, only the responses of $n = 1014$ (79.15%) participants were matched.

The inclusion criteria approach followed four steps: first, the data of participants who did not play video games at both waves were excluded ($n = 347$); second, the data of adolescents who identified themselves as non-binary were excluded due to insufficient numerosity ($n = 9$) for multi-group analyses; third, the data of participants who did not report living with both parents were excluded ($n = 55$), since one aim of this study was to test the reciprocal influences between parental behaviors; fourth, participants with missing data in one or more of the variables of interest ($n = 46$) were excluded. The final sample comprised $n = 557$ adolescents (69% males). The mean age at W2 was 15.62 ($SD = 1.54$, range:13–20). Most of the adolescents (93.9%) were born in Italy, $n = 10$ (1.8%) in Romania, $n = 4$ (0.7%) in Morocco, and the remaining 3.6% were born in other countries (e.g., Albania, Tunisia). Regarding the geographic area of Italy, 72.7% lived in the North, 12.4% lived in the Center, and 14.9% lived in the South. Nearly half of the sample (49.2%) attended the first grade of high school, 15.1% the second, 13.6% the third, 12.7% the fourth, and 9.3% the fifth. Most adolescents (94.9%) came from medium- and high-class families, having reported that their family was “about the same”/ “better off” the other Italian families (ESPAD Group, 2020).

Concerning the participants’ gaming habits, 78.3% reported playing video games online and offline, 15.1% online, and 6.6% offline. On weekdays (Monday to Friday), adolescents reported playing for an average of 100 minutes ($SD = 76$) per day; during the weekend, 140 minutes ($SD = 137$) per day. The three most played genres were: Sport (16.5%), Action-Adventure (14.9%), and First-Person Shooting (14%), and the most used devices for gaming were smartphones (75.2%) and consoles (67.1%).

2.3. Measures

2.3.1. Maternal and paternal phubbing

Maternal and paternal phubbing behaviors were examined by Pancani et al. (2020) using the Parental Phubbing Scale (PPS). This scale was developed in Italian as an adaption of the Partner Phubbing Scale (Roberts & David, 2016) to the parental context and was psychometrically validated in a sample of adolescents. The PPS consisted of two identical subscales, each composed of seven items, to distinctly measure mother phubbing (PPS-M) and father phubbing (PPS-F) (e.g., “During a mealtime together, my mother/father pulls out and checks her/his smartphone”). Adolescents were invited to rate the frequency of each behavior on a five-point Likert scale, ranging from (1) “Never” to (5) “All the time.” Cronbach’s alphas for maternal phubbing at W1 was 0.86 (95% CI [0.84, 0.87]), and for paternal phubbing at W1 was 0.87 (95% CI [0.85, 0.88]).

2.3.2. Maternal and paternal indifference

Maternal and paternal indifferences were examined using the Indifference/Neglect subscales of the Parental Acceptance and Rejection Questionnaire (Rohner & Khaleque, 2005; Italian validation: Rohner & Comunian, 2012). Each subscale is composed of six items assessing adolescents’ perceptions of the enactment of different behaviors, reflecting the physical and psychological unavailability of their parents (e.g., “My mother/father is too busy to answer my questions”). Participants were asked to provide their responses using a four-point Likert scale from (1) “Almost never true” to (4) “Almost always true.” Reverse scoring was applied before summing items for the subscales. Cronbach’s alpha for maternal indifference at W2 was 0.80 (95% CI [0.77, 0.83]) and for paternal phubbing at W2 was 0.80 (95% CI [0.77, 0.82]).

2.3.3. Adolescent problematic gaming

Adolescent PG was assessed using the Internet Gaming Disorder Scale – Short Form (IGDS9-SF; Pontes & Griffiths, 2015; Italian validation: Monacis et al., 2016). This scale comprises nine items corresponding to the nine criteria identified in the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)*; American Psychiatric Association [APA], 2013). Adolescents were asked to indicate the frequency of each symptom experienced in the last 12 months by responding on a five-point Likert scale ranging from (1) “Never” to (5) “Very often.” An example of item is: “Do you systematically fail when trying to control or cease your gaming activity?”. In this study, adolescent PG was conceptualized as a continuum of severity following a dimensional approach applied in previous studies that measured the same outcome in non-clinical samples of adolescents (Ciccarelli et al., 2022; Zhang et al., 2022). Thus, the total IGDS9-SF score served as the primary dependent variable, with higher scores representing higher adolescent PG. Cronbach’s alphas for this measure were: at W1, $\alpha = 0.77$ (95% CI [0.74, 0.80]), and at W2, $\alpha = 0.79$ (95% CI [0.76, 0.82]).

2.4. Data analytic strategy

Descriptive statistics and bivariate Pearson’s correlations were calculated using the Statistical Package for Social Science software (SPSS) V.28.0 software (IBM, 2022).

To estimate the pattern of relationships specified by our theoretical model, a path-analytic model approach (i.e., structural equation modeling for observed variables) using a single observed score for each construct was employed, as implemented in previous studies (e.g., Dou et al., 2022; Wang, Mao, Liu et al., 2022). The mediation models were tested using the lavaan package (Rosseel, 2012) of the open-source software R (R Development Core Team, 2022), and the maximum likelihood method was used to estimate model parameters (Satorra & Bentler, 1994).

Based on our hypotheses, the mediation model included adolescent PG at W2 as the dependent variable, mother and father phubbing at W1

as the independent variables, mother and father indifference at W2 as the mediating variables, and two sociodemographic variables (age at W2 and gender) and the initial level of the dependent variable (adolescent PG at W1) as covariates of adolescent PG at W2. Additionally, the reciprocal paths between parental behaviors (mother phubbing at W1 → father indifference at W2, father phubbing at W1 → mother indifference at W2) were included in the model (see Fig. 1).

Since one aim of the present study was to test whether maternal and paternal behaviors would mutually influence each other, the hypothesized mediation model was compared to an alternative model in which the two reciprocal paths between parental behaviors were removed using the chi-square difference test (Satorra & Bentler, 2001) and information criteria indices, namely the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) (Van de Schoot et al., 2012). Mediation models were first evaluated for the total sample of participants using a single-group path model. We employed bootstrapping with $n = 5000$ iterations to estimate 95% bias-corrected confidence intervals (CI) of the indirect effects, which were considered significant if the CIs did not include zero (Hayes, 2013).

To evaluate the goodness of fit of the selected model, we inspected the Comparative Fit Index (CFI), the Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR). For an acceptable fit, the CFI should be ≥ 0.90 (better if ≥ 0.95), the RMSEA should be ≤ 0.08 (better if ≤ 0.05), and the SRMR should be ≤ 0.08 (better if ≤ 0.05) (Kline, 2012). In addition, we examined the explained variance of each endogenous variable (R^2) and the total coefficient of determination, which is commonly considered a reliable fit index for path analysis (TCD; Bollen, 1989; Jöreskog & Sörbom, 1996).

Finally, to explore whether the pattern of associations in the selected model differed as a function of adolescents' gender, we performed multi-group path analyses by examining a series of increasingly invariant and restrictive models using a nested model comparison (Jöreskog & Sörbom, 1996; Van de Schoot et al., 2012). As a result, three models were compared: Model 1, testing configural invariance (the same model was fitted in the two groups without any equality constraints on the model parameters); Model 2, testing the invariance of the intercepts (the intercepts for males and females were constrained to be equal); and Model 3, in which both the intercepts and regression coefficients of all items were constrained to be equal between groups. To compare the competing models, the Chi-Squared Difference Test (Satorra & Bentler, 2001) was applied: if the χ^2 values do not change significantly as the models become more restrictive, the constraints imposed on the more restricted model do not worsen model fit.

3. Results

3.1. Preliminary analyses

Table 1 presents the means, standard deviations, range, and bivariate Pearson's correlations of the study variables in the total sample. The results indicated that the skewness and kurtosis of all variables fell

within the acceptable range. Regarding Pearson's correlations, adolescent PG at W2 was positively associated with all study variables; small associations were observed between mother and father phubbing at W1 and adolescent PG at W2 and between mother and father indifference at W2 and adolescent PG at W2. Furthermore, reciprocal associations between maternal and paternal variables emerged for both phubbing behaviors at W1 and parental indifference at W2. Descriptive statistics and bivariate Pearson's correlations of the study variables by gender are reported in Supplementary Materials (Table S1).

3.2. Path analyses

3.2.1. Single-group path analyses

We first conducted two single-group path analyses to estimate the hypothesized mediation model (with reciprocal associations between parental behaviors) and alternative model (without reciprocal associations). Model comparison using the Chi-Squared Difference Test confirmed that adding the reciprocal paths between parental behaviors significantly improved model fit ($\Delta\chi^2_{(2)} = 15.045, p < .001$). Furthermore, our hypothesized mediation model showed lower AIC and BIC values ($\chi^2_{(6)} = 32.898, AIC = 8778.9, BIC = 8843.8$) compared to the alternative model ($\chi^2_{(8)} = 47.943, AIC = 8790.0, BIC = 8846.2$), indicating a better trade-off between model fit and complexity. Thus, the mediation model with reciprocal associations between parental behaviors was selected.

The estimation of the indices of this model showed an adequate fit: CFI = 0.956, RMSEA = 0.090 [95% CI (0.061, 0.121)], SRMR = 0.040. The TCD values for this model, standardized parameter estimates, standard errors and 95% confidence intervals are reported in Table 2.

As reported in Fig. 2, the results for the mediation model in the total sample showed that neither mother phubbing at W1 nor father phubbing at W1 were predictive of adolescent PG at W2, contrary to Hp1a and Hp1b. Yet, mother phubbing at W1 was positively associated with mother indifference at W2 and father phubbing at W1 was positively associated with father indifference at W2, providing support for Hp2a and Hp2b. Additionally, mother indifference at W2 positively predicted adolescent PG at W2 (Hp3a), while the association between father indifference at W2 and adolescent PG at W2 was nonsignificant. The estimation of the indirect effects using the bootstrapping method revealed that only mother indifference at W2 mediated the relation between mother phubbing at W1 and adolescent PG at W2, in line with Hp4a, whereas the mediating effect of father indifference at W2 between father phubbing at W1 and adolescent PG at W2 was nonsignificant (Hp4b). Furthermore, regarding the crossover effect between parental behaviors, our findings showed that reciprocal associations emerged both between mother phubbing at W1 and father indifference at W2 and between father phubbing at W1 and mother indifference at W2, respectively supporting Hp5a and Hp5b. However, neither the mediating effect of mother indifference at W2 between father phubbing at W1 and adolescent PG at W2 nor the mediating effect of father indifference at W2 between mother phubbing at W1 and adolescent PG at W2 were significant, failing to support Hp6a and Hp6b. Lastly, age at W2 and

Table 1
Descriptive Statistics and Bivariate Pearson's Correlations in the Total Sample.

Variable	M	SD	Range	Skew	Kurt	1.	2.	3.	4.	5.	6.	7.
1. Maternal Phubbing – W1	12.61	4.87	7–35	1.27	1.74	–						
2. Paternal Phubbing – W1	12.86	5.56	7–35	1.37	1.76	.33	–					
3. Maternal Indifference – W2	9.83	3.50	6–24	0.94	0.15	.35	.20	–				
4. Paternal Indifference – W2	10.93	3.80	6–24	0.71	0.10	.23	.39	.48	–			
5. Adolescent PG – W1	14.40	4.80	9–45	1.35	2.11	.16	.16	.20	.18	–		
6. Adolescent PG – W2	14.10	4.67	9–45	1.15	1.22	.17	.17	.29	.20	.62	–	
7. Age	15.62	1.54	13–20	0.59	–0.73	.04	.03	.07	.01	–.02	–.03	–
8. Gender	–	–	–	–	–	.13	.20	.04	.19	–.13	–.04	–.01

Notes. $n = 557$ adolescent gamers. PG = Problematic Gaming. M = Mean; SD = Standard Deviation; Skew = Skewness; Kurt = Kurtosis. Correlations higher than $r = 0.08$ were significant at the 0.05 level; correlations higher than $r = 0.11$ were significant at the 0.01 level.

Table 2
Single-Group Path Analyses (Total Sample) and Multi-Group Path Analyses (Males vs. Females).

	Total Sample (n = 557)			Males (n = 388)			Females (n = 169)		
Direct Paths	Est	SE	95% CI	Est	SE	95% CI	Est	SE	95% CI
M Phub-W1 → M Ind-W2	.32	.03	.17, .39	.30	.04	.16, .31	.30	.04	.14, .34
M Phub-W1 → F Ind-W2	.12	.04	.02, .15	.18	.04	.07, .22	.06	.04	-.05, .13
M Phub-W1 → PG-W2	.03	.03	-.06, .07	.02	.05	-.07, .12	.05	.05	-.13, .06
M Ind-W2 → PG-W2	.17	.05	.12, .32	.14	.06	.07, .32	.22	.08	.10, .43
F Phub-W1 → F Ind-W2	.35	.02	.18, .39	.24	.03	.10, .24	.39	.04	.23, .44
F Phub-W1 → M Ind-W2	.09	.03	.01, .11	.08	.03	-.01, .12	.11	.03	-.01, .14
F Phub-W1 → PG-W2	.04	.03	.02, .09	.01	.04	-.09, .07	.15	.05	.01, .19
F Ind-W2 → PG-W2	.07	.04	-.10, .08	.05	.06	-.06, .19	.14	.07	.01, .28
Age-W2 → PG-W2	-.09	.09	-.21, .16	-.02	.10	-.25, .14	-.01	.11	-.22, .21
PG-W1 → PG-W2	.59	.03	.50, .63	.59	.04	.49, .65	.60	.06	.47, .70
Indirect Paths									
M Phub-W1 → M Ind-W2 → PG-W2	.05	.01	.02, .08	.04	.02	.01, .08	.08	.02	.02, .11
M Phub-W1 → F Ind-W2 → PG-W2	.01	.00	-.01, .01	.01	.01	-.01, .03	.01	.01	-.01, .02
F Phub-W1 → F Ind-W2 → PG-W2	.01	.01	-.02, .02	.01	.01	-.01, .03	.06	.02	.01, .09
F Phub-W1 → M Ind-W2 → PG-W2	.02	.01	.00, .03	.01	.01	-.01, .02	.02	.01	-.01, .04
Explained Variance									
R ² M Ind-W2	.13			.12			.14		
R ² F Ind-W2	.16			.13			.21		
R ² PG-W2	.40			.40			.43		
TCD	.52			.51			.53		

Notes. Est = Standardized Parameter Estimates; SE = Standard Errors; LLCI = Lower Limit of the 95% Confidence Interval; ULCI = Upper Limit of the 95% Confidence Interval; TCD = Total Coefficient of Determination; M Phub = Mother Phubbing; F Phub = Father Phubbing; M Ind = Mother Indifference; F Ind = Father Indifference; PG = Problematic Gaming.

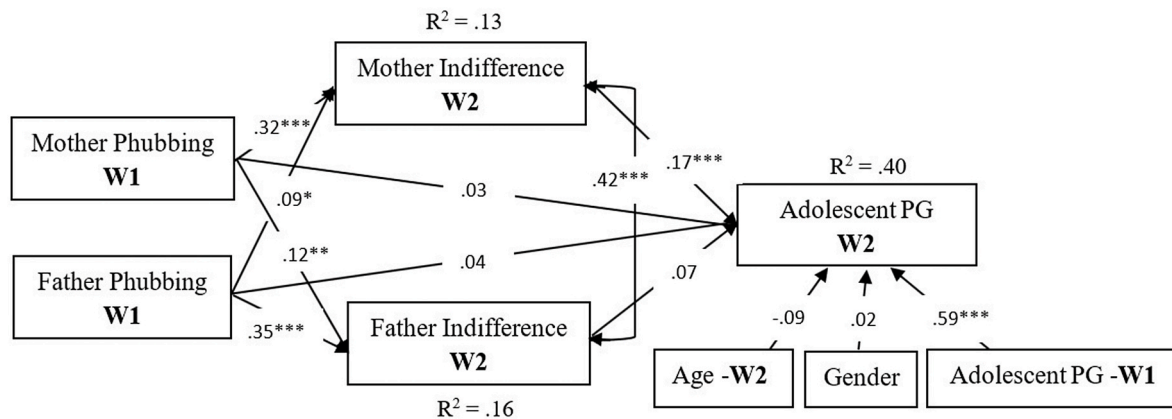


Fig. 2. Standardized Parameters for the Mediation Model in the Total Sample (n = 557).

Notes. n = 557 adolescent gamers. PG = Problematic Gaming. Gender was coded as 0 = males, 1 = females. ***p < .001; **p < .01; *p < .05.

gender did not significantly affect adolescent PG at W2. A moderate association between adolescent PG at W1 and adolescent PG at W2 was observed.

3.2.2. Multi-group path analyses

To examine gender differences in the pattern of associations, we conducted multi-group path analyses by comparing three nested models, testing: configural invariance (Model 1), invariance of the intercepts (Model 2), and invariance of the intercepts and regression coefficients (Model 3). Model comparison using the Chi-Squared Difference Test showed that the values across Model 1 and Model 2 did not change significantly ($\Delta\chi^2_{(3)} = 5.40, p = .144$); thus, the invariance of the intercepts between groups was supported. Following this phase, Models 2 and 3 were compared. Since the χ^2 values changed significantly ($\Delta\chi^2_{(10)} = 19.07, p < .05$), adding the equality constraints on the regression coefficients worsened model fit; this evidenced the relevance of separately analyzing and comparing the regression coefficients between the two groups. Table 2 presents the results of Model 2 for males and females, respectively, including the standardized parameter estimates, standard errors, the 95% confidence intervals for both the direct and indirect effects, and the TCD for each group.

In addition to the direct effects of phubbing at W1 and indifference at W2 within the same parent observed in both groups, a positive association between mother phubbing at W1 and father indifference at W2 was observed in males (see Fig. 3). Furthermore, consistent with the single-group path model, a direct association between mother indifference at W2 and adolescent PG at W2 emerged in both males and females. Interestingly, the comparison of the regression coefficients revealed that adolescent PG at W2 was positively predicted by both father phubbing at W1 and father indifference at W2, only for females (see Fig. 4). Regarding indirect effects, consistent with the single-group model, the mediating effect of mother indifference at W2 between mother phubbing at W1 and adolescent PG at W2 was observed in both groups, whereas the indirect effect of father indifference at W2 between father phubbing and adolescent PG emerged only in females (Table 2).

4. Discussions

Studies on the association between parental phubbing and adolescent PG have received preliminary empirical support from cross-sectional studies conducted in China (Shen et al., 2022; Xie et al., 2021; Zhou et al., 2022). Adding to the literature, the present two-wave

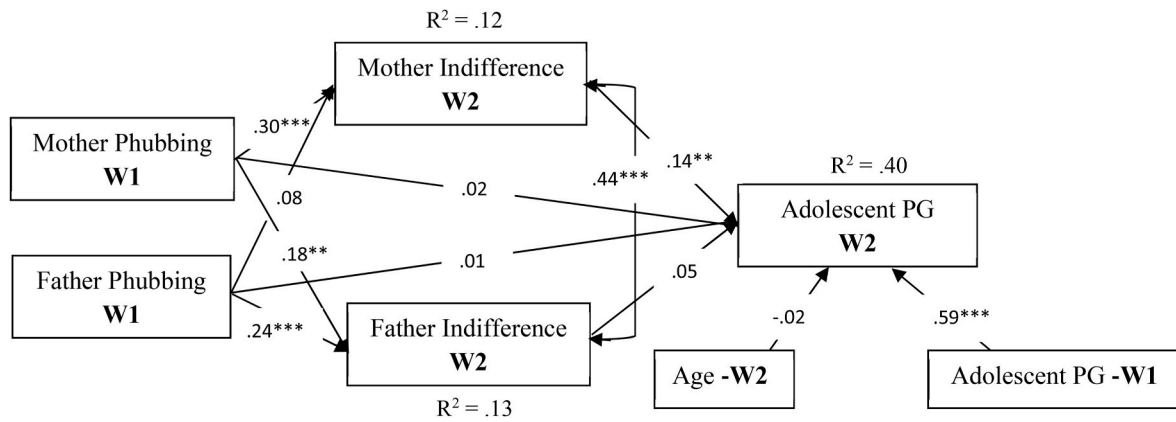


Fig. 3. Standardized Parameters for the Mediation Model in the Group of Males (n = 388).
 Notes. PG = Problematic Gaming. ***p < .001; **p < .01; *p < .05.

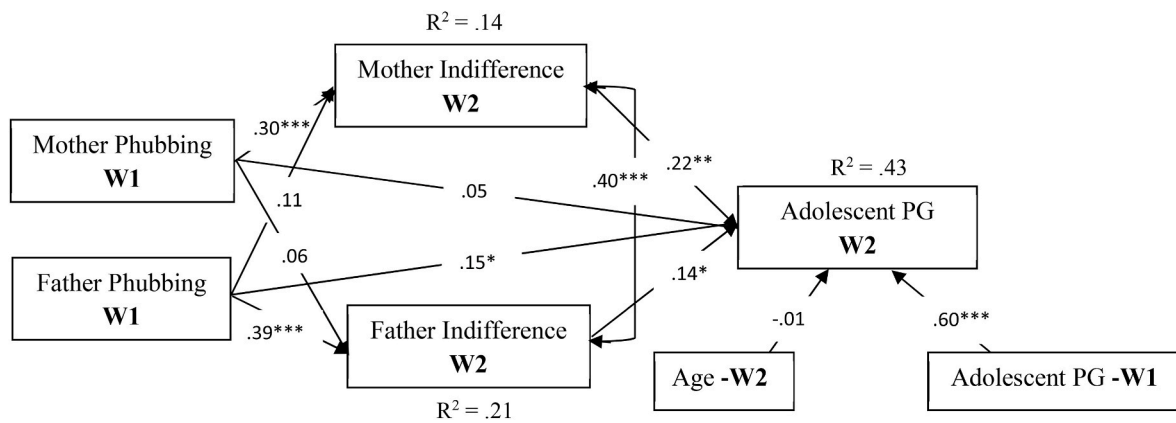


Fig. 4. Standardized Parameters for the Mediation Model in the Group of Females (n = 169).
 Note. PG = Problematic Gaming. ***p < .001; **p < .01; *p < .05.

longitudinal study was carried out within the European area, in Italy, and tested the direct and indirect impact of parental phubbing on later adolescent PG by distinguishing between maternal and paternal behaviors and exploring adolescent gender differences in the pattern of associations.

One contribution of the present study is that mother phubbing at W1 was positively associated with adolescent PG at W2 only at a bivariate level but not in the mediation model, partially disconfirming Hp1a. The absence of a direct effect between mother phubbing and adolescent PG in the complex model is surprising. According to Matthes et al. (2021), parents who excessively use their digital devices may increase the likelihood of adolescent problematic technology-related behaviors for many reasons; for instance, they may have only limited attentional resources left to control the activities of their adolescents (e.g., gaming) or they may reduce their credibility and rule-making legitimacy toward technology use (e.g., setting limits to access/time), which are fundamental to preventing PG (Colasante et al., 2022). While these mechanisms require future investigation, one finding that clearly emerged from our mediation analysis is that mother phubbing at W1 positively predicted the perception of maternal indifference at W2 (Hp2a), which, in turn, predicted higher adolescent PG at W2 (Hp3a). Consequently, in the present study, the indirect effect of mother phubbing at W1 on adolescent PG at W2 via the mediating role of maternal indifference at W2 (Hp4a) was verified, yielding similar results for both male and female adolescents. As some scholars argued (Chotpitayasunondh & Douglas, 2018; Pancani et al., 2020), phubbing behavior may be viewed as a new form of ostracism, which is a specific type of social exclusion mainly characterized by the act of ignoring others (Williams, 2009).

Parental phubbing may be perceived as a social threat occurring in real-life interactions within the family, possibly leading adolescents to conclude that their parents are less interested in and sensitive to their needs. This perception of parental indifference may undermine adolescent adjustment (Khaleque, 2015). Notably, this is the first study showing that the negative effects of maternal phubbing may persist over time, resulting in less responsive maternal behaviors that may become habitual and deleterious, possibly heightening the risk for adolescent PG. According to the temporary need-threat model (Williams, 2009), individuals experiencing ostracism initially feel an increased negative affect and decreased satisfaction of their psychological needs (reflexive stage), and to deal with this unpleasant state, they start to adopt different coping strategies (reflective stage). As evidenced by prior research, adolescents often use video games as a cognitive and behavioral strategy to face negative emotions arising from real-life stressors, such as problems with interpersonal relationships (Milani et al., 2018; Schneider et al., 2017). Furthermore, as explained by Zhu & Chen (2021), following the assumptions of self-determination theory (Deci & Ryan, 2000), adolescents may turn to gaming to restore basic psychological needs (e.g., the need for relatedness), which have been previously frustrated by negative parental behaviors. The risk, however, is that adolescents who intensively play video games as an alternative means to manage daily stressors or to achieve a sense of relatedness to others may develop a series of dysfunctional cognitions about the individual benefits of gaming (e.g., “I could not cope with stress without video games”) and social benefits (e.g., “The online world is the only place I am respected”) that may reinforce the maladaptive gaming patterns underlying PG (Marino & Spada, 2017).

Furthermore, since the mediating effect of indifference conveyed by mothers was observed in both males and females, the present study highlighted the crucial impact of low maternal emotional availability on the development of PG symptoms among Italian adolescents, which is consistent with previous findings on the broader construct of Internet addiction (Trumello et al., 2018). Indeed, despite both parents play important roles in shaping adolescents' emotional experiences and well-being, adolescents often perceive their mothers as the primary source of emotional support (Van Lissa et al., 2019). Hence, the impact of maternal indifference may be highly deleterious to them regardless of their gender. This may be true, especially for adolescents living in countries in which mothers constitute the primary caregiver and who devote more time to childcare, thus being more involved in daily parent-adolescent interactions and playing a central role in emotional socialization, as in Italy (Cannito & Scavarda, 2020; Eurostat, 2022) and China (Wu et al., 2022).

Another contribution of the current study is that the direct effect of father phubbing at W1 on adolescent PG at W2 (Hp1b) and its indirect effect via the mediating role of father indifference at W2 (Hp4b) were observed only in female adolescents. Consistent with a two-wave study by Geng et al. (2021), which showed a direct and positive effect of father phubbing at W1 on adolescent problematic use of digital technology at W2, in particular, smartphones, it is conceivable that fathers' technology-related behaviors, in particular, are considered as an example to imitate by adolescents. Since girls tend to perceive their fathers as more authoritative (McKinney & Renk, 2008), it is possible that observing the paternal figure being intensively engaged in the use of digital devices may lead adolescent girls to assume that similar behaviors are acceptable, potentially heightening their intention to play video games on portable devices. This small effect among females is in line with the literature on social learning theory (Bussey & Bandura, 1999), suggesting that girls, compared to boys, do not exclusively exhibit same-gender modeling behaviors. Yet, the absence of a direct effect of father phubbing on adolescent PG among males constituted an unexpected finding for at least two reasons: first, because it is well-established that boys favor male models and emulate them (Bussey & Bandura, 1999); second, because, based on current evidence showing that males, compared to females, are more prone to use video games, both in general samples of adults (Su et al., 2020) and, specifically, between parents (Stockdale & Coyne, 2020), one might expect that the likelihood of fathers using their smartphones in the presence of their offspring, for instance, to game, may be higher compared to that of mothers and, thus, exert a substantial influence on the development of adolescent PG. However, this is only speculative, and we encourage future research examining the impact of parental phubbing on adolescent PG to replicate our study, possibly by explicitly investigating the different contents of smartphone activities by parents (Park et al., 2021).

Interestingly, the indirect effect of father phubbing via the mediating role of father indifference (Hp4b) obtained in females is consistent with prior research, showing that Italian girls are more susceptible to the adverse influence of parental phubbing than boys (Pancani et al., 2020). In particular, our results suggest that, for female adolescents, the experience of being ignored by fathers may be particularly harmful and trigger negative consequences - including higher adolescents' perception of paternal indifference - that may progressively consolidate, eventually leading to the establishment of maladaptive gaming patterns over time. In line with this, a study by Wang, Mao, et al. (2022) revealed that the negative impact of parental phubbing on adolescent well-being via a reduced quality of the parent-adolescent relationship was more severe among female adolescents. Furthermore, a previous study by Yao et al. (2014) found that paternal rejection was significantly and positively associated with the Internet Addiction of daughters, but not of sons. One possible explanation could be that females may be more sensitive to social exclusion than males, as demonstrated by the experimental studies by Benenson et al. (2013). They found that female participants exhibited a higher speed toward detecting social exclusion cues

and increased heart rates in response to social exclusion. Alternatively, it may be speculated that Italian boys in particular may tend to perceive their fathers as more emotionally detached than their mothers, reflecting the traditional model of fatherhood embedded in Italian society characterized by fathers' low involvement in daily family relationships due to their main breadwinner role and full-time jobs (Cannito & Scavarda, 2020). As a result, paternal indifference may be considered by male adolescents as more normative than maternal indifference and thus may not constitute a salient factor.

In addition to the distinct contribution of maternal and paternal behaviors to adolescent PG, our results confirmed that the mediation model, in which these behaviors mutually influenced each other, showed a better fit with the data. Specifically, the findings in the total sample indicated that mother phubbing at W1 positively predicted adolescents' perceptions not only of maternal indifference at W2 (Hp2a), but also of paternal indifference at W2 (Hp5a); the same pattern of reciprocal associations was observed for fathers, whereby increased father phubbing at W1 was associated with higher perception not only of father indifference at W2 (Hp2b), but also of mother indifference at W2 (Hp5b). These findings support the crossover effect between parental behaviors posited by family systems theory (Emery, 2014). These results align with previous studies that documented the reciprocal and detrimental effects of both mother and father phubbing on mother and father-adolescent relationships, specifically in terms of increased parental rejection (Wu et al., 2022), higher social disconnectedness (Pancani et al., 2020) and reduced quality of communication (Wang, Mao, Liu et al., 2022). As argued by Wu et al. (2022), when one parent is heavily distracted by the smartphone in the presence of the offspring, the other parent may feel the responsibility to increase the amount of attention and energy directed toward the adolescent to ensure adequate parental care; however, this effort may conversely deplete parental psychological resources, ultimately increasing the perception of indifference from both parents. Although our findings supported the presence of the crossover effect between parental behaviors, neither the mediating effect of mother indifference at W2 between father phubbing at W1 and adolescent PG at W2 (Hp6a) nor the mediating effect of father indifference at W2 between mother phubbing at W1 and adolescent PG (Hp6b) were significant. Furthermore, the multi-group analyses did not fully detect the crossover effect in males and females respectively; indeed, results indicated that only mother phubbing positively predicted father indifference in the model of males. Additional research replicating this model with larger samples is required to better understand the potential gender differences underlying the reciprocal associations between maternal and paternal behaviors.

Finally, regarding the covariates included in this study, age at W2 and gender were not significantly associated with adolescent PG at W2. Beyond suggesting the relevance of studying this condition in both early, middle, and late adolescence (Steinberg, 2017), this finding aligns with recent studies stressing the need to consider gaming as a favored pastime activity and a potential problem, not only for male but also for female adolescents (King & Potenza, 2020). Indeed, moving forward the traditional masculine gaming culture, female gaming represents a growing phenomenon (Lopez-Fernandez et al., 2019). Finally, the moderate stability of adolescent PG over time observed in the present study aligns well with the findings of previous two-wave longitudinal studies on adolescent IGD (Teng et al., 2021; Wartberg et al., 2019).

4.1. Limitations

This study has some limitations. First, the data were collected using self-report measures. To improve the accuracy of estimates concerning digital technology use, objective measures directly acquired from devices (e.g., smartphone and console usage time) may be utilized (Geng et al., 2021). Furthermore, since parental phubbing is a behavior that occurs in the context of parent-adolescent interactions, more rigorous assessments can entail experimental procedures applying observational

methods to the study of dyadic interactions, which can be recorded and systematically microanalyzed (McHale et al., 2018). Second, our sample of adolescent gamers included only Italian participants and was unevenly distributed between genders: if, on one hand, the disproportion between males and females reflects current preferences for gaming among adolescents (Bender et al., 2020), on the other, it may have increased the uncertainty of the findings obtained in females. Therefore, larger longitudinal studies involving gender-balanced samples of adolescents living in different countries are required to increase the generalizability of our findings. Third, this study relied exclusively on adolescent perceptions; to gain an in-depth understanding of the association between parental behaviors and adolescent PG, information should be collected from multiple informants, such as parent-adolescent dyads (De Los Reyes & Ohannessian, 2016). Such research would enable the advancement of current knowledge by adding to the perspective of the phubbee (i.e., adolescent) that of the phubbers (i.e., parents), for instance, by exploring the reasons behind the act of phubbing (Chotpitayasonondh & Douglas, 2018) or by considering maternal and paternal attachment styles (Zvara et al., 2020), which may shed further light on the parent-adolescent relationship. Fourth, despite being a longitudinal study, the design encompassed only two time points over a short period. Future research should assess each variable at multiple time points to provide more robust evidence of the causality and stability of the associations over time (Lin et al., 2020). Moreover, some of the estimated parameters of the proposed model were small. Thus, the practical significance of our results should be carefully considered. As this may be at least partially due to the non-clinical nature of our sample, further research involving clinical samples of adolescents is warranted. Finally, this study examined only maternal and paternal indifference as mediators. As suggested by prior research, other mediating variables, such as the need for relatedness (Xie & Xie, 2020), anxiety (Zhu & Chen, 2021) and self-esteem (Shen et al., 2022), should be investigated.

4.2. Practical implications

The results of this study have several practical implications. First, they demonstrated that excessive smartphone use by both mothers and fathers could decrease the quality of parenting behaviors as perceived by their offspring. As suggested by Lippold et al. (2022), parental technology use can hinder mindful parenting, which is fundamental to foster positive parent-adolescent relationships and, in turn, adolescent adjustment. If parents are distracted by their devices during time spent with their children, they may have difficulties maintaining awareness of the present moment and may be unable to listen with full attention to their thoughts and needs (Lippold et al., 2022). Therefore, practitioners should help mothers and fathers acknowledge and minimize the detrimental effects of parental phubbing (Liu et al., 2021); on the other, they should encourage parents to engage in more sensitive parenting practices that convey empathy and warmth. Role-playing activities may be used (Briesmeister & Schaefer, 2007). Second, our study showed that both male and female adolescents who felt unnoticed by at least one parent may develop PG. Since previous research has indicated that adolescents may over-rely on video games to satisfy their social needs or avoid real-life stressors (Männikkö et al., 2017), it may be useful to implement school-based prevention programs that can guide them to understand the role of the motives underlying their gaming activities, to adopt adaptive coping strategies, and to enhance psychological resilience (Canale et al., 2019; Estevez et al., 2019; Paulus et al., 2018). Third, our research paradigm simultaneously examining maternal and paternal behaviors offered some insights into potential gender differences that might be discussed by professionals in the context of prevention programs tackling problematic media use, which may entail psycho-educational activities for adolescents and parent training courses (Throuvala, Griffiths et al., 2019). In the most severe and persistent cases of adolescent PG, both parents and adolescents should be involved in family-based therapeutic sessions, guiding all family members

towards the promotion of positive interpersonal relationships and a healthy adolescent's change (Bonnaire et al., 2019).

5. Conclusions

This study expanded previous cross-sectional literature on parental phubbing and adolescent PG by using a two-wave longitudinal design that examined the direct (and distinct) impact of maternal and paternal phubbing on later adolescent PG, the mediating role of increased maternal and paternal indifference over time and possible gender differences among adolescents. Our results suggested that maternal behaviors may mostly impact adolescent PG from an emotional standpoint for both males and females and revealed that paternal behaviors might specifically influence the gaming activities of daughters. Parents and adolescents living in the digital era should be aware of the benefits and disadvantages associated with technology use in their daily lives to protect the quality of their relationships and avoid harmful outcomes.

Role of funding sources

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

CRediT authorship contribution statement

Erika Pivetta: Conceptualization, Data curation, Formal analysis, Methodology, Project administration, Resources, Software, Visualization, Writing - original draft. **Claudia Marino:** Conceptualization, Methodology, Resources, Supervision, Validation, Writing - review & editing. **Gioia Bottesi:** Conceptualization, Methodology, Supervision, Validation, Writing - review & editing. **Massimiliano Pastore:** Software, Supervision, Validation, Writing - review & editing. **Alessio Vieno:** Conceptualization, Methodology, Resources, Supervision, Validation, Writing - review & editing. **Natale Canale:** Conceptualization, Methodology, Resources, Supervision, Validation, Visualization, Writing - review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.chb.2023.108058>.

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