

Social Relational Factors of Excessive Internet Use in Four  
European Countries

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*Ethical approval:* All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research

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*Informed consent:* Informed consent was obtained from all individual participants included in the study

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## Abstract

**Objectives:** Adolescents who deal with more emotional problems have been found to seek escape online, and struggle with excessive internet use (EIU). Poor social relationships have been linked with emotional problems. The current study investigated positive family and school relationships as protective factors against emotional problems and a preference for online social interaction (POSI), both specified as mediators of the association of family and school relationships with EIU. Cross-cultural differences in the model were tested.

**Methods:** A multi-group SEM was tested on representative samples of 4,104 adolescents ( $M_{\text{age}} = 14.40$  years,  $SD = 1.65$ , range 12 – 17, 50% female) from 4 European countries from Southern, Northern, Central and Eastern Europe (Italy, Norway, Czech Republic and Serbia, respectively).

**Results:** Results suggested consistent associations across countries. Positive family relationships and positive school relationships were associated with lower EIU, with 63-64% of the effect of family, and 91-93% of the effect of school relationships mediated by emotional problems and POSI.

**Conclusions:** Positive family and school relationships protect adolescents against excessive internet usage, regardless of culture and indirectly – through emotional problems and POSI.

**Keywords:** Excessive internet use; Emotional problems; Preference for online social interaction; IPARTheory

## Introduction

Adolescence is a developmental period characterized by the increased importance and salience of social relationships (Somerville 2013). In their review, Crone and Dahl (2012) noted that important changes in socio-cognitive development take place in adolescence, when adolescents master new skills that are important for understanding social interactions. Furthermore, having secure, positive, and caring relationships with significant attachment figures (be it family, peers, or teachers) is paramount for healthy development, while the lack thereof is associated with negative outcomes and emotional problems as posited by the Interpersonal Acceptance-Rejection Theory (IPARTheory; Rohner 2016).

In contemporary society, experiencing relationships have changed with the use of technology. The internet is increasingly becoming the medium through which adolescents fill their developmental needs for social interactions (Borca et al. 2015; Subrahmanyam and Smahel 2011). Relationships are initiated, maintained, and transformed online, and using the internet for social interaction is one of the most frequent online activities among contemporary youth (Smahel et al., 2020). The internet offers young people control over their self-expression, which allows them to experiment with their identity or self-presentation (Mazur & Kozarian 2010). It offers youth with perceived lower social skills a way to connect to their peers (Teppers et al. 2014), or seek emotional support online, while at the same time providing immediate reward and gratification that further reinforces usage (Karim & Chaudhri 2012). This may lead some young people to over time develop a preference for online social interaction (at the expense of face-to-face interaction; Caplan, 2010). Both emotional problems and preference for online social interaction have been found to be associated with using the internet excessively in a way that it might cause negative health outcomes, such as missing social engagements, experiencing subjective problems in life, and

developing difficulties in keeping up with school or work requirements (Caplan 2005; 2010; Fioravanti et al. 2012; Hou et al. 2019).

The current study aimed to test the IPARTheory within a media-use context. While some studies investigated the associations among excessive use and parental and school relationships (Anderson et al. 2017; Throuvala et al. 2019) and the preference for online social interaction (López de Ayala López et al. 2015), no study did so simultaneously. We still lack an understanding of how protective factors, such as positive parental and school relationships, interact with individual factors, such as emotional problems and the preference for social interaction.

### **Interpersonal relationships as predictors of excessive internet use**

The IPARTheory (Rohner 2016) suggests that perceiving acceptance or rejection by an attachment figure or a significant other can leave a lasting socio-emotional impact in an individual by affecting their self-representation (e.g., self-esteem, self-worth). If an adolescent consistently feels rejected or neglected by their caregivers, they may learn to believe that they themselves are undeserving of positive relationships in broader contexts. According to the personality subtheory of IPARTheory (c.f., Rohner 2016), the perceived rejection erodes core self-evaluations and creates emotional problems, which include lower self-esteem and lower self-adequacy. These hypotheses were tested and found support within different cultural contexts and thus can be treated as panculturally applicable (Rohner and Khaleque 2010).

In the current study, we focus specifically on EIU which we understand as a construct closely related to behavioural addictions (Karim & Chaudhri 2012) – more specifically using the internet in such a way and to such an extent that it has a substantive negative impact on the life of the adolescent (Kuss et al. 2013). Emotional problems have been consistently found to be associated with EIU (c.f., a systematic review by Kuss et al. 2014). This

relationship is often explained as adolescents with emotional problems seeking solace in online communities where they experience more acceptance and develop a preference for online social interaction (Caplan 2005, 2010), or adolescents trying to escape the pressures of their everyday lives by distracting themselves online and reinforcing this behaviour until it becomes their dominant method for reducing stress (Kardefelt-Winther 2014). As described in Karim and Chaudhri's (2012) overview of behavioral addictions, not only does internet provide a compensatory tool for people with poorer perceived face-to-face relationships, it also often provides immediate gratification to users which further reinforces usage habits.

There are a number of studies that support the assumption that poor family relationships and functioning are linked to problematic internet use. Throuvala et al., (2019) tested IPARTheory in the context of internet gaming disorder on an online sample of 172 Greek young adults and found that experiencing parental rejection was indirectly associated with problematic online behaviour - mediated through poorer core self-evaluations (e.g., low self-esteem, low self-efficacy, high neuroticism). Based on a sample of 2,215 South Korean adolescents, Lyu (2017) found a direct relationship between family functioning (operationalized as adaptability and cohesion) and internet gaming disorder. In general, positive parenting (e.g., parental acceptance, warmth, closeness, communication) has been consistently found to be a direct or indirect protective factor in studies that focused on excessive or problematic internet use (c.f., a recent systematic review by Anderson et al. 2017; Liu and Kuo 2011; Wang et al. 2011).

### **School relationships**

While initially formulated within a child-attachment-figure context, Rohner (2016) expanded the IPARTheory to include any significant interpersonal relationships in which acceptance or rejection can have developmental consequences, which can also include relationships in the school environment. For instance, Ali et al. (2015) found that perceived



acceptance or rejection from teachers has an impact on children's adjustment. A vast body of empirical literature found support for the relationship of peer-rejection and emotional problems (Clarke 2006; Fisher et al. 2016; Gorrese and Ruggieri 2013). These findings imply that the experience of acceptance or rejection within the context of school can have a similar impact on health as that experienced within the context of family.

Peer and teacher relationships have been also found to be associated with excessive or problematic internet use. Díaz-Aguado et al. (2018) found that adolescents who experienced hostile treatment from teachers were at a higher risk of problematic internet use, whereas the risk was lower for adolescents who appreciated school. Negative peer relationships were consistently found to be associated with a higher risk of internet-related problems (Critselis et al., 2014; Liu and Kuo, 2011; Wang et al., 2011). Furthermore, Zhou et al. (2017) tested a mediation model in which peer relationships and depressive symptoms mediated the relationship of resilience and internet addiction on a sample of more than 58,000 urban Chinese fourth-graders. A part of their model offered support for the indirect pathway from peer relationships through emotional problems (i.e., depressive symptoms) to internet addiction. Relatively few studies, however, tested the effects of both family and school relationships at the same time. To our knowledge, no study to date has focused on explaining these effects on EIU through the mediating influence of emotional problems and the preference for social interaction.

### **Preference for online social interaction**

Building on Davis' (2001) cognitive behavioural model of problematic internet use, Caplan (2005, 2010) suggested that individuals with higher emotional problems (e.g., loneliness, social anxiety, deficient social skills, low self-esteem) choose to interact with others online, rather than face to face because internet-mediated interactions offer higher control of self-presentation. Using the internet for mood regulation was found to be directly

associated with compulsive internet use and cognitive preoccupation, and indirectly associated with the negative outcomes of such internet use (Caplan 2010). In studies by Fioravanti et al. (2012) and Smahel, Brown, and Blinka (2012) the preference for online social interaction has been identified as a predictor for EIU.

### **Research goals**

While the existing empirical literature found support for some relationships between the pairs of variables of interest in our study, a comprehensive test that accounted simultaneously for relational factors, emotional problems, and the preference for online social interaction in predicting EIU has, to our knowledge, not been conducted. Therefore, in our study we tested the association between social relationships in the two most salient contexts during adolescence – family and school (Larson and Csikszentmihalyi 1983) on one hand, and excessive internet use (EIU) on the other. Emotional problems and the preference for online social interaction were tested as mediators of this association.

Additionally, most of the published literature relied on convenience samples or, in better cases, samples representative of a single country. The current study makes use of data from representative samples of adolescents across four diverse countries that represent Southern and Northern Europe (Italy and Norway, respectively) and Central and Eastern Europe (Czech Republic and Serbia, respectively). In previous research, the IPARTheory was conceptualized as a pancultural theory (Rohner and Khaleque 2010) and comparing the proposed model in four countries allowed us to test whether the theoretical assumptions are valid across different socio-political contexts.

Based on the IPARTheory (Rohner 2016) we expected adolescents who experienced rejection within the context of their family or school to be at an increased risk of developing emotional problems. We hypothesized a model, summarized in Figure 1, in which interpersonal relationships within the family and school context predicted EIU both directly

and indirectly through emotional problems and the preference for online social interaction. Furthermore, we assumed that the preference for online social interaction mediated the association between emotional problems and EIU as well. Finally, we expected that the relationships between variables of interest would not differ across the four tested countries.

*Figure 1. (PLACEHOLDER)*

We tested the complex model using structural equation modelling, which allowed us to provide unique and generalizable findings about the relationships between the protective and individual factors and their impact on EIU in different socio-political contexts. Testing the model helped us to understand the protective and risk factors for EIU among adolescents from different regions of Southern, Northern, Central, and Eastern Europe.

## Methods

### Sample

We analysed nationally representative data from the EU Kids Online project (Smahel et al. 2020), collected in 2018. Four countries — the Czech Republic (CZ;  $n = 2,043$ ), Italy (ITA;  $n = 619$ ), Norway (NOR;  $n = 660$ ), and Serbia (SER;  $n = 782$ ) — were selected to represent a diverse socio-political spectrum of European countries. To ensure representativeness of the data and to match the sample demographic distribution with that found in the general population, participants were recruited either from schools, using cluster sampling (CZ, SER), or from households, using random walk, quota sampling, or random recruitment (ITA, NOR). For more information, please see the EU Kids Online technical report (Zlamal et al., 2020). Adolescents responded to pen and paper surveys (SER), surveys on computers or tablets (CZ, NO), or trained interviewers who recorded their answers using

an electronic tool (ITA). Participants were 50% female, with a mean age of 14.40 years old ( $SD = 1.65$ , range 12 – 17), and 63.5% of them spent “about 3 hours” or more on the internet on an average weekday. Base ethical guidelines were met while administering the survey, and national rules and conditions were followed. Oral or written informed consent was obtained from the child or their legal representative (Smahel et al. 2020).

## Measures

All items and their response scales can be found in Electronic Supplementary Material

A. Internal consistencies are listed in Table 1. High values for a variable indicate better family or school relationships or higher levels of the specific variable.

*Family relationships:* three items adapted from the Health Behavior in School-aged Children (HBSC) 2013/2014 survey (WHO 2016), Zimet, Dahlem, Zimet, and Farley, (1988), and newly developed for EU Kids Online. Example item: “*I feel safe at home.*”

*School relationships:* five items adapted from the HBSC survey (WHO 2016). Example item: “*I feel like I belong in my school.*”

*Emotional problems:* four items from the Strengths and Difficulties Questionnaire (Goodman et al. 1998). Example item: “*I worry a lot.*”

*Preference for online social interaction:* three items (Smahel et al. 2012). Example item: “*I find it easier to be myself online than when I am with people face to face.*”

*Excessive internet use:* five items developed within the EU Kids Online network (Livingstone et al. 2011; Smahel et al. 2009), based on the factors proposed by Griffiths (2000). Example item: “*I have gone without eating or sleeping because of the internet.*”

Gender, age, socio-economic status, and time spent online on an average weekday [ranging from (1) *Little or no time* to (9) *About 7 hours or more*] were used as control variables. Long time spent online may seem synonymous with excessive internet use, however, the amount of time spent online can also be productive or at the very least not cause

problems in the life of a use, therefore, it should not be understood as a symptom or an indicator of EIU (c.f. Charlton & Danforth 2007).

### **Plan of analysis**

Measurement invariance is an important property of psychometric tests in cross-cultural research. Before being able to compare relationships, we need to make sure that the scales measure the constructs in the same way in all tested countries. Invariance was tested for all of the scales simultaneously across the four countries following the guidelines of Wang, Chen, Dai, and Richardson (2018). Following the suggestions of Cheung and Rensvold (2002), scalar level of measurement invariance (equivalency of item loadings across the countries) was concluded if the difference in CFI for the configural model (pattern of item loadings same across countries) and scalar model did not exceed  $\Delta CFI = .010$ . Since the study does not focus on comparing mean levels of variables metric invariance (equivalency of intercepts) was not tested.

A latent multi-group mediation model was specified according to Figure 1. Each latent construct was indicated by its individual items. One residual correlation was allowed between the two school-relationships items that asked about relationships with teachers. Age, sex, socio-economic status, and time spent online during weekdays (as observed variables) were controlled for in all endogenous latent variables and specified as covariates of family and school relationships. To estimate differences in the model across the countries, a procedure analogous to invariance testing was followed. The model fit was compared between a model with all regression paths estimated freely within each country and a model with the paths constrained to equality. Indirect effects were estimated and their significance was tested using bootstrapping with 1,000 re-sampled iterations. All analyses were conducted in Mplus 7 (Muthén and Muthén 2012), using WSLMV estimation.

## Results

The means and standard deviations of variables in the model are provided in Table 1. Note that these are observed scale scores (computed as the means of scale items) and not the latent estimates estimated in the model. Multi-group tests of measurement invariance for individual scales provided evidence of partial scalar invariance. Configural measurement model fit the data well  $\chi^2 = 1607.013$ ,  $df = 636$ ,  $p < .001$ , CFI = .976; RMSEA = .050, 90% CI [.036, .041]. Constraining all paths to equality however decreased the fit more than by the accepted threshold of  $\Delta CFI = .010$ :  $\chi^2 = 2500.961$ ,  $df = 696$ ,  $p < .001$ , CFI = .955; RMSEA = .049, 90% CI [.048, .052]. Releasing family and school relationship scales from constraints improved the model fit difference to acceptable level:  $\chi^2 = 1913.276$ ,  $df = 672$ ,  $p < .001$ , CFI = .969; RMSEA = .042, 90% CI [.040, .045].

The full model, with no parameter constraints, fit the data well,  $\chi^2 = 3574.253$ ,  $df = 1017$ ,  $p < .001$ , CFI = .941; RMSEA = .050, 90% CI [.048, .051]. After estimating all paths as equal among the countries, the fit actually improved,  $\chi^2 = 3418.661$ ,  $df = 1080$ ,  $p < .001$ , CFI = .946, RMSEA = .046, 90% CI [.044, .048];  $\Delta\chi^2 = 155.592$ ,  $df = 63$ ,  $p < .001$ ,  $\Delta CFI = .005$ ,  $\Delta RMSEA = .004$ . This indicates that there were no significant differences in relationships between the modelled constructs across the countries in the current study. In other words, the same model is plausible for adolescents from the Czech Republic, Italy, Norway, and Serbia. Given this finding, all estimates reported below are from the constrained model. Results of the unconstrained model can be found in Electronic Supplementary Material B.

The results of the full mediation model (Figure 2) show that both emotional problems and the preference for online social interaction were significant predictors of EIU, with emotional problems being stronger. Family relationships were found to predict both emotional problems and the preference for online social interaction negatively, while school

relationships were only a significant negative predictor of emotional problems and not for the preference for online social interaction. Family and school relationships were no longer directly associated with excessive internet use once indirect pathways through emotional problems and preference for online social interaction were taken into account. Both associations of family and school relationships were mediated through emotional problems. The preference for online social interaction was found to mediate the association between family relationships and EIU as well as the association between emotional problems and EIU, but not the association between school relationships and EIU. The standardized direct effects can be found in Figure 2, while the indirect effects are summarized in Table 2. Even despite the fact that each are based on the same unstandardized path, the standardized estimates for each country differ due to different *SDs* of constructs among the four countries. Therefore, standardized estimates are presented for each country (e.g., four sets of parameters).

Table 1. (PLACEHOLDER)

Figure 2. (PLACEHOLDER)

Table 2. (PLACEHOLDER)

## Discussion

This article investigated the associations of family and school relationships, emotional problems, and the preference for online communication with EIU. Based on large and representative samples of adolescents from four distinct European countries, the results of a structural model indicate that family and school relationships are associated with emotional problems negatively, adding to the plentiful of empirical support for IPARTheory (Rohner 2016). Family or school relationships did not have a direct effect on EIU. The effects of family and school relationships on EIU are indirect – most notably mediated through adolescents' emotional problems. Emotional problems were relatively strongly associated with EIU, falling in line with previous findings already summarized in Kuss et al. (2014). Commonly, emotional problems have been conceptualized as the primary predictors of EIU; however, the current findings now place emotional problems into the role of a mediator, showing that it is necessary to consider the underlying reasons for these problems, such as the unfulfilled developmental needs of family and school relationships.

As presented above, Throuvala et al. (2019) found that the association between parental rejection and internet gaming disorder was mediated through poorer core self-evaluations (e.g., low self-esteem, low self-efficacy, external focus of control, high neuroticism) in the context of the disorder. Our research revealed a mediating role for emotional problems, and for the broader concept of EIU. While emotional problems are a related construct to poor core self-evaluation, they are distinct. Further research into how they relate to EIU or broader aspects of well-being in tandem would be beneficial in preventing and treating negative outcomes.

The current study further expands IPART, as well as EIU literature by testing the model on representative samples and doing so in four countries, providing additional evidence for its socio-political invariance. Furthermore, the current study contributes testing



for the effects of school-based relationships, which were acknowledged as important by Rohner (see 2016), and preference for online social interaction, which is an established predictor of EIU (Fioravanti et al. 2012; López de Ayala López et al. 2015; Smahel et al. 2012).

To our knowledge, no study has tested the preference for online social interaction as a mediator for the paths from interpersonal relationships and emotional problems to EIU. Emotional problems were associated with the preference for online social interaction positively, and that preference, in turn, was associated with EIU; however, the indirect pathway from interpersonal relationships to EIU was only significant for family relationships. School relationships were not associated with the preference for online social interaction directly but indirectly - through emotional problems. In Caplan's (2002, 2005, 2010) work, one way to understand the preference for online social interaction is as a compensation mechanism for insufficient face-to-face interactions or their perceived stressfulness. The current findings show that, after controlling for family relationships, school relationships are unrelated to the preference for online social interaction. This could be because the current 'school relationships' variable is more focused on relationships with teachers and the school in general. Adolescents communicate with their teachers mostly offline; in other words, they have limited control over the channel of communication and they are unable to avoid direct face-to-face interactions with teachers offline. On the other hand, adolescents are more able to decide whether they will interact with parents or siblings within the family or whether they will retreat online and interact with other people. In the case of poor family relationships, the adolescent can more often prefer the online communication with other people online and such a preference for online communication mediates the increase of EIU.

It seems that family relationships play a double role: family relationships had an effect on adolescents' emotional problems and they influenced their preferences for online

communication. Both of these were in turn associated with EIU, explaining the indirect relationship of family. On the other hand, it seems that school relationships were associated with EIU only through adolescents' emotional problems. However, it is likely that there are other variables or relationships which we did not take in account. Future research should include more context, such as perceived social self-efficacy, which might be associated with EIU and which might also further explain the role of the family and school relationships. As discussed earlier, not believing in oneself to be capable of meaningful social interactions may likely further explain the relationships among social relationships, emotional problems, preference for online social interaction, and excessive internet use.

Finally, we found that the relationships in the model did not differ among the four tested countries representing 4 distinct regions of Europe – adolescents from Southern and Northern Europe (Italy and Norway, respectively) and Central and Eastern Europe (Czech Republic and Serbia, respectively) did not differ in this respect. This further supports the applicability of the IPARTheory to different socio-political contexts and the importance of positive family and school relationships, regardless of culture and socio-economic differences. Specifically, positive family and school relationships served as a protective factor against EIU in all four of the countries. Future research would, however, benefit from the inclusion of diverse cultures from non-Western countries.

### **Limitations and implications**

Several limitations need to be acknowledged in order to understand the findings and the context of the current study. First and foremost, the model is based on cross-sectional data. This precludes questions about causal relationships between the constructs. These are the main goal of a mediation model; however, to properly address them, a longitudinal study design would be required. Furthermore, while being cost efficient, a self-report-based survey may introduce a degree of bias to the data. A related common issue associated with analysing

data from large-scale surveys with a broad focus is the relatively poor measurement of the constructs of interest or unavailability of additional potential variables of interest. In order to capture a broad spectrum of relevant phenomena, sacrifices in the length and breadth of the scales or the number of measurement items had to be made. Additionally, the current invariance tests indicate a lack of scalar invariance for family and school relationships, suggesting differences in how the measures assess their intended constructs across countries. This may mean that a “positive relationship” be it in the context of family or school, likely comprises of different elements in the tested countries. This difference and its implication warrants further investigation in future studies. Finally, in addition to the control variables used in the study parental age or attitudes towards the internet, as well as sociodemographic context of the schools may play a role in the studied relationships.

Given the integral relationship between EIU and emotional problems, practitioners should be aware of the more complex role of EIU. It can potentially be a symptom and a coping strategy rather than the cause of problems. For policy makers, it is important to emphasise that EIU must be seen in the context of other factors on both the individual and social level. Efforts to strengthen general youth life skills, coping mechanisms, and mental health should be prioritized.

## References

- Ali S, Khaleque A, Rohner RP (2014) Influence of perceived teacher acceptance and parental acceptance on youth's psychological adjustment and school conduct. *Cross-Cultural Research* 49:204-224. <https://doi.org/10.1177/1069397114552769>
- Anderson EL, Steen E, Stavropoulos V (2017) Internet use and problematic Internet use: A systematic review of longitudinal research trends in adolescence and emergent adulthood. *International Journal of Adolescence and Youth* 22:430-454. <https://doi.org/10.1080/02673843.2016.1227716>
- Borca G, Bina M, Keller PS et al. (2015) Internet use and developmental tasks: Adolescents' point of view. *Computers in Human Behavior* 52:49-58. <https://doi.org/10.1016/j.chb.2015.05.029>
- Caplan SE (2005) A social skill account of problematic internet use. *Journal of Communication* 55:721-736. <https://doi.org/10.1111/j.1460-2466.2005.tb03019.x>
- Caplan SE (2010) Theory and measurement of generalized problematic Internet use: A two-step approach. *Computers in Human Behavior* 26:1089-1097. <https://doi.org/10.1016/j.chb.2010.03.012>
- Charlton JP, Danforth ID (2007) Distinguishing addiction and high engagement in the context of online game playing. *Computers in Human Behavior*, 23:1531-1548.
- Cheung GW, Rensvold RB (2002) Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling: A Multidisciplinary Journal* 9:233-255. [https://doi.org/10.1207/s15328007sem0902\\_5](https://doi.org/10.1207/s15328007sem0902_5)
- Clarke AT (2006) Coping with interpersonal stress and psychosocial health among children and adolescents: A meta-analysis. *Journal of Youth and Adolescence* 35:10-23. <https://doi.org/10.1007/s10964-005-9001-x>
- Critselis E, Janikian M, Paleomilitou N et al. (2014) Predictive factors and psychosocial

- 395 effects of Internet addictive behaviors in Cypriot adolescents. *International Journal of*  
396 *Adolescent Medicine and Health* 26:369-375. [https://doi.org/10.1515/ijamh-2013-](https://doi.org/10.1515/ijamh-2013-0313)  
397 0313
- 398 Crone EA, Dahl RE (2012) Understanding adolescence as a period of social–affective  
399 engagement and goal flexibility. *Nature Reviews Neuroscience* 13:636-650.  
400 <https://doi.org/10.1038/nrn3313>
- 401 Díaz-Aguado MJ, Martín-Babarro J, Falcón L (2018) Problematic Internet use, maladaptive  
402 future time perspective and school context. *Psicothema* 30:195-200.
- 403 Davis RA (2001) A cognitive-behavioral model of pathological Internet use. *Computers in*  
404 *Human Behavior* 17:187-195. [https://doi.org/10.1016/s0747-5632\(00\)00041-8](https://doi.org/10.1016/s0747-5632(00)00041-8)
- 405 Fioravanti G, Dèttore D, Casale S (2012) Adolescent internet addiction: Testing the  
406 association between self-esteem, the perception of Internet attributes, and preference  
407 for online social interactions. *Cyberpsychology, Behavior, and Social Networking*  
408 15:318-323. <https://doi.org/10.1089/cyber.2011.0358>
- 409 Fisher BW, Gardella JH, Teurbe-Tolon AR (2016) Peer cybervictimization among  
410 adolescents and the associated internalizing and externalizing problems: A meta-  
411 analysis. *Journal of Youth and Adolescence* 45:1727-1743.  
412 <https://doi.org/10.1007/s10964-016-0541-z>
- 413 Goodman R, Meltzer H, Bailey V (1998) The strengths and difficulties questionnaire: A pilot  
414 study on the validity of the self-report version. *European Child & Adolescent*  
415 *Psychiatry* 7:125-130. <https://doi.org/10.1007/s007870050057>
- 416 Gorrese A, Ruggieri R (2013) Peer attachment and self-esteem: A meta-analytic review.  
417 *Personality and Individual Differences* 55:559-568.  
418 <https://doi.org/10.1016/j.paid.2013.04.025>
- 419 Hou Y, Xiong D, Jiang T et al. (2019) Social media addiction: Its impact, mediation, and

- 420 intervention. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace* 13  
421 <https://doi.org/10.5817/cp2019-1-4>
- 422 Kardefelt-Winther D (2014) Problematizing excessive online gaming and its psychological  
423 predictors. *Computers in Human Behavior* 31:118-122.  
424 <https://doi.org/10.1016/j.chb.2013.10.017>
- 425 Karim R, Chaudhri P (2012) Behavioral addictions: An overview. *Journal of Psychoactive*  
426 *Drugs* 44:5-17.
- 427 Kuss D, Griffiths M, Karila L et al. (2014) Internet addiction: A systematic review of  
428 epidemiological research for the last decade. *Current Pharmaceutical Design* 20:4026-  
429 4052. <https://doi.org/10.2174/13816128113199990617>
- 430 Kuss DJ, Griffiths MD, Binder JF (2013) Internet addiction in students: Prevalence and risk  
431 factors. *Computers in Human Behavior* 29:959-966.  
432 <https://doi.org/10.1016/j.chb.2012.12.024>
- 433 Larson R, Csikszentmihalyi M (1983) The experience sampling method. *New Directions for*  
434 *Methodology of Social & Behavioral Science* 15:41-56. doi:10.1007/978-94-017-  
435 9088-8\_2
- 436 Liu C-Y, Kuo F-Y (2007) A Study of Internet Addiction through the Lens of the  
437 Interpersonal Theory. *CyberPsychology & Behavior* 10:799-804.  
438 <https://doi.org/10.1089/cpb.2007.9951>
- 439 Livingstone S (2019) *EU Kids Online*. Wiley. doi:10.1002/9781118978238.ieml0065
- 440 Livingstone S, Haddon L, Görzig A, et al. (2011) Risks and safety on the Internet: The  
441 perspective of European children: Full findings and policy implications from the EU  
442 Kids Online survey of 9-16 year olds and their parents in 25 countries. *EU Kids*  
443 *Online, Deliverable D4*. EU Kids Online Network, London, UK. Retrieved from:  
444 <http://eprints.lse.ac.uk/33731/>

- 445 Livingstone S, Haddon L, Görzig A et al. (2014) EU Kids Online II: A large-scale  
446 quantitative approach to the study of European children's use of the Internet and  
447 online risks and safety. SAGE Publications, Ltd.  
448 <https://doi.org/10.4135/978144627305014533936>
- 449 López de Ayala López MC, Sendín Gutierrez JC, García Jiménez A (2015) Problematic  
450 Internet use among Spanish adolescents: The predictive role of Internet preference  
451 and family relationships. *European Journal of Communication* 30:470-485.  
452 <https://doi.org/10.1177/0267323115586725>
- 453 Lyu SO (2017) Developmental process of Internet gaming disorder among South Korean  
454 adolescents: Effects of family environment and recreation experience. *Journal of*  
455 *Child and Family Studies* 26:1527-1535. <https://doi.org/10.1007/s10826-017-0686-8>
- 456 Mazur E, Kozarian L (2010). Self-presentation and interaction in blogs of adolescents and  
457 young emerging adults. *Journal of Adolescent Research*, 25:124-144.
- 458 Muthén LK, Muthen BO (1998-2012) Mplus user's guide. Seventh Edition. Muthén &  
459 Muthén, Los Angeles, CA
- 460 Rohner RP (2016) Introduction to Interpersonal Acceptance-Rejection Theory (IPARTheory)  
461 and evidence. *Online Readings in Psychology and Culture* 6:4.  
462 <https://doi.org/10.9707/2307-0919.1055>
- 463 Rohner RP, Khaleque A (2010) Testing Central Postulates of Parental Acceptance-Rejection  
464 Theory (PARTheory): A Meta-Analysis of Cross-Cultural Studies. *Journal of Family*  
465 *Theory & Review* 2:73-87. <https://doi.org/10.1111/j.1756-2589.2010.00040.x>
- 466 Smahel D, Brown BB, Blinka L (2012) Associations between online friendship and Internet  
467 addiction among adolescents and emerging adults. *Developmental Psychology*  
468 48:381-388. <https://doi.org/10.1037/a0027025>
- 469 Smahel D, Machackova H, Mascheroni G, et al. (2020) EU Kids Online 2020: Survey results

- 470 from 19 countries. EU Kids Online. Doi: 10.21953/lse.47fdeqj01ofo
- 471 Smahel D, Ševčíková A, Blinka L et al. (2009) Addiction and Internet applications. In Stetina  
472 B, Kryspin-Exner I (Eds.), *Gesundheit und Neue Medien*. Springer, Berlin, pp. 235-  
473 260.
- 474 Somerville LH (2013) Special issue on the teenage brain: Sensitivity to social evaluation.  
475 *Curr Dir Psychol Sci* 22:121-127. <https://doi.org/10.1177/0963721413476512>
- 476 Subrahmanyam K, Smahel D (2011) *Digital youth: The role of media in development*.  
477 Springer Science & Business Media, Berlin.
- 478 Teppers E, Luyckx K, Klimstra TA, Goossens L. (2014) Loneliness and Facebook motives in  
479 adolescence: A longitudinal inquiry into directionality of effect. *Journal of*  
480 *Adolescence*, 37:691-699. doi:10.1016/j.adolescence.2013.11.003
- 481 Throuvala MA, Janikian M, Griffiths MD et al. (2019) The role of family and personality  
482 traits in Internet gaming disorder: A mediation model combining cognitive and  
483 attachment perspectives. *J Behav Addict* 8:48-62.  
484 <https://doi.org/10.1556/2006.8.2019.05>
- 485 Wang H, Zhou X, Lu C et al. (2011) Problematic Internet Use in high school students in  
486 Guangdong Province, China. *PLoS One* 6:e19660-e19660.  
487 <https://doi.org/10.1371/journal.pone.0019660>
- 488 Wang S, Chen C-C, Dai C-L et al. (2017) A Call for, and Beginner's Guide to, Measurement  
489 Invariance Testing in Evolutionary Psychology. *Evolutionary Psychological Science*  
490 4:166-178. <https://doi.org/10.1007/s40806-017-0125-5>
- 491 WHO (2016) Growing up unequal: Gender and socioeconomic differences in young people's  
492 health and well-being. In: Inchley JC, Currie T, Young O, et al. (eds) *Health*  
493 *Behaviour in School-aged Children (HBSC) study: International report from the*  
494 *2013/2014 survey. Health policy for children and adolescents (Vol. 7). WHO*



Regional Office for Europe.

Zhou P, Zhang C, Liu J et al. (2017) The relationship between resilience and internet addiction: A multiple mediation model through peer relationship and depression. *Cyberpsychology, Behavior, and Social Networking* 20:634-639.

<https://doi.org/10.1089/cyber.2017.0319>

Zimet GD, Dahlem NW, Zimet SG et al. (1988) The multidimensional scale of perceived social support. *Journal of Personality Assessment* 52:30-41.

[https://doi.org/10.1207/s15327752jpa5201\\_2](https://doi.org/10.1207/s15327752jpa5201_2)

Zlamal R, Machackova H, Smahel D, Abramczuk K, Ólafsson K, Staksrud E. (2020) EU Kids Online 2020: Technical report. EU Kids Online.

<https://doi.org/10.21953/lse.04dr94matpy7>

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**Table 1** Descriptive statistics of key variables. Data from EU Kids Online IV, Czech Republic, Italy, Norway, and Serbia, 2018

	Range	CZ		ITA		NOR		SER		Total		ANOVA/K-W		
		M	SD	M	SD	M	SD	M	SD	M	SD	$\alpha$	$F$	$df$
Female	0-1	51%		48%		48%		54%		50%				
Age	12-17	14.31	1.61	14.56	1.71	14.33	1.68	14.56	1.65	14.40	1.65			
Hours/Weekday	1-9	5.30 <sup>a</sup>	2.17	4.62 <sup>b</sup>	2.02	5.94 <sup>c</sup>	1.63	5.74 <sup>d</sup>	2.07	5.38	2.09		158.17***	3
Socio-Economic Status	0-10	6.32 <sup>a</sup>	1.50	6.35 <sup>a</sup>	1.45	7.64 <sup>n</sup>	1.33	6.68 <sup>b</sup>	1.53	6.41	1.51		31.73***	2
Family Relationships	1-5	3.28 <sup>a</sup>	0.65	3.59 <sup>bc</sup>	0.54	3.63 <sup>b</sup>	0.55	3.54 <sup>c</sup>	0.57	3.43	0.62	.748	87.45***	3; 4,027
School Relationships	1-5	2.78 <sup>a</sup>	0.66	2.95 <sup>b</sup>	0.67	3.39 <sup>c</sup>	0.65	2.92 <sup>b</sup>	0.71	2.93	0.71	.817	132.36***	3; 3,927
Emotional Problems	1-5	2.02 <sup>a</sup>	0.73	1.68 <sup>b</sup>	0.63	1.73 <sup>b</sup>	0.72	1.83 <sup>c</sup>	0.75	1.88	0.73	.804	50.93***	3; 4,056
POSI	1-4	1.73 <sup>a</sup>	0.62	1.68 <sup>ac</sup>	0.73	1.83 <sup>b</sup>	0.65	1.60 <sup>c</sup>	0.65	1.71	0.65	.649	10.07***	3; 4,022
Excessive Internet Use	1-5	1.83 <sup>a</sup>	0.85	1.49 <sup>b</sup>	0.64	1.87 <sup>a</sup>	0.89	1.88 <sup>a</sup>	0.90	1.80	0.85	.751	33.57***	3; 4,068

*Note:* Scale scores were computed as the average of item responses. CZ = Czech Republic, ITA = Italy, NOR = Norway, SER = Serbia, Total = Full sample. POSI = Preference for Online Social Interaction. High values for a variable indicate better family or school relationships or higher levels of the specific variable.

Kruskall-Wallis test computed for Hours/Weekday and SES. Means that share superscripts are statistically not different based on Tukey's HSD post-hoc tests or pairwise comparisons with an alpha level 0.05. E.g. ITA has statistically significantly lower POSI than NOR, but does not differ from CZ or SER; CZ differs from both NOR and SER but not ITA. SER differs from both CZ and NOR, but not ITA. <sup>n</sup> = the SES item in Norwegian survey ranged from 1-10, Norway is therefore excluded from the mean values across countries in this table and from the K-W test. The SES variables are standardized in the regression models to account for this difference.

**Table 2** Standardized indirect effects of relationship variables. Data from EU Kids Online IV, Czech Republic, Italy, Norway, and Serbia, 2018

	CZ	ITA	NOR	SER
Family → Emo → EIU	-0.047***	-0.049***	-0.049***	-0.048***
Family → POSI → EIU	-0.031***	-0.033***	-0.032***	-0.032***
Family → Emo → POSI → EIU	-0.004***	-0.005***	-0.005***	-0.004***
Family indirect effect proportion	63%	64%	64%	64%
School → Emo → EIU	-0.059***	-0.061***	-0.061***	-0.059***
School → POSI → EIU	-0.006 <sup>ns</sup>	-0.007 <sup>ns</sup>	-0.006 <sup>ns</sup>	-0.006 <sup>ns</sup>
School → Emo → POSI → EIU	-0.006***	-0.006***	-0.006***	-0.006***
School indirect effect proportion	92%	93%	92%	91%

*Note.* CZ = Czech Republic, ITA= Italy, NOR Norway, SER = Serbia, Family = Family

relationships, School = School relationships, Emo = Emotional problems, POSI = Preference

for online social interaction, EIU = Excessive internet use. Indirect effect proportion =

proportion of sum of indirect effects from the total effect (indirect + direct). \*\*\*  $p < 0.001$ ,

\*\*  $p < 0.01$ , \*  $p < 0.05$

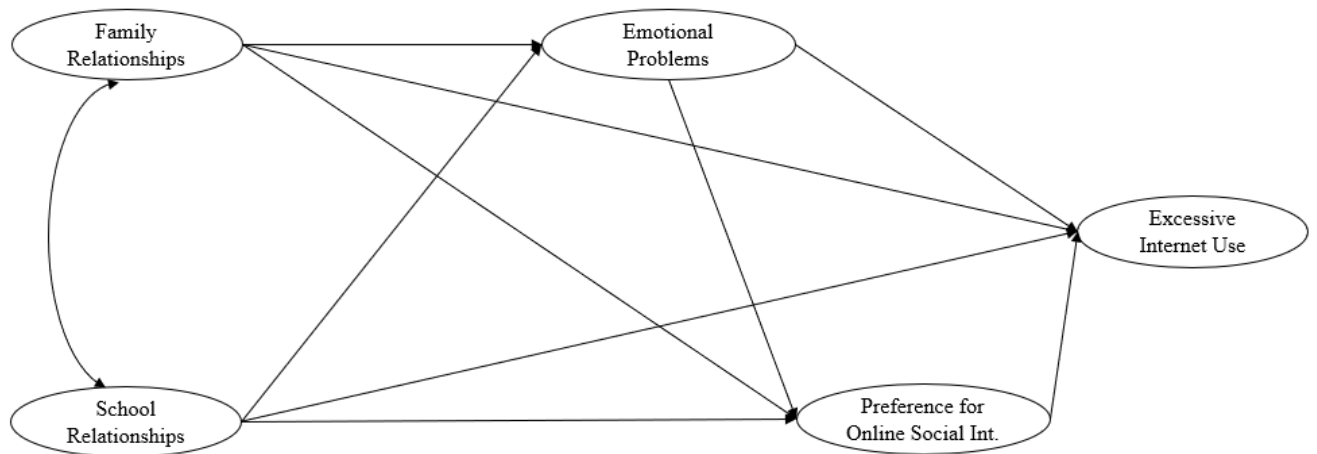


Figure 1. Hypothesized model. Data from EU Kids Online IV, Czech Republic, Italy, Norway, and Serbia, 2018

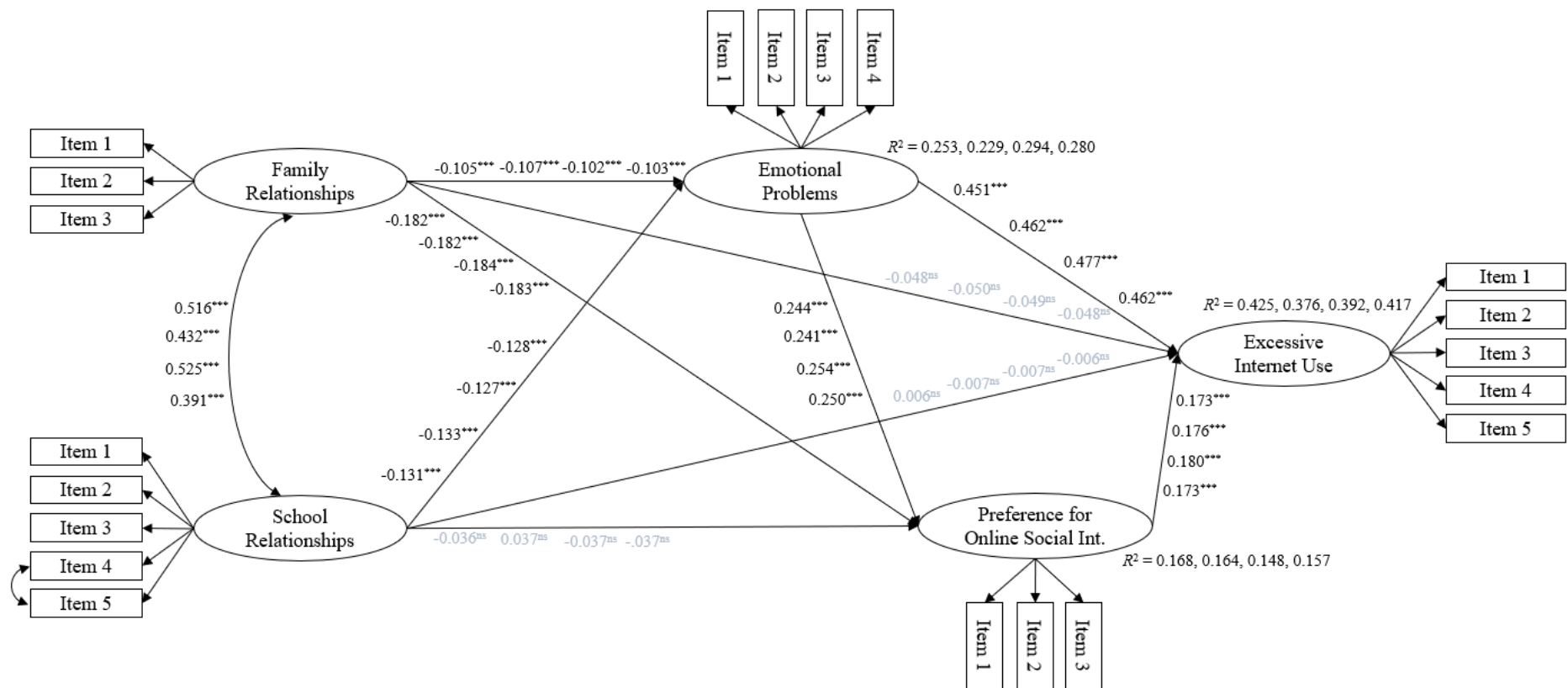


Figure 2. Results of the constrained multi-group structural equation model. Data from EU Kids Online IV, Czech Republic, Italy, Norway, and Serbia, 2018

Note: Error terms and control variables (e.g., age, sex, SES, time spent online during weekdays) were omitted for clarity. Controls were specified to predict each endogenous latent construct. Due to the difference in the group *SDs* of the variables, standardized estimates differ among countries despite being based on a single set of estimates that were constrained to equality across the countries. Estimates are presented in the following order: Czech Republic, Italy, Norway, Serbia (i.e., in the direction of the arrows). \*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$



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Social relational factors of excessive internet use in four  
European countries



## Abstract

**Objectives:** Adolescents who deal with more emotional problems have been found to seek escape online, and struggle with excessive internet use (EIU). Poor social relationships have been linked with emotional problems. ~~The C~~current study investigated positive family and school relationships as protective factors against emotional problems and a preference for online social interaction (POSI), both specified as mediators of the association of family and school relationships with EIU. Cross-cultural differences in the model were tested.

**Methods:** ~~A multi-group SEM was The study was based tested~~ on representative samples of 4,104 adolescents ( $M_{\text{age}} = 14.40$  years,  $SD = 1.65$ , range 12 – 17, 50% female) from 4 European countries from Southern, Northern, Central and Eastern Europe (Italy, Norway, Czech Republic and Serbia, respectively).

**Results:** ~~Multi-group SEM~~Results suggested consistent associations across countries. Positive family relationships and positive school relationships were associated with lower EIU, with 63-64% of the effect of family, and 91-93% of the effect of school relationships mediated by emotional problems and POSI. indicates that family relationships are indirectly associated with lower EIU, mediated by emotional problems and POSI. School relationships are indirectly related to EIU through lower emotional problems. The tested relationships did not differ among the four countries.

**Conclusions:** Positive family and school relationships protect adolescents against excessive internet usage, regardless of culture and indirectly – through emotional problems and POSI.

**Keywords:** Excessive internet use; Emotional problems; Preference for online social interaction; IPARTheory

## Introduction

Adolescence is a developmental period characterized by the increased importance and salience of social relationships (Somerville 2013). In their review, Crone and Dahl (2012) noted that important changes in socio-cognitive development take place in adolescence, when adolescents master new skills that are important for understanding social interactions. Furthermore, having secure, positive, and caring relationships with significant attachment figures (be it family, peers, or teachers) is paramount for healthy development, while the lack thereof is associated with negative outcomes and emotional problems as posited by the Interpersonal Acceptance-Rejection Theory (IPARTheory; Rohner 2016).

In the contemporary society, experiencing relationships have changed with the use of technology. The internet is increasingly becoming the medium through which adolescents fill their developmental needs for social interactions (Borca et al. 2015; Subrahmanyam and Smahel 2011). Relationships are initiated, maintained, and transformed online, and using the internet for social interaction is one of the most frequent online activities among contemporary youth (Smahel et al., 2020). The internet offers young people control over their self-expression, which allows them to experiment with their identity or self-presentation (Mazur & Kozarian 2010). It offers youth with perceived lower social skills a way to connect to their peers (Teppers et al. 2014), or seek emotional support online, while at the same time providing immediate reward and gratification that further reinforces usage (Karim & Chaudhri 2012). This may lead some young people to over time develop a preference for online social interaction (at the expense of face-to-face interaction; Caplan, 2010). Both emotional problems and preference for online social interaction have been found to be associated with using the internet excessively in a way that it might cause negative health outcomes, such as missing social engagements, experiencing subjective problems in life, and

60 developing difficulties in keeping up with school or work requirements (Caplan 2005; 2010;  
61 Fioravanti et al. 2012; Hou et al. 2019).

62         The current study aimed to test the IPARTheory within a media-use context. While  
63 some studies investigated the associations among excessive use and parental and school  
64 relationships (Anderson et al. 2017; Throuvala et al. 2019) and the preference for online  
65 social interaction (López de Ayala López et al. 2015), no study did so simultaneously. We  
66 still lack an understanding of how protective factors, such as positive parental and school  
67 relationships, interact with individual factors, such as emotional problems and the preference  
68 for social interaction.

### 69 **Interpersonal relationships as predictors of excessive internet use**

70         The IPARTheory (Rohner 2016) suggests that perceiving acceptance or rejection by  
71 an attachment figure or a significant other can leave a lasting socio-emotional impact in an  
72 individual by affecting their self-representation (e.g., self-esteem, self-worth). If an  
73 adolescent consistently feels rejected or neglected by their caregivers, they may learn to  
74 believe that they themselves are undeserving of positive relationships in broader contexts.  
75 According to the personality subtheory of IPARTheory (c.f., Rohner 2016), the perceived  
76 rejection erodes core self-evaluations and creates emotional problems, which include lower  
77 self-esteem and lower self-adequacy. These hypotheses were tested and found support within  
78 different cultural contexts and thus can be treated as panculturally applicable (Rohner and  
79 Khaleque 2010).

80         In the current study, we focus specifically on EIU which we understand as a construct  
81 closely related to behavioural addictions (Karim & Chaudhri 2012) – more specifically using  
82 the internet in such a way and to such an extent that it has a substantive negative impact on  
83 the life of the adolescent (Kuss et al. 2013). Emotional problems have been consistently  
84 found to be associated with EIU (c.f., a systematic review by Kuss et al. 2014). This

relationship is often explained as adolescents with emotional problems seeking solace in online communities where they experience more acceptance and develop a preference for online social interaction (Caplan 2005, 2010), or adolescents trying to escape the pressures of their everyday lives by distracting themselves online and reinforcing this behaviour until it becomes their dominant method for reducing stress (Kardefelt-Winther 2014). As described in Karim and Chaudhri's (2012) overview of behavioral addictions, not only does internet provide a compensatory tool for people with poorer perceived face-to-face relationships, it also often provides immediate gratification to users which further reinforces usage habits.

There are a number of studies that support the assumption that poor family relationships and functioning are linked to problematic internet use. Throuvala et al., (2019) tested IPARTheory in the context of internet gaming disorder on an online sample of 172 Greek young adults and found that experiencing parental rejection was indirectly associated with problematic online behaviour - mediated through poorer core self-evaluations (e.g., low self-esteem, low self-efficacy, high neuroticism). Based on a sample of 2,215 South Korean adolescents, Lyu (2017) found a direct relationship between family functioning (operationalized as adaptability and cohesion) and internet gaming disorder. In general, positive parenting (e.g., parental acceptance, warmth, closeness, communication) has been consistently found to be a direct or indirect protective factor in studies that focused on excessive or problematic internet use (c.f., a recent systematic review by Anderson et al. 2017; Liu and Kuo 2011; Wang et al. 2011).

### **School relationships**

While initially formulated within a child-attachment-figure context, Rohner (2016) expanded the IPARTheory to include any significant interpersonal relationships in which acceptance or rejection can have developmental consequences, which can also include relationships in the school environment. For instance, Ali et al. (2015) found that perceived

acceptance or rejection from teachers has an impact on children's adjustment. A vast body of empirical literature found support for the relationship of peer-rejection and emotional problems (Clarke 2006; Fisher et al. 2016; Gorrese and Ruggieri 2013). These findings imply that the experience of acceptance or rejection within the context of school can have a similar impact on health as that experienced within the context of family.

Peer and teacher relationships have been also found to be associated with excessive or problematic internet use. Díaz-Aguado et al. (2018) found that adolescents who experienced hostile treatment from teachers were at a higher risk of problematic internet use, whereas the risk was lower for adolescents who appreciated school. Negative peer relationships were consistently found to be associated with a higher risk of internet-related problems (Critselis et al., 2014; Liu and Kuo, 2011; Wang et al., 2011). Furthermore, Zhou et al. (2017) tested a mediation model in which peer relationships and depressive symptoms mediated the relationship of resilience and internet addiction on a sample of more than 58,000 urban Chinese fourth-graders. A part of their model offered support for the indirect pathway from peer relationships through emotional problems (i.e., depressive symptoms) to internet addiction. Relatively few studies, however, tested the effects of both family and school relationships at the same time. To our knowledge, no study to date has focused on explaining these effects on EIU through the mediating influence of emotional problems and the preference for social interaction.

### **Preference for online social interaction**

Building on Davis' (2001) cognitive behavioural model of problematic internet use, Caplan (2005, 2010) suggested that individuals with higher emotional problems (e.g., loneliness, social anxiety, deficient social skills, low self-esteem) choose to interact with others online, rather than face to face because internet-mediated interactions offer higher control of self-presentation. Using the internet for mood regulation was found to be directly

associated with compulsive internet use and cognitive preoccupation, and indirectly associated with the negative outcomes of such internet use (Caplan 2010). In studies by Fioravanti et al. (2012) and Smahel, Brown, and Blinka (2012) the preference for online social interaction has been identified as a predictor for EIU.

### **Research goals**

While the existing empirical literature found support for some relationships between the pairs of variables of interest in our study, a comprehensive test that accounted simultaneously for ~~the~~ relational factors, ~~the~~ emotional problems, and the preference for online social interaction in predicting EIU has, to our knowledge, not been conducted. Therefore, in our study we tested the association between social relationships in the two most salient contexts during adolescence – family and school (Larson and Csikszentmihalyi 1983) on one hand, and excessive internet use (EIU) on the other. Emotional problems and the preference for online social interaction were tested as mediators of this association.

Additionally, most of the published literature relied on convenience samples or, in better cases, samples representative of a single country. The current study makes use of data from representative samples of adolescents across four diverse countries that represent Southern and Northern Europe (Italy and Norway, respectively) and Central and Eastern Europe (Czech Republic and Serbia, respectively). In previous research, the IPARTheory was conceptualized as a pancultural theory (Rohner and Khaleque 2010) and comparing the proposed model in four countries allowed us to test whether the theoretical assumptions are valid across different socio-political contexts.

Based on the IPARTheory (Rohner 2016) we expected adolescents who experienced rejection within the context of their family or school to be at an increased risk of developing emotional problems. We hypothesized a model, summarized in Figure 1, in which interpersonal relationships within the family and school context predicted EIU both directly

and indirectly through emotional problems and the preference for online social interaction.

Furthermore, we assumed that the preference for online social interaction mediated the association between emotional problems and EIU as well. Finally, we expected that the relationships between variables of interest ~~will~~would not differ ~~among~~across the four tested countries.

*Figure 1. (PLACEHOLDER)*

We tested the complex model using structural equation modelling, which allowed us to provide unique and generalizable findings about the relationships between the protective and individual factors and their impact on EIU in different socio-political contexts. Testing the model helped us to understand the protective and risk factors for EIU among adolescents from different regions of Southern, Northern, Central, and Eastern Europe.

## Methods

### Sample

We analysed nationally representative data from the EU Kids Online project (Smahel et al. 2020), collected in 2018. Four countries — the Czech Republic (CZ;  $n = 2,043$ ), Italy (ITA;  $n = 619$ ), Norway (NOR;  $n = 660$ ), and Serbia (SER;  $n = 782$ ) — were selected to represent a diverse socio-political spectrum of European countries. To ensure representativeness of the data and to match the sample demographic distribution with that found in the general population, participants were recruited either from schools, using cluster sampling (CZ, SER), or from households, using random walk, quota sampling, or random recruitment (ITA, NOR). For more information, please see the EU Kids Online technical report (Zlamal et al., 2020). Adolescents responded to pen and paper surveys (SER), surveys

on computers or tablets (CZ, NO), or trained interviewers who recorded their answers using an electronic tool (ITA). Participants were 50% female, with a mean age of 14.40 years old ( $SD = 1.65$ , range 12 – 17), and 63.5% of them spent “about 3 hours” or more on the internet on an average weekday. Base ethical guidelines were met while administering the survey, and national rules and conditions were followed. Oral or written informed consent was obtained from the child or their legal representative (Smahel et al. 2020).

## Measures

All items and their response scales can be found in ~~Online Resource~~ Appendix Electronic Supplementary Material A. Internal consistencies are listed in Table 1. High values for a variable indicate better family or school relationships or higher levels of the specific variable.

*Family relationships:* three items adapted from the Health Behavior in School-aged Children (HBSC) 2013/2014 survey (WHO 2016), Zimet, Dahlem, Zimet, and Farley, (1988), and newly developed for EU Kids Online. Example item: “*I feel safe at home.*”

*School relationships:* five items adapted from the HBSC survey (WHO 2016). Example item: “*I feel like I belong in my school.*”

*Emotional problems:* four items from the Strengths and Difficulties Questionnaire (Goodman et al. 1998). Example item: “*I worry a lot.*”

*Preference for online social interaction:* three items (Smahel et al. 2012). Example item: “*I find it easier to be myself online than when I am with people face to face.*”

*Excessive internet use:* five items developed within the EU Kids Online network (Livingstone et al. 2011; Smahel et al. 2009), based on the factors proposed by Griffiths (2000). Example item: “*I have gone without eating or sleeping because of the internet.*”

Gender, age, socio-economic status, and time spent online on an average weekday [ranging from (1) *Little or no time* to (9) *About 7 hours or more*] were used as control



variables. Large-Long time spent online may seem synonymous with excessive internet use, however, the amount of time spent online can also be productive or at the very least not cause problems in the life of a use, therefore, it should not be understood as a symptom or an indicator of EIU (c.f. Charlton & Danforth 2007).

#### **Plan of analysis**

Measurement invariance is an important property of psychometric tests in cross-cultural research. Before being able to compare relationships, we need to make sure that the scales measure the constructs in the same way in all tested countries. Invariance was tested for all of the scales simultaneously across the four countries following the guidelines of Wang, Chen, Dai, and Richardson (2018). Following the suggestions of Cheung and Rensvold (2002), scalar level of measurement invariance (equivalency of item loadings across the countries) was concluded if the difference in CFI for the configural model (pattern of item loadings same across countries) and scalar model did not exceed  $\Delta CFI = .010$ . Since the study does not focus on comparing mean levels of variables metric invariance (equivalency of intercepts) was not tested.

A latent multi-group mediation model was specified according to Figure 1. Each latent construct was indicated by its individual items. One residual correlation was allowed between the two school-relationships items that asked about relationships with teachers. Age, sex, socio-economic status, and time spent online during weekdays (as observed variables) were controlled for in all endogenous latent variables and specified as covariates of family and school relationships. To estimate differences in the model across the countries, a procedure analogous to invariance testing was followed. The model fit was compared between a model with all regression paths estimated freely within each country and a model with the paths constrained to equality. Indirect effects were estimated and their significance

234 was tested using bootstrapping with 1,000 re-sampled iterations. All analyses were conducted  
235 in Mplus 7 (Muthén and Muthén 2012), using WSLMV estimation.

236

## Results

The means and standard deviations of variables in the model are provided in Table 1. Note that these are observed scale scores (computed as the means of scale items) and not the latent estimates estimated in the model. Multi-group tests of measurement invariance for individual scales provided evidence of partial scalar invariance. Configural measurement model fit the data well  $\chi^2 = 1607.013$ ,  $df = 636$ ,  $p < .001$ , CFI = .976; RMSEA = .050, 90% CI [.036, .041]. Constraining all paths to equality however decreased the fit more than by the accepted threshold of  $\Delta CFI = .010$ :  $\chi^2 = 2500.961$ ,  $df = 696$ ,  $p < .001$ , CFI = .955; RMSEA = .049, 90% CI [.048, .052]. Releasing family and school relationship scales from constraints improved the model fit difference to acceptable level:  $\chi^2 = 1913.276$ ,  $df = 672$ ,  $p < .001$ , CFI = .969; RMSEA = .042, 90% CI [.040, .045].

The full model, with no parameter constraints, fit the data well,  $\chi^2 = 3574.253$ ,  $df = 1017$ ,  $p < .001$ , CFI = .941; RMSEA = .050, 90% CI [.048, .051]. After estimating all paths as equal among the countries, the fit actually improved,  $\chi^2 = 3418.661$ ,  $df = 1080$ ,  $p < .001$ , CFI = .946, RMSEA = .046, 90% CI [.044, .048];  $\Delta\chi^2 = 155.592$ ,  $df = 63$ ,  $p < .001$ ,  $\Delta CFI = .005$ ,  $\Delta RMSEA = .004$ . This indicates that there were no significant differences in relationships between the modelled constructs ~~among~~ across the countries in the current study. In other words, the same model is plausible for adolescents from the Czech Republic, Italy, Norway, and Serbia. Given this finding, all estimates reported below are from the constrained model. Results of the unconstrained model can be found in [Electronic Supplementary Material Online Resource Appendix B](#).

The results of the full mediation model (Figure 2) show that both emotional problems and the preference for online social interaction were significant predictors of EIU, with emotional problems being stronger. Family relationships were found to predict both emotional problems and the preference for online social interaction negatively, while school

relationships were only a significant negative predictor of emotional problems and not for the preference for online social interaction. Family and school relationships were no longer directly associated with excessive internet use once indirect pathways through emotional problems and preference for online social interaction were taken into account~~Neither family, or school relationships did not predict EIU directly. Their Both effects~~associations of family and school relationships were mediated through emotional problems. The preference for online social interaction was found to mediate the association between family relationships and EIU as well as the association between emotional problems and EIU, but not the association between school relationships and EIU~~The preference for online social interaction was found to mediate the relationships between EIU and family relationships, as well as emotional problems.~~ The standardized direct effects can be found in Figure 2, while the indirect effects are summarized in Table 2. Even despite the fact that each are based on the same unstandardized path, the standardized estimates for each country differ due to different *SDs* of constructs among the four countries. Therefore, standardized estimates are presented for each country (e.g., four sets of parameters).

Table 1. (PLACEHOLDER)

Figure 2. (PLACEHOLDER)

Table 2. (PLACEHOLDER)

## Discussion

This article investigated the associations of family and school relationships, emotional problems, and the preference for online communication with EIU. Based on large and representative samples of adolescents from four distinct European countries, the results of a structural model indicate that family and school relationships are associated with emotional problems negatively, adding to the plentiful of empirical support for IPARTheory (Rohner 2016). Family or school relationships did not have a direct effect on EIU. The effects of family and school relationships on EIU are indirect – most notably mediated through adolescents' emotional problems. Emotional problems were relatively strongly associated with EIU, falling in line with previous findings already summarized in Kuss et al. (2014). Commonly, emotional problems have been conceptualized as the primary predictors of EIU; however, the current findings now place emotional problems into the role of a mediator, showing that it is necessary to consider the underlying reasons for these problems, such as the unfulfilled developmental needs of family and school relationships.

As presented above, Throuvala et al. (2019) found that the association between parental rejection and internet gaming disorder was mediated through poorer core self-evaluations (e.g., low self-esteem, low self-efficacy, external focus of control, high neuroticism) in the context of the disorder. Our research revealed a mediating role for emotional problems, and for the broader concept of EIU. While emotional problems are a related construct to poor core self-evaluation, they are distinct. Further research into how they relate to EIU or broader aspects of well-being in tandem would be beneficial in preventing and treating negative outcomes.

The current study further expands IPART, as well as EIU literature by testing the model on representative samples and doing so in four countries, providing additional

evidence for its socio-political invariance. Furthermore, the current study contributes testing for the effects of school-based relationships, which were acknowledged as important by Rohner (see 2016), and preference for online social interaction, which is an established predictor of EIU (Fioravanti et al. 2012; López de Ayala López et al. 2015; Smahel et al. 2012).

To our knowledge, no study has tested the preference for online social interaction as a mediator for the paths from interpersonal relationships and emotional problems to EIU. Emotional problems were associated with the preference for online social interaction positively, and that preference, in turn, was associated with EIU; however, the indirect pathway from interpersonal relationships to EIU was only significant for family relationships. School relationships were not associated with the preference for online social interaction directly but indirectly - through emotional problems. In Caplan's (2002, 2005, 2010) work, one way to understand the preference for online social interaction is as a compensation mechanism for insufficient face-to-face interactions or their perceived stressfulness. The current findings show that, after controlling for family relationships, school relationships are unrelated to the preference for online social interaction. This could be because the current 'school relationships' variable is more focused on relationships with teachers and the school in general. Adolescents communicate with their teachers mostly offline; in other words, they have limited control over the channel of communication and they are unable to avoid direct face-to-face interactions with teachers offline. On the other hand, adolescents are more able to decide whether they will interact with parents or siblings within the family or whether they will retreat online and interact with other people. In the case of poor family relationships, the adolescent can more often prefer the online communication with other people online and such a preference for online communication mediates the increase of EIU.

It seems that family relationships play a double role: family relationships had an effect on adolescents' emotional problems and they influenced their preferences for online communication. Both of these were in turn associated with EIU, explaining the indirect relationship of family. On the other hand, it seems that school relationships were associated with EIU only through adolescents' emotional problems. However, it is likely that there are other variables or relationships which we did not take in account. Future research should include more context, such as perceived social self-efficacy, which might be associated with EIU and which might also further explain the role of the family and school relationships. As discussed earlier, not believing in oneself to be capable of meaningful social interactions may likely further explain the relationships among social relationships, emotional problems, preference for online social interaction, and excessive internet use.

Finally, we found that the relationships in the model did not differ among the four tested countries representing 4 distinct regions of Europe – adolescents from Southern and Northern Europe (Italy and Norway, respectively) and Central and Eastern Europe (Czech Republic and Serbia, respectively) did not differ in this respect. This further supports the applicability of the IPARTheory to different socio-political contexts and the importance of positive family and school relationships, regardless of culture and socio-economic differences. Specifically, positive family and school relationships served as a ~~n-indirect~~ protective factor against EIU in all four of the countries. Future research would, however, benefit from the inclusion of diverse cultures from non-Western countries.

### **Limitations and implications**

Several limitations need to be acknowledged in order to understand the findings and the context of the current study. First and foremost, the model is based on cross-sectional data. This precludes questions about causal relationships between the constructs. These are the main goal of a mediation model; however, to properly address them, a longitudinal study

design would be required. Furthermore, while being cost efficient, a self-report-based survey may introduce a degree of bias to the data. A related common issue associated with analysing data from large-scale surveys with a broad focus is the relatively poor measurement of the constructs of interest or unavailability of additional potential variables of interest. In order to capture a broad spectrum of relevant phenomena, sacrifices in the length and breadth of the scales or the number of measurement items had to be made. Additionally, the current invariance tests indicate a lack of scalar invariance for family and school relationships, suggesting differences in how the measures assess their intended constructs across countries. This may mean that a “positive relationship” be it in the context of family or school, likely comprises of different elements in the tested countries. This difference and its implication warrants further investigation in future studies. Finally, In addition to the control variables used in the study parental age or attitudes towards the internet, as well as sociodemographic context of the schools may play a role in the studied relationships.

Given the integral relationship between EIU and emotional problems, practitioners should be aware of the more complex role of EIU. It can potentially be a symptom and a coping strategy rather than the cause of problems. For policy makers, it is important to emphasise that EIU must be seen in the context of other factors on both the individual and social level. Efforts to strengthen general youth life skills, coping mechanisms, and mental health should be prioritized.



## References

- Ali S, Khaleque A, Rohner RP (2014) Influence of perceived teacher acceptance and parental acceptance on youth's psychological adjustment and school conduct. *Cross-Cultural Research* 49:204-224. <https://doi.org/10.1177/1069397114552769>
- Anderson EL, Steen E, Stavropoulos V (2017) Internet use and problematic Internet use: A systematic review of longitudinal research trends in adolescence and emergent adulthood. *International Journal of Adolescence and Youth* 22:430-454. <https://doi.org/10.1080/02673843.2016.1227716>
- Borca G, Bina M, Keller PS et al. (2015) Internet use and developmental tasks: Adolescents' point of view. *Computers in Human Behavior* 52:49-58. <https://doi.org/10.1016/j.chb.2015.05.029>
- Caplan SE (2005) A social skill account of problematic internet use. *Journal of Communication* 55:721-736. <https://doi.org/10.1111/j.1460-2466.2005.tb03019.x>
- Caplan SE (2010) Theory and measurement of generalized problematic Internet use: A two-step approach. *Computers in Human Behavior* 26:1089-1097. <https://doi.org/10.1016/j.chb.2010.03.012>
- Charlton JP, Danforth ID (2007) Distinguishing addiction and high engagement in the context of online game playing. *Computers in Human Behavior*, 23:1531-1548.
- Cheung GW, Rensvold RB (2002) Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling: A Multidisciplinary Journal* 9:233-255. [https://doi.org/10.1207/s15328007sem0902\\_5](https://doi.org/10.1207/s15328007sem0902_5)
- Clarke AT (2006) Coping with interpersonal stress and psychosocial health among children and adolescents: A meta-analysis. *Journal of Youth and Adolescence* 35:10-23. <https://doi.org/10.1007/s10964-005-9001-x>
- Critselis E, Janikian M, Paleomilitou N et al. (2014) Predictive factors and psychosocial

- 405 effects of Internet addictive behaviors in Cypriot adolescents. *International Journal of*  
406 *Adolescent Medicine and Health* 26:369-375. [https://doi.org/10.1515/ijamh-2013-](https://doi.org/10.1515/ijamh-2013-0313)  
407 0313
- 408 Crone EA, Dahl RE (2012) Understanding adolescence as a period of social–affective  
409 engagement and goal flexibility. *Nature Reviews Neuroscience* 13:636-650.  
410 <https://doi.org/10.1038/nrn3313>
- 411 Díaz-Aguado MJ, Martín-Babarro J, Falcón L (2018) Problematic Internet use, maladaptive  
412 future time perspective and school context. *Psicothema* 30:195-200.
- 413 Davis RA (2001) A cognitive-behavioral model of pathological Internet use. *Computers in*  
414 *Human Behavior* 17:187-195. [https://doi.org/10.1016/s0747-5632\(00\)00041-8](https://doi.org/10.1016/s0747-5632(00)00041-8)
- 415 Fioravanti G, Dèttore D, Casale S (2012) Adolescent internet addiction: Testing the  
416 association between self-esteem, the perception of Internet attributes, and preference  
417 for online social interactions. *Cyberpsychology, Behavior, and Social Networking*  
418 15:318-323. <https://doi.org/10.1089/cyber.2011.0358>
- 419 Fisher BW, Gardella JH, Teurbe-Tolon AR (2016) Peer cybervictimization among  
420 adolescents and the associated internalizing and externalizing problems: A meta-  
421 analysis. *Journal of Youth and Adolescence* 45:1727-1743.  
422 <https://doi.org/10.1007/s10964-016-0541-z>
- 423 Goodman R, Meltzer H, Bailey V (1998) The strengths and difficulties questionnaire: A pilot  
424 study on the validity of the self-report version. *European Child & Adolescent*  
425 *Psychiatry* 7:125-130. <https://doi.org/10.1007/s007870050057>
- 426 Gorrese A, Ruggieri R (2013) Peer attachment and self-esteem: A meta-analytic review.  
427 *Personality and Individual Differences* 55:559-568.  
428 <https://doi.org/10.1016/j.paid.2013.04.025>
- 429 Hou Y, Xiong D, Jiang T et al. (2019) Social media addiction: Its impact, mediation, and

- 430 intervention. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace* 13  
431 <https://doi.org/10.5817/cp2019-1-4>
- 432 Kardefelt-Winther D (2014) Problematizing excessive online gaming and its psychological  
433 predictors. *Computers in Human Behavior* 31:118-122.  
434 <https://doi.org/10.1016/j.chb.2013.10.017>
- 435 Karim R, Chaudhri P (2012) Behavioral addictions: An overview. *Journal of Psychoactive*  
436 *Drugs* 44:5-17.
- 437 Kuss D, Griffiths M, Karila L et al. (2014) Internet addiction: A systematic review of  
438 epidemiological research for the last decade. *Current Pharmaceutical Design* 20:4026-  
439 4052. <https://doi.org/10.2174/13816128113199990617>
- 440 Kuss DJ, Griffiths MD, Binder JF (2013) Internet addiction in students: Prevalence and risk  
441 factors. *Computers in Human Behavior* 29:959-966.  
442 <https://doi.org/10.1016/j.chb.2012.12.024>
- 443 Larson R, Csikszentmihalyi M (1983) The experience sampling method. *New Directions for*  
444 *Methodology of Social & Behavioral Science* 15:41-56. doi:10.1007/978-94-017-  
445 9088-8\_2
- 446 Liu C-Y, Kuo F-Y (2007) A Study of Internet Addiction through the Lens of the  
447 Interpersonal Theory. *CyberPsychology & Behavior* 10:799-804.  
448 <https://doi.org/10.1089/cpb.2007.9951>
- 449 Livingstone S (2019) *EU Kids Online*. Wiley. doi:10.1002/9781118978238.ieml0065
- 450 Livingstone S, Haddon L, Görzig A, et al. (2011) Risks and safety on the Internet: The  
451 perspective of European children: Full findings and policy implications from the EU  
452 Kids Online survey of 9-16 year olds and their parents in 25 countries. *EU Kids*  
453 *Online, Deliverable D4*. EU Kids Online Network, London, UK. Retrieved from:  
454 <http://eprints.lse.ac.uk/33731/>

- 455 Livingstone S, Haddon L, Görzig A et al. (2014) EU Kids Online II: A large-scale  
456 quantitative approach to the study of European children's use of the Internet and  
457 online risks and safety. SAGE Publications, Ltd.  
458 <https://doi.org/10.4135/978144627305014533936>
- 459 López de Ayala López MC, Sendín Gutierrez JC, García Jiménez A (2015) Problematic  
460 Internet use among Spanish adolescents: The predictive role of Internet preference  
461 and family relationships. *European Journal of Communication* 30:470-485.  
462 <https://doi.org/10.1177/0267323115586725>
- 463 Lyu SO (2017) Developmental process of Internet gaming disorder among South Korean  
464 adolescents: Effects of family environment and recreation experience. *Journal of*  
465 *Child and Family Studies* 26:1527-1535. <https://doi.org/10.1007/s10826-017-0686-8>
- 466 Mazur E, Kozarian L (2010). Self-presentation and interaction in blogs of adolescents and  
467 young emerging adults. *Journal of Adolescent Research*, 25:124-144.
- 468 Muthén LK, Muthen BO (1998-2012) Mplus user's guide. Seventh Edition. Muthén &  
469 Muthén, Los Angeles, CA
- 470 Rohner RP (2016) Introduction to Interpersonal Acceptance-Rejection Theory (IPARTheory)  
471 and evidence. *Online Readings in Psychology and Culture* 6:4.  
472 <https://doi.org/10.9707/2307-0919.1055>
- 473 Rohner RP, Khaleque A (2010) Testing Central Postulates of Parental Acceptance-Rejection  
474 Theory (PARTheory): A Meta-Analysis of Cross-Cultural Studies. *Journal of Family*  
475 *Theory & Review* 2:73-87. <https://doi.org/10.1111/j.1756-2589.2010.00040.x>
- 476 Smahel D, Brown BB, Blinka L (2012) Associations between online friendship and Internet  
477 addiction among adolescents and emerging adults. *Developmental Psychology*  
478 48:381-388. <https://doi.org/10.1037/a0027025>
- 479 Smahel D, Machackova H, Mascheroni G, et al. (2020) EU Kids Online 2020: Survey results

- 480 from 19 countries. EU Kids Online. Doi: 10.21953/lse.47fdeqj01ofo
- 481 Smahel D, Ševčíková A, Blinka L et al. (2009) Addiction and Internet applications. In Stetina  
482 B, Kryspin-Exner I (Eds.), *Gesundheit und Neue Medien*. Springer, Berlin, pp. 235-  
483 260.
- 484 Somerville LH (2013) Special issue on the teenage brain: Sensitivity to social evaluation.  
485 *Curr Dir Psychol Sci* 22:121-127. <https://doi.org/10.1177/0963721413476512>
- 486 Subrahmanyam K, Smahel D (2011) *Digital youth: The role of media in development*.  
487 Springer Science & Business Media, Berlin.
- 488 Teppers E, Luyckx K, Klimstra TA, Goossens L. (2014) Loneliness and Facebook motives in  
489 adolescence: A longitudinal inquiry into directionality of effect. *Journal of*  
490 *Adolescence*, 37:691-699. doi:10.1016/j.adolescence.2013.11.003
- 491 Throuvala MA, Janikian M, Griffiths MD et al. (2019) The role of family and personality  
492 traits in Internet gaming disorder: A mediation model combining cognitive and  
493 attachment perspectives. *J Behav Addict* 8:48-62.  
494 <https://doi.org/10.1556/2006.8.2019.05>
- 495 Wang H, Zhou X, Lu C et al. (2011) Problematic Internet Use in high school students in  
496 Guangdong Province, China. *PLoS One* 6:e19660-e19660.  
497 <https://doi.org/10.1371/journal.pone.0019660>
- 498 Wang S, Chen C-C, Dai C-L et al. (2017) A Call for, and Beginner's Guide to, Measurement  
499 Invariance Testing in Evolutionary Psychology. *Evolutionary Psychological Science*  
500 4:166-178. <https://doi.org/10.1007/s40806-017-0125-5>
- 501 WHO (2016) *Growing up unequal: Gender and socioeconomic differences in young people's*  
502 *health and well-being*. In: Inchley JC, Currie T, Young O, et al. (eds) *Health*  
503 *Behaviour in School-aged Children (HBSC) study: International report from the*  
504 *2013/2014 survey. Health policy for children and adolescents (Vol. 7)*. WHO

Regional Office for Europe.

Zhou P, Zhang C, Liu J et al. (2017) The relationship between resilience and internet addiction: A multiple mediation model through peer relationship and depression. *Cyberpsychology, Behavior, and Social Networking* 20:634-639.

<https://doi.org/10.1089/cyber.2017.0319>

Zimet GD, Dahlem NW, Zimet SG et al. (1988) The multidimensional scale of perceived social support. *Journal of Personality Assessment* 52:30-41.

[https://doi.org/10.1207/s15327752jpa5201\\_2](https://doi.org/10.1207/s15327752jpa5201_2)

Zlamal R, Machackova H, Smahel D, Abramczuk K, Ólafsson K, Staksrud E. (2020) EU Kids Online 2020: Technical report. EU Kids Online.

<https://doi.org/10.21953/lse.04dr94matpy7>

### Table and figure captions

**Table 1** Descriptive statistics of key variables. Data from EU Kids Online IV, Czech Republic, Italy, Norway, and Serbia, 2018

**Table 2** Standardized indirect effects of relationship variables. Data from EU Kids Online IV, Czech Republic, Italy, Norway, and Serbia, 2018

**Figure 1** Hypothesized model. Data from EU Kids Online IV, Czech Republic, Italy, Norway, and Serbia, 2018

**Figure 2** Results of the constrained multi-group structural equation model. Data from EU Kids Online IV, Czech Republic, Italy, Norway, and Serbia, 2018

## Abstract

**Objectives:** Adolescents who deal with more emotional problems have been found to seek escape online, and struggle with excessive internet use (EIU). Poor social relationships have been linked with emotional problems. The current study investigated positive family and school relationships as protective factors against emotional problems and a preference for online social interaction (POSI), both specified as mediators of the association of family and school relationships with EIU. Cross-cultural differences in the model were tested.

**Methods:** A multi-group SEM was tested on representative samples of 4,104 adolescents ( $M_{\text{age}} = 14.40$  years,  $SD = 1.65$ , range 12 – 17, 50% female) from 4 European countries from Southern, Northern, Central and Eastern Europe (Italy, Norway, Czech Republic and Serbia, respectively).

**Results:** Results suggested consistent associations across countries. Positive family relationships and positive school relationships were associated with lower EIU, with 63-64% of the effect of family, and 91-93% of the effect of school relationships mediated by emotional problems and POSI.

**Conclusions:** Positive family and school relationships protect adolescents against excessive internet usage, regardless of culture and indirectly – through emotional problems and POSI.

Keywords: Excessive internet use; Emotional problems; Preference for online social interaction; IPARTheory