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ADOLESCENTS' ONLINE SOCIAL NETWORK USE AND LIFE SATISFACTION: A LATENT GROWTH CURVE MODELING APPROACH

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Highlights:

- Online social networks (OSN) use was related to life satisfaction only at baseline
- This association was gender-specific
- Higher initial OSN use was related to lower life satisfaction in female adolescents
- In male adolescents, this association depended on parental engagement
- Changes in OSN use and life satisfaction over time were unrelated

Abstract:

The global popularity of online social networks (OSN) prompted concerns about adverse effects on adolescents' psychological well-being. To further the understanding of the relation between adolescents' use of OSN and life satisfaction, we used data from 701 female and 456 male Croatian high-school students collected over a period of 23 months. Multivariate conditional and unconditional dual-domain latent growth curve modeling was used to explore the following research questions: How are changes in OSN use and life satisfaction interrelated; is the association gender-specific; and whether parental engagement plays a role in the relation? The only significant association between the use of OSN and life satisfaction was observed at baseline and only in female adolescents, with higher OSN use corresponding to lower life satisfaction. Among male adolescents, the target relation at baseline depended on parental engagement. Higher OSN use was related to higher life satisfaction in male participants who reported lower parental engagement, but not their peers characterized by higher parental engagement. The gender differences likely reflect gendered motivation for and vulnerability to OSN use. Insights from this longitudinal study contribute to the body of research on psychosocial outcomes associated with adolescents' use of OSN and can inform educational and media experts.

Keywords: Adolescents; online social networks; subjective well-being; gender; parenting; longitudinal assessment

1. Introduction

Since their emergence two decades ago, online social networks (OSN) such as Facebook, Instagram, and Twitter, also known as social networking sites, have captured the interest of adolescents and young adults in digitalized societies globally (boyd & Ellison, 2007). OSN offered new ways to satisfy age-specific psychological needs, primarily the need for relatedness and belongingness (Barker, 2009; Baumeister & Leary, 1995; Deci & Ryan, 2000; Nadkarni & Hofmann, 2012). Consequently, adolescents' peer interactions have extended from physical, offline, to virtual, online, contexts, with OSN use becoming a normative activity in adolescence. According to a survey conducted in 25 European countries, 77% of 13 to 16-year-olds who use Internet have a profile on one or more OSN (Livingstone, Ólafsson, & Staksrud, 2011). A more recent study found that almost 92% of 14-18 years old adolescents from six European countries used at least one OSN, with 70% of participants reporting daily use (Tsitsika et al., 2014). Similar figures have been reported for US adolescents. According to 2018 Pew Research Center's report, 97% of 13- to 17-year-olds reportedly used at least one OSN (Anderson & Jiang, 2018). Given such a high popularity of OSN among adolescents, it is important to investigate its association with adolescents' well-being in a longitudinal fashion. In the present study we examined the link between adolescents' use of OSN and life satisfaction—the cognitive component of subjective well-being considered to reflect an overall evaluation of a quality of person's life (Diener, 1994)—using a latent growth curve modeling of data collected in a three-wave longitudinal study with a large-scale sample of Croatian high-school students. In addition, we assessed if the relation is gender-specific and whether parental engagement plays a role, which to the best of our knowledge has not been explored in the literature.

1.1. Associations Between OSN Use and Life Satisfaction

Although life satisfaction has been investigated more often in adults than in children and adolescents (Oberle, Schonert-Reichl, & Zumbo, 2011; Proctor, Linley, & Maltby, 2009), there is evidence to suggest that processes involved in OSN use might have negative impact on adolescents' life satisfaction. Three of these processes may be of special importance. Firstly, OSN use is a sedentary activity and lack of physical exercise has been related to reduced life satisfaction among adolescents (Valois, Zullig, Huebner, & Drane, 2004). Secondly, OSN use has been associated with unfavorable social comparisons (Vogel, Rose, Roberts, & Eckles, 2014), which may negatively influence adolescents' self-evaluation and lead to reduced life satisfaction. Finally, adolescents who use OSN are sometimes exposed to upsetting online experiences such as cyberbullying (Gray, 2018; Sampasa-Kanyinga & Hamilton, 2015), which is likely to affect their life satisfaction (Callahan, Tolman, & Saunders, 2003).

Prior studies linking OSN use with adolescents' and emerging adults' life satisfaction have yielded mixed findings. Analyzing an annual national survey of US adolescents in the 1999-2016 period, Twenge, Martin, & Campbell (2018) have documented a sudden reduction in psychological well-being, which included life satisfaction, after 2012. The decrease corresponded with the rapid adoption of smartphones and increased time spent online. In a longitudinal study carried out over a two-week period, mean Facebook use time was associated with a decrease in life satisfaction in a sample of US emerging adults (Kross et al., 2013). Similarly, in a cross-sectional study of young German adults, the frequency of passive (i.e., "voyeuristic") Facebook use was negatively related to life satisfaction (Krasnova, Wenninger, Widjaja, & Buxmann, 2013). In contrast, other researchers have reported no or positive associations between adolescents' and emerging adults' OSN use and life satisfaction (see Apaolaza, Hartmann, Medina, Barrutia, & Echebarria, 2013; Lee, Lee, & Kwon, 2011; Verduyn et al., 2015). In a cross-sectional study of US college students, higher Facebook use was significantly related to

higher life satisfaction, after controlling for socio-demographic characteristics and social trust (Valenzuela, Park, & Kee, 2009). Similar association was observed in another cross-sectional study of US undergraduates, in which the use of Instagram and Snapchat was positively related to life satisfaction (Pittman & Reich, 2016). Although no direct association has been reported in two cross-sectional studies of European adolescents (Apaolaza et al., 2013; Valkenburg, Peter, & Schouten, 2006), the analyses pointed to positive indirect links. In the Dutch study, higher OSN use was associated with more positive reactions to participants' postings, which in turn were related to more positive social self-esteem and higher life satisfaction (Valkenburg, Peter, & Schouten, 2006). A comparable mediation was suggested in the Spanish study (Apaolaza et al., 2013). The authors found that more use of OSN was associated with higher (online) socializing, which was related to lower loneliness and higher self-esteem—both of which were positively related to life satisfaction.

The predominance of cross-sectional studies is a serious limitation in the current understanding of links between OSN use and adolescent life satisfaction. However, the emerging longitudinal (see Kross et al., 2013) and experimental assessment (Tromholt, 2016) in young adults has suggested that the directionality of the association—when it exists—is from use of OSN to life satisfaction, rather than the other way round. Nevertheless, considering that only short-term associations (lasting up to two weeks) have been examined (Kross et al., 2013), little is known about the long-term interplay between OSN use and LS. First steps in filling this gap were recently taken by two longitudinal studies that used the same large-scale national probability-based sample of British adolescents aged 10-15 years (Booker, Kelly, & Sacker, 2018; Orben, Dienlin, & Przybylski, 2019). Over the period of five years, the authors of the first of the two studies found a significant and negative association between baseline levels of OSN use and life happiness, as well as a significant relation between baseline OSN use and a decrease

in life happiness—but only in female adolescents. In the second, and more recent, study, the authors observed mostly very small (i.e., practically irrelevant) and inconsistent associations between OSN use and life satisfaction, which were somewhat more systematic—in terms of multiple domains of life satisfaction being implicated—among female adolescents (Orben et al., 2019).

1.2. The Role of Gender

Conflicting results of studies focusing on the relation between OSN use and life satisfaction suggest that OSN use does not affect users uniformly. Consequently, it is important to identify individuals who are more vulnerable to negative outcomes associated with OSN use. Some studies have indicated that the association between OSN use and adolescent well-being may be gender-specific, with female adolescents being at a higher risk of adverse outcomes than their male peers. As noted above, OSN use was recently related to lower happiness and higher levels of psychological problems among UK female but not male adolescents (Booker et al., 2018). Consistent with this, a recent meta-analysis reported that a negative link between OSN use and academic performance is stronger in female compared to male adolescents and young adults (Liu, Kirschner, & Karpinski, 2017).

A higher vulnerability of female adolescents seems to be related to their exposure to and motives for OSN use. A number of studies found that female adolescents spend more time using OSN than male adolescents (Barker, 2009; Booker et al., 2018; Tsitsika et al., 2014). In addition, female adolescents are more likely to use OSN for relational purposes and social comparisons, whereas instrumental use of OSN, which focuses on information exchange and promoting personal ideas and opinions, is more prevalent among male adolescents (Barker, 2009; Gray, 2018; Haferkamp, Eimler, Papadakis, & Kruck, 2012). Although female adolescents' use of OSN is focused on relationships ties, weak or acquaintance ties which dominate OSN (Manago,

Taylor, & Greenfield, 2012) may not serve well girls' psychological needs for relatedness and self-disclosure in close relationships (Quinn & Oldmeadow, 2013; Rose & Rudolph, 2006) and their relationship-based self-construal (Cross & Madson, 1997). In line with Rose and Rudolph's (2006) suggestion that boys may benefit more from participating in larger peer groups than girls, the use of OSN—which include large communities of peers—may impact female and male adolescents' life satisfaction differently. Compared to their male peers, female adolescents are also exposed to higher levels of upsetting online experiences, including cyberbullying (Gray, 2018; Sampasa-Kanyinga & Hamilton, 2015). Another reason for higher female vulnerability to negative effects of OSN may be related to their body image concerns (Brajdić Vuković, Lucić, & Štulhofer, 2018; Bucchianeri, Arikian, Hannan, Eisenberg, & Neumark-Sztainer, 2013) and the fact that adolescent OSN use revolves around sharing visual material, which promotes social comparisons (Lindberg, Grabe, & Hyde, 2007). In sum, more time spent using OSN, along with relational focus of these activities, body image concerns and proneness to unfavorable social comparisons, exposure to cyberbullying, and self-objectification (Vandenbosch & Eggermont, 2015), may put female adolescents, in comparison to their male peers, at higher risk for negative impact of OSN use on life satisfaction.

1.3. The Role of Parents

Adolescents' OSN use and its possible outcomes may also depend on the quality of parent-adolescent relationship—i.e., parents' involvement in their children's lives. Because parents have worries and concerns about their children's Internet use (Sorbring, 2014), they try to regulate and monitor this activity using a range of strategies and practices (Livingstone & Helsper, 2008). In a multi-country European study, the percentage of children having an OSN profile was higher among children whose parents did not impose restrictions about OSN use than in other children (Livingstone et al., 2011). However, it is likely that parents' involvement in and

monitoring of their children's online activities diminish over time. During adolescence, direct parental monitoring of child's online, as well as offline, activities becomes not only more difficult, but also increasingly less effective (Kerr & Stattin, 2000; Stattin & Kerr, 2000). Not surprisingly, a study that focused on Internet use among US high school students found that only 9% of students reported parental monitoring of their OSN use (Reich, Subrahmanyam, & Espinoza, 2012). Similarly, a recent Belgian study showed that parents have little knowledge about their adolescents' online activities and exposure to online risks (Symons, Ponnet, Emmery, Walrave, & Heirman, 2017).

Apart from limited parental knowledge about adolescents' online activities, general quality of the parent-adolescent relationship and parenting styles may moderate the impact of OSN use on adolescents' well-being. To the best of our knowledge, no prior studies tested this, which is surprising given the evidence about protective effects of high quality parenting in offline contexts (Aceves & Cookston, 2007; Brookmeyer, Henrich, & Schwab-Stone, 2005). The current study investigated whether parental engagement, operationalized as high emotional support, monitoring, and autonomy granting, plays a role in the association between male and female adolescents' OSN use and life satisfaction. Following the co-construction theory (Subrahmanyam, Smahel, & Greenfield, 2006), which posits that young people (co-)construct their online environment through both online and offline social interaction—importing issues from their offline reality into their online lives and vice versa—we expected that high parental engagement would have a similar protective role in the online as it has in the offline world. Highly engaged parents talk with their adolescents more than less engaged parents, and these conversations are likely to also include topics such as risks of OSN use. In addition, adolescents with highly engaged parents are more likely to share information about their offline and online activities and experiences with their parents, providing them with more opportunity for

assistance, advice, and support. This may reduce potential negative effects of OSN use on adolescents' life satisfaction.

1.4. Current Study

Recently, Underwood and Ehrenreich (2017) pointed to a lack of theories to guide research on adolescents' OSN use and psychological well-being and stimulate the generation of specific hypotheses. Thus, our exploratory study is an attempt to start bridging the gap in the assessment of associations between adolescent OSN use and life satisfaction over time, which may aid future conceptualizations. Considering that the only two longitudinal studies included participants in early to middle adolescence (Booker et al., 2018; Orben et al., 2019), the current study, which used a panel sample of middle to late adolescents, extends the exploration of the link between OSN use and life satisfaction to the next developmental phase.

Following the literature on the importance of parental engagement, our exploration of links between adolescent OSN use and life satisfaction included a comparison of adolescents who reported higher vs. lower levels of parental engagement. Our analyses were organized around the following three research questions: How are changes in OSN use and life satisfaction interrelated in the period from middle to late adolescence and what is the direction of this association (RQ1)? Considering that female adolescents spend more time using OSN and that they seem to be more vulnerable to possible adverse outcomes compared to their male peers, what are gender differences in the association between the OSN use and life satisfaction (RQ2)? Finally, what is the role of parental engagement in the relationship between the key constructs (RQ3)?

2. METHOD

2.1. Participants and Procedure

As a part of the PROBIOPS longitudinal study (Štulhofer, Tafro, & Kohut, 2019), a panel sample of high-school sophomore students ($M_{\text{age at baseline}}$ = 15.8 years, SD = 0.52) was

recruited from 14 out of 15 larger schools in Rijeka, the third largest city in Croatia. While smaller high-schools (≤ 50 sophomore students enrolled) were omitted due to limited funding, the non-selected larger school had pending criminal investigation for arson at the time the study was launched. The participating schools included 63% of the city's high-school sophomore population. The initial survey (n = 1,307) took place in December 2015 and was repeated five times in approximately 5-month intervals. After excluding questionnaires (< 30 per wave) containing gross inconsistencies (such as reporting a decreasing number of lifetime sexual partners or changing gender category across waves) or humorous responses, in this study we use data from 701 female and 456 male students who participated in at least two of the three study waves in which both constructs of interest were measured: T2 (April 2016), T4 (March 2017), and T6 (March 2018). The gender misbalance was expected, because female adolescents are more likely than their male peers to continue participation in longitudinal studies (Bauman, Ennett, Foshee, Pemberton, & Hicks, 2001; Post, Gilljam, Bremberg, & Galanti, 2012), possibly due to a stronger sense of responsibility (female high-school students have, on average, better grades compared to male students), higher cooperativeness, and higher interest in discussing their life. Moreover, female participants in our study were less likely to skip classes than male participants. At baseline, the majority of participants (79.3%) were living with both parents. Over a third reported college educated mother (38.9%) or father (35.7%).

To assess possible attrition bias, we carried out multivariate logistic regression analysis with two groups of participants as dependent variable: 1 = those included in this study and 0 = participants who were excluded. Independent variables were baseline measures of sociodemographic characteristics (gender, mother's and father's education, academic achievement, and religiosity), OSN use and life satisfaction. Two significant differences emerged between students who were included in this study and the rest of the panel. Compared to the

latter, the former had higher odds of being female (AOR = 2.57, p = .000) and reporting better grades (AOR = 1.69, p = .007).

Self-administered paper and pencil survey was used to collect data in classrooms, with large screens placed between participants to maximize privacy and confidentiality. Information required for informed consent was printed on the first questionnaire page at each study wave and also delivered by a research assistant. At the end of each questionnaire, which took less than 30 minutes to complete, contact information for a youth health center was provided. Following national guidelines for ethical research in minors, all parents received a leaflet with essential information about the study. The PROBIOPS project and all study procedures were approved by the Ethical Research Committee of the Faculty of Humanities and Social Sciences, University of Zagreb.

2.2. Measures

Time spent using online social networks was measured at each wave by asking the following question: "On average, how many hours per day do you spend using online social networks, such as *Facebook*, *Twitter*, *Instagram*, etc.?" Although prone to individual biases, including person-specific cognitive approaches, this self-reported indicator of OSN use has been widely used in the literature (see, for example, Booker et al., 2018; Tsitsika et al., 2014). While we agree that it should not be treated as an absolute measure, we believe that the indicator is highly useful in relative terms—particularly when measured over time and with acceptable stability. A 15-point scale (with full and half-hour marks) ranging from 0 to 7 and more hours was used to anchor answers. Participants were specifically instructed to disregard the total time they spend online and report time spent solely on OSN. Due to the fact that life satisfaction was assessed only at T2, T4 and T6, here we used only information about OSN use at these time

points. Stability coefficients for the indicator were satisfactory ($r_{T2\text{-}T4}$ = .64, $r_{T4\text{-}T6}$ = .74, and $r_{T2\text{-}T6}$ = .61).

Life satisfaction was assessed by a 5-item adapted version of the Personal Wellbeing Index-School Children (PWI-SC; Tomyn & Cummins, 2011). The five items indicated satisfaction with one's health, achievements in life, relationships, perceived future, and life in general. Answers were recorded on a Likert-like scale ranging from 1 = extremely dissatisfied to 5 = extremely satisfied, except for the item "How do you see your future" that used "very negative" and "very positive" as end points. For descriptive purposes, the scores were averaged in a composite scale that was characterized by satisfactory reliability (Cronbach's α ranged from .81 to .84) and stability over time (r = .62-.68).

Parental engagement was a dichotomous variable denoting lower and higher parental warmth, autonomy granting and monitoring/knowledge. The indicator was obtained by cluster analyzing 12 parental styles items, measured at baseline, that indicated warmth (e.g., "My parents show me love"), autonomy granting (e.g., "My parents encourage me to think independently"), and parental monitoring/knowledge (e.g., "My parents know my whereabouts when I am out at night"). While the first two dimensions were taken from the Parental Behavior Questionnaire (PBQ29; Keresteš, Brković, Kuterovac Jagodić, & Greblo, 2012), the parental monitoring scale was developed and validated in a national study of reproductive and sexual health in emerging Croatian adults (Landripet, Štulhofer, & Baćak, 2011). A 5-point Likert-like scale (1 = never or almost never, 5 = always or almost always) was used to anchor responses to all 12 items. Two-step cluster analysis, with log-likelihood selected as the probability-based measure of distance, produced a two-cluster solution as the model with best fit to the data. According to the silhouette measure of fit (Kaufman & Rousseeuw, 1990), the 2-cluster solution fit was "fair" in both genders. Indicative of a reasonable homogeneity of the new measure, the smaller cluster (29.2%

of participants) was characterized by low mean scores and the larger cluster by high mean scores on all parenting styles items. Accordingly, the two clusters were labeled as lower and higher levels of parental engagement.

2.3. Analytical Strategy

We used latent growth curve modeling (LGCM), which enables the estimation of between-individual and within-individual changes over time (i.e., growth trajectories; Grimm, Ram, & Estabrook, 2017), to explore a dynamic relationship between OSN use and life satisfaction. To take full advantage of accounting for measurement error offered by latent variable approach, in the case of life satisfaction we applied a curve-of-factors LGCM approach (Isiordia & Ferrer, 2018). As suggested by McArdle and Grimm (2010) the analytical procedure included several steps. We started by comparing a linear (expressed in months) and a non-specified cumulative growth (the first slope loading was fixed to 0 and the last to 1; Preacher, Wichman, MacCallum, & Briggs, 2008) in OSN use by gender. The standard chi-square test pointed that the cumulative curve had better fit compared to the linear specification in both genders. A linear latent curve was found to be superior (due to its higher parsimoniousness) to the non-specified curve specification of change in life satisfaction in both genders.

Next, the multivariate LGC model of life satisfaction was tested for configural, weak factorial, and strong factorial measurement invariance over time by progressively applying more equality constraints (Little, 2013). Partial strong factorial invariance, which is regarded the minimum requirement for curve-of-factors LGCM, was obtained in both gender groups after unconstraining one of the five life satisfaction item's mean. After inspecting latent mean and variance in life satisfaction separately for each gender, unconditional dual-domain or parallel growth model was estimated by gender. Due to significant structural differences between the two models, all further analyses were carried out separately for female and male adolescents. In

female participants, we observed no significant mean change in life satisfaction, but also no individual variation around the mean. Thus, an intercept only model was used (Duncan, Duncan, & Strycker, 2006), which fit the data equally well as the model with the insignificant latent slope ($\Delta\chi^2_{(\Delta df = 3)} = 6.42$, $\Delta CFI = .000$, $p > .05$). In contrast to female adolescents, mean change in male adolescents' life satisfaction was significant, but not individual variation in this change (the mean change was likely too small to ascertain differences in individual trajectories with only three observations). Although this intercept and slope model was characterized by substantially better fit than an intercept only model ($\Delta\chi^2_{(\Delta df = 3)} = 25.28$, $\Delta CFI = .007$, $p < .01$), due to non-significant individual variation in the dynamics of life satisfaction among male adolescents cross-domain paths between OSN use and latent change in life satisfaction were omitted as meaningless.

In the final step, the female and male dual-domain models were multi-group analyzed to compare two groups of participants, those characterized by higher and lower parental engagement. The fit of all structural equation models explored in this study was evaluated on the basis of χ^2, CFI, and RMSEA statistics, with TLI and CFI values $\geq .95$ and RMSEA values $\leq .05$ representing adequate fit (see Little, 2013). Given that missing information on OSN use and life satisfaction appeared to be missing completely at random (Little's MCAR test $\chi^2_{(84)} = 100.83$, $p = .104$), full information maximum likelihood estimation was employed to deal with missing values (Graham, 2012). Considering that gender-specific data nesting in schools was marginal (< 2.7% in OSN use and < 2.5% in life satisfaction), multilevel adjustment for intra-cluster correlation was omitted. All analyses were carried out using AMOS 24 and IBM SPSS 24 statistical software packages.

3. RESULTS

On average, female adolescents reported spending 3.50 hours per day (SD = 1.86) using OSN at T2, compared to 2.39 hours a day (SD = 1.68) reported by their male peers ($t_{(843)} = -8.89$,

p = .000). A similar significant difference ($t_{(818)}$ = -8.32, p = .000) was observed at the end of the observed period. In contrast, male adolescents reported significantly higher life satisfaction than female adolescents at T2 ($t_{(1037)}$ = 5.32, p = .000), but not at T6 ($t_{(919)}$ = .92, p = .358).

Associations between the key constructs over time are presented in Table 1. Associations between OSN use and life satisfaction were not consistent, but when significant they were of small size. The link was negative among female adolescents (the higher the OSN use, the lower the life satisfaction), but mostly positive among their male peers. In both gender groups, mean OSN use increased from T2 to T6. The dynamics of life satisfaction, however, were gender-specific. On average, life satisfaction increased over time in female but decreased in male adolescents. In both genders, reported parental engagement was significantly and consistently associated with life satisfaction, but not OSN use. The associations were positive (higher parental engagement was related to higher life satisfaction) and moderate in size.

TABLE 1 ABOUT HERE

Multi-group LGC modeling of OSN use by gender had good fit ($\chi^2_{(6)}$ = 20.83, TLI = .971, CFI = .986, RMSEA = .046 [90% CI = .026-.069]) and pointed to significant baseline levels (M_{female} = 3.48, S.E. = .07, p = .000, var. = 2.53, S.E. = .19, p = .000 and M_{male} = 2.38, S.E. = .08, p = .000, var. = 1.91, S.E. = .20, p = .000) and subsequent growth in OSN use (M_{female} = .26, S.E. = .06, p = .000, var. = .70, S.E. = .17, p = .000 and M_{male} = .34, S.E. = .09, p = .000, var. = 1.33, S.E. = .25, p = .000). The significant and positive change in OSN use during the observed period was somewhat higher in male adolescents, but the difference did not reach statistical significance ($\Delta\chi^2_{(\Delta df = 3)}$ = 25.28, ΔCFI = .007, p < .01).

3.1. RQ1 – Parallel Growth in OSN Use and Life Satisfaction

In female participants, unconditional dual-domain LCG model had very good fit to the data ($\chi^2_{(120)}$ = 203.68, TLI = .977, CFI = .984, RMSEA = .032 [.024-.039]). As shown in Figure 1, we observed a small but significant negative relation between baseline levels (T2) in the two constructs (r = -.16, S.E. = .05, p = 002), with female adolescents who initially scored higher in OSN use also reporting lower life satisfaction at baseline compared to other female participants. In addition, there was a significant link between baseline OSN use and its subsequent growth (r = -.28, S.E. = .15, p = .009), which is likely an artifact of the indicator's scaling (see Little, 2013: 260). Female adolescents with higher initial OSN use were characterized by comparatively lower increase in the use over time.

FIGURE 1 ABOUT HERE

Figure 2 presents the unconditional parallel growth model in male adolescents: $\chi^2_{(129)}$ = 199.66, TLI = .966, CFI = .975, RMSEA = .035 (.025-.044). In contrast to the female model, neither of the two cross domain associations in male participants reached statistical significance. We found no evidence of the link between changes in OSN use and life satisfaction during the period under observation in either gender.

FIGURE 2 ABOUT HERE

3.2. RQ2 – Gender Differences in Cross-Domain Associations

Although we found no parallel growth in OSN use and life satisfaction, there was a substantial gender difference in the association between baseline levels in the two constructs (see Figures 1 and 2); the link was significant only in the female sample. It should also be noted that

the direction of the association was negative in female and positive in male adolescents, suggesting different processes behind the observation.

3.3. RQ3 – The Role of Parental Engagement

Multi-group model with female adolescents who reported higher vs. lower parental engagement as groups, which was carried out to assess moderation, was also characterized by good fit to the data ($\chi^2_{(297)}$ = 435.28, TLI = .959, CFI = .965, RMSEA = .028 [90% CI = .022-.034]). Consistent with the protective role of high quality parenting, baseline levels of life satisfaction were lower in participants who reported lower parental engagement (*M* = 3.72, S.E. = .06, *p* = .000) then in the other group (*M* = 4.29, S.E. = .03, *p* = .000). In addition, the cross-domain path linking baseline OSN use and life satisfaction levels was slightly higher in the lower parental engagement group (*r* = -.14, S.E. = .05) compared to the other group (*r* = -.12, S.E. = .05), but the difference was non-significant. The fit of the model in which this path was constrained to equality across the two groups was indistinguishable from the one in which the path varied freely across the groups ($\Delta\chi^2_{(\Delta df = 1)}$ = .26, ΔCFI = .000, *p* >.50).

In adolescent men, the multi-group model had acceptable fit ($\chi^2_{(273)}$ = 391.44, TLI = .934, CFI = .947, RMSEA = .035 [90% CI = .027-.043]) and pointed to higher baseline life satisfaction in students who reported higher parental engagement (*M* = 6.17, S.E. = .39, *p* = .000) compared to those with lower parental engagement (*M* = 5.74, S.E. = .39, *p* = .000). Interestingly, the two groups also differed in the average change in life satisfaction over time, with the higher parental engagement group reporting a small but significant decrease (*M* = -.01, S.E. = .00, *p* = .000), possibly due to the ceiling effect. In contrast, no significant change in life satisfaction was observed in the lower engagement group (*M* = -.00, S.E. = .00, *p* = .306). Finally, we observed a significant difference in the association between baseline levels of OSN use and life satisfaction between the two groups. The association was significant, positive and of moderate size in the

lower parental engagement group (r = .33, S.E. = .09, p = .018), but non-significant among participants who reported higher parental engagement (r = .17, S.E. = .06, p = .300).

4. DISCUSSION

Considering that parallel changes in OSN use and indicators of subjective well-being have been explored only among 10-15 year olds (Booker et al., 2018; Orben et al., 2019), this study focused on the period marked by transition from middle to late adolescence. The study's social relevance is underscored by the global popularity of OSN use, particularly among young people, and growing concerns about its possible adverse effects on adolescents' psychological well-being and general quality of life (Livingstone & Brake, 2010). To explore this issue over a period of about two years, we formulated the three research questions: (RQ1) are changes in OSN use and life satisfaction interrelated; (RQ2) are these associations gender-specific; and (RQ3) does parental engagement buffer the link between OSN use and life satisfaction? Using dual-domain LGCM, we observed no significant associations between changes in OSN use and life satisfaction in either gender over a period of almost two years. The sole significant cross-domain relation was the one between baseline levels of the two constructs among female participants; adolescent women who reported higher initial levels of OSN use were also characterized by lower life satisfaction. It should be noted that the observed relation was small in size and, hence, of limited practical relevance. Parental engagement moderated the target association only in adolescent men. Although the link between baseline levels in OSN use and life satisfaction was non-significant in the male sample, a comparison of participants with lower and higher reported parental engagement revealed, unexpectedly, a significant and moderately sized positive association among adolescent men who reported lower parental engagement.

The finding that neither baseline level nor changes in OSN use were related to changes in life satisfaction in middle to late adolescence is encouraging and speaks against widespread

worries about adverse outcomes of young people's OSN use. Despite the fact that OSN use increased among both female and male adolescents (the increase being somewhat steeper for adolescents who reported lower baseline OSN use), the increase was unrelated to life satisfaction. Adolescents' life satisfaction remained stable in our study, except among male adolescents who reported higher parental engagement—whose life satisfaction decreased during the observed period, but this was probably an artifact resulting from the ceiling effect. Overall, we observed no evidence that either male or female adolescents' OSN use influenced or was influenced by how satisfied they were with life. The findings are in discord with Kross et al.'s (2013) observation that Facebook use was related to declining life satisfaction in a sample of emerging adults. In addition to surveying older individuals than was the case in our study, the authors explored short-term effects. Taken together, the findings of the two longitudinal studies suggest that OSN use may be associated with short-term, but not longer-term changes in life satisfaction.

There are several possible explanations of this null effect. Firstly, the finding may simply reflect the reality among middle to late adolescents, suggesting that most of them have learned how to successfully navigate online networks, whether by developing a more critical perspective, by becoming more resilient to negative virtual experiences or by becoming more skillful in obtaining parental or peer support when faced with challenges related to OSN use. Secondly, the null finding may be related to the fact that we measured general life satisfaction and not some of its more specific facets (e.g., body image satisfaction). This may have resulted in negative and positive online experiences canceling each other out. It should be noted, however, that this does not invalidate the current study's finding: OSN use may be related to some particular facets of adolescents' life satisfaction without substantially affecting it in general. Thirdly, our one-item OSN use measure indicates time spent using OSN, but does not differentiate between active (posting) and passive (browsing) activities. Finally, it is possible that we were unsuccessful in

identifying individuals who are exceptionally vulnerable to adverse effects of OSN use. To minimize this risk, future studies will need to explore a number of potential moderators.

A number of gender differences were found in the current study. Consistent with other studies, female participants in this study were characterized by significantly higher levels of OSN use and lower levels of life satisfaction than their male peers (Barker, 2009; Booker et al., 2018; Goldbeck, Schmitz, Besier, Herschbach, & Henrich, 2007; Lenhart & Madden, 2007; Levin, Dallago, & Currie, 2012; Tsitsika et al., 2014; Valenzuela et al., 2009). Furthermore, the significant association between baseline OSN use and life satisfaction levels was observed only in female adolescents. Although very limited, this gender-specific finding is likely related to differences in reasons for and time spent using OSN, which seem to reflect many well-documented differences between male and female adolescents, including higher importance of social relationships and social comparisons (Barker, 2009; Gray, 2018; Haferkamp, Eimler, Papadakis, & Kruck, 2012), higher body image concerns and self-objectification (Bucchianeri et al., 2013; Lindberg et al., 2007; Vandenbosch & Eggermont, 2015), greater exposure to cyberbullying (Gray, 2018; Sampasa-Kanyinga & Hamilton, 2015), and less physical activity among female, compared to male adolescents (Sallis, Prochaska, & Taylor, 2000).

All these gender differences might have contributed to the gender-specific link between baseline OSN use and life satisfaction observed in this study, which was negative among female adolescents and positive in male adolescents with low perceived parental engagement. The findings point to possible interrelatedness in early adolescence, the period when children start using OSN (Gray, 2018). According to the 2017 EU Kids Online survey, 48% of Croatian children aged 9-13 years had a profile on at least one OSN (personal communication with Dunja Potočnik, a Croatian member of the EU KID Online research team, from 9 December 2018). Considering that early adolescence is a period of substantial changes in different domains of

functioning, including academic performance, social behavior and relationships, and personality (Brković, Keresteš, & Puklek Levpušček, 2014; Harden & Tucker-Drob, 2011; Spaeth, Weichold, & Silbereisen, 2015), early adolescents may be especially sensitive to influences, positive or negative, associated with OSN use. Another reason for greater susceptibility to OSN influences in early vs. middle to late adolescence may lie in the fact that younger adolescents lack skills and experience to deal with online risks and challenges. This is compatible with the recent longitudinal study in early British adolescents that found weak associations between OSN use and subjective well-being, mostly in female adolescents (Booker et al., 2018; Orben et al., 2019). It should be noted, however, that the reported effect size was small, indicating that the link may be of little practical or policy relevance. In addition, the possibility that the observed relation represented a spurious association, confounded by individual characteristics (such as low academic achievement, social isolation, or a combination of low self-esteem and high peer conformism), cannot be ruled out. This is also relevant for our findings.

According to our findings, perceived parental engagement has an important role in adolescents' life satisfaction and, in some cases, in the interrelatedness between baseline OSN use and life satisfaction, which adds to the body of literature on the importance of parents in adolescent development and adjustment (for reviews and meta-analyes see Kawabata, Alink, Tseng, van Ijzendoorn, & Crick, 2011; Pinquart, 2016, 2017a, 2017b). We found that both female and male adolescents who reported low parental engagement were characterized by lower life satisfaction than their peers who reported higher parental involvement. This corroborates earlier findings of the link between the quality of parent-adolescent relationship and adolescents' life satisfaction (Jiménez-Iglesias, García-Moya, & Moreno, 2017; Levin et al., 2012; Schwarz et al., 2012).

The role of parental engagement in the association between OSN use and life satisfaction was confirmed only among male adolescents. As expected, no significant relation between the key constructs was observed among participants who reported higher parental engagement. Contrary to what we expected, the association was positive and significant among participants who reported lower parental engagement. These findings suggest that time spent in online interaction with others is beneficial for the latter group's life satisfaction, possibly as a source of relatedness, social appreciation and support, and a possible substitute for lower parental involvement. This is compatible with the findings that offline friendships were more strongly related to well-being of early adolescents from low cohesive and low adaptive families than those coming from more cohesive and more adaptive families (Gauze, Bukowski, Aquan-Assee, & Sippola, 1996). Further speculations about underlying psychosocial mechanism would require that the finding is first replicated and then explored in a more systematic fashion.

Finally, it should be noted that the absence of the moderating role of parental engagement among female participants indicates that parental engagement may not buffer all potentially adverse outcomes of girls' OSN use. Considering that adverse outcomes associated with OSN use have more often been found among female than male adolescents (Booker et al., 2018; Liu et al., 2017; Orben et al., 2019), Internet literacy interventions appear warranted (Livingstone, 2008; Livingstone & Haddon, 2009), especially during early adolescence.

4.1. Study Limitations

A few limitations should be taken into account when interpreting our findings. Firstly, due to the fact that our multivariate LGCM was based on only three time points (the minimum number for this analytical approach), individual differences in trajectories of change over time could not be assessed with high precision. Considering the very limited (although significant) average growth in male adolescents' OSN use, the observed non-significant variation in

individual growth curves around this average likely reflects the aforementioned low precision, rather than a uniform latent growth in OSN use in the male sample. Secondly, a marked gender difference in panel attrition resulted in substantially more female than male adolescents included in this study. Given that more vulnerable adolescents may be more likely to drop out of longitudinal assessments than their peers, this gender imbalance possibly affected our analysis of the link between OSN use and life satisfaction in male adolescents. However, taking into account the findings presented in Figure 2, it is highly unlikely that this potential bias masked a negative association between the constructs of interest. Finally, in addition to the intensity of OSN use, future investigations of the link between OSN use and adolescents' life satisfaction, as well as psychological well-being in general, should address possible moderation by the preferred type of online networking activities.

5. CONCLUSIONS AND IMPLICATIONS

To the best of our knowledge, this is the first longitudinal exploration of the association between changes in OSN use and life satisfaction in the period of transitioning from middle to late adolescence. Generally, our results do not support frequently expressed concerns about a negative impact of using OSN on adolescents' life satisfaction, which is in line with insights from the recent British longitudinal study (Orben et al., 2019). It should be noted, however, that we focused on general life satisfaction. Future studies should examine possible links between growth in OSN use over time and changes in domain-specific life satisfaction, and explore if this association is gender-specific. Our finding that baseline levels of OSN use and life satisfaction were negatively related among female adolescents and positively related in male adolescents who reported lower parental engagement points to a possibility that the two constructs were interrelated in the past, during early adolescence when young people usually begin to use OSN. To explore this issue, longitudinal studies that include different age cohorts would be needed.

Our study provided some evidence that the association between OSN use and life satisfaction is gender specific, which extends to the moderating role of parental engagement that was observed only among adolescent men. This contribution to the search for factors that moderate the link between OSN use and adolescent development is a reminder of the importance of identifying adolescents who are particularly vulnerable to OSN use, as well as their peers for whom it may be beneficial. Future research should approach this task systematically by taking into account likely gender- and developmentally-specific influences. In general, the results of our study, which indicate similarities between online and offline experiences and process, fit well within the framework of the co-construction conceptual approach, but they also point to the need for a coherent and more specific theoretical model of adolescent OSN use and its potential effects.

REFERENCES

Aceves, M. J., & Cookston, J. T. (2007). Violent victimization, aggression, and parent-adolescent relations: Quality parenting as a buffer for violently victimized youth. *Journal of Youth and Adolescence*, *36*(5), 635–647. https://doi.org/10.1007/s10964-006-9131-9

Anderson, M., & Jiang, J. (2018). *Teens, social media and technology 2018*. Retrieved from http://www.pewinternet.org/2018/05/31/teens-social-media-technology-2018/

Apaolaza, V., Hartmann, P., Medina, E., Barrutia, J. M., & Echebarria, C. (2013). The relationship between socializing on the Spanish online networking site Tuenti and teenagers' subjective wellbeing: The roles of self-esteem and loneliness. *Computers in Human Behavior*, *29*(4), 1282–1289. https://doi.org/10.1016/j.chb.2013.01.002

Barker, V. (2009). Older adolescents' motivations for social network site use: The influence of gender, group identity, and collective self-esteem. *Cyberpsychology & Behavior*, *12*(2), 209–213. https://doi.org/10.1089/cpb.2008.0228

Bauman, K. E., Ennett, S. T., Foshee, V. A., Pemberton, M., & Hicks, K. (2001). Correlates of participation in a family-directed tobacco and alcohol prevention program for adolescents. *Health Education & Behavior*, *28*(4), 440–461. https://doi.org/10.1177/109019810102800406

Baumeister, R. F., & Leary, M. R. (1995). The Need to Belong: Desire for Interpersonal Attachments as a Fundamental Human Motivation. *Psychological Bulletin*, *117*(3), 497–529. https://doi.org/10.1037/0033-2909.117.3.497

Booker, C. L., Kelly, Y. J., & Sacker, A. (2018). Gender differences in the associations between

age trends of social media interaction and well-being among 10-15 year olds in the UK. *BMC Public Health*, *18*(1). https://doi.org/10.1186/s12889-018-5220-4

boyd, d. m., & Ellison, N. B. (2007). Social network sites: Definition, history, and scholarship. *Journal of Computer-Mediated Communication*, *13*(1), 210–230. https://doi.org/10.1111/j.1083-6101.2007.00393.x

Brajdić Vuković, M., Lucić, M., & Štulhofer, A. (2018). Internet Use Associated Body-Surveillance Among Female Adolescents: Assessing the Role of Peer Networks. *Sexuality & Culture*, *22*(2), 521–540. https://doi.org/10.1007/s12119-017-9480-4

Brković, I., Keresteš, G., & Puklek Levpušček, M. (2014). Trajectories of Change and Relationship Between Parent-Adolescent School-Related Conflict and Academic Achievement in Early Adolescence. *Journal of Early Adolescence*, *34*(6), 792–815. https://doi.org/10.1177/0272431613503213

Brookmeyer, K. A., Henrich, C. C., & Schwab-Stone, M. (2005). Adolescents who witness community violence: Can parent support and prosocial cognitions protect them from committing violence? *Child Development*, *76*(4), 917–929. https://doi.org/10.1111/j.1467-8624.2005.00886.x

Bucchianeri, M. M., Arikian, A. J., Hannan, P. J., Eisenberg, M. E., & Neumark-Sztainer, D. (2013). Body dissatisfaction from adolescence to young adulthood: Findings from a 10-year longitudinal study. *Body Image*, *10*(1), 1–7. https://doi.org/10.1016/j.bodyim.2012.09.001

Callahan, M. R., Tolman, R. M., & Saunders, D. G. (2003). Adolescent dating violence victimization and psychological well-being. *Journal of Adolescent Research*, *18*(6), 664–681. https://doi.org/10.1177/0743558403254784

Costello, E. J., Copeland, W., & Angold, A. (2011). Trends in psychopathology across the adolescent years: What changes when children become adolescents, and when adolescents

become adults? *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *52*(10), 1015–1025. https://doi.org/10.1111/j.1469-7610.2011.02446.x

Cross, S. E., & Madson, L. (1997). Models of the self: Self-construals and gender. *Psychological Bulletin*, *122*(1), 5–37. https://doi.org/10.1037/0033-2909.122.1.5

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, *11*(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01

Diener, E. (1994). Assessing subjective well-being: Progress and opportunities. *Social Indicators Research*, *31*(2), 103–157. https://doi.org/10.1007/BF01207052

Dishman, R. K., Dowda, M., McIver, K. L., Saunders, R. P., & Pate, R. R. (2017). Naturally-occurring changes in socialcognitive factors modify change in physical activity during early adolescence. *PLoS ONE*, *12*(2). https://doi.org/10.1371/journal.pone.0172040

Duncan, T. E., Duncan, S. C., & Strycker, L. A. (2006). *An introduction to latent variable growth curve modeling*. New York: Psychology Press.

Gauze, C., Bukowski, W. M., Aquan-Assee, J., & Sippola, L. K. (1996). Interactions between family environment and friendship and associations with self-perceived well-being during early adolescence. *Child Development*, *67*(5), 2201–2216. https://doi.org/10.1111/j.1467-8624.1996.tb01852.x

Goldbeck, L., Schmitz, T. G., Besier, T., Herschbach, P., & Henrich, G. (2007). Life satisfaction decreases during adolescence. *Quality of Life Research*, *16*(6), 969–979. https://doi.org/10.1007/s11136-007-9205-5

Graham, J. W. (2012). *Missing Data: Analysis and Design*. New York: Springer. https://doi.org/10.1007/978-1-4614-4018-5

Gray, L. (2018). Exploring how and why young people use social networking sites. *Educational*

Psychology in Practice, *34*(2), 175–194. https://doi.org/10.1080/02667363.2018.1425829

Grimm, K. J., Ram, N., & Estabrook, R. (2017). *Growth Modeling: Structural Equation and Multilevel Modeling Approaches*. New York: Guilford Press.

Haferkamp, N., Eimler, S. C., Papadakis, A.-M., & Kruck, J. V. (2012). Men are from Mars, women are from Venus? Examining gender differences in self-presentation on social networking sites. *Cyberpsychology, Behavior, and Social Networking*, *15*(2), 91–98. https://doi.org/10.1089/cyber.2011.0151

Harden, K. P., & Tucker-Drob, E. M. (2011). Individual differences in the development of sensation seeking and impulsivity during adolescence: Further evidence for a dual systems model. *Developmental Psychology*, *47*(3), 739–746. https://doi.org/10.1037/a0023279

Isiordia, M., & Ferrer, E. (2018). Curve of factors model: A latent growth modeling approach for educational research. *Educational and Psychological Measurement*, *78*(2), 203–231. https://doi.org/10.1177/0013164416677143

Jiménez-Iglesias, A., García-Moya, I., & Moreno, C. (2017). Parent–child relationships and adolescents' life satisfaction across the first decade of the new millennium. *Family Relations*, *66*(3), 512–526. https://doi.org/10.1111/fare.12249

Kaufman, L., & Rousseeuw, P. J. (1990). *Finding Groups in Data: An Introduction to Cluster Analysis*. New York: John Wiley.

Kawabata, Y., Alink, L. R. A., Tseng, W. L., van Ijzendoorn, M. H., & Crick, N. R. (2011). Maternal and paternal parenting styles associated with relational aggression in children and adolescents: A conceptual analysis and meta-analytic review. *Developmental Review*, *31*(4), 240–278. https://doi.org/10.1016/j.dr.2011.08.001

Keresteš, G., Brković, I., Kuterovac Jagodić, G., & Greblo, Z. (2012). Razvoj i validacija upitnika roditeljskog ponašanja [Development and validation of Parental Behavior

Questionnaire]. *Suvremena Psihologija*, *15*(1), 23–41.

Kerr, M., & Stattin, H. (2000). What parents know, how they know it, and several forms of adolescent adjustment: Further support for a reinterpretation of monitoring. *Developmental Psychology*, *36*(3), 366–380.

Kohut, T., & Štulhofer, A. (2018). Is pornography use a risk for adolescent wellbeing? An examination of temporal relationships in two independent panel samples. *PLOS ONE*, *13*(8), e0202048. https://doi.org/10.1371/journal.pone.0202048

Krasnova, H., Wenninger, H., Widjaja, T., & Buxmann, P. (2013). Envy on Facebook: A hidden threat to users' life satisfaction? *Wirtschaftsinformatik*.

Kross, E., Verduyn, P., Demiralp, E., Park, J., Lee, D. S., Lin, N., … Ybarra, O. (2013). Facebook Use Predicts Declines in Subjective Well-Being in Young Adults. *PLoS ONE*, *8*(8). https://doi.org/10.1371/journal.pone.0069841

Landripet, I., Štulhofer, A., & Baćak, V. (2011). Changes in human immunodeficiency virus and sexually transmitted infections-related sexual risk taking among young Croatian adults: findings from the 2005 and 2010 population-based surveys. *Croatian Medical Journal*, *52*(4), 458–468. https://doi.org/10.3325/cmj.2011.52.458

Lee, G., Lee, J., & Kwon, S. (2010). Use of social networking sites and subjective well-being: A study in South Korea. *Cyberpsychology, Behavior, and Social Networking*, *14*(3), 151–155. https://doi.org/10.1089/cyber.2009.0382

Lenhart, A., & Madden, M. (2007). Social networking websites and teens | Pew Research Center. Retrieved December 29, 2018, from http://www.pewinternet.org/2007/01/07/social-networking-websites-and-teens/

Levin, K. A., Dallago, L., & Currie, C. (2012). The association between adolescent life satisfaction, family structure, family affluence and gender differences in parent-child

communication. *Social Indicators Research*, *106*(2), 287–305. https://doi.org/10.1007/s11205-011-9804-y

Lindberg, S. M., Grabe, S., & Hyde, J. S. (2007). Gender, pubertal development, and peer sexual harassment predict objectified body consciousness in early adolescence. *Journal of Research on Adolescence*, *17*(4), 723–742. https://doi.org/10.1111/j.1532-7795.2007.00544.x

Little, T. D. (2013). *Longitudinal Structural Equation Modeling*. New York: Guilford Press.

Liu, D., Kirschner, P. A., & Karpinski, A. C. (2017). A meta-analysis of the relationship of academic performance and Social Network Site use among adolescents and young adults. *Computers in Human Behavior*, *77*, 148–157. https://doi.org/10.1016/j.chb.2017.08.039

Livingstone, S. (2008). Internet literacy: Young people's negotiation of new online opportunities. In T. McPherson (Ed.), *Digital Youth, Innovation, and the Unexpected* (pp. 101–122). Cambridge, MA: MIT Press. https://doi.org/10.1162/dmal.9780262633598.101

Livingstone, S., & Brake, D. R. (2012). *Children, risk and safety on the Internet: Research and policy challenges in comparative perspective*. (S. Livingstone, L. Haddon, & A. Görzig, Eds.). Policy Press.

Livingstone, S., & Haddon, L. (2009). Introduction. In S. Livingstone & L. Haddon (Eds.), *Kids Online: Opportunities and Risks for Children.* (pp. 1–6). Bristol: Policy Press.

Livingstone, S., & Helsper, E. J. (2008). Parental mediation of children's internet use. *Journal of Broadcasting and Electronic Media*, *52*(4), 581–599. https://doi.org/10.1080/08838150802437396

Livingstone, S., Ólafsson, K., & Staksrud, E. (2011). *Social networking, age and privacy*. EU Kids Online, London, UK.

Lucas-Thompson, R. G., & Granger, D. A. (2014). Parent-child relationship quality moderates the link between marital conflict and adolescents' physiological responses to social

evaluative threat. *Journal of Family Psychology*, *28*(4), 538–548. https://doi.org/10.1037/a0037328

Manago, A. M., Taylor, T., & Greenfield, P. M. (2012). Me and my 400 friends: The anatomy of college students' facebook networks, their communication patterns, and well-being. *Developmental Psychology*, *48*(2), 369–380. https://doi.org/10.1037/a0026338

McArdle, J. J., & Grimm, K. J. (2010). Five steps in latent curve and latent change score modeling with longitudinal data. In K. van Montfort, J. Oud, & A. Sattora (Eds.), *Longitudinal Research with Latent Variables* (pp. 245–273). New York: Springer. https://doi.org/10.1007/978-3-642-11760-2_8

Nadkarni, A., & Hofmann, S. G. (2012). Why do people use Facebook? *Personality and Individual Differences*, *52*(3), 243–249. https://doi.org/10.1016/j.paid.2011.11.007

Oberle, E., Schonert-Reichl, K. A., & Zumbo, B. D. (2011). Life satisfaction in early adolescence: Personal, neighborhood, school, family, and peer influences. *Journal of Youth and Adolescence*, *40*(7), 889–901. https://doi.org/10.1007/s10964-010-9599-1

Orben, A., Dienlin, T., & Przybylski, A. K. (2019). Social media's enduring effect on adolescent life satisfaction. *PNAS*, *116*(21), 10226–10228. https://doi.org/10.1073/pnas.1902058116

Pieters, D., De Valck, E., Vandekerckhove, M., Pirrera, S., Wuyts, J., Exadaktylos, V., … Cluydts, R. (2014). Effects of pre-sleep media use on sleep/wake patterns and daytime functioning among adolescents: The moderating role of parental control. *Behavioral Sleep Medicine*, *12*(6), 427–443. https://doi.org/10.1080/15402002.2012.694381

Pinquart, M. (2016). Associations of parenting styles and dimensions with academic achievement in children and adolescents: A meta-analysis. *Educational Psychology Review*, *28*(3), 475–493. https://doi.org/10.1007/s10648-015-9338-y

Pinquart, M. (2017a). Associations of parenting dimensions and styles with externalizing

problems of children and adolescents: An updated meta-analysis. *Developmental Psychology*, *53*(5), 873–932. https://doi.org/10.1037/dev0000295

Pinquart, M. (2017b). Associations of Parenting Dimensions and Styles with Internalizing Symptoms in Children and Adolescents: A Meta-Analysis. *Marriage and Family Review*, *53*(7), 613–640. https://doi.org/10.1080/01494929.2016.1247761

Pittman, M., & Reich, B. (2016). Social media and loneliness: Why an Instagram picture may be worth more than a thousand Twitter words. *Computers in Human Behavior*, *62*, 155–167. https://doi.org/10.1016/j.chb.2016.03.084

Post, A., Gilljam, H., Bremberg, S., & Galanti, M. R. (2012). Psychosocial determinants of attrition in a longitudinal study of tobacco use in youth. *Scientific World Journal*, *2012*, 1–7. https://doi.org/10.1100/2012/654030

Preacher, K. J., Wicham, A. L., MacCallum, R. C., Briggs, N. E., Wichman, A. L., MacCallum, R. C., … Preacher, K. J., Wichman, A. L., MacCallum, R. C., & Briggs, N. E. (2008). *Latent Growth Curve Modeling*. Thousand Oaks, CA, CA: Sage.

Proctor, C. L., Linley, P. A., & Maltby, J. (2009). Youth life satisfaction: A review of the literature. *Journal of Happiness Studies*, *10*(5), 583–630. https://doi.org/10.1007/s10902-008-9110-9

Quinn, S., & Oldmeadow, J. A. (2013). Is the Igeneration a 'we' generation? Social networking use among 9- to 13-year-olds and belonging. *British Journal of Developmental Psychology*, *31*(1), 136–142. https://doi.org/10.1111/bjdp.12007

Reich, S. M., Subrahmanyam, K., & Espinoza, G. (2012). Friending, IMing, and hanging out face-to-face: Overlap in adolescents' online and offline social networks. *Developmental Psychology*, *48*(2), 356–368. https://doi.org/10.1037/a0026980

Rose, A. J., & Rudolph, K. D. (2006). A review of sex differences in peer relationship processes:

Potential trade-offs for the emotional and behavioral development of girls and boys. *Psychological Bulletin*, *132*(1), 98–131. https://doi.org/10.1037/0033-2909.132.1.98

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68

Sallis, J. F., Prochaska, J. J., & Taylor, W. C. (2000). A review of correlates of physical activity of children and adolescents. *Medicine and Science in Sports and Exercise*, *32*(5), 963–975.

Sampasa-Kanyinga, H., & Hamilton, H. A. (2015). Social networking sites and mental health problems in adolescents: The mediating role of cyberbullying victimization. *European Psychiatry*, *30*(8), 1021–1027. https://doi.org/10.1016/j.eurpsy.2015.09.011

Schwarz, B., Mayer, B., Trommsdorff, G., Ben-Arieh, A., Friedlmeier, M., Lubiewska, K., … Peltzer, K. (2012). Does the Importance of Parent and Peer Relationships for Adolescents' Life Satisfaction Vary Across Cultures? *Journal of Early Adolescence*, *32*(1), 55–80. https://doi.org/10.1177/0272431611419508

Sorbring, E. (2014). Parents' Concerns About Their Teenage Children's Internet Use. *Journal of Family Issues*, *35*(1), 75–96. https://doi.org/10.1177/0192513X12467754

Spaeth, M., Weichold, K., & Silbereisen, R. K. (2015). The development of leisure boredom in early adolescence: Predictors and longitudinal associations with delinquency and depression. *Developmental Psychology*, *51*(10), 1380–1394. https://doi.org/10.1037/a0039480

Stattin, H., & Kerr, M. (2000). Parental monitoring: A reinterpretation. *Child Development*, *71*(4), 1072–1085.

Štulhofer, A., Tafro, A., & Kohut, T. (2019). The dynamics of adolescents' pornography use and psychological well-being: A six-wave latent growth and latent class modeling approach. *European Child & Adolescent Psychiatry*. https://doi.org/10.1007/s00787-019-01318-4

Subrahmanyam, K., Smahel, D., & Greenfield, P. (2006). Connecting developmental constructions to the internet: Identity presentation and sexual exploration in online teen chat rooms. *Developmental Psychology*, *42*(3), 395–406. https://doi.org/10.1037/0012-1649.42.3.395

Symons, K., Ponnet, K., Emmery, K., Walrave, M., & Heirman, W. (2017). Parental Knowledge of Adolescents' Online Content and Contact Risks. *Journal of Youth and Adolescence*, *46*(2), 401–416. https://doi.org/10.1007/s10964-016-0599-7

Tomyn, A. J., & Cummins, R. A. (2011). The Subjective Wellbeing of High-School Students: Validating the Personal Wellbeing Index-School Children. *Social Indicators Research*, *101*(3), 405–418. https://doi.org/10.1007/s11205-010-9668-6

Tromholt, M. (2016). The Facebook Experiment: Quitting Facebook Leads to Higher Levels of Well-Being. *Cyberpsychology, Behavior, and Social Networking*, *19*(11), 661–666. https://doi.org/10.1089/cyber.2016.0259

Tsitsika, A. K., Tzavela, E. C., Janikian, M., Ólafsson, K., Iordache, A., Schoenmakers, T. M., … Richardson, C. (2014). Online social networking in adolescence: Patterns of use in six European countries and links with psychosocial functioning. *Journal of Adolescent Health*, *55*(1), 141–147. https://doi.org/10.1016/j.jadohealth.2013.11.010

Twenge, J. M., Martin, G. N., & Campbell, W. K. (2018). Decreases in psychological well-being among American adolescents after 2012 and links to screen time during the rise of smartphone technology. *Emotion*, *18*(6), 765–780. https://doi.org/10.1037/emo0000403

Underwood, M. K., & Ehrenreich, S. E. (2017). The power and the pain of adolescents' digital communication: Cyber victimization and the perils of lurking. *American Psychologist*, *72*(2), 144–158. https://doi.org/10.1037/a0040429

Valenzuela, S., Park, N., & Kee, K. F. (2009). Is there social capital in a social network site?:

Facebook use and college students' life satisfaction, trust, and participation. *Journal of Computer-Mediated Communication*, *14*(4), 875–901. https://doi.org/10.1111/j.1083-6101.2009.01474.x

Valkenburg, P. M., Peter, J., & Schouten, A. P. (2006). Friend networking sites and their relationship to adolescents' well-being and social self-esteem. *CyberPsychology & Behavior*, *9*(5), 584–590. https://doi.org/10.1089/cpb.2006.9.584

Valois, R. F., Zullig, K. J., Huebner, E. S., & Drane, J. W. (2004). Physical activity behaviors and perceived life satisfaction among public high school adolescents. *Journal of School Health*, *74*(2), 59–65.

Vandenbosch, L., & Eggermont, S. (2015). The interrelated roles of mass media and social media in adolescents' development of an objectified self-concept: A longitudinal study. *Communication Research*, *45*(August). https://doi.org/10.1177/0093650215600488

Verduyn, P., Lee, D. S., Park, J., Shablack, H., Orvell, A., Bayer, J., … Kross, E. (2015). Passive facebook usage undermines affective well-being: Experimental and longitudinal evidence. *Journal of Experimental Psychology: General*, *144*(2), 480–488. https://doi.org/10.1037/xge0000057

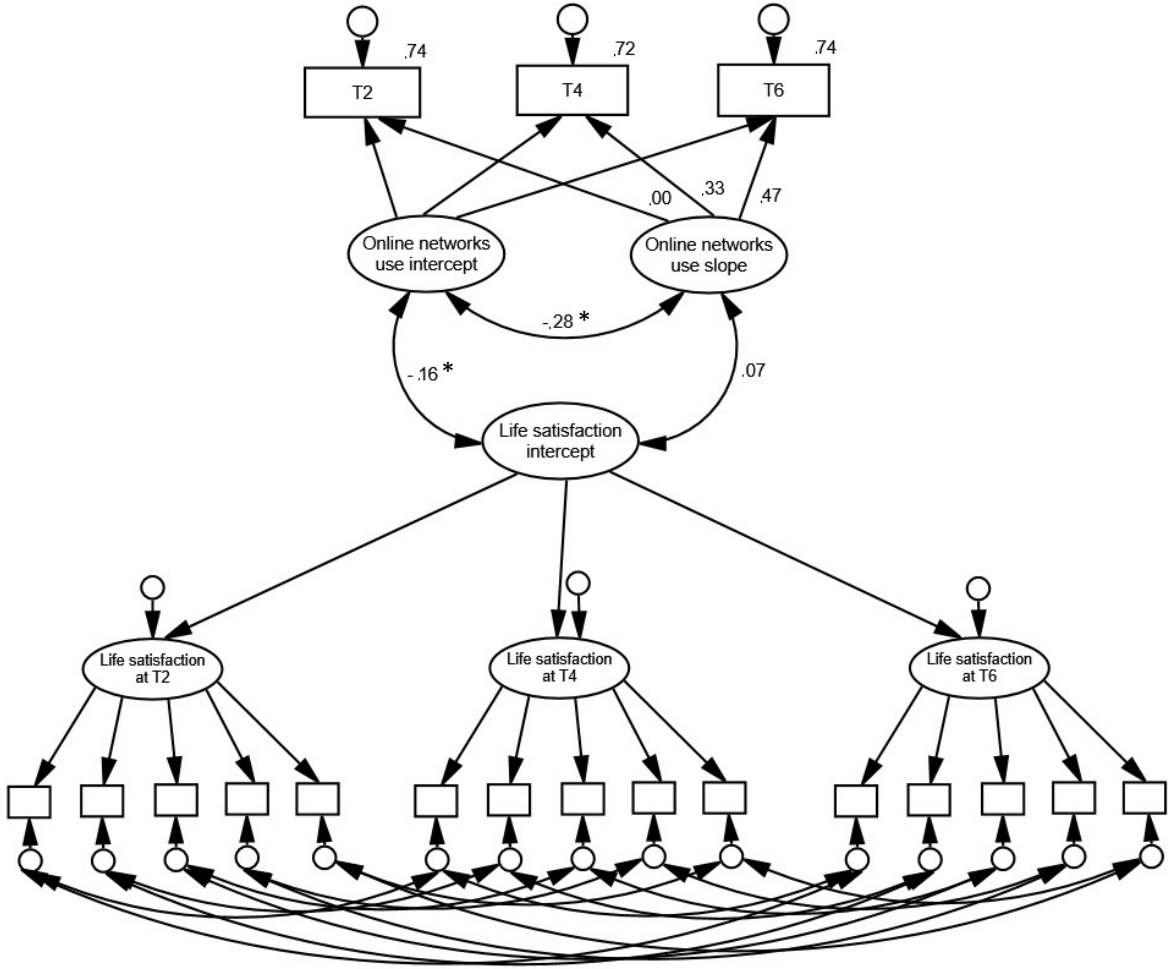
Vogel, E. A., Rose, J. P., Roberts, L. R., & Eckles, K. (2014). Social comparison, social media, and self-esteem. *Psychology of Popular Media Culture*, *3*(4), 206–222. https://doi.org/10.1037/ppm0000047

Table 1 – Associations between the Key Constructs Over Time

	OSN use at T2	OSN use at T4	OSN use at T6	LS at T2	LS at T4	LS at t6	Parental engagement	$M_{females}(SD)$	M_{males} (SD)
OSN use at T2		.68**	.62**	-.09*	-.05	-.10*	-.06	3.50 (1.86)	2.39 (1.68)
OSN use at T4	.48**		.73**	-.07	-.05	-.08	-.00	3.59 (1.84)	2.58 (1.73)
OSN use at T6	.49**	.68**		-.09	-.07	-.10*	-.05	3.75 (1.78)	2.70 (1.71)
LS at T2	.10*	.10*	.17**		.69**	.63**	.38**	4.12 (0.66)	4.32 (0.60)
LS at T4	.11*	.04	.12	.65**		.61**	.32**	4.14 (0.67)	4.28 (0.62)
LS at T6	.12	-.01	.10	.59**	.68**		.30**	4.17 (0.64)	4.19 (0.64)
Parental engagement	-.07	-.02	-.07	.30**	.26**	.17**		1.73 (.44)	1.67 (.47)

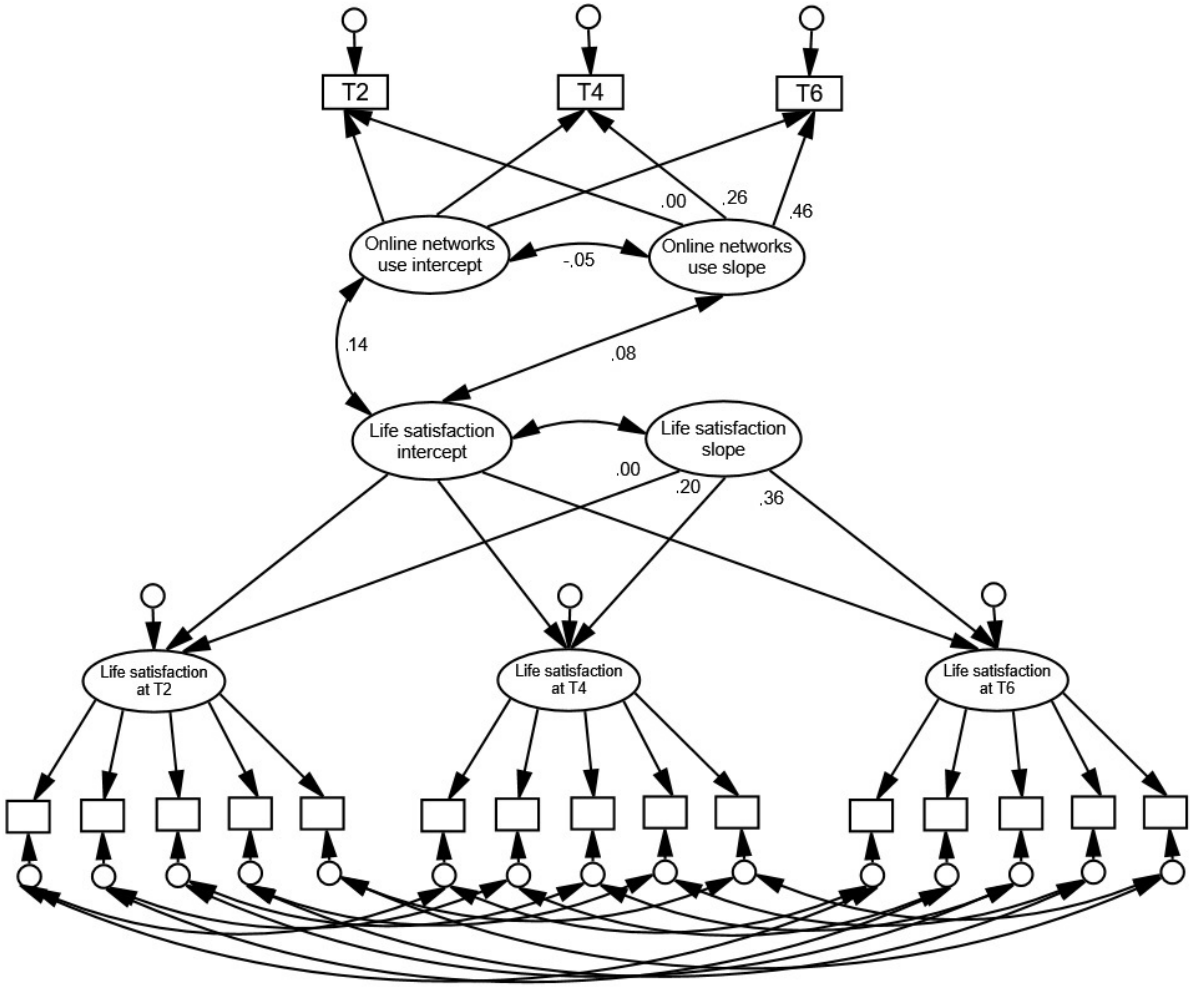
Note. Zero-order correlation coefficients in the female adolescent sample are presented above the main diagonal and coefficients for their male peers below the main diagonal; OSN - online social networks; LS - life satisfaction; * $p < .05$, ** $p < .01$

Figure 1 – Parallel Growth in the Use of Online Social Networks and Life Satisfaction in Female Croatian Adolescents (n = 701)



Notes. Model fit: $\chi^2_{(120)}$ = 203.68, TLI = .977, CFI = .984, RMSEA = .032 (.024-.039); * p < .01; standardized path coefficients are presented

Figure 2 – Parallel Growth in the Use of Online Social Networks and Life Satisfaction in Male Croatian Adolescents (n = 456)



Notes. Model fit: $\chi^2_{(129)}$ = 199.66, TLI = .966, CFI = .975, RMSEA = .035 (.025-.044); standardized path coefficients are presented