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Beyond screen time: Multidimensionality of socio-digital participation and relations to academic well-being in three educational phases

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ABSTRACT

This study contributes to the research on the differences in young peoples' approaches to socio-digital participation (SDP). We first investigated the differences in SDP between three samples of Finnish students (i.e., elementary school 6th grade, n = 741; high school 1st year, n = 1317; higher education 1st year, n = 1232) and then looked at how these differences are associated with academic well-being. We used exploratory structural equation modeling to investigate the factor structure of SDP and further structural relations to study engagement and study burnout. Despite some differences between the three student cohorts regarding the factor structure of SDP, the same five dimensions of participation were identified in all of them: social networking oriented participation, knowledge-oriented participation, media-oriented participation, action gaming, and social gaming. In the high school sample also a sixth factor, blogging-oriented participation, differentiated from the knowledge oriented dimension. Taken together, using digital technologies to communicate and maintain social networks (social networking), was consistently either related to lower study engagement or to higher study burnout. Playing of action and sports games (action gaming) was related in all samples either to lower engagement or higher cynicism. Using digital tools to gain and share knowledge (knowledge-oriented) was, in contrast, related to higher study engagement. The results demonstrate that students' digital activities reflect multiple dimensions that are differently related to academic well-being. This study sheds light on the complexity of young peoples' SDP orientations and their related outcomes such as socio-emotional and motivational functioning.

1. Introduction

Since the introduction of the “digital natives” metaphor (Prensky, 2001), there has been debates claiming that today's young people would be either disconnected in schools (e.g., Selwyn, 2006) or “destroyed as a generation” (Twenge, 2017a; 2017b) by digital technologies having a negative effect on their social and emotional functioning. This study contributes and adds depth to the discussion by empirically tapping into the different ways adolescent engage with these digital technologies and their relations to academic well-being from early adolescence to young adulthood. This phase can be contextualized as a critical phase of development characterized by various developmental tasks (e.g., Dietrich, Parker, & Salmela-Aro, 2012; Eccles, 2004) including the psychophysiological maturation of cognitive, emotional, and social functioning (e.g., Burnett, Sebastian, Kadosh, & Blakemore, 2011), identity formation and building of social relations (e.g., Baumeister & Leary, 1995; Havighurst, 1948; Maurizi, Grogan-Kaylor, Granillo, & Delva, 2013) and the development of individual interests (Barron, 2006) through activities that appear to be increasingly mediated by digital tools (Hur & Gupta, 2013). Simultaneously, during this life phase students negotiate through their educational track and are expected to perform and build competencies needed in the future, posing challenges in terms of academic and general well-being (e.g., Roeser, Eccles, & Sameroff, 1998). It is important to see what role digital activities play in this development.

The digital activities of students were conceptualized as socio-digital participation (SDP; see Hakkarainen, Hietajärvi, Alho, Lonka, & Salmela-Aro, 2015). The concept takes into account that digital activities are social in the sense that they involve direct or artifact-mediated networking interaction and involve participation in culturally mediated activities (Gee & Hayes, 2011; Ito et al., 2010; Jenkins, 2009) motivated by, for instance, friendship-driven (maintaining of social networks) or interest-driven (pursuing personal interests) motives (Ito et al., 2010). Further, we focus on the underlying multiple dimensions out of which

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previously has been recognized at least social networking/communicating oriented participation (chatting, communicating), knowledge-oriented participation (knowledge seeking and sharing knowledge), media-oriented participation (creating and sharing media), and digital gaming (e.g., Eynon & Malmberg, 2011; Hietajärvi, Seppä, & Hakkarainen, 2016; Kennedy, Judd, Dalgarno, & Waycott, 2010; Li, Hietajärvi, Palonen, Salmela-Aro, & Hakkarainen, 2016; Thompson, 2013; Van den Beemt, Akkerman, & Simons, 2011).

Further, SDP has been proposed to facilitate learning through social participation and appropriation of new skills (Barron, 2006; Chassiakos, Radesky, Christakis, Moreno, & Cross, 2016; Granic, Lobel, & Engels, 2014; Hakkarainen et al., 2000; Ito et al., 2010; Li et al., 2016; Moisala et al., 2016a; Scardamalia & Bereiter, 2014). Therefore, beyond merely "using technologies", we identify SDP as informally emerging social participation that provides affordances for connected learning (e.g., Kumpulainen & Sefton-Green, 2012), that is, learning extended across time, space, networks and tools, situated in the reciprocal interactive processes between the learners and their social ecologies (Nardi & O'Day, 2000). Further, much of this has been identified as happening in informal, out-of-school, contexts (Kumpulainen & Sefton-Green, 2012). Considering this, there is a reason to suspect that the educational outcomes of SDP are not homogeneous, and that to rely on a simplistic unidimensional concept of "screen time" is not enough (see Bell, Bishop, & Przybylski, 2015).

The goal of the present study was, therefore, to expand our knowledge about students' out-of-school digital technology use by exploring multidimensionality of digital activities in groups from three distinct educational phases (elementary school, high school, and higher education). A further goal was to examine how this multidimensionality is related to academic well-being conceptualized as study engagement and burnout. More precisely, study engagement was defined as consisting of emotional, cognitive, and behavioral components: energy, dedication, and absorption (Salmela-Aro & Upadaya, 2012). Study burnout (Salmela-Aro, Kiuru, Leskinen, & Nurmi, 2009), was defined as consisting of three dimensions: emotional exhaustion due to study demands, a cynical and detached orientation towards school, and feelings of inadequacy as a student (Salmela-Aro et al., 2009).

1.1. SDP and academic well-being

As highlighted above, SDP (and gaming) have been associated with positive outcomes, at least among some students (see also Naqshbandi, Ainin, Jaafar, Liyana & Shuib, 2017). Another debate has focused on the possible risks related with intensive digital activities, but with a lack of consensus in the field (see Bell et al., 2015). Meta-analyses on the relation between the use of digital media and general well-being suggest a small negative effect (e.g., Huang, 2010; 2017), and individual studies show mixed results. Studies of higher education students and adults, for instance, suggest a negative relation between digital participation and academic adjustment and self-esteem (Kalpidou, Costin, & Morris, 2011) and mental-health (Shakya & Christakis, 2017) when others differentiate the effects with regards to the tone of feedback (Valkenburg, Peter, & Schouten, 2006) or strength of social ties (Burke & Kraut, 2016). Furthermore, some studies suggest that use of social media has negative (e.g. Kirschner & Karpinski, 2010) or positive (e.g. Ainin, Naqshbandi, Moghavvemi, Jaafar, 2015) effects on academic performance whereas others reveal differing relations from social media to student engagement (e.g., Junco, 2012a) and performance (Junco, 2012b) as a function of type of usage, that is, some activities have negative outcomes whereas other positive. Nevertheless, it appears that at least excessive use of digital technologies is consistently related to issues in both overall and academic well-being (Holmgren & Coyne, 2017; Przybylski & Weinstein, 2017; Salmela-Aro, Upadyaya, Hakkarainen, Lonka, & Alho, 2016b). Furthermore, problems with academic well-being have been shown to spill over to general well-being (Salmela-Aro & Upadyaya, 2014). Prior studies also indicate that differences in student school motivation are associated with differences in SDP (Hietajärvi, Tuominen-Soini, Hakkarainen, Salmela-Aro, & Lonka, 2015).

There are two main competing hypotheses in explaining the relationship between SDP and well-being outcomes in general, and academic outcomes in particular: one can be described as the *digital Goldilocks hypothesis*, referring to an understanding that moderate technology use is not harmful but excessive digital engagement can displace alternate activities that are known to be linked to well-being, such as spending time with friends, reading, or exercise (see e.g., Przybylski & Weinstein, 2017). From a psychological point of view the digital Goldilocks hypothesis can be approached from the theoretical framework of the demands-resources model (see e.g., Salmela-Aro & Upadyaya, 2014). In this framework the potential negative effects of SDP on academic well-being can indicate an imbalance between study demands and individual psychological resources that may be depleted in the case of excessive digital activities, leading to lower academic well-being through the energy-depletion process (Salmela-Aro & Upadyaya, 2014). It again may not be such a direct relationship, as SDP can also be providing novel resources that support study activities and lead to higher study engagement in line with the motivational process: increased resources may spill over to higher motivation (Salmela-Aro & Upadyaya, 2014). That said, the empirical evidence to support the digital Goldilocks hypothesis so far relies on a rather simple operationalization of SDP, measured with rudimentary one-item measures such as time spent "using computers" (see Przybylski & Weinstein, 2017).

A second general hypothesis relevant specifically in the educational context is the *gap hypothesis* (see e.g., Kumpulainen & Sefton-Green, 2012; Prensky, 2001) which proposes that students who are engaged in SDP out of school, and would prefer to use technologies for learning in school, are possibly disengaged in traditional school, perhaps because their out-of-school interests and competencies are not recognized (Rajala, Kumpulainen, Hilppö, Paananen, & Lipponen, 2015). This is possible in the Finnish context as technology-enhanced pedagogies are not used that intensively in schools (OECD, 2015). Also globally, it appears that many students have their most engaging experiences with SDP outside of the school environment (e.g., Chen & Hong, 2016; McFarlane, 2015). This suggestion is supported by findings indicating that students reporting more cynicism towards schoolwork also reported that they would be more engaged in their schoolwork if they were able to use more digital technologies (Salmela-Aro, Muotka, Alho, Hakkarainen, & Lonka, 2016a).

2. The present study

In the present study we set out to move beyond the concept of "screen time" and examine the multidimensionality of SDP across different samples of students, and to use an empirically explorative approach to analyze the relationship of SDP to study engagement and to study burnout, which, to our knowledge, is a novel setting. The Goldilocks and gap hypotheses were adopted as interpretative frameworks while the effects on academic well-being were approached through prior work on the demands-resources model (e.g., Salmela-Aro & Upadyaya, 2014).

As the role of context (e.g., educational) in development from early adolescence to young adulthood is crucial (e.g., Roeser, Eccles, & Sameroff, 2000; Steinberg & Morris, 2001), it is necessary to examine SDP across various groups of students and educational stages. Besides representing different educational stages the three cohorts in this study were born and have grown up in very different times regarding the prominence of digital technologies. The younger adolescents who are sometimes referred to as "born digital" (Palfrey & Gasser, 2013) have engaged in various forms of SDP from very early on whereas the young adults adopted novel digital technologies at a later age.

The first aim of the study was to examine *how the frequencies of*

different digital activities are distributed in elementary school, high school, and higher education samples. This was done to provide an explorative overview of the students' digital activities. The second aim was to examine *what kinds of an underlying multidimensional structure of SDP orientations do the different digital activities reflect* and if the three groups would show similar structures. Regarding this we expected that we could identify similar approaches to SDP as recognized previously, that is social networking oriented participation, knowledge-oriented participation, media oriented participation, and different types of gaming orientations (e.g. Hietajärvi et al., 2016). The third aim of the paper was to examine *how the dimensions of SDP are related to academic well-being in terms of study engagement and burnout.* Considering the findings that link excessive digital technology use and school burnout (Salmela-Aro et al., 2016b) and willingness to use digital technologies in school with cynicism (Salmela-Aro et al., 2016a), we expected to uncover some associations between SDP and academic well-being that would indicate either an imbalance between the demands and resources, or a gap between adolescents' digital practices and their educational environment. However, due to the mixed results reported in previous studies we explored this as an open empirical question.

3. Method

3.1. Participants

The elementary school student data were collected in May 2013 from 33 schools in Helsinki, Finland ($N = 741$; Male = 43.7%, Female = 56.3%). The participants were attending sixth grade ($M_{age} = 13.02$, $SD = 0.18$). The high school student data were collected between December 2013 and January 2014 from 18 high schools in Helsinki, Finland ($N = 1317$; Male = 32.6%, Female = 67.4%) out of which 16 were public high schools and two were private. The participants were attending their first year in high school ($M_{age} = 16.04$, $SD = 0.39$). The higher education student data were collected between December 2013 and October 2014 from three institutions providing higher education in the Helsinki metropolitan area ($N = 1232$; Male = 34.6%, Female = 65.4%). The participants were first year students from 76 different degree programs ($M_{age} = 23.64$, $SD = 5.58$).

The participants filled in a self-report questionnaire on SDP and academic well-being. Most participants completed the questionnaire during school hours or lectures, but some of the higher education students received an electronic form which they could fill in at any time. Participation in the study was voluntary and informed consent forms were collected from the students and from their parents in the case of participants under the age of 18. The study protocol was approved by the University of Helsinki Ethical Review Board in the Humanities and Social and Behavioral Sciences.

3.2. Measures

3.2.1. Socio-digital participation

The SDP measure (see e.g. Hietajärvi et al., 2016, Moisala et al., 2016a; 2016b) consisted of 33 items (32 items were used in the elementary school questionnaire). The multi-item instrument is designed and previously used to assess different approaches and latent orientations to digital participation (Hietajärvi et al., 2016) especially among adolescents.

Items measuring technology-mediated communication and maintenance of social relations ("I visit and send messages at social media sites") were used to assess *social networking oriented participation*, while *knowledge-oriented participation* was assessed with items measuring activities related to acquiring, discussing, creating, and sharing knowledge on different platforms (e.g., "I search for new information about my hobbies or things I am interested in," with one additional item, which was included only on the later high school and higher education questionnaires: "I learn new skills related to my hobbies or things I am interested in"). Items measuring creation and sharing of media artefacts (e.g., "I share music that I have created or mixed") were used to assess *media-oriented participation*, and an array of questions inquired about the frequency of different types of *gaming* (e.g., "How often do you play … music, rhythm, or dance games?"; "… sports games?"; "… first-person shooters?"). A benefit of the SDP-inventory is that it taps into a wide array of gradually more complex digital activities (inc. gaming). All items assessing SDP and gaming were rated using a 7-point frequency scale ranging from 1 (= never) to 7 (= all the time). Item means and 95% confidence intervals are given in Fig. 1.

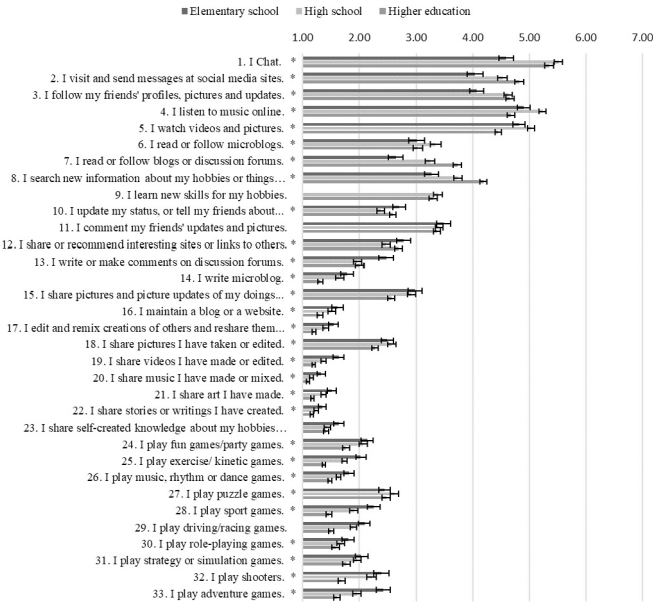

Fig. 1. Univariate means and 95% confidence intervals for socio-digital participation items. Note: Asterisk indicates statistically significant $p < .005$ differences between samples (Kruskall-Wallis -test). Item 9 included only in high school and higher education samples.

3.2.2. Academic well-being

Academic well-being included study engagement and study burnout. *Study engagement* was assessed using the schoolwork engagement inventory (i.e., EDA abbreviated from energy, dedication, and absorption; Salmela-Aro & Upadaya, 2012) which is based on the Utrecht Work Engagement Scale originally developed by Schaufeli, Bakker, and Salanova (2006).

The inventory consists of three subscales, each including three items, measuring energy (e.g., "When I study, I feel I'm bursting with energy"), dedication (e.g., "I am enthusiastic about my studies"), and absorption (e.g., "Time flies when I'm studying"). However, the EDA is generally specified as a unidimensional measurement model (Salmela-Aro & Upadaya, 2012) indicating a general study-related positive state of mind. EDA items were rated on a scale ranging from 1 (= never) to 7 (= every day).

Study burnout was assessed using the school burnout inventory (SBI; Salmela-Aro et al., 2009), based on the Bergen Burnout Inventory (BBI-15; Näätänen, Aro, Matthiesen, & Salmela-Aro, 2003) by changing the work context to the school context. The SBI consists of three subscales: *emotional exhaustion at school* (3 items, e.g., "I feel overwhelmed by my schoolwork"), *cynicism towards the meaning of school* (3 items, e.g., "I feel that I'm losing interest in my schoolwork"), and *sense of inadequacy as a student* (2 items, e.g., "I often have feelings of inadequacy in my schoolwork"). The SBI items were rated on a scale ranging from 1 (= completely disagree) to 6 (= completely agree).

Both the EDA and SBI have been modified to fit the school context as well as widely used across different age samples (Salmela-Aro & Read, 2017; Tuominen-Soini & Salmela-Aro, 2014) and outcomes

Table 1
Summary of descriptive values for study engagement and study burnout for elementary school, high school and higher education samples.

	Mean	SD	SE	Skewness	Kurtosis	Cronbach's Alpha
Elementary School						
Engagement	4.47	1.42	.05	-.44	-.55	.93
Exhaustion	2.57	1.10	.04	.77	.20	.72
Cynicism	2.27	1.24	.05	.95	.20	.78
Inadequacy	2.50	1.22	.04	.64	-.23	.78
High School						
Engagement	4.66	1.23	.03	-.56	-.23	.92
Exhaustion	3.13	1.17	.03	.28	-.63	.79
Cynicism	2.30	1.19	.03	.94	.29	.81
Inadequacy	2.87	1.20	.03	.37	-.56	.77
Higher Education						
Engagement	5.36	1.04	.03	-.98	.95	.92
Exhaustion	2.81	1.10	.03	.50	-.27	.77
Cynicism	1.79	1.00	.03	1.60	2.42	.84
Inadequacy	2.48	1.14	.03	.68	-.11	.73

(Salmela-Aro & Upadaya, 2012; Salmela-Aro et al., 2009; Wang, Chow, Hofkens & Salmela-Aro, 2015) and when combined have been shown to provide a good overview of students' academic and psychological functioning (Salmela-Aro, 2017; Upadyaya & Salmela-Aro, 2013). The raw descriptive values for study engagement and study burnout are presented in Table 1.

3.3. Analysis strategy

We followed the same analysis strategy with all three samples. First, the data were screened for multivariate outliers and missing values using the IBM Statistical Package for Social Sciences, version 24 (SPSS). In the elementary school data we identified four cases as multivariate outliers (e.g., all values in the extremes) and eliminated them: there were no outliers in the high school and higher education datasets. There were less than 5% missing values overall and less than 10% missing for any given individual item in all three data sets. Based on Little's MCAR -test, the data were not missing completely at random (elementary school: $\chi^2(6946) = 7361.143$, $p = .000$; high school: $\chi^2(6791) = 7481.900$, $p = .000$; higher education: $\chi^2(4012) = 4248.889$, $p = .005$). The data was then multiply imputed by following a stepwise method in Mplus 8.0 (Muthén & Muthén, 2015) by, first, creating a set of five two-level H1 imputed datasets using the default variance-covariance method and second, running the subsequent models on these datasets and evaluating the pooled results. Five datasets have been shown to provide sufficiently accurate estimates (Asparouhov & Muthén, 2010).

3.3.1. Exploratory structural equation modeling

Second, we estimated a set of exploratory factor analyses for the SDP items. To ensure the structural validity for our measurement models we adopted an exploratory structural equation modeling (ESEM) framework, as it is most suited for examining multidimensional phenomena (see e.g., Asparouhov & Muthén, 2009; Marsh, Liem, Martin, Morin, & Nagengast, 2011). In contrast to a more traditional confirmatory factor analysis approach (CFA), the use of exploratory structural equation modeling allowed us to specify a less restrictive exploratory factor analysis measurement model with rotations for the SDP items, as we expected that many of the items reflect more than one underlying orientation. A CFA-based model would have been too restrictive and might have resulted in distorted factors and inflated factor correlations, and subsequently led to distorted structural relations (Asparouhov & Muthén, 2009).

As the items were ordinal, the models were estimated with robust weighted least squares (WLSMV) estimation in Mplus 8.0 (Muthén & Muthén, 2015). Geomin -rotation was used with a rotation criterion of 0.01 which has been shown to provide satisfactory rotated loadings in most cases (Hattori, Zhang, & Preacher, 2017). The complex survey-data option (Muthén & Muthén, 2015; see also; Asparouhov & Muthen, 2006; Muthén & Satorra, 1995) was used in all analyses to correct for nonindependence due to the nested structure of the data at the class level in elementary and high school, and at the degree program level in higher education. These were the lowest clustering levels.

An a priori strategy was adopted to select the most parsimonious well-fitting and substantively interpretable factor model for each sample. The fit was evaluated based on the mean (and standard error) of the fit indices across the five multiple imputed datasets. The fit indices used were chi-square, root mean square error of approximation (RMSEA) with an approximate cutoff value for a good fit of less than 0.05, comparative fit index (CFI) with a cutoff value of greater than 0.96 as well as the Tucker-Lewis index (TLI) with a cutoff value of greater than 0.95 (Yu, 2002) as well as SRMR with a cut-off value $<$ 0.08.

After identifying the most suitable exploratory factor analysis model for the SDP items we specified the full model as an ESEM – CFA measurement model by adding study engagement and study burnout as latent CFA-factors. Study engagement and burnout were specified as CFA factors due to the stronger theoretical underpinnings behind the constructs (Salmela-Aro et al., 2009; Salmela-Aro & Upadaya, 2012).

The structural paths were specified so that the academic well-being components were regressed on SDP, although the opposite could be equally feasible. There is, however, no proper way to assess the direction of effects in a cross-sectional setting. Given the explorative approach, in interpreting the structural results we focused on effects with an approximate statistical significance cut-off of .005 as suggested by Benjamin et al. (2018). Effects with a more liberal statistical significance cut-off less than 0.05 are, however, also printed for review but considered as weaker evidence.

4. Results

4.1. Distribution of digital activities and academic well-being

As can be inferred from Fig. 1 the univariate distributions follow a similar pattern across the three student groups, although in general high school and higher education students reported more digital activities related to social media than did the elementary school students, while the higher education students appeared to participate less in gaming and creative activities. The highest means were generally on items reflecting social media activities and the lowest on creative activities such as creating and sharing media, with gaming in between.

Regarding the distributions of study engagement and study burnout, the samples were similar in that they all had high values for study engagement and low values for study burnout, which is typical for Finnish students, especially in rather selective settings such as high school and higher education.

4.2. Dimensions of digital activities

For the elementary school data, we selected a five-factor solution which showed a good fit (χ^2 (346) = 906.41 (16.5), RMSEA = 0.047 (0.001), CFI = 0.964 (0.001), TLI = 0.948 (0.001), SRMR = 0.035 ($<$ 0.001)). For high school data we selected a six-factor solution which showed an adequate fit (χ^2 (345) = 1372.40 (10.32), RMSEA = 0.048 ($<$ 0.001), CFI = 0.947 (0.001), TLI = 0.920 ($<$ 0.001), SRMR = 0.034 ($<$ 0.001)). For the higher education data, we selected a five-factor solution which showed a good fit (χ^2 (373) = 890.70 (5.42), RMSEA = 0.034 ($<$ 0.001), CFI = 0.949 ($<$ 0.001), TLI = 0.927 ($<$ 0.001), SRMR = 0.041 ($<$ 0.001)). The five-factor solution was well interpretable and replicated similar factors as in Hietajärvi et al. (2016), that is *social networking oriented participation*, *knowledge-oriented participation*, *media-oriented participation*, *action gaming*, and *social*

Table 2
Summary of latent factor correlations for elementary school, high school, and higher education samples.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Social networking	–									
2. Knowledge-oriented	.58 / .14									
3. Blogging-oriented	.18 / .38*	.26 / .19								
4. Media-oriented	.32 / .34	-.07 / .40	/ .00	.17						
5. Action gaming	.41 / -.51*	.06 / .45	/ .24	.02 / .29*	/ .22					
6. Social gaming	.26 / .43	-.05 / .51	/ .10	-.01 / .18	.09 / / .31	.09 / .22	/ -.06	.06		
7. Engagement	-.16* / -.04	-.04 / .17	/ .09	-.04 / .01	-.05 / / .07*	-.06* / / -.13	/ -.13	-.11* / .02	/ -.07	.08
8. Exhaustion	.26* / .02	.13* / .13	/ .00	.18* / .27*	/ .11 / .06*	.09 / / -.02	/ -.02	-.11* / .16	/ .04	.08 / -.33*
9. Cynicism	.24* / -.04	.06 / .04	/ .01	.15* / .16*	/ .17* / .06	.21* / / .17*	/ .17*	.08 / .06	/ .10*	.00 / -.67*
10. Inadequacy	.27* / .02	.12* / .06	/ -.01	.19* / .23*	/ .16* / .02	.21* / / .10*	/ .10*	.03 / .12	/ .05	.01 / -.48*
										/ -.58*

	8.	9.	10.
7.	-.20* / -.29*		
8.	-.58* / -.68*	.79* / .53*	
9.	-.42* / /	.89* / .84*	.94* / .83*
10.			.91* / .94*

Note: * = $p < .005$. *Values for elementary school and high school are separated by slash, respectively, higher education below.*

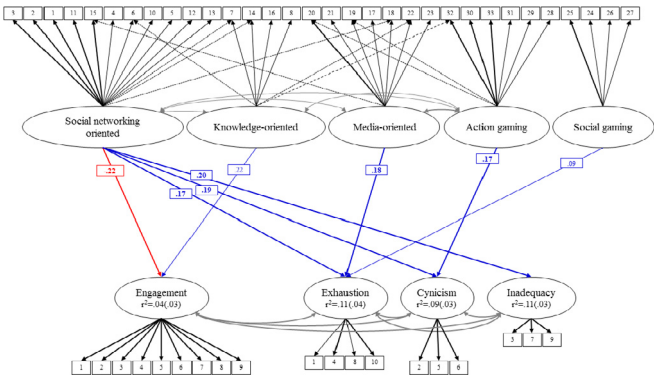

Fig. 2. Elementary school model. Thicker lines in measurement model represent factor loadings > 0.7, narrower < 0.7. Dashed lines represent cross-loadings and longer dashes represent negative cross-loadings. Thicker structural paths represent effects with a statistical significance of < 0.005, narrower < 0.05. Factor loadings < 0.3, insignificant paths and error variances omitted.

gaming, while in the six-factor solution selected for the high school data, the *knowledge-oriented* factor was split into two factors with a novel *blogging-oriented* being the new factor.

Then we specified measurement models in which also the latent variables for study engagement and burnout were included. The models fit the data well (elementary school: χ^2 (1080) = 1654.48 (16.25), RMSEA = 0.027 (< 0.001), CFI = 0.972 (0.001), TLI = 0.967 (0.001), SRMR = 0.042 (< 0.001), high school: χ^2 (1094) = 2214.71 (10.03), RMSEA = 0.028 (< 0.001), CFI = 0.968 (< 0.001), TLI = 0.961 (< 0.001), higher education: χ^2 (1126) = 1729.07 (5.14), RMSEA = 0.022 (< 0.001), CFI = 0.968 (< 0.001), TLI = 0.963 (< 0.001), SRMR = 0.044 (< 0.001)). In sum, the measurement model fits were all acceptable and indicated sufficient structural validity for the measures used. Latent factor correlations are presented in Table 2, and factor loadings and r^2 are given in Appendix.

4.2.1. Social networking

As illustrated in Figs. 2–4, social networking-oriented participation was mainly reflected by activities for communicating with friends through social media. Across the three student groups the five highest loading items were the same, whereas in the elementary school sample social networking was also reflected through primary loadings on more production oriented social media-related activities. Sharing of photos had cross-loadings in all three samples, and an item relating to sharing updates which had primary loading in the elementary school sample had notable cross-loadings in the other two samples. Otherwise there were some expected cross-loadings with items measuring other social-

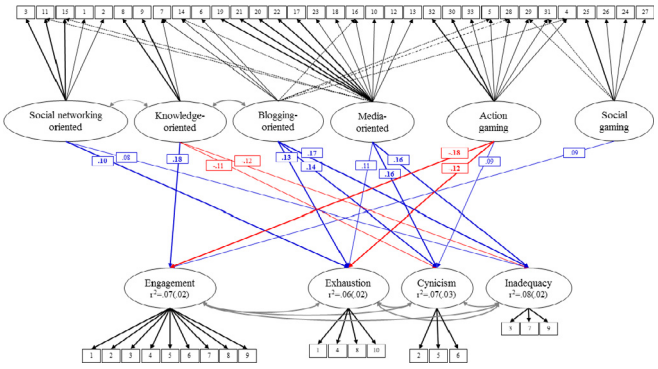

Fig. 3. High school model. Thicker lines in measurement model represent factor loadings > 0.7, narrower < 0.7. Dashed lines represent cross-loadings and longer dashes represent negative cross-loadings. Thicker structural paths represent effects with a statistical significance of < 0.005, narrower < 0.05. Factor loadings < 0.3, insignificant paths and error variances omitted.

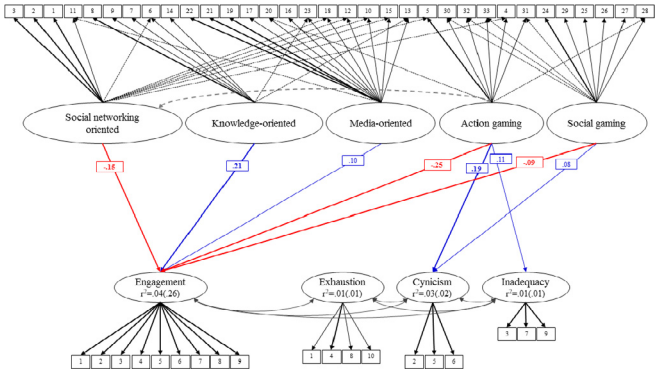

Fig. 4. Higher education model. Thicker lines in measurement model represent factor loadings > 0.7, narrower < 0.7. Dashed lines represent cross-loadings and longer dashes represent negative cross-loadings. Thicker structural paths represent effects with a statistical significance of < 0.005, narrower < 0.05. Factor loadings < 0.3, insignificant paths and error variances omitted.

media related activities and media consumption (video, music).

4.2.2. Knowledge-oriented participation

Knowledge-oriented participation was reflected mainly through the use of social media to gain and share information related, for example, to one's interests. However, only two items had consistent primary loadings across the three samples, both related to knowledge acquisition. In the elementary school sample, the other primary loadings and the cross-loadings related to sharing of information, following and posting updates. In the high school sample, the primary items were related to acquiring information with the added item relating to learning new skills, with no cross-loadings.

A separate *blogging-oriented* participation factor was also identified in the high school sample which was reflected by activities relating explicitly to blogging – the primary items captured reading and writing tweets (items 14 and 6), whereas the cross-loadings captured other blogging-related activities such as reading or maintaining a blog, as well as media consumption.

In the higher education sample, the knowledge-oriented factor reflected the same activities as the high school knowledge- and blogging-factors combined, with cross-loading for sharing knowledge on discussion forums.

4.2.3. Media-oriented participation

Media-oriented participation was reflected through more long-term and complex activities related to creating and sharing media (video, picture, music, etc.) artefacts. The same media-related items accounted for the main primary loadings across all three samples. This orientation differs from the social networking orientation in that it is reflected by more complex and long-term creative activities (e.g. creating and editing music) in contrast to the day-to-day sharing of short-term content (e.g. mobile pictures) in social media. In the elementary school sample there was only one cross-loading which was for picture-mediated communication. In the high school and higher education samples, however, besides being reflected by engagement with media artefacts, the factor also had loadings and cross-loadings for items related to creating and sharing other kinds of content.

4.2.4. Action gaming

Action gaming was reflected mainly through playing first person shooter (FPS) games, role-playing games (RPG), and adventure games. In the elementary and high school samples, also items for driving and sports games loaded on the factor. In the high school and higher education samples the factor was, interestingly, also reflected by media consumption.

4.2.5. Social gaming

Social gaming was reflected through playing of games with social motives such as exercise, fun, puzzle, and music games in all three samples. In the elementary school sample there was also a cross-loading for driving games. In the high school sample there was cross-loading for driving games and for strategy games, and in the higher education sample there was primary loading for driving and sports games as well as cross-loading for all action games.

4.3. Structural model

After exploring the multidimensional structure of the activities that make up adolescents' SDP, we turned to examine how the factors that emerged are related to study engagement and study burnout. No covariates or additional constrains were added, so the fit of the structural models remained identical to the full measurement models presented earlier. All unstandardized structural path coefficients are presented in Table 3.

As shown in Fig. 2 and Table 3, in the elementary school sample, social networking-oriented participation related negatively to study

Table 3
Summary of unstandardized path coefficients for elementary school, high school and higher education models.

	Engagement					Exhaustion					Cynicism					Inadequacy				
	est	se	95% CI		*p*	est	se	95% CI		*p*	est	se	95% CI		*p*	est	se	95% CI		*p*
Elementary school																				
Social networking	-.17	.05	-.27	-.08	.000	.10	.03	.04	.17	.001	.15	.04	.07	.23	.000	.15	.04	.07	.22	.000
Knowledge-oriented	.17	.06	.05	.30	.006	.02	.03	-.04	.08	.525	-.05	.04	-.13	.04	.300	-.04	.04	-.11	.03	.255
Media-oriented	.05	.06	-.08	.17	.448	.11	.03	.05	.17	.001	.04	.04	-.05	.12	.384	.08	.04	.00	.16	.052
Action gaming	-.06	.04	-.14	.02	.125	-.01	.03	-.07	.05	.688	.13	.04	.05	.21	.001	.10	.04	.03	.18	.006
Social gaming	.00	.04	-.08	.07	.948	.06	.03	.00	.11	.039	.01	.04	-.06	.08	.730	.05	.04	-.03	.12	.212
High school																				
Social networking	-.03	.03	-.09	.02	.253	.07	.02	.03	.11	.001	.03	.03	-.03	.08	.312	.06	.03	.01	.11	.020
Knowledge-oriented	.15	.03	.09	.21	.000	-.03	.03	-.08	.03	.373	-.09	.04	-.15	-.02	.015	-.08	.03	-.14	-.02	.008
Blogging-oriented	-.06	.03	-.12	.01	.112	.09	.03	.03	.15	.002	.12	.03	.05	.18	.001	.12	.03	.06	.17	.000
Media-oriented	-.06	.03	-.12	.00	.052	.08	.03	.02	.14	.012	.13	.03	.06	.19	.000	.11	.03	.06	.17	.000
Action gaming	-.14	.03	-.20	-.09	.000	-.09	.03	-.14	-.04	.001	.07	.03	.01	.13	.022	.03	.03	-.03	.09	.319
Social gaming	.07	.03	.02	.13	.013	.05	.03	.00	.11	.053	-.03	.04	-.10	.04	.430	-.01	.03	-.07	.04	.614
Higher education																				
Social networking	-.12	.03	-.19	-.06	.000	-.01	.03	-.06	.05	.834	.01	.03	-.06	.07	.794	.04	.03	-.01	.09	.143
Knowledge-oriented	.17	.03	.10	.23	.000	-.01	.03	-.06	.04	.701	-.06	.03	-.13	.00	.059	.01	.03	-.05	.06	.763
Media-oriented	.08	.03	.01	.15	.017	.04	.02	.00	.09	.056	.03	.04	-.05	.11	.461	-.01	.03	-.06	.04	.678
Action gaming	-.20	.03	-.26	-.14	.000	-.02	.03	-.07	.03	.399	.16	.03	.10	.22	.000	.08	.03	.02	.13	.006
Social gaming	-.07	.02	-.11	-.03	.001	.02	.03	-.04	.08	.524	.07	.03	.01	.12	.015	.01	.03	-.04	.07	.634

engagement and to higher exhaustion, cynicism, and inadequacy. Knowledge-oriented participation was, in turn, positively related to study engagement. Media-oriented participation was positively related to exhaustion, action gaming was positively related to cynicism and inadequacy.

In the high school sample (Fig. 3) social networking-oriented participation was again positively related to exhaustion and knowledge-oriented participation positively to study engagement (with also marginal negative effects on cynicism and inadequacy). Surprisingly, blogging-oriented participation was positively related to exhaustion, cynicism, and inadequacy, and media-oriented participation was positively related to cynicism and inadequacy. Action gaming was interestingly negatively related to study engagement but also to exhaustion.

In the higher education sample (Fig. 4) social networking-oriented participation was negatively related to study engagement as it was in the elementary school sample, and knowledge-oriented participation continued to be positively related to study engagement. Action gaming was again negatively related to engagement and, positively to cynicism and inadequacy. Social gaming was also negatively related to engagement.

5. Discussion

Our aims were to move beyond the concept of screen time by exploring the multidimensionality of students' SDP practices, and to extend the exploration towards examining how these multiple dimensions of SDP are related to study engagement and study burnout in three cohorts of students at different educational levels. First, the distributions of the digital activities that we assessed in our survey were of a similar structure across the student groups and were consistent with those found in previous surveys on the topic (e.g., Livingstone, Haddon, Görzig, & Olafsson, 2011). The students spent the most time engaging in activities related to social media and spent less time with more complex and technically demanding activities.

Although there were some differences between the samples regarding the factor structure, the same five orientations were identified in all three groups: *social networking-oriented participation*, *knowledge-oriented participation*, *media-oriented participation*, *action gaming,* and *social gaming*. Interestingly, in the high school sample also a distinct sixth factor, *blogging-oriented participation,* separated from knowledge-oriented participation. The factor structures were similar to those identified in previous studies (e.g., Eynon & Malmberg, 2011; Hietajärvi et al., 2016; Van den Beemt et al., 2011) and reflected the genres of participation identified by Ito et al. (2010). Towards this end, social networking-oriented participation could be interpreted as a friendship-driven activity whereas knowledge, blogging and media oriented participation would resemble more interest-driven practices. Social gaming, in turn, resembles “killing time” or “hanging out” gaming, in which the activity is motivated with hanging out with friends whereas action and sports gaming resembles “recreational gaming”, which, although also social, has the actual gameplay as the main focus of activities (Ito et al., 2010).

The most substantive difference in the factor loadings was the shift of items from social networking oriented participation towards more creative media practices from the elementary school sample to the high school sample. This might imply that the more production oriented social media practices that loaded on the social networking oriented participation factor in the elementary school sample can work as activities that mediate development towards more interest-driven creative practices in high school and higher education. Some students in elementary school that engaged in more social networking might also be on a path towards more technologically complex practices (Ito et al., 2010). Simultaneously, however, they may be struggling with regulating the time they spend using these technologies in conjunction with other areas of life (see e.g., Przybylski & Weinstein, 2017). This is reflected also in the observation that in the elementary student group the social networking oriented participation was related to both low study engagement and to all burnout symptoms. These findings may indicate the functioning of the Goldilocks hypothesis through the energy-depletion process.

The high school model provided the most complex model both in the measurement part as well as the structural part. An interesting finding with the measurement model was the differentiation of the specifically blogging related items as their own factor, which correlated equally with both social networking and knowledge-oriented dimensions and may indicate an extension of social networking activities towards a more productive and interest-driven use of social media that needs to be considered in future research. Interestingly, the blogging-oriented participation, similarly to the social networking oriented participation was related to exhaustion.

The complexity of the model for the high school data might reflect the students' age in that they were old enough to have appropriated to most novel technologies, yet were at a very demanding developmental stage (Eccles, 2004). During high school students are expected to develop career plans for the future as well as to start orienting towards an independent adulthood. This combined with the pressure of keeping up social relations and pursuing out-of-school interests might be reflected in the relationship between SDP and burnout symptoms in this student group, and again possibly indicate an imbalance between demands and resources as well as a gap between their out-of-school digital activities and school.

The analysis of the data for higher education students, in turn, did not indicate a relationship between SDP and exhaustion. With them, the relation appeared more to reflect motivational problems. This might be due to their greater maturity and a better capacity for self-regulation in terms of allocating time and resources. In general, in higher education, exhaustion has been found to be more related to performance and high workload (Litmanen, Loyens, Sjöblom, & Lonka, 2014). On the other hand, the motivational aspect might indicate a friction between their digital practices and the educational environment, thus supporting the gap hypothesis.

Taken together, our data show that among elementary and high school students, social networking oriented digital participation (and in high school, blogging-oriented digital participation) were consistently related to lower study engagement and/or to higher symptoms of burnout, especially exhaustion, indicating a possible effect through the energy-depletion process due to an imbalance between the subjects' daily resources and the demands of schoolwork (Salmela-Aro & Upadyaya, 2014). Indeed, as inferred from the univariate means it appears that these social media -related activities are also the most frequent, perhaps indicating, in some cases, excessive digital participation. Excessive digital participation has been found in previous studies to have a reciprocal effect with school burnout (Salmela-Aro et al., 2016). In line with the Goldilocks hypothesis, excessive use of social media or other technologies can lead to issues with well-being through disruptions to and multi-tasking in daily activities (Carrier, Rosen, Cheever, & Lim, 2015; Moisala et al., 2016b) and by interfering with studying, sleep (Cain & Gradisar, 2010), or physical exercise (Melkevik, Torsheim, Iannotti, & Wold, 2010). However, given the extent to which young people's daily life is digitally mediated, moderate digital participation should be developmentally more beneficial than total disconnection (Przybylski & Weinstein, 2017) and perhaps lead to more resources that can be applied also in educational contexts. Understanding what actually is beneficial and why, however, calls for a more nuanced cultural analysis of the digital participation practices of the youth.

An action gaming orientation was in all student samples related to either lower study engagement or higher cynicism, giving a reason to suspect that the effect is due to motivational mechanisms: the motivational pull for gaming (Ryan, Rigby, & Przybylski, 2006) might override the motivation towards school, thus being in line with the gap hypothesis. Also, as gaming has been shown to have benefits in developing

various competencies (Granic et al., 2014) it could be that such competencies and experiences are not capitalized on in educational institutions, leading to experiences of disengagement (Rajala et al., 2015). Nevertheless, given the possibility of excessive gaming, the results might also be interpreted to support the Goldilocks hypothesis. More detailed studies are needed before it can be clarified which of the two hypotheses is more applicable.

The finding that a knowledge orientation was related to higher study engagement is a positive finding that suggests a possible beneficial overlap between out-of-school and in-school digital practices and a possible positive motivational effect sparked by the resources provided by the knowledge-oriented activities. It is, however, still unclear how out-of-school knowledge-oriented participation benefits in-school practices, and it is quite likely students need adequate social support in order to make the most out of their competencies cultivated through informal learning (Ito et al., 2010). Combining adolescents' out-of-school knowledge-building competencies with, for instance, collaborative, inquiry-based, and design-centered pedagogies might well be the best way forward in terms of developing the kinds of knowledge practices that support learning and development on a broader scale (see Hakkarainen, 2009; Sawyer, 2014).

This study contributed theoretically to the discussion of screen time and the different well-being outcomes that emerge as a function of different types of digital participation and that screen time can hold both destructive and constructive components. However, prior studies have also indicated that individual differences affect the relations of digital participation and well-being. For instance, it appears that to some students the use of social networking services appears to be related to better academic performance (Ainin et al., 2015), depending on, for example, personality traits (Naqshbandi, Ainin, Jaafar, & Shuib, 2017) and that adolescents different identity profiles are related to differences in digital participation (Mannerström, Hietajärvi, Muotka, & Salmela-Aro, 2018). Furthermore, individual traits such as experiencing fear-of-missing-out has been shown to mediate the relationship from social media to various negative outcomes (Przybylski, Murayama, DeHaan, & Gladwell, 2013). Towards that end, the practical implication of this study is in joining to the call that everyone concerned of the well-being of youth should be more adept in understanding the content and qualitative differences in screen time and their interplay with individual differences as well as varying contexts, and only after that considering how to provide the best support in the case of problematic behavior.

5.1. Methodological reflections and suggestions for future studies

Exploratory structural equation modeling has allowed us to model the complex multidimensionality of SDP and to examine the factor cross-loadings that might be masked by the use of a confirmatory approach. Using an ESEM-CFA approach allowed us to construct a structurally valid measurement model free of measurement error. That said, some item shifts between student groups or cross-loadings do not necessarily carry a substantive meaning and may merely indicate noise. The questionnaire needs further development in additional studies.

With a cross-sectional setting like this we cannot infer causal relations. Thus, it needs to be noted that the effects could very well be the other way around: students with more severe study burnout symptoms might end up using more social media and students with lower study engagement or a cynical attitude towards school might turn to gaming. Students with a higher schoolwork engagement might use technologies in ways that support their interests and learning in general. Further, there might be substantive gender (see e.g., Cai, Fan, & Du, 2017) or other differences in both the measurement model and the structural paths that were not in the scope of this study, but definitely warrant further consideration as do the presence of other confounders.

Also, in future research, the possible variation between, for example, schools, needs to be examined with a multilevel setting which, in this study, was merely controlled for. Further, to properly examine the “gap” hypothesis the educational practices in schools, especially related to digital technologies, should be assessed. Acquiring multiple sources of data and going beyond self-report questionnaires is desirable since subjective self-report measures of time spent on various digital activities are not optimal. In addition, we need objective as well as qualitative data to gain depth to our understanding of the actual activities engaged in, the underlying motives for them, and the various qualitatively different ways students use different digital tools. Acknowledging the importance of building and maintaining social networks across adolescence and young adulthood in different social contexts needs also to be taken into account by combining social network analyses with our questionnaire data (compare Li et al., 2016). Longitudinal research needs to be conducted to further elucidate the interconnected relationships between the students' SDP, individual differences and their social and academic environments, performance, and well-being. A fruitful way would be to pursue experience sampling methods in this.

6. Conclusion

The results demonstrate that students' digital activities reflect separate dimensions of socio-digital participation and that these dimensions are differently related to their academic well-being. The psychological dynamics behind the relationships with academic well-being can be interpreted in various ways, however, and more detailed analyses are needed to be able to test competing hypotheses. However, this study contributes to the wider discussion in shedding light on the complex multidimensionality underlying young peoples' socio-digital participation orientations and how these orientations differ in their relationships with study engagement and study burnout. This highlights the need to move from simple screen time measures to a more complex understanding of SDP. We acknowledge that the correlations are small and that only excessive SDP, in which the balance in life is compromised, appears to be a cause for concern, whereas some forms of SDP also appear to have positive outcomes in terms of broadening and deepening of social networks and resources for learning.

Nevertheless, the motivational side of the explanation should also be taken into account and out-of-school SDP experiences should be recognized in educational settings. Furthermore, students should be provided with tools for cultivating SDP that enable them to, on the one hand, critically evaluate and regulate their time and concentration in and out of digital contexts and, on the other hand, to capitalize on the connected learning possibilities. As said, this is not simply a question of screen time: for the students it is a question of how they themselves take agency and ownership over their SDP and learn to balance the equation of why and how they engage with digital technologies and, more importantly, to understand the possibilities and potential threats regarding both learning and well-being. After all, young people cannot be viewed as merely passive subjects to screen time, but as active participators shaping what screen time for them is, and what it will become. For the educational system, it is a question of how novel digital tools as well as students' out-of-school practices are taken into account and implemented to best support students' personal and collaborative learning and development.

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Appendix

Appendix A
Measurement model and STDYX standardized factor loadings and r^2 in elementary school

	Social networking	Knowledge- oriented	Media-oriented	Action gaming	Social gaming	Engagement	Exhaustion	Cynicism	Inadequacy	r^2	se
SDP3	**.87**	.02	-.04	.02	.02	.00	.00	.00	.00	.76	.05
SDP2	**.85**	-.08	-.03	.04	.04	.00	.00	.00	.00	.66	.05
SDP1	**.79**	-.16	.02	.00	.11	.00	.00	.00	.00	.54	.07
SDP11	**.76**	-.01	.25	.01	-.02	.00	.00	.00	.00	.74	.07
SDP15	**.70**	-.09	.38	-.15	.02	.00	.00	.00	.00	.65	.09
SDP4	**.63**	.10	-.07	.19	.05	.00	.00	.00	.00	.61	.08
SDP6	**.60**	**.45**	-.08	-.04	.05	.00	.00	.00	.00	.85	.15
SDP10	**.58**	.06	.29	.01	.00	.00	.00	.00	.00	.60	.08
SDP5	**.54**	.11	-.14	.41	-.03	.00	.00	.00	.00	.67	.13
SDP12	**.54**	.09	.21	.28	-.11	.00	.00	.00	.00	.70	.09
SDP13	**.45**	.23	.24	.13	-.08	.00	.00	.00	.00	.59	.08
SDP7	**.35**	**.52**	.06	-.09	.02	.00	.00	.00	.00	.58	.11
SDP14	**.43**	**.51**	.10	.07	-.02	.00	.00	.00	.00	.81	.15
SDP16	.19	**.48**	.22	-.01	.09	.00	.00	.00	.00	.56	.12
SDP8	.09	**.42**	.14	.18	-.04	.00	.00	.00	.00	.40	.09
SDP20	-.01	.03	**.73**	**.37**	-.01	.00	.00	.00	.00	.84	.08
SDP21	-.06	.19	**.69**	-.01	.11	.00	.00	.00	.00	.59	.09
SDP19	.05	-.03	**.65**	**.34**	-.02	.00	.00	.00	.00	.68	.06
SDP17	.15	.01	**.61**	.18	-.03	.00	.00	.00	.00	.58	.07
SDP18	**.44**	-.04	**.56**	-.18	.02	.00	.00	.00	.00	.55	.07
SDP22	-.06	**.32**	**.54**	.01	.13	.00	.00	.00	.00	.51	.11
SDP23	.03	.27	**.50**	.18	.04	.00	.00	.00	.00	.56	.10
SDP32	.04	-.30	.04	**.84**	-.14	.00	.00	.00	.00	.62	.13
SDP30	-.15	.00	.03	**.83**	.09	.00	.00	.00	.00	.66	.06
SDP33	-.13	.00	-.01	**.76**	.09	.00	.00	.00	.00	.55	.05
SDP31	-.09	.10	-.06	**.58**	.25	.00	.00	.00	.00	.49	.08
SDP29	.07	-.17	.02	**.53**	.29	.00	.00	.00	.00	.39	.07
SDP28	.05	-.19	.12	**.52**	.15	.00	.00	.00	.00	.34	.07
SDP25	-.01	-.04	.05	.02	**.78**	.00	.00	.00	.00	.60	.06
SDP24	.03	.06	-.01	.07	**.70**	.00	.00	.00	.00	.57	.07
SDP26	.26	.04	.08	-.06	**.65**	.00	.00	.00	.00	.62	.11
SDP27	.02	.17	-.04	.10	**.45**	.00	.00	.00	.00	.36	.08
EDA1	.00	.00	.00	.00	.00	**.80**	.00	.00	.00	.64	.02
EDA2	.00	.00	.00	.00	.00	**.82**	.00	.00	.00	.68	.02
EDA3	.00	.00	.00	.00	.00	**.73**	.00	.00	.00	.53	.02
EDA4	.00	.00	.00	.00	.00	**.83**	.00	.00	.00	.69	.03
EDA5	.00	.00	.00	.00	.00	**.90**	.00	.00	.00	.81	.02
EDA6	.00	.00	.00	.00	.00	**.70**	.00	.00	.00	.49	.03
EDA7	.00	.00	.00	.00	.00	**.84**	.00	.00	.00	.70	.02
EDA8	.00	.00	.00	.00	.00	**.84**	.00	.00	.00	.71	.02
EDA9	.00	.00	.00	.00	.00	**.80**	.00	.00	.00	.64	.02
SBI1	.00	.00	.00	.00	.00	.00	**.60**	.00	.00	.36	.04
SBI4	.00	.00	.00	.00	.00	.00	**.77**	.00	.00	.60	.03
SBI8	.00	.00	.00	.00	.00	.00	**.61**	.00	.00	.38	.03
SBI10	.00	.00	.00	.00	.00	.00	**.79**	.00	.00	.63	.04
SBI2	.00	.00	.00	.00	.00	.00	.00	**.77**	.00	.59	.03
SBI5	.00	.00	.00	.00	.00	.00	.00	**.85**	.00	.73	.03
SBI6	.00	.00	.00	.00	.00	.00	.00	**.74**	.00	.55	.04
SBI3	.00	.00	.00	.00	.00	.00	.00	.00	**.72**	.52	.03
SBI7	.00	.00	.00	.00	.00	.00	.00	.00	**.84**	.70	.03
SBI9	.00	.00	.00	.00	.00	.00	.00	.00	**.75**	.56	.03

Note: factor loadings > 0.3 in bold.

Appendix B
Measurement model and STDYX standardized factor loadings and r^2 in high school

	Social networking	Knowledge-oriented	Blogging-oriented	Media-oriented	Action gaming	Social gaming	Engagement	Exhaustion	Cynicism	Inadequacy	r^2	se
SDP3	**.76**	.19	.08	-.02	.05	.05	.00	.00	.00	.00	.73	.04
SDP11	**.73**	.09	-.02	**.36**	-.05	.03	.00	.00	.00	.00	.63	.06
SDP15	**.71**	-.16	.01	**.48**	-.02	.00	.00	.00	.00	.00	.69	.07
SDP1	**.68**	-.03	.08	.04	.17	.00	.00	.00	.00	.00	.54	.04
SDP2	**.60**	.16	.06	.03	.08	.05	.00	.00	.00	.00	.47	.03
SDP8	-.10	**.82**	.02	-.05	.03	-.05	.00	.00	.00	.00	.68	.06
SDP9	.05	**.71**	-.18	.07	.03	-.03	.00	.00	.00	.00	.48	.08
SDP7	.02	**.40**	**.40**	.06	-.22	.09	.00	.00	.00	.00	.43	.09
SDP14	.08	.01	**.64**	**.40**	.03	.01	.00	.00	.00	.00	.71	.07
SDP6	.17	.16	**.57**	.08	.02	.07	.00	.00	.00	.00	.54	.07

(*continued on next page*)

Appendix B (*continued*)

	Social networking	Knowledge-oriented	Blogging-oriented	Media-oriented	Action gaming	Social gaming	Engagement	Exhaustion	Cynicism	Inadequacy	r^2	se
SDP19	.08	-.01	-.15	**.77**	.21	-.09	.00	.00	.00	.00	.67	.08
SDP21	-.11	-.06	.06	**.76**	.05	.05	.00	.00	.00	.00	.65	.05
SDP20	-.02	.00	-.22	**.76**	.27	.00	.00	.00	.00	.00	.73	.11
SDP22	-.14	.08	.07	**.72**	-.10	.14	.00	.00	.00	.00	.59	.07
SDP17	.04	-.01	.04	**.71**	.14	-.07	.00	.00	.00	.00	.57	.07
SDP23	-.01	.23	-.14	**.61**	.06	.02	.00	.00	.00	.00	.43	.08
SDP18	**.53**	-.07	-.04	**.59**	-.03	-.02	.00	.00	.00	.00	.55	.07
SDP16	-.06	.02	**.43**	**.54**	-.11	.00	.00	.00	.00	.00	.54	.07
SDP10	**.38**	.15	.08	**.51**	-.11	.06	.00	.00	.00	.00	.45	.07
SDP12	.21	.17	.03	**.50**	.09	-.09	.00	.00	.00	.00	.36	.06
SDP13	-.07	.27	.18	**.46**	.10	.03	.00	.00	.00	.00	.42	.08
SDP32	-.10	.02	-.25	.05	**.81**	.00	.00	.00	.00	.00	.75	.07
SDP30	**-.36**	.01	.00	.10	**.70**	.17	.00	.00	.00	.00	.69	.09
SDP33	**-.40**	.00	.01	.09	**.66**	.24	.00	.00	.00	.00	.69	.09
SDP5	.05	.13	**.44**	-.10	**.59**	-.11	.00	.00	.00	.00	.63	.09
SDP28	.13	.04	**-.34**	-.08	**.56**	.26	.00	.00	.00	.00	.49	.07
SDP29	.00	.03	-.24	.03	**.50**	**.45**	.00	.00	.00	.00	.54	.07
SDP31	**-.32**	.08	.03	.06	**.47**	**.32**	.00	.00	.00	.00	.48	.06
SDP4	.27	-.05	**.39**	-.02	**.47**	-.13	.00	.00	.00	.00	.54	.08
SDP25	.08	.01	-.11	-.06	.00	**.81**	.00	.00	.00	.00	.67	.05
SDP26	.17	-.01	-.03	.10	-.06	**.67**	.00	.00	.00	.00	.48	.04
SDP24	-.05	-.04	.07	-.03	.24	**.58**	.00	.00	.00	.00	.40	.04
SDP27	-.01	-.08	.10	-.03	.24	**.58**	.00	.00	.00	.00	.39	.04
EDA1	.00	.00	.00	.00	.00	.00	**.82**	.00	.00	.00	.67	.02
EDA2	.00	.00	.00	.00	.00	.00	**.79**	.00	.00	.00	.62	.02
EDA3	.00	.00	.00	.00	.00	.00	**.72**	.00	.00	.00	.52	.02
EDA4	.00	.00	.00	.00	.00	.00	**.85**	.00	.00	.00	.72	.02
EDA5	.00	.00	.00	.00	.00	.00	**.88**	.00	.00	.00	.77	.01
EDA6	.00	.00	.00	.00	.00	.00	**.72**	.00	.00	.00	.51	.02
EDA7	.00	.00	.00	.00	.00	.00	**.81**	.00	.00	.00	.66	.02
EDA8	.00	.00	.00	.00	.00	.00	**.70**	.00	.00	.00	.50	.02
EDA9	.00	.00	.00	.00	.00	.00	**.77**	.00	.00	.00	.59	.02
SBI1	.00	.00	.00	.00	.00	.00	.00	**.72**	.00	.00	.52	.03
SBI4	.00	.00	.00	.00	.00	.00	.00	**.72**	.00	.00	.52	.03
SBI8	.00	.00	.00	.00	.00	.00	.00	**.73**	.00	.00	.53	.03
SBI10	.00	.00	.00	.00	.00	.00	.00	**.75**	.00	.00	.56	.02
SBI2	.00	.00	.00	.00	.00	.00	.00	.00	**.80**	.00	.65	.02
SBI5	.00	.00	.00	.00	.00	.00	.00	.00	**.89**	.00	.79	.02
SBI6	.00	.00	.00	.00	.00	.00	.00	.00	**.75**	.00	.57	.02
SBI3	.00	.00	.00	.00	.00	.00	.00	.00	.00	**.70**	.49	.02
SBI7	.00	.00	.00	.00	.00	.00	.00	.00	.00	**.88**	.77	.02
SBI9	.00	.00	.00	.00	.00	.00	.00	.00	.00	**.74**	.55	.02

Note: factor loadings > 0.3 in bold.

Appendix C

Measurement model and STDYX standardized factor loadings and r^2 in higher education

	Social networking	Knowledge-oriented	Media-oriented	Action gaming	Social gaming	Engagement	Exhaustion	Cynicism	Inadequacy	r^2	se
SDP3	**.80**	.01	.02	-.07	-.02	.00	.00	.00	.00	.70	.05
SDP2	**.79**	.00	.00	.04	-.03	.00	.00	.00	.00	.58	.06
SDP1	**.73**	-.09	.03	.26	.04	.00	.00	.00	.00	.42	.06
SDP11	**.61**	.05	**.37**	-.25	-.01	.00	.00	.00	.00	.83	.27
SDP4	**.56**	.02	-.02	**.62**	-.08	.00	.00	.00	.00	.32	.18
SDP15	**.55**	-.07	**.40**	-.25	.00	.00	.00	.00	.00	.76	.28
SDP8	-.02	**.79**	-.01	.09	-.07	.00	.00	.00	.00	.65	.15
SDP9	-.08	**.65**	.18	.11	-.03	.00	.00	.00	.00	.59	.29
SDP7	.18	**.55**	-.06	-.02	.00	.00	.00	.00	.00	.34	.14
SDP6	**.30**	**.48**	.05	.02	.08	.00	.00	.00	.00	.48	.08
SDP14	.14	**.46**	**.37**	-.14	.10	.00	.00	.00	.00	.63	.38
SDP22	-.13	.06	**.75**	.06	-.03	.00	.00	.00	.00	.56	.14
SDP21	-.07	-.01	**.73**	.11	-.05	.00	.00	.00	.00	.51	.20
SDP19	.07	-.05	**.71**	.19	.08	.00	.00	.00	.00	.61	.45
SDP17	.08	.09	**.66**	.07	-.01	.00	.00	.00	.00	.54	.18
SDP20	-.03	-.06	**.65**	**.39**	-.04	.00	.00	.00	.00	.57	.59
SDP16	-.01	.18	**.64**	-.13	.01	.00	.00	.00	.00	.51	.34
SDP23	-.12	**.30**	**.61**	.00	.04	.00	.00	.00	.00	.57	.22
SDP18	**.33**	-.12	**.56**	-.20	-.01	.00	.00	.00	.00	.59	.27
SDP12	**.30**	.17	**.51**	.11	-.02	.00	.00	.00	.00	.56	.30
SDP10	**.43**	.08	**.48**	-.25	.07	.00	.00	.00	.00	.79	.42
SDP13	.08	**.33**	**.35**	.24	.08	.00	.00	.00	.00	.52	.63

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Appendix C (*continued*)

	Social networking	Knowledge-oriented	Media-oriented	Action gaming	Social gaming	Engagement	Exhaustion	Cynicism	Inadequacy	r^2	se
SDP5	**.52**	.11	-.06	**.83**	.01	.00	.00	.00	.00	.60	.24
SDP30	-.16	.05	.09	**.67**	**.38**	.00	.00	.00	.00	.72	1.25
SDP32	.02	-.02	.06	**.66**	**.37**	.00	.00	.00	.00	.54	.85
SDP33	-.07	.03	.11	**.63**	**.43**	.00	.00	.00	.00	.65	1.22
SDP31	-.03	.00	-.01	**.60**	**.47**	.00	.00	.00	.00	.55	.92
SDP24	-.02	.06	-.10	.00	**.70**	.00	.00	.00	.00	.47	.08
SDP29	-.02	-.02	.00	.26	**.68**	.00	.00	.00	.00	.49	.52
SDP25	.03	.00	.01	-.21	**.68**	.00	.00	.00	.00	.56	.52
SDP26	.07	-.14	.03	-.02	**.67**	.00	.00	.00	.00	.46	.30
SDP27	.04	.05	-.15	.01	**.61**	.00	.00	.00	.00	.37	.04
SDP28	.14	-.01	-.02	**.30**	**.42**	.00	.00	.00	.00	.27	.30
EDA1	.00	.00	.00	.00	.00	.82	.00	.00	.00	.68	.02
EDA2	.00	.00	.00	.00	.00	.84	.00	.00	.00	.71	.01
EDA3	.00	.00	.00	.00	.00	.73	.00	.00	.00	.53	.02
EDA4	.00	.00	.00	.00	.00	.83	.00	.00	.00	.69	.02
EDA5	.00	.00	.00	.00	.00	.90	.00	.00	.00	.81	.01
EDA6	.00	.00	.00	.00	.00	.69	.00	.00	.00	.48	.03
EDA7	.00	.00	.00	.00	.00	.84	.00	.00	.00	.71	.02
EDA8	.00	.00	.00	.00	.00	.77	.00	.00	.00	.59	.02
EDA9	.00	.00	.00	.00	.00	.80	.00	.00	.00	.64	.02
SBI1	.00	.00	.00	.00	.00	.00	.68	.00	.00	.47	.03
SBI4	.00	.00	.00	.00	.00	.00	.73	.00	.00	.53	.02
SBI8	.00	.00	.00	.00	.00	.00	.77	.00	.00	.60	.03
SBI10	.00	.00	.00	.00	.00	.00	.70	.00	.00	.50	.03
SBI2	.00	.00	.00	.00	.00	.00	.00	.86	.00	.74	.02
SBI5	.00	.00	.00	.00	.00	.00	.00	.96	.00	.92	.02
SBI6	.00	.00	.00	.00	.00	.00	.00	.76	.00	.58	.03
SBI3	.00	.00	.00	.00	.00	.00	.00	.00	.65	.43	.03
SBI7	.00	.00	.00	.00	.00	.00	.00	.00	.89	.79	.02
SBI9	.00	.00	.00	.00	.00	.00	.00	.00	.72	.52	.03

Note: factor loadings > 0.3 in bold.

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