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Title: International perspectives on social media use among adolescents : Implications for mental and social well-being and substance use

Year: 2022

Version: Published version

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Please cite the original version:

Boniel-Nissim, M., van den Eijnden, R. J., Furstova, J., Marino, C., Lahti, H., Inchley, J., Šmigelskas, K., Vieno, A., & Badura, P. (2022). International perspectives on social media use among adolescents : Implications for mental and social well-being and substance use. *Computers in Human Behavior*, 129, Article 107144. <https://doi.org/10.1016/j.chb.2021.107144>



International perspectives on social media use among adolescents: Implications for mental and social well-being and substance use

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ARTICLE INFO

Keywords:

Social media use
HBSC
Cross-national research
Adolescence
Well-being
Substance use

ABSTRACT

In the present study, we aimed to explore the relationship between intensity of social media use (SMU), problematic SMU and well-being outcomes. Four categories of SMU were developed taking into account both intensity of use and problematic SMU simultaneously: non-active; active; intense; and problematic use. Using these four categories, we assessed associations between SMU and mental and social well-being, and substance use. Data from 190,089 respondents aged 11, 13, and 15 years from 42 countries involved in the Health Behavior in School-aged Children (HBSC) study were analyzed. With a slight cross-national variance, 78% of adolescents in the sample were classified as active or intense users, and 7% showed signs of problematic SMU. The remaining 15% belonged to the non-active users. Three-level regression analyses revealed that the problematic users showed the least favorable mental and social well-being profile and the highest level of substance use. Compared with active users, non-active users reported lower mental and social well-being, but also the lowest substance use levels. Intense non-problematic users showed the highest levels of social well-being. Our findings highlight the importance of assessing both the intensity and problematic component of SMU to reliably assess associations with mental and social well-being and substance use.

1. Introduction

The current generation of adolescents, referred to as generation Z, was born to the reality of social media platforms. Hence, for this generation, who have never known a world without technology, social media acts as a vehicle for fostering social connectedness (Allen et al., 2014; Radovic et al., 2017), entertainment, and education (Smahel et al., 2020). According to the cross-national Health Behavior in School-aged Children (HBSC) survey 2017/18, more than 1 in 3 adolescents aged 11, 13, and 15 years old report having online contact with others via social media almost all the time throughout the day, varying between 17% in Switzerland to 50% in Italy (Boer et al., 2020). Social

media offer numerous possibilities to find and strengthen friendships, gain social support, reduce social isolation (Clark et al., 2018), and provide opportunities for learning and creativity (Ito et al., 2019). However, the increased popularity of social media use (SMU) has raised concerns regarding its consequences for adolescents' health and well-being (Uhls et al., 2017).

Research into the (mental) health impact of SMU increasingly shows that it is important to distinguish between two aspects of SMU, namely the intensity of SMU, and (symptoms of) problematic SMU (Boer et al., 2020, 2021a). While the intensity of SMU expresses the frequency of communication with peers and others via social media such as instant messengers and social network sites, problematic SMU is an expression

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<https://doi.org/10.1016/j.chb.2021.107144>

Received 8 October 2021; Received in revised form 17 November 2021; Accepted 8 December 2021

Available online 13 December 2021

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of addiction-like symptoms (van den Eijnden et al., 2016) that reflect one's inability to control SMU to the extent to which it causes impairments in daily life (Griffiths et al., 2014). Thus, while problematic SMU points to pathological behavior with negative consequences, for instance on mental well-being (Keles et al., 2020), intense SMU is not necessarily problematic (Boer et al., 2020).

1.1. Intense versus problematic SMU in relationship to adolescents' well-being

While some scholars imply that SMU intensity is negatively associated with adolescents' wellbeing (Kelly et al., 2018; Twenge et al., 2018), others emphasize that this relationship is much more complex. Recent review studies have yielded a conflicting mix of weak positive, weak negative, or null associations, suggesting that the direction and strength of the association is dependent on many methodological and theoretical factors, for instance, the conceptualization of SMU and mental health, and the analytical approach used (Meier & Reinecke, 2020; Odgers & Jensen, 2020; Orben, 2020).

One of the possible explanations for the mixed and often conflicting research findings is that most cross-sectional and longitudinal studies do not take account of problematic SMU when testing the association between intensity of SMU and mental well-being. Research, including meta-analytic studies and systematic reviews, consistently shows that problematic SMU indeed is related to indicators of lower well-being in adolescents (Andreassen, 2015; Best et al., 2014; Boer et al., 2020; Keles et al., 2020; Shensa et al., 2017; van den Eijnden et al., 2018), such as, depressive symptoms (Bányai et al., 2017; Boer et al., 2020; Ivie et al., 2020; Raudsepp & Kais, 2019), anxiety (Andreassen, 2015), irritability and nervousness (Paakkari et al., 2021), body image dissatisfaction (Kircaburun et al., 2020), lower life-satisfaction and psychosocial well-being (Boer et al., 2020; Marino et al., 2018; van den Eijnden et al., 2018), lower self-esteem (Andreassen, 2015), and more (psycho)somatic complaints (Boer et al., 2020; Marino et al., 2020; Paakkari et al., 2021). As intensity of SMU and symptoms of problematic SMU are different but related concepts, previously found negative associations between intense SMU and mental health may have been driven by the confounding effect of problematic SMU (Boer, Stevens, et al., 2021). Thus, it is crucial to consider problematic SMU when studying the relationship between intense SMU and adolescents' mental well-being.

A second possible explanation for the fact that research findings on the relationship between SMU intensity and adolescents' well-being are mixed, is provided by the *digital Goldilocks hypothesis* (Przybylski & Weinstein, 2017). This hypothesis states that, up to a certain point, adolescents' well-being increases as their screen time increases, whereas, after that point, increased screen time is associated with a decrease in well-being. This assumption is based on the idea that a lack of SMU may hinder young people in acquiring and maintaining social relationships and obstruct participating in social activities that are crucial for their social development. Moreover, it may also reflect low peer engagement and poor social functioning (Kim et al., 2016). However, at the other end of the spectrum, very high levels of SMU may replace important daily activities, such as participation in real-life social gatherings (Przybylski & Weinstein, 2017), physical activities or schoolwork, which may be displaced at the expense of adolescents' wellbeing. Accordingly, in their study, Przybylski and Weinstein (2017) revealed that the relationship between digital screen time (e.g., using a computer, a smartphone, engaging in social media use or gaming) and mental well-being was indeed not linear but curvilinear, whereby moderate involvement in these digital activities was the optimal condition. This finding suggests that the relationship between SMU and mental well-being requires a more complex examination of what can be construed as normative or optimal SMU.

Regarding the role of normative SMU, a recent international study based on HBSC data 2017/2018, highlighted the importance of considering the country-level context of SMU when studying the

association between adolescents' intensity of SMU and well-being (Boer et al., 2020). More specifically, in countries with a lower prevalence of intense SMU, intense users reported lower levels of life satisfaction and more psychological complaints than non-intense users of social media. In contrast, in countries with a higher prevalence of intense SMU, intense users reported higher levels of life satisfaction than non-intense users, and similar levels of psychological complaints. These findings can possibly be explained by the *Normalization Theory*, which posits that risk behaviors may not necessarily indicate problematic profiles in social contexts where it is relatively prevalent (Sznitman et al., 2015). That is, there may be a general pattern where adolescent risk behaviors are less indicative of lower well-being, in places where most adolescents exhibit these behaviors. Thus, when intense SMU is widespread in society, this behavior may become normative.

To better understand the effect of SMU on adolescent well-being, it is crucial to take account of the above-mentioned issues. More specifically, it is important to differentiate between different levels of SMU, and to use a classification that takes account of both intensity of SMU and problematic SMU, as well as non-use. The present study, therefore, identifies four SMU groups, ranging from non-active users to active users, to intense non-problematic users to problematic users. Such a SMU group categorization allows for more nuanced examination of differences in mental and social well-being. On the basis of the Goldilocks hypothesis, it is expected that *mental and social well-being will be lower in the non-active user and in the problematic user groups, compared to the active user and intense non-problematic groups* (Hypothesis 1).

1.2. SMU and offline risk behaviors

During the 21st century, adolescents' exposure to risky behaviors has changed considerably. Along with the increase of SMU, a decline in traditional risk behaviors such as substance use has been observed (De Looze et al., 2019). Despite the well-known negative impact of traditional risk behaviors on adolescents' mental and physical well-being (Leather, 2009), an update of the traditional models of risk (including new behaviors and their risk factors) is needed, as well as the examination of how current adolescents' daily life is influenced by the interplay between traditional and emergent risky behaviors (Walsh et al., 2020).

In line with the co-construction model (Subrahmanyam et al., 2006), it has been suggested that SMU and offline risk behaviors are interconnected, in that social media might constitute the present-day social context in which adolescents could manifest their developmental tendency toward engagement in risk behaviors and sensation seeking. In this perspective, one possible social mechanism accounting for the association between offline and new (online) risk behaviors lies in the peer influence processes occurring online that are transformed and re-modeled as compared to traditional offline influence processes. Specifically, the Facebook Influence Model (Moreno et al., 2013) indicates that the exposure to social media messages and images connected to substance use (e.g., images of substance using peers) can inspire the development of positive attitudes toward these behaviors as being normative and socially desirable. Adolescents are assumed to engage in risk behaviors to conform to these normative behaviors and to receive social reinforcement, and foster a positive social identity, both online and offline.

Moreover, adolescents' desire to seek peer approval may be strengthened by the neural sensitivity of the socio-emotional system that enhances the anticipated reward value of risk behaviors in the presence of peers (Albert et al., 2013). Within the social media context, these mechanisms might be manifested in terms of increasing importance paid to online peer feedback, and growing vulnerability toward online peer influences on risky behaviors (Crone & Konijn, 2018; Sherman et al., 2018).

Taken together, these findings suggest that social media may act as a *super peer* by exerting an especially profound influence on adolescents to

engage in risky behaviors that are depicted as normative (Strasburger, 2007). In line with the super-peer assumption, a recent meta-analysis conducted by Vannucci et al. (2020) showed small-to-medium associations between the levels of SMU and engagement in substance use. In addition to these peer group mechanisms, individual characteristics, such as low self-control or psychosocial difficulties may underlie both the development of problematic SMU, (e.g., Billieux & Van Der Linden, 2012) as well as the development of problematic substance use (Wills et al., 2002). Thus, a linear relationship between SMU and substance use is hypothesized whereby *substance use is lowest in the non-active user group, and highest in the problematic user group* (Hypothesis 2).

1.3. The current study

The aims of the present study were (1) to create a new classification of social media users based both on the intensity and the problematic components of SMU, and (2) to test the association between the SMU categories (non-active; active; intense; problematic users) and indicators of mental well-being (psychological and somatic symptoms, life satisfaction), social well-being (perceived social support from friends and classmates), and substance use (cigarette smoking, alcohol consumption and drunkenness, and cannabis use) (Fig. 1). This classification of social media users into four SMU groups, including a group of problematic users, is essential to gain a more nuanced understanding of the impact of SMU on adolescent well-being and substance use. This user-friendly categorization will make it easier to detect possible non-linear relationships between SMU and certain outcome domains and will thereby fuel future research. Moreover, this categorization is easy to use in practical settings, for instance to detect risk groups of adolescents in the school context.

2. Methods

2.1. Sample & procedure

The present data were drawn from the HBSC study. HBSC is an international WHO-collaborative study that investigates health and health behaviors among pupils aged 11, 13, and 15 years old in four-year intervals (<http://www.hbsc.org>). The dataset for this study comes from the 2017/18 wave of data collection which took place in 46 countries and regions across Europe, North America, and Middle East. All the participating countries adhered to the HBSC research protocol (Inchley et al., 2018) which prescribes to the member countries sampling procedures to generate nationally representative samples, modes of survey administration, use of standardized and validated questionnaire, and data coding and processing. The data were collected in the classes nested within schools, which were primary sampling units. Participation in the

study was voluntary and anonymous, and the research conformed to the principles outlined by the Declaration of Helsinki. The ethical clearance was obtained by lead institutions in all HBSC member countries.

Samples from Bulgaria, Greenland, and Slovakia were excluded from the final dataset because they did not collect the data on intense SMU and/or problematic SMU. Similarly, we removed the Denmark's data because they used different response scale for one of the fundamental control variables (family support). The overall sample from the remaining 42 countries included 222,934 respondents. Of these, 32,845 (14.7%) were not eligible for analyses because they did not provide valid responses to either intensity of SMU, or problematic SMU, or both. The final sample, thus, comprised 190,089 respondents (48.1% boys and 51.9% girls; mean age = 13.58 years; SD = 1.62).

2.2. Measures

SMU Intensity (Mascheroni & Ólafsson, 2014). Participants were asked how often they were in contact with the following four categories of people via social media – close friends, friends from a larger friend group, friends they met through the internet, and other people (such as parents, siblings, classmates, or teachers). Five frequency options ranged from ‘(almost) never’ to ‘almost all the time throughout the day’ and were complemented by ‘don’t know/does not apply’ response. If at least one response out of the four items provided information on frequency (i. e., must not have been ‘do not know/does not apply’), missing values on the remaining items were ignored. The highest frequency reported across the four items was used to establish three levels of SMU intensity: a) never or at most weekly; b) daily/several times a day; and c) almost all the time.

Problematic SMU. The Social Media Disorder Scale (van den Eijnden et al., 2016), was used to identify respondents displaying signs of possible problematic SMU. The scale showed good validity and reliability across countries (Boer, van den Eijnden, et al., 2021). It consists of nine items that relate to SMU, such as regularly neglecting other activities, having conflict with family, often using social media to escape from negative feelings or lying about the amount of time spent on social media. The respondents indicated whether they experienced any of these symptoms during the past year using binary response (yes/no). Adolescents who reported six or more symptoms were labelled as problematic users, whereas those with five or less symptoms as non-problematic users.

Four categories of SMU. Both scales (problematic SMU and intense SMU) were combined to create four categories of social media use, as follows: i) non-active user (online contact with others not at all or at most weekly AND non-problematic user, i.e. less than six symptoms); ii) active user (online contact with others daily but not all time AND non-problematic user); iii) intense user (online contact almost all the time

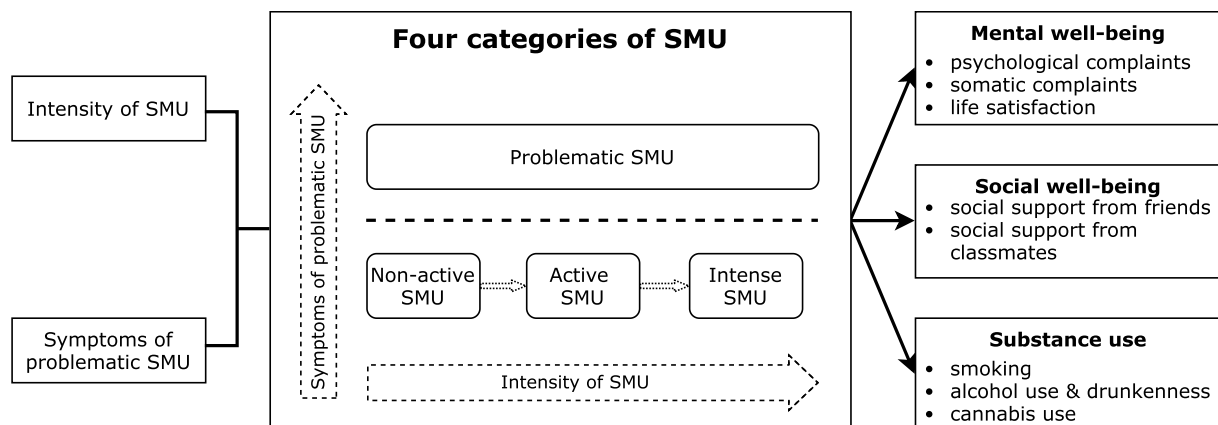


Fig. 1. Theoretical model of the associations investigated in the study.

throughout the day with at least one of the groups above AND non-problematic user); and iv) problematic user (six or more symptoms regardless of intensity of SMU).

Health & Mental Well-Being. The HBSC Symptom Checklist (Haugland et al., 2001) was used to assess somatic and psychological complaints. Participants were asked to rate the frequency of symptoms over the last six months, with responses rated on a 5-point scale (from 0 = “about every day” to 4 = “rarely or never”). The somatic complaints subscale consists of four symptoms (headache, stomachache, backache, feeling dizzy; Cronbach $\alpha = 0.69$) and the psychological complaints subscale also consists of four symptoms (feeling low, feeling irritable or in a bad mood, feeling nervous and having difficulties falling asleep; Cronbach $\alpha = 0.76$). The items were reverse scored and summed to obtain two separate scores for somatic and psychological complaints. Higher scores represent more frequent occurrence of complaints (ranging from 0 to 16). Life satisfaction was measured using the Cantril ladder (Cantril, 1965; Levin & Currie, 2014). Participants were asked to rate their life on a scale ranging from 0 (“worst possible life”) to 10 (“best possible life”).

Social Well-Being. Two dimensions of social well-being were measured: Friend support was assessed using a subscale of the Multidimensional Scale of Perceived Social Support (Zimet et al., 1988). Participants were asked to rate their agreement with four items (e.g., “I can count on my friends when things go wrong”), on a 7-point scale (from 1 = “very strongly disagree” to 7 = “very strongly agree”). Total score was obtained as the mean of all items with higher scores (ranging from 1 to 7) indicating higher support (Cronbach $\alpha = 0.92$). Classmate support was assessed using a subscale of the Teacher and Classmate Support scale (Torsheim et al., 2000). Participants were asked to rate their agreement with three items (e.g., “Most of the students in my class (es) are kind and helpful”) on a 5-point scale (from 0 = “strongly disagree” to 4 = “strongly agree”). Items were summed to obtain a continuous score for classmate support. Higher scores represent higher support (ranging from 0 to 12; Cronbach $\alpha = 0.77$).

Substance use (Hibell et al., 1997). Four different types of substance use were included: Cigarette smoking was assessed by asking participants on how many days (if any) ‘in the last 30 days’ they had smoked cigarettes. To measure alcohol consumption, participants were asked on how many days (if any) ‘in the last 30 days’ they had drunk alcohol: Similarly, drunkenness was assessed asking participants how many times ‘in the last 30 days’ they drank so much alcohol that they were really drunk. And lastly, cannabis use was assessed asking participants on how many days (if any) ‘in the last 30 days’ they had taken cannabis. There were 7 response options ranging from “never” to “30 days or more”, except for drunkenness with 5-point scale (from “never” to “yes, more than 10 times”). Answers for smoking, drunkenness, and cannabis use were dichotomized as follows: 1 (at least one day/time in the last 30 days) vs. 0 (not at all). For alcohol consumption, a different cut-off was used: 1 = at least three days in the last 30 days vs. 0 = less than three days.

Control variables. Adolescents reported their gender, and month and year of birth were used to calculate their age. In addition, we used the Family Affluence Scale (FAS) version 3. FAS is a six-item index developed within the HBSC and was shown to be a valid and age-appropriate indicator used to estimate the socio-economic status (SES) of their families (Torsheim et al., 2016): a) number of cars in family; b) number of bathrooms in household; c) number of computers in household; d) ownership of a dishwasher; e) having one’s own bedroom; and f) number of holidays spent abroad in the last 12 months prior. The item responses were summed and transformed into a fractional rank score for each country separately (Elgar et al., 2017). The score ranged from 0 (low SES) to 1 (high SES). In line with the most recent HBSC international report that allows cross-national comparisons (Inchley et al., 2020), FAS was categorized as low SES (0–0.2), medium SES (0.21–0.8), and high SES (0.81–1) to account for economic differences across the countries.

We also included four items measuring family support adopted from

the Multidimensional Scale of Perceived Social Support (Zimet et al., 1988) because of assumed influence of family environment on multiple variables included in the analyses. Using a 7-point Likert scale of response options (1 = strongly disagree; 7 = strongly agree), the respondents indicated, for instance, whether they could talk about problems with their family or whether their family helped them make decisions. The responses were categorized according to the mean scores: a) low (1.0–2.9); b) medium (3.0–5.0); and high (5.1–7.0) perceived family support. The scale showed very high internal consistency in the present sample (Cronbach $\alpha = 0.94$).

2.3. Statistical analyses

First, we assessed the number of symptoms of problematic SMU, in relation to intensity of SMU (Fig. 2) to provide a picture of the distribution of SMU categories. Second, the distribution of SMU by the category of their usage was assessed per country (Fig. 3), as well as stratified by control variables, and tested for differences using chi-squared tests with a Rao-Scott correction to account for the complex survey design (Table 1). These differences were also tested after splitting the total sample by individual countries. Third, we used *t*-tests and one-way ANOVA with post-stratification weights, and chi-squared tests with a Rao-Scott correction to analyze the outcome variables according to sociodemographic factors.

Next, a series of three-level linear and logistic regression analyses were carried out considering the hierarchical structure of our data. The multivariate associations of SMU with mental and social well-being indicators, controlled for gender, age, FAS and perceived family support, are presented in Table 2, and in Table 3 for the multivariate associations with substance use. Active users served as a reference category in the regression analyses, because they were the most prevalent group and considered as ‘normative’ in our sample.

Due to a large sample, the level of significance was set at $\alpha = 0.001$. In addition to statistical significance, the effect size was evaluated: Cohen’s *d* for *t*-tests and one-way ANOVA, and Cohen’s *w* for chi-squared tests. The effect size was interpreted as small, medium, and large for *d* = 0.2, 0.5, and 0.8, respectively (Cohen, 1988; Sawilowsky, 2009), and for *w* = 0.1, 0.3, and 0.5, respectively (Ellis, 2010). All the analyses and data processing were conducted using the IBM SPSS 25.0 and R 4.0.5. The data from ten countries (Canada, Czech Republic, France, Israel, Netherlands, Slovenia, Ukraine, England, Scotland, and Wales) were weighted using post-stratification weights to account for actual distribution of adolescents in the given countries (e.g., by territories or regions in the given country, sex, School program or type, and ethnicity).

3. Results

3.1. Descriptive characteristics of social media use

Overall, we observed that the number of reported symptoms of the Social Media Disorder Scale was higher in adolescents classified as active users than in non-active users in terms of intensity of their online communication via social media. The median, as well as the most frequent number of positive responses, was zero in non-active users, whereas in active users, the median value was one. Among intense users, there were fewer respondents indicating no symptoms, and the median number of symptoms was two.

Fig. 2 displays the prevalence rates of SMU by country. The category of active users (i.e., those who interacted via social media daily but did not show signs of problematic SMU), was the largest group in the total sample (46%), as well as in most countries (34 out of 42 involved in the analyses). The rate of intense SMU, as the second most populated category, ranged from 15% in Switzerland to 46% in Serbia, whereas intense users accounted for 31% of the total cross-national sample. Non-active users were more common than problematic users (15% vs 7%), which

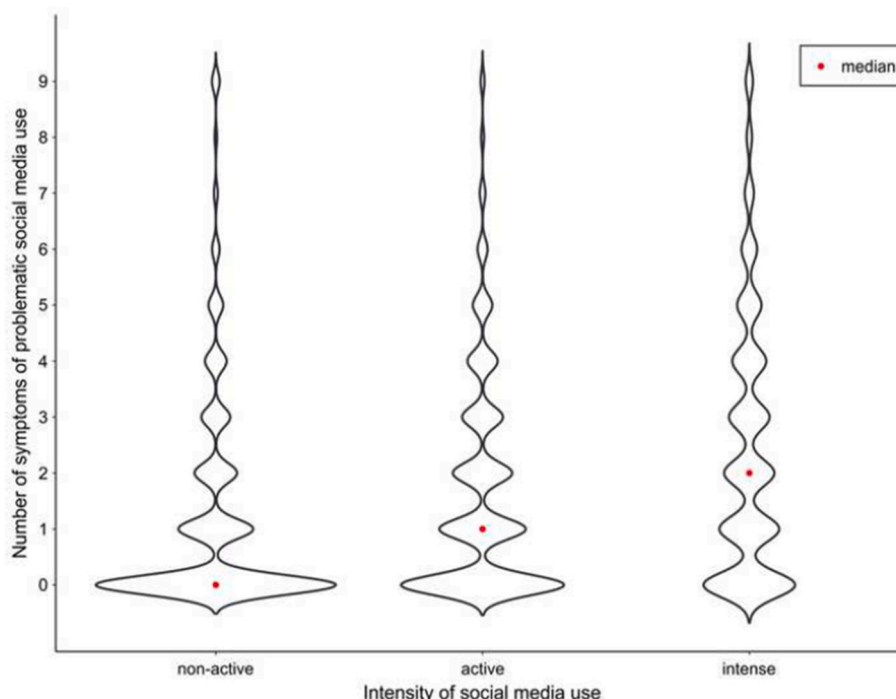


Fig. 2. The relationship between intensity of social media use with number of symptoms of problematic social media use; 2017/18 HBSC study, 42 countries.

held true across most of the countries. Exceptions to this pattern were Albania, Finland, Italy, Malta, and Romania, which also belonged to the countries with the lowest occurrence of non-active SMU. In Italy, only 7% of respondents indicated no or at most weekly SMU. The highest number of non-active users was observed in Azerbaijan (37%). Regarding problematic SMU, the prevalence rates varied between 3% in the Netherlands and 15% in Malta. The descriptive results of the outcome variables (indicators of mental and social well-being, and substance use) according to sociodemographic and family-related factors are provided in [Supplementary Tables 1 and 2](#)

In the full sample, we found that intense and problematic SMU were slightly more common in girls, while boys were more frequently classified as non-active users ([Table 1](#)). This was confirmed also in national samples. There were more boys among non-active users in 36 countries and this gender pattern was reversed only in Albania and Azerbaijan. The gender-stratified analyses yielded somewhat mixed results in the problematic user group across countries, with girls being more likely to problematic SMU in 19 countries, boys in four countries and the rest showed no difference by gender. The relative proportion of non-active users was significantly higher in younger age categories (from 24% in 11-year-olds to 8% in 15-year-olds), which held true in all 42 countries. Conversely, intense and problematic users were more prevalent in older age groups. However, age differences in problematic SMU were less pronounced at the national level, as no difference was found in 16 countries.

There was a higher rate of non-active users among families with low FAS, compared to their more affluent peers, in the total sample, as well as in 33 individual countries. In turn, within the overall sample we observed a higher number of intense SMU in the high-FAS group. However, at the national level the association between intense SMU and high FAS was evident only in 20 countries. The number of intense users did not vary by FAS in 21 countries and there were more intense users from less affluent families identified in Belgium (French). Finally, the lowest relative rate of problematic SMU was observed in adolescents who felt a high level of support from their family, compared with adolescents perceiving medium-to-low support. This difference was apparent in all but two countries (Azerbaijan and Moldova). Despite the

variance at the national level, all the differences were statistically significant ($p < 0.001$) in the full sample with small-to-medium effect sizes ($w < 0.20$) after accounting for the hierarchical structure of the data using the Rao-Scott correction ([Table 1](#)). The full set of results of descriptive analyses split by country is shown in [Supplementary Tables 3–6](#).

3.2. The associations between social media use and outcome variables

As shown in [Table 2](#), intense and problematic users reported more frequent psychological and somatic complaints than active users, however, the associations were especially pronounced in the problematic SMU category ($\beta = 2.52$ and 1.57 for psychological and somatic complaints, respectively). Non-active users reported fewer somatic complaints ($\beta = -0.11$) than active users, but also indicated slightly lower levels of life satisfaction ($\beta = -0.07$). The lowest life satisfaction was observed in problematic users ($\beta = -0.60$).

Regarding social well-being, intense users showed higher scores for support from both friends ($\beta = 0.23$) and classmates ($\beta = 0.15$), compared to active users. In contrast, both non-active users and problematic users reported lower support from friends and classmates, in comparison to active users. The non-active users reported the lowest level of support from friends out of the four SMU categories ($\beta = -0.305$), whereas problematic users reported the lowest level of classmate support ($\beta = -0.51$).

The odds ratios (OR) for the associations of SMU with substance use are presented in [Table 3](#). Non-active users displayed lower odds of smoking, recurrent alcohol consumption and drunkenness, than active users, with ORs between 0.72 and 0.79. The association with cannabis use was not statistically significant. Conversely, intense, and especially problematic social media users were more likely to engage in all four substance use behaviors. Compared with active social media users, problematic users had from twice higher odds for cannabis use ($OR = 2.26$) up to more than three-times higher odds for smoking in the past 30 days ($OR = 3.21$).

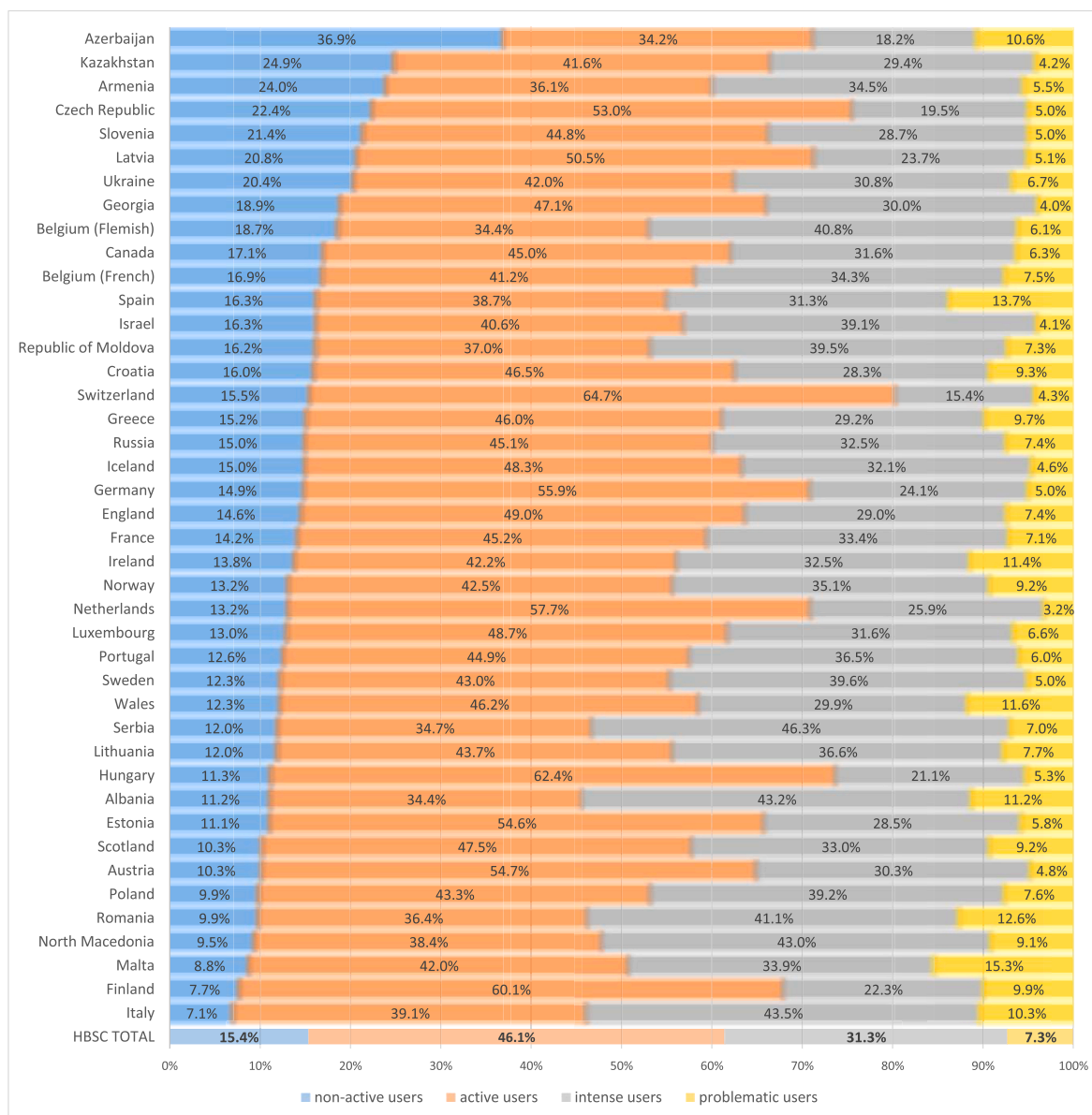


Fig. 3. Prevalence of four categories of social media users by country and in the total sample, 2017/18 HBSC study, 42 countries.

4. Discussion

The first aim of the present study among 190,089 adolescents from 42 countries, was to create a classification of social media users based on a combination of both the intensity of SMU and problematic SMU, distinguishing between non-active, active, intense, and problematic social media users. Findings show that the largest group was constituted of active social media users (46%), while non-active social media users and problematic users were least prevalent (15% and 7% respectively). Despite observed differences in SMU across countries, the associations between SMU group and mental and social well-being, and substance use were statistically significant in the multi-level regression models after accounting for this variance across countries. Problematic social media users experienced the lowest levels of mental and social well-being (except friend support). However, as expected, the non-active users also reported lower levels of life satisfaction and peer support than the active users. Substance use was highest among problematic social media users and least prevalent among non-active social media users, supporting the expected linear relationship between SMU and substance use. These findings highlight the need to use a classification

system that incorporates both intensity of SMU and problematic characteristics of SMU in order to more fully understand the relationship between SMU and health outcomes among adolescents.

Our first hypothesis was that mental and social well-being would be lower in the non-active user and in the problematic user groups, compared to the active user and intense user groups. Regarding mental well-being, we found that problematic users indeed are prone to more frequent psychological and somatic complaints than active users, and although this association was also present among intense users, it was especially pronounced in the problematic group. Non-active users experienced fewer somatic complaints compared to the active user group; however, they also reported slightly lower levels of life satisfaction. In addition, as expected, SMU also seems to be important for social well-being. Non-active users and problematic users reported lower levels of support from friends and classmates compared to active users. Interestingly, intense non-problematic social media users rated friend and classmate support even more positively than active users. This accords with previous studies (e.g., Abbas & Mesch, 2018; Mitev et al., 2021), concluding that social media act as a platform enhancing social capital and feelings of connectedness. Overall, these findings are

Table 1
Descriptive characteristics of the sample, 2017/18 HBSC study, 42 countries.

	Proportion		Four Categories of SMU (N = 42 countries; 190,089 respondents)			Rao-Scott χ^2 (df)	p-value	Cohen's w effect size	% of missing values ^a
	(%)	Non-active user (%)	Active user (%)	Intense user (%)	Problematic user (%)				
Gender						1206.6 (3)	<0.001	0.08	0
girls	51.8	13.0	45.5	33.6	7.9				
Boys	48.2	17.9	46.8	28.9	6.5				
Age						6522.9 (6)	<0.001	0.19	0.6%
11 yrs	31.3	24.4	44.5	25.6	5.5				
13 yrs	34.7	12.1	47.9	32.9	8.1				
15 yrs	33.9	8.1	46.7	36.7	8.5				
Relative FAS						860.8 (6)	<0.001	0.07	2.6%
Low	19.0	19.2	43.9	29.2	7.7				
Medium	62.0	15.0	47.0	31.0	7.0				
High	18.9	12.1	45.9	34.6	7.5				
Family support						1846.6 (6)	<0.001	0.10	2.8%
Low	9.9	17.5	41.7	30.2	10.6				
Medium	15.9	14.7	45.6	28.1	11.7				
High	74.2	15.1	46.2	31.3	5.8				

Note: Rao-Scott adjustment used in χ^2 tests to control for the survey design with three levels (individual-school-country).

^a No. of missing cases per controlling variables is not weighted, unlike the rest of the Table.

Table 2
The multivariate associations of categories of social media use with mental and social well-being indicators, 2017/18 HBSC study, 42 countries.

	Psychological complaints ^a (0–16)		Somatic complaints (0–16)		Life satisfaction (0–10)		Friend support (1–7)		Classmate support ^b (0–12)	
	(n = 171,694)		(n = 174,303)		(n = 177,632)		(n = 177,058)		(n = 173,278)	
	M (SD)	beta (95% CI)	M (SD)	beta (95% CI)	M (SD)	beta (95% CI)	M (SD)	beta (95% CI)	M (SD)	beta (95% CI)
<i>Fixed effects</i>										
Non-active users	4.53 (3.95)	−0.09 (−0.14, −0.03)	2.68 (3.13)	−0.11 (−0.16, −0.07)	7.87 (1.87)	−0.07 (−0.09, −0.04)	4.94 (1.83)	−0.31 (−0.33, −0.28)	8.49 (2.50)	−0.23 (−0.26, −0.19)
Active users	5.02 (3.92)	Ref	3.09 (3.11)	Ref	7.78 (1.73)	Ref	5.34 (1.64)	Ref	8.55 (2.35)	Ref
Intense users	5.57 (4.25)	0.44 (0.40, 0.49)	3.60 (3.44)	0.41 (0.37, 0.45)	7.78 (1.90)	0.02 (0.01, 0.04)	5.56 (1.71)	0.23 (0.21, 0.25)	8.65 (2.60)	0.15 (0.13, 0.18)
Problematic users	7.90 (4.58)	2.52 (2.44, 2.59)	4.86 (3.89)	1.57 (1.51, 1.63)	6.99 (2.21)	−0.60 (−0.63, −0.56)	5.08 (1.85)	−0.09 (−0.12, −0.06)	7.83 (2.85)	−0.51 (−0.56, −0.47)
<i>Random effects</i>										
country	0.65		0.39		0.10		0.15		0.40	
school	0.76		0.39		0.21		0.05		0.42	

Note: n in each column presents the overall number of cases included in the respective regression model; boldface values denote p < 0.001; Adjusted for gender, age, FAS, family support.

^a North Macedonia did not provide data;

^b Latvia did not provide data.

in line with the digital Goldilocks hypothesis (Przybylski & Weinstein, 2017), indicating possible benefits of SMU for adolescents' mental and social well-being at moderate-to-high levels of use, as long as SMU does not become problematic. Alternately, it could be that problematic users spend their time on social media as a form of evasion from reality if they lack sufficient social and emotional support or feel unhappy in their everyday lives. In a similar sense, non-active users might simply avoid social media because of the lack of close 'face-to-face' interactions.

Our second hypothesis implied a linear relationship between SMU and substance use. As predicted, substance use was found to be the lowest in the non-active user group, and highest in the problematic user group. The Problem-Behavior Theory (Jessor & Jessor, 1977) acknowledges the importance of the social environment in the occurrence of behaviors like delinquency and substance use. In the context of the digital environment, non-active users have fewer opportunities to be exposed to peers who present risk behaviors and related content. Substance-related contents are very frequently posted and viewed on social media for self-presentation and identity purposes (e.g., McCreanor

et al., 2013; Westgate et al., 2014; Westgate & Holliday, 2016). Westgate and Holliday (2016) suggested that "how social media is used and who uses it may matter in determining whether increased use is associated with adverse alcohol outcomes" (p. 28). The results of the present study provide new evidence showing that users experiencing addiction-like symptoms related to social media (i.e., problematic users) may be more likely to use different substances compared with adolescents who rarely use social media (i.e., non-active users). Specifically, problematic social media users might have higher levels of exposure to alcohol-related contents "in general" (e.g., marketing) and to peers' drinking behaviors shared by friends on social media (e.g., Westgate & Holliday, 2016) and may be more vulnerable to such content especially if they use social media to escape from negative feelings. Moreover, in turn, problematic social media users may post their own pictures of drinking and using substances more frequently, driven by approval seeking and social network development (Westgate et al., 2014). Although a measure of the specific behavior of substance-related content sharing on social media was not included in the current study, a possible

Table 3
The multivariate associations of categories of social media use with substance use indicators, 2017/18 HBSC study, 42 countries.

	Smoking ($\geq 1 \times$ in the last 30 days)		Alcohol consumption ($\geq 3 \times$ in the last 30 days)		Drunkenness ($\geq 1 \times$ in the last 30 days)		Cannabis use ^a ($\geq 1 \times$ in the last 30 days)	
	(n = 173,577)		(n = 172,723)		(n = 171,320)		(n = 55,956)	
	% (95% CI)	OR (95% CI)	% (95% CI)	OR (95% CI)	% (95% CI)	OR (95% CI)	% (95% CI)	OR (95% CI)
<i>Fixed effects</i>								
Non-active users	6.4 (5.9, 6.9)	0.79 (0.73, 0.85)	6.2 (5.7, 6.7)	0.72 (0.67, 0.78)	5.5 (5.0, 6.0)	0.76 (0.70, 0.82)	3.2 (2.8, 3.6)	0.81 (0.70, 0.93)
Active users	8.9 (8.6, 9.2)	<i>Ref</i>	10.3 (10.0, 10.6)	<i>Ref</i>	8.5 (8.2, 8.8)	<i>Ref</i>	4.3 (4.1, 4.5)	<i>Ref</i>
Intense users	12.3 (11.9, 12.7)	1.52 (1.46, 1.60)	14.1 (13.7, 14.5)	1.54 (1.47, 1.61)	12.5 (12.1, 12.9)	1.67 (1.60, 1.75)	5.6 (5.4, 5.9)	1.41 (1.30, 1.52)
Problematic users	20.5 (19.6, 21.5)	3.21 (3.012, 3.42)	19.8 (18.8, 20.7)	2.61 (2.45, 2.78)	19.1 (18.1, 20.0)	2.99 (2.80, 3.20)	9.1 (8.4, 9.8)	2.26 (2.02, 2.52)
<i>Random effects</i>								
	<i>Variance</i>		<i>Variance</i>		<i>Variance</i>		<i>Variance</i>	
country	0.17		0.26		0.21		0.40	
school	0.93		0.96		0.96		0.55	

Note: n in each column presents the overall number of cases included in the respective regression model; boldface values denote $p < 0.01$; Adjusted for gender, age, FAS, family support.

^a the question on cannabis use was asked only in 15-year-olds.

explanation of this result may lie in the idea that exposure and disclosure of substance-related content play a role in the association between problematic SMU and substance use (Erevik et al., 2017).

In the case of alcohol use, it has been suggested that, along with the pro-alcohol behaviors encouraged by online advertisements, one possible mechanism explaining how exposure to alcohol content on social media may influence drinking behavior is the alteration of perceived social norms in that social media make substance-related content more frequent and salient (e.g., Westgate & Holliday, 2016). In addition, sharing information about alcohol on social media was found to be associated with drinking, especially for those prone to peer pressure (Geusens et al., 2020). These studies reinforce the importance of the social context in relation to adolescent behavior, and our findings suggest that adolescents who have lower levels of support from peers and classmates might be more prone to online risk behavior (i.e., problematic SMU), as well as to traditional risk behaviors such as substance use. As the present study does not allow definite causal inference, it is thus plausible that problematic users are generally more prone to addiction-like behaviors both online and offline.

Gender differences can be discerned among the four SMU categories. It is evident that non-active use, as well as active use are more prevalent among boys, while intense and problematic SMU are more common among girls. This finding is consistent with previous studies indicating that girls are more inclined than boys to problematic SMU, in that they might be more vulnerable to the negative effects of the online world in terms of social comparison and preference for online social interaction (Marino et al., 2018). Moreover, it is possible that boys are more drawn to other online activities, not necessarily social media. For instance, according to Przybylski and Weinstein (2017), boys devoted more time to playing computer and console games, whereas girls spent more time using smartphones, using computers (for non-gaming purposes), and watching videos. Furthermore, according to Lahti et al. (2021), boys were more likely to be drawn to video gaming, whereas girls were more likely drawn to socially oriented activities such as liking posts, commenting, following, and posting in social media.

Interestingly, it appears that family affluence and family support are distributed in a way that describes the phenomenon of SMU among adolescents. Non-active users and problematic users seem to be more common among low affluence families and within families perceived as less supportive. It is possible that higher levels of non-active use among low family affluence families relates to less access to digital technology in their families, where financial resources are low. On the other hand, higher levels of problematic SMU among low family affluence families

may be linked to lower levels of parental monitoring (Paakkari et al., 2021), and less access to alternative activities both within and outside of the home. In addition, previous finding shows that heavy SMU is associated with negative parent-child relationships. Therefore, it appears that SMU can act as an escape pattern from negative relationship (Sampasa-Kanyinga et al., 2020). Active and intense social media users were more likely to be from medium-to-high socioeconomic status and to report high family support. This pattern can be explained by the Rich-Get-Richer-Theory (Kraut et al., 2002), claiming that people who are more familiar with the internet and have strong social skills and communication skills (analogous to supportive parental relationship in the present study) will manage their online behaviors, resulting in more beneficial outcomes.

4.1. Strengths and limitations

The present study has important strengths related to the number of countries included, the representative nature of the data, and the conceptual distinction between intense and problematic SMU. However, the study also has several limitations. First, the data were obtained using self-report questionnaires; therefore, various biases might affect the responses. For example, it can be argued that self-report instruments may not give an objective view of adolescents' SMU due to the risk of overly emphasizing the frequency of use (Parry et al., 2021). Consequently, measures may deviate from adolescents' actual frequency of using social media (Orben & Przybylski, 2019a; 2019b). Moreover, the cross-sectional design of the study does not allow for causal inferences. Therefore, the present study cannot determine with certainty whether the outcomes observed are an effect of different categories of SMU or, for instance, they occur because of common underlying factors including latent personality traits or predisposition to addictive behaviors affecting the outcome variables too. Nonetheless, previous research (Viner et al., 2019) indicates that SMU predicts well-being rather than vice versa. Further longitudinal studies would be required to test the direction of the associations.

Future studies should emphasize the kind of activities adolescents prefer on social media and the content adolescents are exposed to, in order to provide more detailed profiles of social media users. A further investigation is also needed on the distinction between active or passive social media use and their association with mental and social well-being. Moreover, it is desirable to reveal the reasons behind being a non-active user. The observed associations could have differed between those adolescents who are not allowed (e.g. by parents) or do not have access to

use social media (as suggested by higher rates of non-active users among low-FAS group) and those who are not active on social media of their own will.

To conclude, the findings in the present study provide a more nuanced understanding of associations between social media use and wellbeing within a large, cross-national adolescent population and support the goldilocks hypothesis by highlighting potential risks to very low social media users on the one hand and problematic users on the other. Low levels of social media use may reflect higher levels of social isolation but also offer protection against risk behaviors such as substance use. For the majority of adolescents, there appear to be benefits to their mental and social wellbeing of active engagement with social media. This study therefore promotes the discourse about the positive use of social media, and thus allows policy-makers, educators and families to take a more balanced approach to managing social media use within this population. Risks may be greater for adolescents growing up in socio-economically disadvantaged families or those with lower levels of family support, and therefore interventions may need to be targeted in order to address these important underlying social and economic factors.

CRedit author statement

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Funding statement

The work was supported by the Technology Agency of the Czech Republic (ĚTA TL03000291) and by the Czech Ministry of Education, Youth and Sports (Inter-Excellence; LTT18020). Henri Lahti's contribution to the manuscript was further supported by the Ministry of Social Affairs and Health of Finland. Joanna Inchley is supported by the UK Medical Research Council (MC.UU.00022/1) and the Scottish Government Chief Scientist Office (SPHSU16).

Acknowledgements

Health Behavior in School-aged Children is an international study carried out in collaboration with WHO/EURO. Jo Inchley (University of Glasgow) was the International Coordinator for the 2017/2018 survey. The Data Bank Manager was Professor Oddrun Samdal (University of Bergen). The 2017/2018 survey included in this study was conducted by the following principal investigators in the 42 countries:

Albania (Gentiana Qirjako), Armenia (Sergey G. Sargsyan and Marina Melkumova), Austria (Rosemarie Felder-Puig), Azerbaijan (Gahraman Hagverdiyev), Flemish Belgium (Bart De Clercq), French Belgium (Katia Castetbon), Canada (William Pickett and Wendy Craig), Croatia (Ivana Pavic Simešin), Czech Republic (Michal Kalman), England (Fiona Brooks and Ellen Klemra), Estonia (Leila Oja), Finland (Jorma Tynjälä), France (Emmanuelle Godeau), Germany (Matthias Richter), Georgia (Lela Shengelia), Greece (Anna Kokkevi), Hungary (Ágnes Németh), Iceland (Arsael M. Arnarsson), Ireland (Saoirse Nic Gabhainn), Israel (Yossi Harel-Fisch), Italy (Franco Cavallo and Alessio Vieno), Kazakhstan (Shynar Abdrakhmanova and Valikhan Akhmetov), Latvia (Iveta Pudule), Lithuania (Kastytis Šmigelskas), Luxembourg

(Helmut Willems), Malta (Charmaine Gauci), Moldova (Galina Lesco), The Netherlands (Gonneke Stevens and Saskia van Dorsselaer), North Macedonia (Lina Kostarova Unkovska), Norway (Oddrun Samdal), Poland (Joanna Mazur and Agnieszka Malkowska-Szkutnik), Portugal (Margarida Gaspar de Matos), Romania (Adriana Baban), Russia (Anna Matochkina), Scotland (Jo Inchley), Serbia (Jelena Rakić), Slovenia (Helena Jericek), Spain (Carmen Moreno), Sweden (Petra Lofstedt), Switzerland (Marina Delgrande-Jordan, Hervé Kuendig), Ukraine (Olga Balakireva), Wales (Chris Roberts).

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.chb.2021.107144>.

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