



Decrease of well-being and increase of online media use: Cohort trends in German university freshmen between 2016 and 2019



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ABSTRACT

Research from the U.S. described a decrease of subjective well-being and an increase of online media use in young adults today. The present study investigated whether similar trends occur in Germany. Data of overall 1985 university freshmen (four cohorts: 2016: $N=658$, 2017: $N=333$, 2018: $N=562$, 2019: $N=432$) were collected by online surveys in the years 2016 to 2019. The comparison of the four cohorts revealed a significant increase of depression, anxiety and stress symptoms, as well as of the use of social platforms from 2016 to 2019. In contrast, positive mental health (PMH) significantly decreased over the years. No significant changes of the gaming behavior were found. A slight significant positive relationship occurred between the negative variables of well-being and online media use. The association between PMH and online media use was significantly negative. Thus, cohort trends found in the U.S. can at least rudimentarily be replicated in Germany. Young adults in 2019 seem to have lower levels of well-being and to engage in more use of social platforms than older cohorts.

1. Introduction

Recent research from the U.S. described a significant increase of depression symptoms and psychological distress in young adults today (Twenge et al., 2019a). In comparison to older generations, they are lonelier and tend more often to suicide ideation and behavior (Twenge et al., 2019a; Twenge et al., 2019c). Enhanced use of online media might be a potential reason for the cohort differences (Twenge et al., 2018). In the U.S., many young adults and adolescents daily engage in online activities, such as browsing social platforms and playing online games (Twenge et al., 2019b). This behavior may negatively impact their subjective well-being by for example increasing depression symptoms (Twenge and Campbell, 2019).

Negative impact of media use on well-being has been reported by further U.S. authors and by authors from other countries (Duradoni et al., 2020; Marino et al., 2018a, 2018b; Verduyn et al., 2017). Intensive use of social platforms such as Facebook was found to decrease positive mood and life satisfaction (Kross et al., 2013; Shakya and Christakis, 2017; Verduyn et al., 2015), to increase depression and anxiety symptoms (Brailovskaia et al., 2019a; Shensa et al., 2018), to foster addictive tendencies (Andreassen et al.,

2017; Brailovskaia and Margraf, 2017) and suicide-related outcomes (Brailovskaia et al., 2020b). However, to the best of our knowledge, investigations that at the same time consider cohort trends of well-being and of online media use outside the U.S. are missing. Therefore, the generalizability of findings from the U.S. to other countries remains unclear.

The present study – that is part of the “Bochum Optimism and Mental Health (BOOM)” program which is a large international project from Germany that investigates risk and protective factors of well-being – aimed to at least partly close this research gap. Within the framework of the BOOM program since 2011, freshmen who enroll at a large university in the Ruhr region in Germany are invited by email to participate in an anonymous online survey to learn more about their well-being. The assessed variables partly differ between annual investigations.

Based on findings from the U.S. that emphasized the increase of depression symptoms, psychological distress, and of online media use in younger cohorts (e.g., Twenge et al., 2018), in the current exploratory investigation, the focus was on the negative variables depression, anxiety, and stress symptoms, as well as on online media use that was operationalized by gaming behavior and by use of social platforms.

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Moreover, considering that well-being is more than just the absence of psychopathological symptoms (World Health Organization, 2014), and following the dual-factor model of subjective well-being that highlights the importance to focus on negative and positive factors (Keyes, 2005), the variable positive mental health (PMH) was included. PMH represents emotional, psychological and social well-being (Lukat et al., 2016). A retrospective check revealed that all six variables of interest were simultaneously assessed in the BOOM program in the freshmen cohorts 2016 to 2019. Results of the current study may shed light on potential cohort differences considering well-being and media use in Germany, and therefore enable first conclusions about the generalizability of the findings from the U.S. Additionally to the cohort trends, the relationship between the factors of well-being and media use will be considered. This may contribute to the investigation of the hypothesis (Twenge et al., 2018) that the decrease of well-being is significantly linked to the increase of online media use.

Considering the explorative character of the present study, three research questions were investigated:

Does the level of well-being differ between freshmen in the year 2016 to 2019 at a German university? (Research Question 1)

Does the level of online media use differ between freshmen in the year 2016 to 2019 at a German university? (Research Question 2)

Is the level of well-being related to the level of online media use? (Research Question 3)

2. Materials and methods

2.1. Procedure and participants

Data collection took place, respectively, from October to December 2016, 2017, 2018 and 2019. An email that included an invitation to the online survey was sent to all freshmen who enrolled at a large university in the Ruhr region. There were no specific requirements for participation that was voluntary and compensated by course credits. Overall 1985 students participated in the four surveys (2016: $N = 658$, 65.8% women, $M_{age}(SD_{age}) = 21.77(5.40)$, range: 16–59; 2017: $N = 333$, 70.6% women, $M_{age}(SD_{age}) = 20.68(4.48)$, range: 17–64; 2018: $N = 562$, 75.3% women, $M_{age}(SD_{age}) = 21.07(4.61)$, range: 17–52; 2019: $N = 432$, 69.2% women, $M_{age}(SD_{age}) = 20.92(4.74)$, range: 17–54). There were no missing data. All data sets were complete. The responsible Ethics Committee approved the implementation of the BOOM program. All participants were fully informed about the study and provided informed consent to participate online.

Table 1

Descriptive statistics and multiple analysis of variance (multiple analysis of variance, MANOVA) of variables of well-being and of online media use, and correlations between them (overall, and separately for the samples from 2016 to 2019).

	2016, $N = 658$		2017, $N = 333$		2018, $N = 562$		2019, $N = 432$		<i>F</i>	<i>p</i>	η_p^2	
	<i>M(SD)</i>		<i>M(SD)</i>		<i>M(SD)</i>		<i>M(SD)</i>					
Depression Symptoms	5.29(5.11)		5.70(5.46)		6.30(5.29)		6.29(5.60)		4.794	.002	.017	
Anxiety Symptoms	4.15(4.00)		5.02(4.57)		5.46(4.88)		5.40(4.90)		10.493	< .001	.016	
Stress Symptoms	7.12(4.77)		7.73(5.22)		8.56(5.10)		8.33(5.13)		9.660	< .001	.014	
Positive Mental Health	17.72(5.84)		17.09(5.96)		17.08(6.07)		16.42(6.40)		4.063	.007	.006	
Gaming Behavior	2.99(2.10)		2.64(1.95)		2.54(1.79)		2.85(1.95)		6.170	< .001	.009	
Social Platform Use	4.84(1.97)		5.28(1.80)		5.18(1.82)		6.15(1.61)		153.563	< .001	.065	
<i>Correlation analyses</i>												
	2016-19, $N = 1985$				2016, $N = 658$		2017, $N = 333$		2018, $N = 562$		2019, $N = 432$	
	Gaming		Social Platform		Gaming		Social Platform		Gaming		Social Platform	
Depression Symptoms	.166**		.069**		.100*		.023		.133*		.079	
Anxiety Symptoms	.076**		.098**		.031		-.012		.106*		.120**	
Stress Symptoms	-.028		.111**		-.091*		.051		.000		.113*	
Positive Mental Health	-.109**		.023		-.059		.063		-.119*		-.064	
									.123**		.106*	
									.106*		.120**	
									.015		.133**	
									-.122**		.027	
									-.180**		-.039	

Notes. *M* = Mean; *SD* = Standard Deviation; *p* = significance; η_p^2 = partial eta-squared, effect-size measure. ***p* < .01, **p* < .05.

2.2. Measures

2.2.1. Depression, Anxiety and Stress Symptoms

The Depression Anxiety Stress Scales 21 (DASS-21; Nilges and Essau, 2015) assessed symptoms of depression, anxiety and stress with respectively seven items per subscale (e.g., depression subscale: “I couldn't seem to experience any positive feeling at all”, anxiety subscale: “I felt scared without any good reason”, stress subscale: “I tended to over-react to situations”). Items are rated on a 4-point Likert scale (0 = *did not apply to me at all*, 3 = *applied to me very much or most of the time*). Current scale reliability: depression subscale: Cronbach's $\alpha = .90-.91$, anxiety subscale: $\alpha = .79-.84$, stress subscale: $\alpha = .86-.88$.

2.2.2. Positive Mental Health (PMH)

To assess PMH, the unidimensional Positive Mental Health Scale (PMH-Scale; Lukat et al., 2016) was included. This instrument consists of nine items rated on a 4-point Likert scale (e.g., “I enjoy my life”; 0 = *do not agree*, 3 = *agree*; current scale reliability: $\alpha = .91-.92$).

2.2.3. Media Use: games and social platforms

Participants were asked to rate, respectively, on a 7-point Likert scale how often they play online games (excluding games on social platforms), and how often they engage in the use of social platforms (1 = *never*, 7 = *more than once a day*).

2.3. Statistical analysis

Statistical analyses were conducted with SPSS 24. After descriptive analyses, a multivariate analysis of variance (MANOVA) was calculated to compare the means of the investigated variables between the four samples (i.e., depression, anxiety, stress symptoms, PMH, use of social platforms and gaming). Since the Box's test was significant ($p < .001$), the Hotelling's trace statistics were used. Partial eta-squared (η_p^2) served as the effect-size measure of main effects, Hedge's *g* was included as effect-size measure of post-hoc comparisons between groups due to the different sizes of the four samples. Post-hoc comparisons were all Bonferroni-corrected (level of significance: $p < .05$, two-tailed). To investigate the associations between well-being and media use, zero-order correlations were calculated for each sample separately and for the overall $N = 1985$.

3. Results

Table 1 summarizes descriptive statistics of the investigated variables and results of the MANOVA. Hotelling's trace was significant, $T = .102$, $F(18,5924) = 11.139$, $p < .001$, $\eta_p^2 = .033$, indicating that the

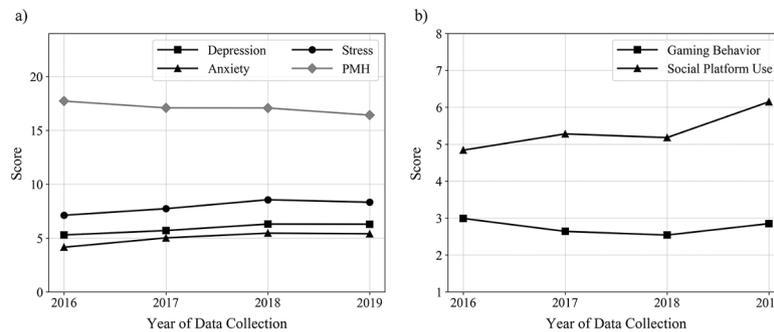


Figure 1. Means of the investigated variables in the years 2016 to 2019: a) Levels of depression, anxiety, stress symptoms and positive mental health (PMH); b) Frequency of gaming behavior and of social platform use (2016: $N=658$, 2017: $N=333$, 2018: $N=562$, 2019: $N=432$).

levels of the investigated variables differ between the four samples. Main effects for all assessed variables were significant (see Table 1).

Figure 1a shows a similar result pattern for depression, anxiety and stress symptoms. The levels of all three variables increased between the years 2016 and 2019. Pairwise comparisons indicated a significant lower depression level in 2016 than in 2018 (2016 < 2018: mean difference, $md=1.005$, $p=.006$, 95% Confidence Interval, $CI[.20, 1.81]$, effect size: $g=.19$), and in 2019 (2016 < 2019: $md=.999$, $p=.015$, 95% $CI[.12, 1.87]$, $g=.18$). For anxiety symptoms, pairwise comparisons revealed significant lower levels in 2016 than in 2017 (2016 < 2017: $md=.866$, $p=.029$, 95% $CI[.06, 1.68]$, $g=.21$), in 2018 (2016 < 2018: $md=1.311$, $p<.001$, 95% $CI[.62, 2.00]$, $g=.30$), and in 2019 (2016 < 2019: $md=1.244$, $p<.001$, 95% $CI[.50, 1.99]$, $g=.29$). Significant lower stress levels were found in 2016 than in 2018 (2016 < 2018: $md=1.438$, $p<.001$, 95% $CI[.68, 2.20]$, $g=.29$), and in 2019 (2016 < 2019: $md=1.202$, $p<.001$, 95% $CI[.38, 2.02]$, $g=.25$).

The level of PMH decreased between the years 2016 and 2019 (see Figure 1a). Pairwise comparisons revealed a significant higher PMH level in 2016 than in 2019 (2016 > 2019: $md=-1.297$, $p=.003$, 95% $CI[-2.29, -.31]$, $g=.21$).

Figure 1b shows a slight reduction of the gaming frequency between the years 2016 and 2018, followed by a slight increase between the years 2018 and 2019. Pairwise comparisons indicated that only the slight decrease between 2016 and 2018 was significant (2016 > 2018: $md=-.454$, $p<.001$, 95% $CI[-.75, -.16]$, $g=.23$). In contrast, the use frequency of social platforms remarkably increased (see Figure 1b). Pairwise comparisons revealed significant differences between the four samples: Use frequency was significantly lower in 2016 than in 2017 (2016 < 2017: $md=.443$, $p=.002$, 95% $CI[.12, .77]$, $g=.23$), in 2018 (2016 < 2018: $md=.344$, $p=.006$, 95% $CI[.07, .62]$, $g=.18$), and in 2019 (2016 < 2019: $md=1.312$, $p<.001$, 95% $CI[1.01, 1.61]$, $g=.71$). Moreover, use frequency was significantly lower in 2017 than in 2019 (2017 < 2019: $md=.869$, $p<.001$, 95% $CI[.52, 1.22]$, $g=.51$), and it was also lower in 2018 than in 2019 (2018 < 2019: $md=.968$, $p<.001$, 95% $CI[.66, 1.28]$, $g=.56$).

As shown in Table 1, the relationship between the four variables of well-being and the two variables of media use were partly significant, but weak. In the calculation that included all samples, gaming and social platform use were both significantly positively correlated with depression and anxiety symptoms. Additionally, social platform use was significantly positively correlated with stress symptoms. Gaming was significantly negatively correlated with PMH. In 2016, gaming was significantly positively correlated with depression symptoms and significantly negatively with stress symptoms. No significant associations were found between social platform use and well-being. In 2017, gaming was significantly positively correlated with depression symptoms and significantly negatively with PMH. Social platform use was significantly positively correlated with anxiety and stress symptoms. In 2018, gaming was significantly positively correlated with depression and anxiety symptoms, and significantly negatively with PMH. Social

platform use was significantly positively correlated with depression, anxiety and stress symptoms. In 2019, the same result pattern was found for gaming as in 2018. Social platform use was significantly positively correlated with anxiety and stress symptoms.

4. Discussion

Our results demonstrate that the level of well-being decreased in the last years and the level of online media use increased. More specifically, students who started their university life in 2019 had higher levels of depression, anxiety and stress symptoms, and lower level of PMH than older cohorts since the matriculation year 2016 (see Research Question 1). And younger students engaged in remarkable more use of social platforms (see Research Question 2). Thus, present findings confirm results from the U.S. (Twenge et al., 2018) at least for the past four years for German students.

Earlier research reported young adults – particularly students – to experience high levels of daily stress and to be at enhanced risk to low levels of well-being in comparison to the general population (Wege et al., 2016; Wunsch et al., 2017). The current study expands previous findings by showing that the well-being of young students even decreased in the past four years. Additionally to the increase of negative factors, PMH decreased. Note that PMH is an important factor that confers resilience and reduces suicide-related outcomes (Teismann et al., 2019). Particularly individuals with enhanced levels of the negative factors of well-being and low levels of PMH are prone to mental disorders (Keyes, 2005; Teismann et al., 2018).

The found increase of social platform use corresponds to the results of Twenge et al., 2019c. An earlier work from Germany (Brailovskaia et al., 2019b) showed that particularly young adults who experience high levels of daily stress and miss social support in the offline world engage in intensive use of social media such as Facebook. Often, they receive online social support which however may contribute to the development of addictive tendencies that reduce well-being (Brailovskaia et al., 2019a; Brailovskaia et al., 2019b). Also, intensive gaming behavior was reported to be associated with lower levels of life satisfaction and with higher levels of loneliness, depression, anxiety, and addictive tendencies (Király et al., 2015; Kuss, 2013; Lemmens et al., 2011).

The investigation of the relationship between the levels of well-being and the levels of online media use revealed significant results (see Research Question 3). In the present study, the use of social platforms was positively correlated with depression, anxiety, and stress symptoms since the measurement in 2017. Gaming behavior was positively linked to depression symptoms in all investigated cohorts, and since 2017 it was also negatively related to PMH. Even though associations found in the current investigation are weak, they confirm the previously assumed trend: More online media use – less well-being (Twenge and Campbell, 2019). Correspondingly, two previously published studies showed that experimentally induced reduction of Facebook use

significantly improved well-being by fostering life-satisfaction and by decreasing depression symptoms (Brailovskaia et al., 2020a; Hunt et al., 2018). Thus, earlier research and the present results emphasize the urgent need to develop intervention programs that, on the one hand, contribute to a conscious reduction of the daily time spent on online media. On the other hand, they should focus on functional strategies to cope with daily stress. One of such coping strategies may be physical activity (for example jogging, cycling and swimming) that is an important protective factor of well-being (Klaperski et al., 2013). Specifically younger cohorts who typically immerse into the online world to escape negative experiences might profit from the intervention programs (Brailovskaia et al., 2018).

Following limitations should be considered when interpreting present findings. In the current study, only four freshman cohorts from the past four years were investigated. In contrast to the large gender balanced samples from the U.S. (for example Twenge et al., 2018), the present samples were comparatively small and included more female than male participants from the same campus in Germany. This limits the representative nature of present results. Furthermore, in the current study, the focus was only on online media use and well-being that was operationalized by positive mental health, depression, anxiety, and stress symptoms. Future studies that investigate cohort trends and mechanisms that may explain potential differences should include further factors such as perceived social support. Previous research emphasized the need to differ between offline social support and online social support (Brailovskaia et al., 2019b). Offline social support is an important protective factor that fosters well-being. It may reduce depression, anxiety, and stress symptoms (Cohen and Wills, 1985; Sarason et al., 2001). Moreover, it may reduce the intensity of online media use. In contrast, as reported earlier, online social support is positively associated with online activity and is an antecedent of addictive tendencies (Brailovskaia et al., 2019b). Addictive media use can negatively impact well-being (Brailovskaia et al., 2020b). Therefore, future research should investigate potential cohort differences considering the level of both forms of social support. A decrease of offline social support and an increase of online social support might contribute to the explanation of the increase of online media use and the decrease of well-being that was found in the U.S. (Twenge et al., 2019c) and replicated in the present study in Germany.

To conclude, the same trends of decrease of well-being and increase of online media use seem to occur in Germany and in the U.S. A potential causal relationship should be investigated in future longitudinal experimental studies with more representative samples in different countries.

Contributors

Both authors read and approved the final manuscript. Julia Brailovskaia and Jürgen Margraf conducted the study design. Julia Brailovskaia conducted the data collection, data preparation, statistical analysis and wrote the lead of the article. Julia Brailovskaia and Jürgen Margraf reviewed and edited the final version of the article. Both authors state their compliance with the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Conflict of Interest

Conflicts of interest: none

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Supplementary materials

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