

# Relationship Between Depression Symptoms, Physical Activity, and Addictive Social Media Use

Julia Brailovskaia, PhD and Jürgen Margraf, Prof

## Abstract

This study investigated the link between depression symptoms, physical activity (e.g., jogging, cycling, and swimming), and addictive social media use (SMU). In a sample of 638 users of social media [mean ( $M$ )<sub>age</sub> standard deviation ( $SD$ )<sub>age</sub> = 21.57 (4.89)], depression symptoms, physical activity, and addictive SMU were assessed by an online survey. Physical activity significantly moderated the positive relationship between depression symptoms and addictive SMU. The higher the physical activity, the weaker the link between depression symptoms and addictive tendencies. Depressed individuals often tend to intensive use of social media to escape negative mood and to find relief. This enhances their risk to develop addictive tendencies. Physical activity may reduce this risk and foster well-being. Therefore, persons with increased depression symptoms should be screened for problematic SMU and be motivated to engage in physical activity.

**Keywords:** depression symptoms, physical activity, addictive social media use

## Introduction

DEPRESSION SYMPTOMS BELONG to leading cause of disability worldwide. They affect different aspects of daily life (e.g., family, study, and work), foster the development of further disorders, and may lead to suicide ideation and behavior.<sup>1</sup> Recent research reported an increase of depression symptoms and suicide-related outcomes particularly in adolescents and young adults.<sup>2,3</sup>

Individuals with enhanced depression symptoms often feel overwhelmed by requirements and obligations of everyday life.<sup>4</sup> Particularly younger people with increased depression symptoms often tend to immerse into the online world to escape them.<sup>5</sup> On social networking sites (SNSs) such as Instagram and Facebook they at least temporarily find distraction from their negative symptoms. Amusing content uploaded by friends and positive comments on own updates foster mood improvement.<sup>6</sup> However, positive experiences made during social media use (SMU) may contribute to the development of a close emotional bond to the SNSs that foster the addictive need to stay permanently online.<sup>7</sup> Six characteristics are typical for addictive SMU: salience, tolerance, mood modification, relapse, withdrawal symptoms, and interpersonal conflicts.<sup>8</sup> In the longer-term addictive SMU may contribute to insomnia and suicide-related outcomes.<sup>9,10</sup> Depression symptoms positively predict the level of addictive SMU.<sup>11–13</sup>

Considering the high prevalence of depression<sup>1,2</sup> and the potential negative consequences of addictive SMU,<sup>10</sup> the question arises which factors may reduce the risk of addictive tendencies particularly in individuals with enhanced depression symptoms. The investigation of this question seems to be of great importance. Results may contribute to the development of prevention programs. They may be applied in the educational system and they may be included in the therapeutic setting when treating patients with depression symptoms to improve their well-being.

Physical activity such as jogging, cycling, tennis, or swimming that can be integrated into daily life is an important strategy to cope with stressful experiences. It is a significant source for mood improvement and physical as well as mental health.<sup>14–16</sup> Previous research indicated that physical activity improves quality of life and may reduce depression symptoms.<sup>17–19</sup> In addition, physical activity contributed to the decrease of addictive Facebook use.<sup>20</sup> However, to the best of our knowledge, the direct relationship between depression symptoms, physical activity, and addictive SMU has not been investigated.

On this background, this study aimed to close this gap. It was assumed that depression symptoms are positively related to addictive SMU (Hypothesis 1); physical activity was expected to be negatively associated with depression symptoms (Hypothesis 2a) and addictive SMU (Hypothesis 2b). Moreover, physical activity was assumed to serve as a moderator

between depression symptoms and addictive SMU (i.e., the higher physical activity, the weaker the link between depression symptoms and addictive SMU; Hypothesis 3).

## Materials and Methods

### Procedure and participants

The sample comprises 638 users of SM [75.4 percent women; mean ( $M$ )<sub>age</sub> standard deviation ( $SD$ )<sub>age</sub> = 21.57 (4.89), range: 18–58; all students]. In November 2019, an invitation e-mail that included a link leading to the online survey was sent to a randomly collected group of 700 students of a large university in the Ruhr region who previously agreed to be contacted for research investigations. The only requirement for participation was a current membership on a social platform. Participation was voluntary and compensated by course credits. The responsible Ethics Committee approved the implementation of this study. All participants were properly instructed and gave their informed consent online to participate.

### Measures

**Depression symptoms.** Depression symptoms were assessed with the depression subscale of the Depression Anxiety Stress Scales 21 (DASS-21).<sup>21</sup> The seven items are rated on a 4-point Likert scale (i.e., “I couldn’t seem to experience any positive feeling at all”; 0 = *did not apply to me at all*; 3 = *applied to me very much or most of the time*; current scale reliability: Cronbach’s  $\alpha$  = 0.916). The DASS-21 is a quantitative dimensional instrument. Higher sum scores indicate higher depression symptoms. It does not serve as a categorical measure of clinical diagnoses. Nevertheless, to characterize the individual degree of depression symptoms relative to the population, following cutoff scores for the severity levels were suggested: “normal” = 0–4 points, “mild” = 5–6 points, “moderate” = 7–10 points, “severe” = 11–13 points, “extremely severe” = 14+ points.<sup>22</sup>

**Addictive SMU.** The brief version of the Bergen Social Media Addiction Scale (BSMAS)<sup>8</sup> measured addictive SMU. This instrument includes six items (e.g., “Felt an urge to use social media more and more?”) according to the six core features of addictive SMU rated on a 5-point Likert scale (1 = *very rarely*, 5 = *very often*; current scale reliability:  $\alpha$  = 0.831). The higher the sum scores, the higher the levels of addictive SMU. Even though addictive SMU is a continuous variable, a possible categorization approach was suggested for problematic scores, cutoff:  $\geq 3$  on at least four of the six items.<sup>23</sup>

**Physical activity.** The item “How frequently do you engage in physical exercise (e.g., swimming, cycling, jogging)?” assessed the frequency of physical activity. This item is rated on a 5-point Likert scale (1 = *never*, 5 = *four times a week or more*). Previous research described it to be a reliable and valid instrument to measure physical activity.<sup>20,24</sup>

### Statistical analyses

Statistical analyses were conducted using SPSS 24 and the macro Process version 2.16.1.<sup>25</sup> After descriptive analyses, the relationship between the investigated variables was assessed by zero-order bivariate correlations. Next, a moderation analysis (Process: model 1) was calculated that included depression symptoms as predictor, physical activity as moderator, and addictive SMU as outcome, controlling for age and gender as covariates. The bootstrapping procedure (10,000 samples) that provides accelerated confidence intervals (95 percent CIs) assessed the moderation effect.

## Results

Table 1 presents the descriptive statistics of the investigated variables. The level of depression symptoms of about 33.5 percent of the participants was in the moderate range or higher. About 44.8 percent of the participants engaged in

TABLE 1. DESCRIPTIVE STATISTICS OF DEPRESSION SYMPTOMS, PHYSICAL ACTIVITY, AND ADDICTIVE SOCIAL MEDIA USE

	n (percent)	<i>M</i> ( <i>SD</i> )	<i>Min–Max</i>
DASS-21: depression		5.83 (5.52)	0–21
“normal” = 0–4 points	346 (54.2)		
“mild” = 5–6 points	78 (12.2)		
“moderate” = 7–10 points	87 (13.6)		
“severe” = 11–13 points	47 (7.4)		
“extremely severe” = 14+ points	80 (12.5)		
Physical activity		3.13 (1.12)	1–5
“never”	92 (14.4)		
“one time a month or less”	85 (13.3)		
“two to four times a month”	175 (27.4)		
“two to three times a week”	221 (34.6)		
“four times a week and more”	65 (10.2)		
BSMAS		12.16 (5.01)	6–29
$\geq 3$ on no to one item	324 (50.8)		
$\geq 3$ on two to three items	202 (31.7)		
$\geq 3$ on four to six items	112 (17.6)		

$N$  = 638; due to rounding the sum scores of the frequencies are not 100 percent.

BSMAS, Bergen Social Media Addiction Scale; DASS, Depression Anxiety Stress Scales; *M*, mean; *Max*, maximum; *Min*, minimum; *SD*, standard deviation.

physical activity at least several times a week. The critical cutoff score of addictive SMU was reached by 17.6 percent of the participants.

Depression symptoms were significantly positively correlated with addictive SMU,  $r=0.405$ ,  $p<0.001$ . Physical activity was significantly negatively correlated with both depression symptoms,  $r=-0.307$ ,  $p<0.001$ , and addictive SMU,  $r=-0.210$ ,  $p<0.001$ .

The moderation model was significant,  $R^2=0.229$ ,  $F(5, 632)=30.026$ ,  $p<0.001$ . As revealed by the significant interaction between depression symptoms and physical activity,  $b=-.110$ , standard error (SE)=0.040, 95 percent CI [-0.189, -0.031],  $t=-2.732$ ,  $p=0.007$ , the relationship between depression symptoms and addictive SMU was moderated by physical activity. The simple slopes tests revealed that the positive link between depression symptoms and addictive SMU was confirmed equally for low, medium, and high levels of physical activity. However, it was strong for individuals who expressed a low level of physical activity (one  $SD$  below  $M=-1.000$ ),  $b=0.438$ ,  $SE=0.058$ , 95 percent CI [0.323, 0.553],  $t=7.507$ ,  $p<0.001$ , but was weaker for individuals who expressed a medium level of physical activity ( $M=0$ ),  $b=0.328$ ,  $SE=0.040$ , 95 percent CI [0.250, 0.407],  $t=8.206$ ,  $p<0.001$ , and remarkable weaker for individuals with a high level of physical activity (one  $SD$  beyond  $M=1.000$ ),  $b=0.219$ ,  $SE=0.055$ , 95 percent CI [0.111, 0.327],  $t=3.981$ ,  $p<0.001$  (Fig. 1).

## Discussion

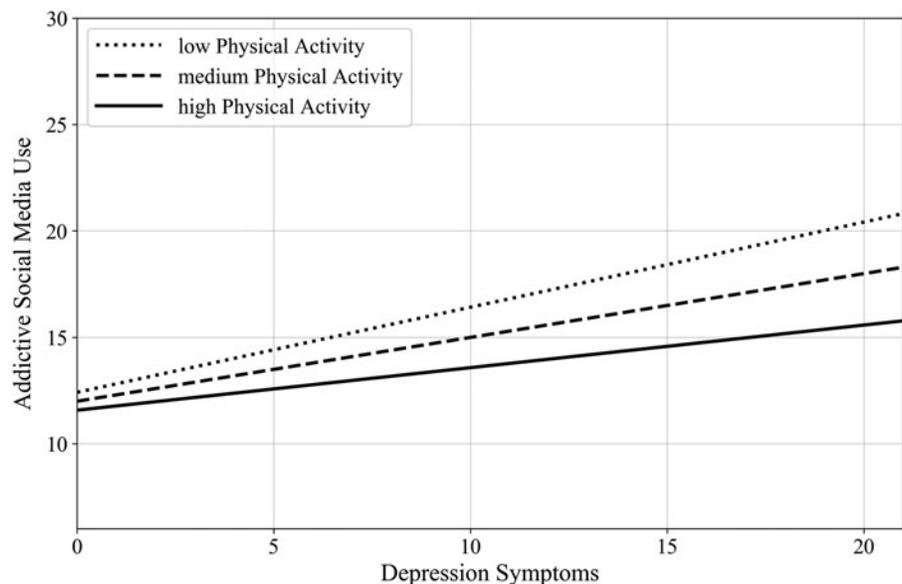
Intensive use of SNSs may contribute to the development of addictive tendencies.<sup>8</sup> Individuals with enhanced depression symptoms seem to be at specific risk for this development.<sup>13</sup> This study complements earlier findings demonstrating that physical activity may moderate the association between depression symptoms and addictive SMU, and thus reduce the risk of addictive tendencies.

Corresponding to previous research,<sup>7,26</sup> depression symptoms were positively associated with addictive SMU (confirmation of Hypothesis 1). SNSs offer individuals with increased

depression symptoms the possibility to immerse in an exciting online world where they can temporarily escape their negative mood.<sup>27</sup> Therefore, for some individuals concerned SMU may be a strategy to cope with negative offline experiences. However, the more positive experiences they gain online and the more social support they receive by their online friends, the higher is the risk that they develop addictive symptoms associated with the need to stay permanently online.<sup>28,29</sup>

In this study, physical activity was negatively linked to both depression symptoms (confirmation of Hypothesis 2a) and addictive SMU (confirmation of Hypothesis 2b). This corresponds to earlier research that showed physical activity to be an important factor that may confer resilience and foster the physical and mental health.<sup>16,30</sup> Physical activity is a functional coping strategy that reduces the negative impact of stressful experiences and contributes to the decrease of depression symptoms.<sup>19,20,31</sup> The protective effect of physical activity is confirmed by current results: physical activity moderates the relationship between depression symptoms and addictive SMU (confirmation of Hypothesis 3). Participants who had increased depression symptoms but engaged in physical activity such as jogging or cycling were at less risk to develop addictive use tendencies of social platforms than individuals who did not integrate these activities in their everyday life. This buffering effect may inter alia be explained by the fact that sportive activity fosters the rest and relief that depressed individuals typically search for on SNSs. It contributes to mood improvement and reduces the need to search for positive emotions online. In addition, individuals who engage in physical activity have less time to immerse into the online world.

Current findings should be integrated in the therapeutic treatment. On the one hand, individuals with enhanced depression symptoms should be screened for addictive SMU. On the other hand, they should be offered and motivated to engage in sportive activities to reduce their symptoms and the risk of addictive bonding to SNSs, and to improve their well-being. Furthermore, they can be applied in educational and prevention systems: less SMU and more sportive activities may improve the mental and physical



**FIG. 1.** Moderating effect of physical activity on the connection between depression symptoms and addictive social media use.

health specifically of children and adolescents with an increased predisposition to depression symptoms.

Some limitations should be considered when interpreting current findings. First, given the cross-sectional nature of present data, only hypothetical conclusions on causality of the found relationships may be drawn. Future longitudinal and experimental research is necessary for real causal conclusions. Second, the mostly young and female composition of the investigated sample limits the generalizability of current results. Their replication in a more age and gender representative sample is desirable. Third, following earlier research<sup>24</sup> physical activity was assessed very generally with only one item. Future research should use more detailed instruments that, for example, assess the daily duration (in minutes) and the nature of physical activity to allow more specific conclusions.

To sum up, this study emphasizes the enhanced risk of persons with increased depression symptoms to develop tendencies of addictive SMU, and it underscores the protective impact of physical activity as moderator between depression symptoms and addictive use of social media.

#### Author Disclosure Statement

No competing financial interests exist.

#### Funding Information

No funding was received.

#### References

- World Health Organization. Depression. 2020. <https://www.who.int/news-room/fact-sheets/detail/depression> (accessed Apr. 3, 2020).
- Twenge JM, Joiner TE, Rogers ML, et al. Increases in depressive symptoms, suicide-related outcomes, and suicide rates among US adolescents after 2010 and links to increased new media screen time. *Clinical Psychological Science* 2018; 6:3–17.
- Twenge JM, Cooper AB, Joiner TE, et al. Age, period, and cohort trends in mood disorder indicators and suicide-related outcomes in a nationally representative dataset, 2005–2017. *Journal of Abnormal Psychology* 2019; 128:185–199.
- Andrews B, Wilding JM. The relation of depression and anxiety to life-stress and achievement in students. *British Journal of Psychology* 2004; 95:509–521.
- Shensa A, Sidani JE, Dew MA, et al. Social media use and depression and anxiety symptoms: a cluster analysis. *American journal of health behavior* 2018; 42:116–128.
- Brailovskaia J, Margraf J. What does media use reveal about personality and mental health? An exploratory investigation among German students. *PLoS One* 2018; 13:e0191810.
- Brailovskaia J, Margraf J. Facebook Addiction Disorder (FAD) among German students—a longitudinal approach. *PLoS One* 2017; 12:e0189719.
- Andreassen CS, Pallesen S, Griffiths MD. The relationship between addictive use of social media, narcissism, and self-esteem: findings from a large national survey. *Addictive Behaviors* 2017; 64:287–293.
- Brailovskaia J, Rohmann E, Bierhoff H-W, et al. Relationships between addictive Facebook use, depressive-ness, insomnia, and positive mental health in an inpatient sample: a German longitudinal study. *Journal of Behavioral Addictions* 2019; 8:703–713.
- Brailovskaia J, Teismann T, Margraf J. Positive mental health mediates the relationship between Facebook Addiction Disorder and suicide-related outcomes: a longitudinal approach. *Cyberpsychology, Behavior, and Social Networking* 2020; 23:346–350.
- Brailovskaia J, Velten J, Margraf J. Relationship between daily stress, depression symptoms, and Facebook Addiction Disorder in Germany and in the USA. *Cyberpsychology, Behavior, & Social Networking* 2019; 22:610–614.
- Ryan T, Chester A, Reece J, et al. The uses and abuses of Facebook: a review of Facebook addiction. *Journal of Behavioral Addictions* 2014; 3:133–148.
- Koc M, Gulyagci S. Facebook addiction among Turkish college students: the role of psychological health, demographic, and usage characteristics. *Cyberpsychology, Behavior, and Social Networking* 2013; 16:279–284.
- Klaperski S, von Dawans B, Heinrichs M, et al. Does the level of physical exercise affect physiological and psychological responses to psychosocial stress in women? *Psychology of Sport and Exercise* 2013; 14:266–274.
- Gerber M, Kellmann M, Hartmann T, et al. Do exercise and fitness buffer against stress among Swiss police and emergency response service officers? *Psychology of Sport and Exercise* 2010; 11:286–294.
- Hallal PC, Victora CG, Azevedo MR, et al. Adolescent physical activity and health. *Sports Medicine* 2006; 36:1019–1030.
- Haible S, Volk C, Demetriou Y, et al. Physical activity-related health competence, physical activity, and physical fitness: analysis of control competence for the self-directed exercise of adolescents. *International Journal of Environmental Research and Public Health* 2020; 17:39–53.
- Wendel-Vos GCW, Schuit AJ, Tijhuis MAR, et al. Leisure time physical activity and health-related quality of life: cross-sectional and longitudinal associations. *Quality of Life research* 2004; 13:667–677.
- Rebar AL, Stanton R, Geard D, et al. A meta-meta-analysis of the effect of physical activity on depression and anxiety in non-clinical adult populations. *Health Psychology Review* 2015; 9:366–378.
- Brailovskaia J, Teismann T, Margraf J. Physical activity mediates the association between daily stress and Facebook Addiction Disorder (FAD)—a longitudinal approach among German students. *Computers in Human Behavior* 2018; 86:199–204.
- Lovibond PF, Lovibond SH. The structure of negative emotional states: comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy* 1995; 33:335–343.
- Lovibond SH, Lovibond PF. (1995) *Manual for the Depression Anxiety & Stress Scales*, 2nd ed. Sydney: Psychology Foundation.
- Andreassen CS, Torsheim T, Brunborg GS, et al. Development of a Facebook addiction scale. *Psychological Reports* 2012; 110:501–517.
- Milton K, Bull FC, Bauman A. Reliability and validity testing of a single-item physical activity measure. *British Journal of Sports Medicine* 2011; 45:203–208.
- Hayes A. (2013) *Introduction to mediation, moderation, and conditional process analysis*. London: Guilford Press.
- Brailovskaia J, Schillack H, Margraf J. Facebook Addiction Disorder (FAD) in Germany. *Cyberpsychology, Behavior, and Social Networking* 2018; 21:450–456.

27. Brailovskaia J, Rohmann E, Bierhoff H-W, et al. The brave blue world: facebook Flow and Facebook Addiction Disorder (FAD). *PLoS One* 2018; 13:e0201484.
28. Brailovskaia J, Rohmann E, Bierhoff H-W, et al. The relationship between daily stress, social support and Facebook Addiction Disorder. *Psychiatry Research* 2019; 276: 167–174.
29. Marino C, Gini G, Vieno A, et al. The associations between problematic Facebook use, psychological distress and well-being among adolescents and young adults: a systematic review and meta-analysis. *Journal of Affective Disorders* 2018; 226:274–281.
30. Vuillemin A, Boini S, Bertrais S, et al. Leisure time physical activity and health-related quality of life. *Preventive Medicine* 2005; 41:562–569.
31. Harris AHS, Cronkite R, Moos R. Physical activity, exercise coping, and depression in a 10-year cohort study of depressed patients. *Journal of Affective Disorders* 2006; 93:79–85.

Address correspondence to:

*Dr. Julia Brailovskaia*

*Department of Clinical Psychology and Psychotherapy*

*Mental Health Research and Treatment Center*

*Ruhr-Universität Bochum*

*Massenbergstraße 9-13*

*Bochum 44787*

*Germany*

*E-mail: julia.brailovskaia@rub.de*