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# International Classification of Diseases-11-Based External Assessment of Social Media Use Disorder in Adolescents: Development and Validation of the Social Media Use Disorder Scale for Parents

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## Abstract

Social media use disorder (SMUD) is associated with substantial impairments in daily functioning, and adolescents are particularly at risk. The 11th revision of the International Classification of Diseases (ICD-11) criteria of gaming disorder (GD) could be shown to be suitable to describe SMUD in adolescents. Since adolescents' insight might be limited due to young age or symptom denial, it is essential to include their parents in the diagnostic process. The development and validation of a parental scale are, therefore, of great interest to clinicians and scientists. The Social Media Use Disorder Scale for Parents (SOMEDIS-P) was developed by clinical experts and validated in 944 parent-child dyads. Adolescents were 10–17 years old and frequently used social media (SM). Besides SM use times, standardized questionnaires were applied to assess SM use patterns according to ICD-11 and *Diagnostic and Statistical Manual of Mental Disorders-5* criteria of (Internet) GD, psychological stress, and depressive symptoms in an online survey. Item structure was investigated by confirmatory factorial analysis. Receiver operating characteristic curve analyses to determine cutoff values and accordance with adolescent self-ratings were computed. A presumed two-factorial structure of SOMEDIS-P could be confirmed describing cognitive-behavioral symptoms and negative consequences. The instrument showed good to excellent internal consistency and criterion validity with moderate to strong correlations, excellent discriminatory characteristics, and moderate accordance with the adolescents' self-ratings. As the first successfully validated tool for the assessment of ICD-11-based SMUD in adolescents by parental judgment, SOMEDIS-P can make an important contribution to reliable SMUD screening in clinical practice and research.

**Keywords:** social media use disorder, behavioral addictions, adolescents, parental rating, questionnaire

## Introduction

IN THE PAST DECADE, THE USE of social media (SM) services among adolescents has significantly increased, especially during the ongoing COVID-19 pandemic, due to their important role to stay socially connected, fight boredom, and acquire information under repeated contact restrictions and a lack of alternative activities.<sup>1–4</sup> Adolescents are considered to be especially at risk to develop problematic use patterns because of an imbalance between high sensation, novelty, and

reward seeking on the one hand and immature cognitive control functions on the other hand.<sup>5</sup> Average prepandemic prevalence estimation for a problematic social media use (PSMU) among European adolescents was 7.38 percent.<sup>6</sup>

Affected young users show significant sleep reduction, lower daily functioning, reduced well-being, difficulties in emotion regulation, more psychological stress, and peer problems.<sup>7,8</sup> Moreover, comorbid symptoms of depression, attention deficit hyperactivity, and obsessive compulsive disorder, as well as anxiety disorders have been reported.<sup>9</sup>

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Despite ongoing debates about the conceptual framework of PSMU, previous research showed that transferring criteria of Internet gaming disorder (IGD) as defined in the appendix of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)*<sup>10</sup> and of gaming disorder (GD) as introduced in the 11th revision of the International Classification of Diseases (ICD-11)<sup>11</sup> are valuable approaches to describe at-risk and pathological SM use patterns.<sup>12,13</sup>

However, the ICD-11 criteria are associated with a higher diagnostic threshold than the *DSM-5* criteria since, besides specific symptoms, significant impairments arising from them must be present.<sup>14,15</sup> In addition, pathological SM use patterns can be distinguished from hazardous patterns by the ICD-11. Accordingly, hazardous use refers to a persistent pattern with awareness of an increased risk of physical or psychological harm to self or others.

To refer to the different concepts and in line with previous research, we will use the term PSMU<sup>16,17</sup> in this article to address SM use meeting *DSM-5* IGD criteria and the term *social media use disorder* (SMUD)<sup>13</sup> to describe SM use meeting ICD-11 GD criteria.

To the best of our knowledge, SMUD in adolescents can only be assessed by one self-rating instrument at this time.<sup>13</sup> No questionnaires based on external ratings are available, even though the added value of parental ratings for the diagnostic process in adolescent psychiatry and psychotherapy was repeatedly shown in general<sup>18</sup> and specific for PSMU.<sup>19</sup>

Clinicians and researchers working with children and adolescents call for a reliable and valid tool to detect SMUD by parental ratings at a time of increased SM usage. Therefore, the aims of this study were (1) the development of a parental SMUD screening instrument for adolescents (Social Media Use Disorder Scale for Parents, SOMEDIS-P), (2) the description of the psychometric properties of the new scale, (3) the validation in a representative sample of parents and their 10- to 17-year-old frequent SM using children, and (4) the calculation of the accordance between parental and adolescent ratings.

## Methods

### Participants and procedure

A representative online survey was conducted by the German market and opinion polling company forsa on the basis of a random sampling procedure. One thousand one hundred forty-two parents and one respective child between 10 and 17 years ( $N_{\text{dyads}} = 2284$ ) participated between November 10 and December 1, 2020. Sample representativity was ensured regarding gender, children's age, and region of residence. A detailed description of the sample acquisition can be found in Paschke et al.<sup>13</sup> Ethical consent was sought by the local institutional review board (Local Psychological Ethics Commission, LPEK) at the University Medical Center Hamburg-Eppendorf. Participants gave their informed consent prior to enrolment and could withdraw from the study at any time, for any reason.

### Measures

Social media use disorder. The SOMEDIS-P was adapted from the psychometrically profound Social Media Disorder Scale for Adolescents (SOMEDIS-A)<sup>13</sup> by specialized clinicians and researchers to assess SMUD by ado-

lescents' parents based on the ICD-11 criteria of GD. These are shown together with corresponding *DSM-5* IGD criteria and the 10 questionnaire items in Table 1.

To determine the accordance of parental and self-reports of SMUD symptoms, adolescents were asked to complete SOMEDIS-A. Adolescents were classified with a SMUD when the two subscale sum scores (cognitive-behavioral symptoms and negative consequences) were above the cutoff and the time criterion was fulfilled.<sup>13</sup> The internal consistency for the current sample was very good (Cronbach's  $\alpha = 0.91$ ).

To assess PSMU symptoms according to *DSM-5*, the parental version of the one-factor polythetic 9-item Social Media Disorder Scale (SMDS-P) was used.<sup>19</sup> For the current sample, the internal consistency was good (Cronbach's  $\alpha = 0.86$ ). As suggested by Ko et al.<sup>15</sup> and Jo et al.<sup>14</sup> for GD, SMDS-P items reflecting ICD-11 criteria (Table 1) were analyzed to estimate SMUD. Adolescents were classified with SMUD when all four corresponding items were answered with yes.

PSMU correlates with the time spent with SM.<sup>9,20</sup> Therefore, parents and the corresponding adolescents rated the average number of days with SM use per week, and the average time spent with SM per week (school) day, and per weekend (leisure) day. Out of the latter two, a mean time was computed.

Symptoms of psychological stress perception and depression. Additional criteria validity was measured by applying standardized measures of adolescent stress and depressive symptoms previously shown to be correlated with PSMU.<sup>7,9</sup> The internal consistencies of the 10-item Perceived Stress Scale (PSS-10)<sup>21</sup> and the 9-item Patient Health Questionnaire (PHQ-9), based on the *DSM-IV* criteria for depression,<sup>22</sup> were good in this study (Cronbach's  $\alpha_{\text{PSS-10}} = 0.82$ ;  $\alpha_{\text{PHQ-9}} = 0.88$ ).

### Statistical analysis

Data management. One thousand forty-seven (91.68 percent) parents reported that their children used SM at least once a week. Corresponding dyads were considered for further analysis. One hundred three parent-child dyads with substantial (more than one third) missing values in SOMEDIS-A, -P, and SMDS-P were excluded leading to a final number of 944 dyads ( $N_{\text{total}} = 1888$ ). To retain all remaining respondents, missing data were replaced using multiple imputation<sup>23</sup> with the package mice of the statistical program R.<sup>24</sup> Moreover, multiple imputations were performed for adolescent PHQ-9 and PSS-10 with nonsubstantial missing answers. This led to a total replacement of 0.15 percent (SOMEDIS-P) to 1.51 percent (PSS-10) per instrument.

Factor analysis, internal consistency, and criterion validity. Confirmatory factor analysis (CFA) with robust minimal residuals was applied to confirm the two-dimensional factor structure analogous to SOMEDIS-A. Internal consistency was estimated using Cronbach's alpha and McDonald's omega.<sup>25</sup> Criterion validity was assessed by correlation tests (Pearson or Spearman depending on variable/scale distribution)<sup>26,27</sup> of SOMEDIS-P with SMDS-P sum scores (based on complete questionnaire) as well as with SOMEDIS-A, PHQ-9, and PSS-10 sum scores, days with SM use per week, and the time spent with SM per day as reported by the adolescents.

TABLE 1. SOCIAL MEDIA USE DISORDER SCALE FOR PARENTS ITEMS WITH CORRESPONDING INTERNATIONAL CLASSIFICATION OF DISEASES-11 AND *Diagnostic and Statistical Manual of Mental Disorders-5* CRITERIA

ICD-11 criteria and corresponding DSM-5 item <sup>a</sup>	SOMEDIS-P items Thinking of the past 12 months, how strongly do you agree with the following statements? <sup>b</sup>
A) Impaired control over SM use (e.g., onset, frequency, intensity, duration, termination, context). <i>unsuccessful attempts to control participation in SM (i.e., loss of control)</i>	1. My child often uses social media more frequently and longer than he/she planned to or agreed upon with me or my partner. 2. My child often cannot stop using social media even though it would be sensible to do so or, for example, I have told him/her to stop
B) Increasing priority given to SM use to the extent that it takes precedence over other life interests and daily activities. <i>Loss of interest in previous hobbies and entertainment as a result of, and with the exception of SM (i.e., give up other activities)</i>	3. My child often does not pursue interests outside the digital world (e.g., meeting friends or partner in real life, attending sports club/societies, reading books, making music) because he/she prefers using social media. 4. My child neglects daily duties (e.g., grocery shopping, cleaning, tidying up after himself/herself, tidying his/her room, obligations for school/apprenticeship/job) because he/she prefers using social media
C) Continuation or escalation of SM use despite the occurrence of negative consequences. <i>Continued excessive use of SM despite knowledge of psychosocial problems (i.e., continuation)</i>	5. My child continues using social media even though it causes him/her stress with others (e.g., with me or my partner, siblings, friends, partner, teachers). 6. My child continues using social media although it harms his/her performance at school/apprenticeship/job (e.g., by being late, not participating in class, neglecting homework, worse grades)
D) The behavior pattern is of sufficient severity to result in significant impairment in personal, family, social, educational, occupational, or other important areas of functioning. <i>Jeopardizing or losing a significant relationship, job, or education or career opportunity because of participation in SM (i.e., negative consequences)</i>	7. Owing to social media use, my child neglects his/her appearance, personal hygiene, and/or health (e.g., sleep, nutrition, exercise). 8. Owing to social media use, my child risks losing important relationships (friends, family, partner) or has lost them already. 9. Owing to social media use, my child has disadvantages at school/apprenticeship/job (e.g., bad [final] grades, inability to continue to the next grade/no graduation, no apprenticeship or university spot, poor reference, warning/dismissal)
E) The pattern of SM use may be continuous or episodic and recurrent and normally evident over a period of at least 12 months	10. For how long did your child experience such problems, conflicts, or difficulties due to social media use during the past year? Did this only occur for single days, during longer periods of several days to weeks, or was it almost daily? <sup>c</sup>

<sup>a</sup>ICD-11/selected DSM-5 (Internet) gaming disorder criteria adapted to social media use.

<sup>b</sup>Response options for items 1–9: Five-point Likert scale: “strongly disagree”–“strongly agree.”

<sup>c</sup>Response options: “not at all,” “only on single days,” “during longer periods,” “almost daily.”

DSM-5, 5th revision of the *Diagnostic and Statistical Manual of Mental Disorders*; ICD-11, 11th revision of the International Classification of Diseases; SM, social media; SOMEDIS-P, Social Media Use Disorder Scale for Parents.

**Sensitivity and specificity.** Receiver operating characteristic (ROC) curve analyses were performed using the R package pROC<sup>28</sup> to assess sensitivity and specificity across the SOMEDIS-P subscale sum scores to predict SMUD based on the already mentioned four-item SMDS-P classification. CIs (95% confidence intervals) were estimated by 999 bootstrapping replications. Youden’s criterion was applied to define cutoff points for classifying pathological and nonpathological SM users. The area under curve (AUC) value was used to evaluate the goodness of differentiation between the two diagnostic groups.

The means and standard error of means of age and SOMEDIS-A, SOMEDIS-P, SMDS-P (complete questionnaire), PHQ, and PSS-10 sum scores as well as days spent with SM per week and mean time spent with SM per day were computed for both groups. For group comparison, a multivariate analysis of variance (MANOVA) with *post hoc* Scheffé tests as well as a chi-square test on gender proportions was calculated. Effect sizes for metric variables were evaluated by Cohen’s *d*.<sup>26</sup>

**Accordance rate.** The two factors of SOMEDIS-P and SOMEDIS-A were correlated separately using Pearson corre-

lations. Moreover, the SOMEDIS-P-derived SMUD classification was compared with the SOMEDIS-A-based classification in a 2 × 2-contingency table with absolute and relative frequencies. Cohen’s  $\kappa$  (unweighted) was calculated to depict the accordance rate between parental and adolescents’ self-ratings.<sup>29</sup>

## Results

The sample characteristics are given in Table 2.

### Factor structure

The fit indices of the CFA to test the two-factor model revealed mixed results: comparative fit index of 0.993 and Tucker-Lewis index of 0.990 were excellent; standardized root mean square residual of 0.061 was acceptable; and the chi-square/*df* ratio ( $\chi^2(26) = 364.306$ ,  $p < 0.001$ , ratio = 14.01) as well as root mean square error of approximation value of 0.117 indicated poor fit.<sup>30</sup> Nevertheless, the two-factor model modeled the data significantly better than a single-factor solution ( $\chi_{diff}^2(1) = 171.67$ ,  $p < 0.001$ ). All items loaded significantly positive on the two factors with standardized coefficients ranging from 0.83 to 0.90.

TABLE 2. CHARACTERISTICS OF FINAL SAMPLE PARENT–CHILD DYADS

Variables/categories	Adolescents, N (percent [95% CI])/mean (SD; range)	Parents, N (percent [95% CI])/mean (SD; range)
Absolute frequency	944	944
Gender		
Male	474 (50.2 [47.0–53.4])	474 (50.2 [47.0–53.4])
Female	470 (49.8 [46.6–53.0])	470 (49.8 [46.6–53.0])
Age in years	13.62 (2.20; 10–17)	47.0 (7.55; 28–75)
Relationship status <sup>a</sup>		
Biological child	863 (91.2 [89.7–93.3])	
Adoptive child	6 (0.6 [0.1–1.1])	
Stepchild	47 (5.0 [3.6–6.4])	
Other <sup>b</sup>	27 (2.9 [1.8–3.9])	
Education level <sup>c,d</sup>		
High	151 (31.9 [27.7–36.1])	288 (30.6 [27.7–33.6])
Medium	288 (60.9 [56.5–65.3])	554 (58.9 [55.7–62.0])
Low	34 (7.2 [4.9–9.5])	99 (10.5 [8.6–12.5])
Occupation <sup>e</sup>		
Full-time employment/school attendance	881 (93.3 [91.7–94.9])	577 (61.3 [58.1–64.4])
Part-time employment/apprenticeship	41 (4.3 [3.0–5.6])	261 (27.7 [24.9–30.6])
Other <sup>f</sup>	22 (2.34 [0.3–3.0])	95 (10.1 [7.5–12.7])
Place of residence		
Urban living <sup>g</sup>	779 (82.5 [80.1–84.9])	
Rural living	165 (17.5 [15.1–19.9])	

Dyads with frequently social media using adolescents, that is, adolescents use social media at least once a week.

<sup>a</sup>No response  $n = 1$ .

<sup>b</sup>Foster child/not specified.

<sup>c</sup>For adolescents: (prospective) school leaving certificate (based on the current school performance)—high = university entry qualification (Abitur), medium = secondary school certificate (Realschulabschluss), low = no/special school (*Förderschulabschluss*)/lower school certificate (Hauptschulabschluss), for parents: highest level achieved—high = bachelor/master’s degree to doctorate (PhD), medium = secondary school-leaving certificate (*Realschulabschluss*)/university entry qualification (Abitur)/completed apprenticeship, low = no or lower school-leaving certificate (*Hauptschulabschluss*).

<sup>d</sup>Adolescents not questioned (under 14 years)  $n = 468$ , no response adolescents (14 years and older)  $n = 3$ , no response parents  $n = 3$ .

<sup>e</sup>No response parents  $n = 2$ .

<sup>f</sup>For adolescents: university students, in voluntary service, military service, other occupation, or unemployed; for parents: job-seeking, welfare recipient, pensioners, disabled, trainee, student, no specification.

<sup>g</sup>Areas with  $\geq 5000$  residents.

CI, confidence interval; N, absolute frequency; SD, standard deviation.

Although SOMEDIS-P items 7 to 9 (personal, social, and academic/occupational impairments), 6 (continuation despite academic/occupational disadvantages), and 3 (loss of other interests due to SM use) loaded significantly on factor 1, SOMEDIS-P items 1 and 2 (loss of control), 5 (continuation despite social stress), and 4 (neglecting daily duties) loaded significantly on factor 2. In line with SOMEDIS-A, factor 1 reflects impending or manifest consequences due to SM use and factor 2 cognitive-behavioral symptoms (Fig. 1).

A significant positive correlation was found between the two latent factors ( $r = 0.695, p > 0.001$ ). Factor 1 explained a variance proportion of 0.81 and factor 2 of 0.80. Table 3 depicts relative item–response frequencies. The nine scale items and the additional timing item showed moderate to strong correlations ( $r = 0.49–0.67$ ).

**Internal consistency**

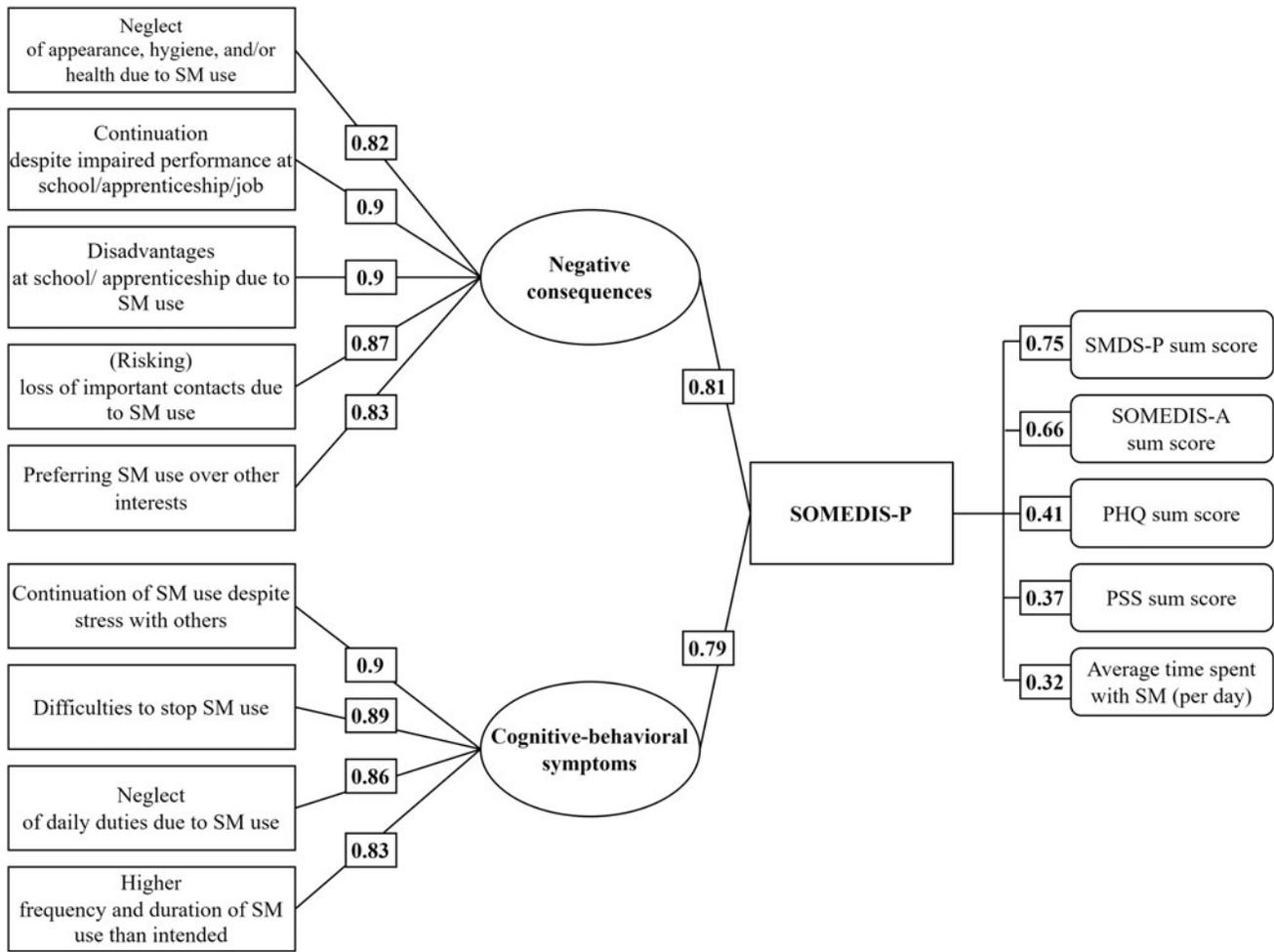
SOMEDIS-P showed a Cronbach’s alpha of 0.93 and McDonald’s omega of 0.95, reflecting excellent internal consistency. The two subscales (based on the two factors) were associated with Cronbach’s alpha of 0.90 for subscale 1 and 0.89 for subscale 2 as well as McDonald’s omega of 0.92 for both subscales indicating good to excellent internal consistency.

**Criterion validity**

Strong positive correlations were found between the SOMEDIS-P sum score and the number of fulfilled DSM-5 criteria of PSMU (SMDS-P sum score,  $r = 0.75, p < 0.001$ ) mirroring excellent criterion validity. SOMEDIS-P sum score and SM use days per week did not significantly correlate (Spearman’s  $\rho = 0.05, p = 0.1436$ ). Yet, the mean SM use per day reported by the adolescents ( $r = 0.32, p < 0.001$ ) and the SOMEDIS-P sum score correlated positively moderately. Moderate positive correlations of the SOMEDIS-P sum score could be found with the PHQ score as a measure of depression ( $r = 0.41, p < 0.001$ ) and the PSS-10 score as a measure of psychological stress perception ( $r = 0.37$ ). These results indicate an overall good criterion validity. Figure 1 visualizes the results (right column).

**Sensitivity and specificity**

According to Youden’s criterion, the optimal cutoff value for the classification as SMUD affected was 6.5 (95% CI, 5.5–7.5) for subscale 1 with a specificity of 84.45 percent (95% CI, 77.18–90.72), a sensitivity of 90.0 percent (80.0–98.0), and an AUC value of 93.0 percent (95% CI, 89.7–96.3).



**FIG. 1.** CFA factor loadings on the latent SOMEDIS-P factor 1 (negative consequences) and SOMEDIS-P factor 2 (cognitive-behavioral SM use symptoms) are depicted in the *left column*. Explained variance proportions of both factors are given in the center. Significant correlation coefficients of the SOMEDIS-P sum score with criteria are shown in the *right column*. All factor loadings and correlations were significant with  $p$  values  $<0.001$ . The usage days per week did not significantly correlate with the SOMEDIS-P sum score and are, thus, not presented. CFA, confirmatory factor analysis; PHQ, Patient Health Questionnaire; PSS, Perceived Stress Scale; SM, social media; SMDS-P, Social Media Disorder Scale for Parents; SOMEDIS-A, Social Media Use Disorder Scale for Adolescents; SOMEDIS-P, Social Media Use Disorder Scale for Parents.

**TABLE 3.** RELATIVE ITEM-RESPONSE FREQUENCY OF SOCIAL MEDIA USE DISORDER SCALE FOR PARENTS ITEMS

SOMEDIS-P items <sup>a</sup>	Response options				
	Strongly disagree	Somewhat disagree	Partially agree/ partially disagree	Somewhat agree	Strongly agree
Item 1	16.8	23.9	32	19.4	7.8
Item 2	22.9	29.6	23.3	17.7	6.6
Item 3	47.7	27.6	13.9	7.7	3.1
Item 4	31.9	32.0	21.9	9.4	4.8
Item 5	37.1	34.4	16.3	9.3	2.9
Item 6	53.7	28.8	9.1	5.0	3.4
Item 7	55.5	25.3	12.5	4.6	2.1
Item 8	62.5	24.8	7.6	3.1	2.0
Item 9	62.5	24.8	7.6	3.1	2.0
	<i>Not at all</i>	<i>Only on single days</i>	<i>For longer periods</i>	<i>Nearly daily</i>	
Timing item	33.5	58.5	5.9	2.1	

Reported in percent.

<sup>a</sup>For the description of items, please refer to Table 1.

TABLE 4. *Post Hoc* MULTIVARIATE ANALYSIS OF VARIANCE AND BETWEEN GROUPS TESTS IN ADOLESCENTS (UN-)AFFECTED WITH SOCIAL MEDIA USE DISORDER ACCORDING TO RECEIVER OPERATING CHARACTERISTIC-CURVE CUTOFFS AND FULFILLED TIME CRITERION

Variables	No SMUD	SMUD	$\chi^2$ /post hoc Scheffé tests	Cramér's V/Cohen's d
Absolute frequency	888	56		
Relative frequency in percent (95% CI)	94.07 (92.56–95.57)	5.93 (4.43–7.44)		
Female gender in percent (95% CI)	49.55 (46.26–52.84)	53.57 (40.51–66.63)	0.002 NS	—
Age mean (SE)	13.6 (0.07)	13.93 (0.24)	—	—
SOMEDIS-P factor 1 score (SE)	3 (0.11)	13.2 (0.57)	10.2***	3.01
SOMEDIS-P factor 2 score (SE)	5.15 (0.12)	13.11 (0.31)	7.95***	2.28
SOMEDIS-P time criterion (SE)	0.67 (0.02)	2.23 (0.06)	1.56***	2.89
SOMEDIS-A factor 1 score (SE)	2.36 (0.11)	8.79 (0.76)	6.43***	1.92
SOMEDIS-A factor 2 score (SE)	4.72 (0.11)	9.55 (0.76)	4.84***	1.34
SMDS-P sum score (SE)	1.42 (0.07)	6.57 (0.3)	5.15***	2.5
Average number of days with SM use per week (SE)	6.24 (0.05)	6.16 (0.25)	—	—
Average time spent with SM per day [in minutes] (SE)	156.49 (16.88)	273.32 (24.5)	116.83***	0.9
PHQ sum score	4.17 (0.13)	10.23 (0.26)	6.07***	1.41
PSS sum score	14.86 (0.22)	21.25 (0.25)	6.39***	0.98

\*\*\* $p < 0.001$ .

Cramér's V/Cohen's d, effect sizes; NS, not significant; PHQ, Patient Health Questionnaire; PSS, Perceived Stress Scale; SE, standard error of the mean; SMDS-P, DSM-5 Social Media Disorder Scale for Parents; SMUD, social media use disorder; SOMEDIS-A factor 1, negative consequences; SOMEDIS-A factor 2, cognitive-behavioral symptoms; SOMEDIS-A, Social Media Use Disorder Scale for Adolescents; SOMEDIS-P factor 1, negative consequences; SOMEDIS-P factor 2, cognitive-behavioral symptoms.

percent) and 8.5 (95% CI, 8.5–10.5) for subscale 2 with a specificity of 81.77 percent (95% CI, 78.07–92.73), a sensitivity of 90.0 percent (95% CI, 76.0–98.0) and an AUC value of 92.0 percent (95% CI, 87.8–96.1 percent). An excellent differentiation is indicated by the AUC values.

Under the cutoff of >6 for subscale 1, >8 for subscale 2, and under consideration of the ICD-11-time item (symptoms at least for longer periods or daily), 5.93 percent (95% CI, 4.43–7.44) of the adolescents were classified as affected by SMUD ( $N = 56$ ). Strong effects were revealed with (per definition) higher SOMEDIS-P, but also higher SOMEDIS-A, SMDS-P-, PHQ-9-, and PSS-10 scores as well as more time spent with SM per day in affected adolescents compared with nonaffected SM users with large effect sizes.

Except for age and the number of days spent with SM per week, all dependent variables (SOMEDIS-P subscale sum scores, SOMEDIS-P time criterion, SOMEDIS-A subscale sum score, SMDS-P sum score, mean SM use per day, PSS-10, PHQ-9) reached significance when being included in a MANOVA with the cutoff-based classification (Pillai score (1,918) = 0.32,  $F(8,911) = 55.66$ ,  $p < 0.001$ ). No difference

was found for gender between the two groups ( $\chi^2(1) = 0.002$ ,  $p = 0.97$ ). For details on the comparisons refer to Table 4.

**Accordance rate**

Strong positive correlations were observed between the total ( $r = 0.66$ ,  $p < 0.001$ ), factor 1 ( $r = 0.66$ ,  $p < 0.001$ ), and factor 2 scores ( $r = 0.60$ ,  $p < 0.001$ ) of SOMEDIS-P and SOMEDIS-A and a moderate correlation for the time criterion ( $r = 0.45$ ,  $p < 0.001$ ).

SMUD classification of adolescents based on SOMEDIS-P and SOMEDIS-A was associated with Cohen's  $\kappa = 0.44$  (95% CI, 0.3–0.57) and a concordance of 95.02 percent. On a factorial level, Cohen's  $\kappa = 0.45$  was calculated for factor 1 and  $\kappa = 0.42$  for factor 2. This resembles a moderate concordance between the parental and the adolescent ratings. For the time criterion,  $\kappa = 0.38$  was calculated indicating fair concordance. Frequencies and accordances rates of positively and negatively screened adolescents by the parental and the adolescent judgment are given in Table 5.

**Discussion**

In this representative study, we developed and validated a 10-item screening instrument to assess SMUD in adolescents by parental ratings applying the ICD-11 criteria of GD for the very first time. SOMEDIS-P could be introduced as a psychometrically robust instrument with good to excellent internal consistency, criterion validity, and discriminatory power to distinguish between adolescents with and without SMUD. The concordance of parental and adolescent self-ratings was moderate.

CFA supported the assumption of two factors underlying the scale: one factor resembling cognitive-behavioral

TABLE 5. ABSOLUTE FREQUENCIES AND ACCORDANCE OF ADOLESCENTS POSITIVELY AND NEGATIVELY SCREENED WITH SOCIAL MEDIA USE DISORDER

	SOMEDIS-P +	SOMEDIS-P –	Accordance (percent)
SOMEDIS-A +	20	11	64.52
SOMEDIS-A –	36	877	96.06
Accordance (percent)	35.71	98.76	95.02

Note: + positively screened, – negatively screened.

symptoms (increased frequency and duration of SM use, inability to stop, and neglect of daily duties) and one factor reflecting negative consequences (loss of contacts, withdrawal, poor health, and reduced educational achievements). This finding is in line with other ICD-11 questionnaires assessing GD<sup>31</sup> but also SMUD.<sup>13</sup> It is supported by the innovated ICD-11 concept and the biaxial model of addiction.<sup>32,33</sup> In absence of negative consequences, PSMU patterns can be classified as hazardous.<sup>11</sup> This allows a better differentiation between different SM use patterns that is important for a better understanding of the phenomenon, for estimating prognosis, and deriving therapeutic offers.<sup>19</sup>

ROC curve analyses revealed the same cutoff values for SOMEDIS-P factors as for the adolescents' self-rating SOMEDIS-A. Together with strong correlations between the two scales and moderate concordance, this suggests a good comparability of both instruments. In total, 5.93 percent (95% CI, 4.43–7.44) of the adolescents with frequent SM use were classified as affected by an SMUD based on the parental ratings. The confidence interval is overlapping with the prevalence of 3.33 percent (95% CI, 2.18–4.48) based on the self-ratings<sup>13</sup> and comparable with the prevalence of 5.4 percent for PSMU estimated by Boer et al. for German adolescents.<sup>6</sup>

On a descriptive level, slightly higher rates derived from parental views were also found when classifying frequent adolescent gamers by self- and parental ratings using the ICD-11-based Gaming Disorder Scale for Adolescents (GADIS-A) and Gaming Disorder Scale for Parents (GADIS-P).<sup>34</sup> This might be explainable by adolescent underestimation or parental exaggeration. On one hand, adolescent underestimation could result from socially desirable response patterns<sup>35</sup> and reduced introspective abilities associated with the ongoing development<sup>36</sup> as well as reduced self-regulation and executive control functions in problematic users.<sup>37</sup>

Moreover, effects of a potential symptom denial and concealment need to be considered for addictive disorders.<sup>38</sup> Parental exaggeration, on the other hand, might result from a perspective based on worries and uncertainties about their children's symptom severity.<sup>39,40</sup> Given the potential biases of both approaches, the combination of self- and proxy ratings is of high diagnostic value.<sup>18</sup>

Adolescents with SMUD could be clearly separated from adolescents without SMUD by SOMEDIS-P. In contrast to unaffected adolescents, SM users with SMUD fulfilled more criteria of PSMU, used SM longer per day, and scored significantly higher on the depression and the stress scale. In line with other studies,<sup>12,13,19,41</sup> no differences were found regarding gender and age.

Adolescents with SMUD fulfilled more than six criteria in the *DSM-5*-based PSMU questionnaire on average. This is clearly above the suggested threshold of  $\geq 5$ <sup>12</sup> and resembles the relatedness of ICD-11 and *DSM-5* concepts on the one hand, but the higher specificity by ICD-11 criteria on the other hand.<sup>14,15,31</sup> Affected adolescents used SM on average  $\sim 2$  hours longer per day than unaffected adolescents. This is comparable with the reports of Banyai et al.<sup>42</sup> No differences were found for the number of days with SM use per week as the majority of adolescents use SM daily.<sup>1</sup> Psychological stress is considered a major predisposing factor for health problems.<sup>43</sup>

Adolescents with SMUD showed PSS-10 scores almost 50 percent higher than those without SMUD. A positive correlation between PSMU and stress was shown earlier.<sup>17</sup>

Moreover, the PHQ-9 scores of affected SM users resembled a moderate depressive symptom expression (compared with no depressive symptoms for adolescents without SMUD).<sup>44</sup> This is in line with a systematic review that reported positive associations between PSMU and depression in high school students.<sup>45</sup> The latter two findings underline the potential clinical relevance of SMUD and the urgent need for adequate and valid screening instruments. SOMEDIS-P can make a significant contribution by actively involving parents of the vulnerable group of adolescents in a standardized manner.

In clinical practice, parents are usually the first to notice behavioral problems in their children and seek medical help. It adds on information given by the adolescents themselves or allows a first evaluation when self-ratings are not available or potentially biased due to young age, symptom denial, or motivational problems. Thereby, together with the clinical interview, diagnosis can be improved for an early detection and initiations of interventions to reduce symptoms and prevent severe impairments and chronification.

This study has numerous strengths including the up-to-date topic, the large representative study population of parent-child dyads, and the variety of standardized ratings used to evaluate the validity and discriminatory potential of the new scale. However, face-to-face interviews would have obtained highest validity regarding full and uninfluenced answers but usually to the cost of sample size. Future studies should externally verify the screening results by a clinical interview to fulfill the gold standard of concurrent validity. Yet, given the early stage of research on SMUD, phenomenological ambiguity, and the lack of clinically validated screening alternatives, our study endorses important efforts toward early detection of affected young SM users.

## Conclusion

SOMEDIS-P is the first successfully validated screening instrument to assess SMUD in adolescents according to ICD-11 GD criteria based on parental ratings. The 10-item questionnaire is feasible and fast to use to enhance screening processes in research and clinical work. It can supplement self-reports to reduce potential report biases or allow an initial standardized screening before self-reports can be acquired. Owing to its excellent discrimination between affected and unaffected adolescents, it can contribute to more clarity within the ongoing debate on SMUD conceptualization within ICD-11 behavioral addictions.

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