Sarah Hartmann*, Brigitta Wanner

Chapter 3. Does Facebook Cause Addiction? An Analysis of German Facebook Users

Abstract: With the increasing use of social networking services (SNSs), such as Facebook, the topic of Facebook addiction attracts more and more researchers' interest. However, until recently, it has been neither clear which characteristics define Facebook addiction nor whether it even exists. This chapter aims to explore the relatively new phenomenon of Facebook addiction and identify factors pointing toward excessive Facebook usage. As Facebook addiction is presumed to be a specific form of Internet addiction, an Internet addiction scale was tested for its applicability to measure Facebook addiction and was used as the basis for developing a Facebook addiction scale. Using an online survey, German Facebook users' addiction potential was measured; moreover, participants supposed to be at risk were analyzed in detail to gain further insight into factors that may lead to excessive as well as addictive Facebook usage.

Keywords: Facebook addiction; Online behavioral disorder; Excessive Facebook usage; Social networking site addiction; Internet addiction

Introduction

The use of social networking services (SNSs) has increased significantly in recent years. One of the most prominent examples is Facebook, with 1.44 billion monthly active users in March 2015 and a year-over-year increase of 13 % (Facebook, 2015). Facebook is the world's largest SNS and has become an integral part of most users' daily lives. On average, 69 % of German users visit Facebook at least once per day, with 33 % using it for more than one hour (BITKOM, 2013).

With the use of such SNSs on the rise, however, the potential for a new mental disorder has entered the discussion: s*ocial networking site addiction* (Kuss & Griffith, 2011). Facebook use was found to be primarily motivated by users' maintaining and participating in offline social networks in contrast to many other social networking websites, which are primarily aimed at establishing new contacts

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(Ellison, Steinfield, & Lampe, 2007). In particular, however, the maintenance of these offline networks and social ties is assumed to be related to addictive behavior (Kuss & Griffith, 2011). Furthermore, Griffith (2000) argues users become addicted to specific activities they carry out on the Internet, as a medium, and are not addicted to the Internet itself. Therefore, it is possible users may have already been addicted to an activity before using the Internet, like pathological gambling, in addition to becoming addicted while using functions that are only available on the Internet, like an online chat service (Widyanto & Griffith, 2006).

To explore the phenomena and extent of Facebook addiction in more detail, addiction scales are needed (Andreassen, Torsheim, Brunborg, & Pallesen, 2012; Koc & Gulyagci, 2013), but are still only sparsely available. We also lack a consistent body of research as well as widely accepted theories to explain such activities (Kuss, Griffiths, Karila, & Billieux, 2014). These deficiencies may explain why none of the previously mentioned behavioral addictions is included in the recent version of the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 2013). Accordingly, we will explore the phenomenon of Facebook addiction in detail and analyze core components of addiction and usage behavior of participants considered to be at risk in the following sections of this chapter.

Online Behavioral Addictions

Thus far, pathological gambling is the only behavioral addiction that has been recognized as a formal disorder. However, research has underlined other potential behavioral addictions, such as mobile-phone addiction (Choliz, 2010), online sex addiction (Griffiths, 2012), and Internet addiction (Young, 1998), which one day may also be officially recognized as psychological maladies.

The American psychologist Kimberly Young was the first scientist to establish a set of criteria for identifying Internet addiction, based on the characteristics of pathological gambling (Young, 1996). She categorized Internet addiction by the five subtypes: cyber-sexual addiction, cyber-relationship addiction, net compulsions, information overload, and computer addiction, and established an 8-item scale to measure dependence (Young, 1998). However, Internet addiction can also be deduced from criteria on substance-based addictions (Brenner, 1997). Further co-occurrences with psychiatric disorders, such as impulse control disorder can be found (Shapira, Goldsmith, Keck, Khosla, & McElroy, 2000). In addition, such factors as personality traits and self-esteem seem to be related to Internet addiction (Widyanto & Griffith, 2006). These findings support the assumption that the

Internet itself is not the causal factor of behavioral addiction. No consensus on a definition has been reached. Indeed, Griffith (2012, p. 519) argues the term *Internet addiction* "may already be obsolete" as it comprises several activities to which users can be addicted (e.g., social networking). He calls for research concerning the addictive potential of these specific activities, instead endorsing such terms as *social networking site addiction* to describe the disorder.

Social Networking Site Addiction

As SNS usage has increased over the past two decades (Brenner & Smith, 2013), many people believe they must use them to stay in contact with their offline social connections, in addition to finding or establishing contact with people from work or educational contexts, romantic relationships, or individuals sharing similar interests (Ellison et al., 2007).

The concern of SNS addiction falls into the category of cyber-relationship addictions as a specific form of Internet addiction (Young, Pistner, O'Mara, & Buchanan, 2000). The term s*ocial media addiction* (Al-Menayes, 2015) can also include other platforms, for example, Twitter or YouTube. According to Griffith (2005), SNS addiction should be seen from a bio-psychological perspective. To establish the pathological definition for an addiction, he argues one must derive criteria from already recognized addictions (Kuss & Griffith, 2011). He defines six criteria that addictions share in general (Griffiths, 1996): salience (the activity dominates the person's life), mood modification (the activity causes a sense of delight), tolerance (increasing amounts of activity are needed to retain mood modification), withdrawal symptoms (the occurrence of unpleasant feeling states or physical effects when use is discontinued or suddenly reduced), conflict (interpersonal conflicts, conflicts with other activities, or within the individuals themselves are caused by too much spent on the activity), and relapse (the tendency to revert to earlier patterns after periods of abstinence or control). Observing the presence of these criteria is the first step to diagnosing behavioral addictions, in this case, an SNS addiction.

Social reasons, for example, keeping in touch with people known from offline relationships, were found to be the main motivation for SNS usage (Subrahmanyam, Reich, Waechter, & Espinoza, 2008). Some users prefer online communication via these services rather than face-to-face interaction (Kujath, 2011). In particular, exhibiting a preference for online communication via social networking websites is assumed to be one causal factor of SNS addiction (Kuss & Griffith, 2011). Further influencing factors are personality traits: people who have low self-esteem (Steinfield, Ellision, & Lampe, 2008), narcissistic tendencies (La

Barbera, La Paglia, & Valsavoia, 2009), and high levels of extraversion as well as of low conscientiousness (Wilson, Fornasier, & White, 2010) were found to be more likely to become addicted to substances or activities. Subrahmanyam et al. (2008) stated the most commonly used social networking activities are reading messages (77 %), reading comments and posts (75 %), and browsing pages (66 %). Furthermore, some studies observed age and gender differences in SNS usage, although the results in the latter instance vary widely among studies (Pfeil, Arjan, & Zaphiris, 2009; Raacke & Bonds-Raacke, 2008); thus, its effect on SNS addiction remains vague.

Concerning reasons and motivations underlying SNSs usage, contrasting results were reported. These may be best understood broadly in terms of examining SNSs in general instead of focusing on specific services (Ryan, Chester, Reece, & Xenos, 2014). We can presume the reasons for using social networking websites depend on the specific service (Dunne, Lawlor, & Rowley, 2010; Gülnar, Balcý, & Çakýr, 2010), with further differentiation among SNS addictions needed, for example, Facebook addiction (Ryan et al., 2014) compared with another platform. However, the extent to which differences and characteristics of SNSs causes behavioral addictions remains unclear as the existence of SNS addiction has not yet been established (Griffiths, Kuss, & Demetrovics, 2014).

Facebook Addiction

A recent literature review found only a small number of studies concerning Facebook addiction had been conducted (Ryan et al., 2014). Similar to SNS addiction, these studies also ascertained that personality traits, such as neuroticism and extraversion, are positively related to Facebook addiction scores, whereas consciousness is negatively related (Andreassen et al., 2012). Furthermore, Facebook addiction could be linked to aspects of psychological wellbeing, such as depression (Hong, Huang, Lin, & Chiu, 2014), anxiety (Koc & Gulyagci, 2013), loneliness (Balakrishnan & Shamim, 2013), or relationship dissatisfaction (Elphinston & Noller, 2011). In addition, symptoms of preferring online social interaction, along with mood alteration, deficient self-regulation, negative outcomes, salience, loss of control, withdrawal, relapse, and tolerance also were found (Ryan et al., 2014).

The main reasons for using Facebook are to maintain existing relationships or simply to pass time (Ryan et al., 2014), to occupy oneself, or to procrastinate (Foregger, 2008; Sheldon, 2008). Additional reasons are self-expression and entertainment (Gülnar et al., 2010), companionship, and escape from problems (Ryan et al., 2014). Research has found the motives of self-presentation and escapism especially strongly related to Facebook addiction (Masur, Reinecke, Ziegele, &

Quiring, 2014). Reasons for both general use and specific activities (e.g., chatting or posting status updates) are presumed to be interlinked with usage intensity, and these may lead to heavy Facebook use (Alhabash, Park, Kononova, Chiang, & Wise, 2012). Excessive use does not necessarily lead to addiction, although the reverse is often true (Ryan et al., 2014).

To measure Facebook addiction, we needed to develop appropriate measurement scales. In most cases, these are based on Internet addiction scales that in turn adapt criteria from other addiction disorders, such as pathological gambling or substance-related disorders as mentioned above. Until recently, only a few measures concerning Facebook addiction have been developed, which "underscore a lack of construct validity surrounding Facebook addiction" and therefore differ widely (Ryan et al., 2014). Examples of Facebook addiction scales are the Bergen Facebook Addiction Scale (BFAS) by Andreassen et al. (2012), which includes addiction criteria such as salience, withdrawal, and relapse; the Facebook Intrusion Questionnaire (Elphinston & Noller, 2011), which also includes loss of control and euphoria; and the second Generalised Problematic Internet Use Scale (GPIUS2) (Lee, Cheung, & Thadani, 2012), which includes a preference for online social interaction as a factor to measure Facebook addiction. However, none of these measures proposed a cutoff score to identify problematic Facebook use. Moreover, they have not yet been clinically tested, which is most especially presumed to be mandatory to establish any of the previously mentioned online behavioral addictions in the international classification manuals (Griffiths et al., 2014).

Therefore, the scope of criteria that must be defined to classify Facebook addiction remains unclear. Griffiths (2012) commented on the BFAS that Facebook is a commercial product of which social networking is just one aspect. He believes we must clarify which activities people become addicted to on social networks and which behaviors scales like BFAS are measuring. SNSs are capable of changing quickly and can offer an increasing array of activities, such as playing games, watching videos and films, swapping photos, and sending messages (Griffiths, 2012). Thus, it seems reasonable to posit these varied activities might lead to different types of addiction. However, in the case of Facebook, most of the offered functions, for example, posting, commenting, and so forth (with the exception of playing games on Facebook) are aimed at social interactions among people and the maintenance of relationships, which are both among the main motivations for using Facebook (Ryan et al., 2014). Therefore, the nature of Facebook activities (e.g., reading posts) should certainly be considered when seeking to uncover more about the causal factors of Facebook addiction.

This chapter aims at offering further insights into the causal factors of Facebook addiction and excessive Facebook usage by presenting results obtained

from an online survey conducted with German Facebook users. This sample is used to test an extended version of an Internet addiction scale for its applicability to Facebook addiction. In addition, we look at participants thought to be at risk to detect salience in usage behavior and coherences between Facebook addiction and usage motivations as well as the activities they pursue while using the site.

Method

To measure the extent of Facebook addiction and to investigate whether there are coherences between usage reasons as well as performed activities and Facebook addiction, an online questionnaire was distributed among Facebook users. The questionnaire was online from September 12, 2014 until October 16, 2014, and was disseminated on the authors' Facebook wall as well as on several Facebook groups (with more than 30,000 members total) and forums for university students, for example, forum.student.de and www.studentenseite.de. Both the Facebook groups and the two student forums were chosen because they had a large number of members, which were assumed to be of potential interest for the underlying study. Furthermore, these forums aim to distribute surveys and find participants.

The questionnaire could be answered in approximately ten minutes. In the event a participant needed to pause or stop the study, the survey tool (umfrageonline.de) offered a resume code for each participant, so the study could be resumed after a break.

The measure of Facebook addiction was based on the well-validated Internet addiction scale developed by Hahn and Jerusalem (2010). Their original scale comprises 20 items covering five dimensions of addiction: loss of control, tolerance, withdrawal symptoms, negative consequences for social relations, and negative consequences for work and performance. Each dimension is addressed by four items that can be answered using a 4-point Likert scale: "Strongly Disagree" (1), "Disagree" (2), "Agree" (3), and "Strongly Agree" (4). The wording of the original questions was modified to fit the topic of Facebook addiction with the exception of one item. "I spend more money for the Internet than I can afford" was excluded since money can only be spent for gaming activities on Facebook and not for social networking purposes. After excluding that item, the subscale "loss of control" is composed of only three questions, such as "I spend more time on Facebook than I originally planned" or "I already tried in vain to reduce my time spend on Facebook." The items of the other subscales were adapted in a similar

way to accommodate Facebook usage, but we retained the original number of items.

Based on the literature review, we located a few items from other addiction scales that Hahn and Jerusalem (2010) did not include, but that seem reasonable for our study. For example, Al-Menayes (2015) included such items as "I often use social media while driving" or "My school grades have deteriorated because of my social media usage." Also, items regarding some motives for Facebook use (e.g., self-presentation, escapism, loneliness, passing time, and self-esteem) were included and tested for their potential to be integrated into a Facebook addiction scale as these motives were reported to be strongly related to Facebook addiction (Masur et al., 2014).

We asked survey participants about usage reasons, which they could select from among 21 possible answers. In this case, multiple specifications were possible because participants could have more than one reason to use Facebook. In addition, a free text field was added if participants had another reason for using Facebook not listed in the 21 possibilities presented (Kuss & Griffiths, 2011). Furthermore, participants were asked to specify the average time they spend on their Facebook activities per day. Possible activities were "Reading postings from other users" to "Chat usage" (Rosen, Whaling, Rab, Carrier, & Cheever, 2013, p. 1246). In total, there were 17 possible activities, which could be rated on a 6-point Likert scale ranging from "Never" to "More than 3 hours," adapted from Rosen et al. (2013).

To determine excessive Facebook usage, learning the average amount of time spent on Facebook, along with the time of day or night users log in and during which situations, were all deemed important considerations. We compared whether they log in at generic times (e.g., "right after getting up," "during my breaks," or "right before going to bed") or during critical situations, which could be assumed to result from excessive usage (i.e., "during school/college/work," "when I am driving or biking," or "in the middle of the night") (Wilson et al., 2010). For these items, we used a 4-point Likert rating scale.

Results

Of the 218 students surveyed, five (2.3 %) did not have a Facebook account and therefore were forwarded to the end of the questionnaire. After a validity check, one inapplicable answer (age: 211) was found. As we do not known whether that answer resulted from a typing error or an act of conscious deception, we removed all answers from the participant. Finally, an answer set of 212 partici-

pants remained for analysis. The sample included 70 male (33 %) and 142 female (67 %) participants with an average age of 27 years, and more than 90 % of all participants were 40 years old or younger. The youngest participant in this study was 16 years old, whereas the oldest one was 66 years old. For most of the participants, (47 %), the highest level of education was the "German university entrance diploma" closely followed by 92 participants (43 %) with a university degree. Most of the participants have had a Facebook account since 2009 (29 %); 28 % joined Facebook before 2009; and 28 %, in 2010. The age distribution was unaffected by gender.

Facebook Usage

Over the years, time spent for Facebook use changed. More than 46 % reported the time they spent on Facebook had increased over the past few years, whereas nearly 30 % saw a decrease of time spent on the social network. Barely 24 % of the participants recognized no change.

The most common usage reasons are "to stay in contact with acquaintances" (181 participants), "to communicate with friends I see less often" (170), "to get news from friends" (157), "to stay in contact with family and friends" (125), and "because I am bored" (119). These results confirm findings of other studies as described in the literature review (section above, this chapter).

The activities "chatting," "reading posts," and "browsing photos" are those on which participants reported spending the most time. On average, participants spent 14 minutes per day chatting, twelve minutes reading posts, and five minutes browsing through photos, with 23 participants stating they chat approximately from half to one hour daily. Of participants, eleven use this function more than one hour daily, while six participants use it more than three hours per day. Of the participants, 18 said they read postings from others up to one hour a day, while 17 participants read Facebook posts more than one hour a day. Furthermore, "browsing photos" was reported to be used over a long period each day. While 13 participants look at other people's photos up to one hour per day, one person uses this activity up to two hours a day.

Measure of Facebook Addiction

To verify whether survey participants exhibit addictive behavior or tendencies, a Facebook addiction scale should be used. However, as noted, there is no generally accepted scale, and all available scales result in great differences in the

underlying criteria and characteristics, in the number of items measuring addiction, as well as in survey samples. Therefore, as noted, our decision was to draw on a well-validated Internet addiction scale, based on a German sample, and modify its items to correlate with Facebook addiction. Several other Facebook addiction scales are based on this approach because researchers have presumed the underlying criteria and characteristics of Internet addiction, SNS addiction, and Facebook addiction are similar.

The resulting Facebook addiction scale needed to fit the data collected from this study. To verify fit, we subjected the scale to exploratory factor analysis using primary component analysis (PCA) as well as confirmatory factor analysis (CFA). With PCA, we tested which factor structure underlies our measurement items as well as whether that is equivalent to the structure supposed by Hahn and Jerusalem (2010). CFA is used to test the acceptability of the suggested measurement model by verifying the number of underlying dimensions, called factors, and the pattern of item-factor relationships, called factor loadings (Brown, 2006). Factor loadings are regression coefficients expressing the latent variables' (the factors) direct effect on the indicators (the items); their value should be at least 0.3 (Brown, 2006). In addition, error variances are given for each indicator; they show the proportion of variance in the indicator not explained by the factor.

The original scale proposed by Hahn and Jerusalem (2010) consists of five factors whose variance is explained by Internet addiction, that is, loss of control, withdrawal, tolerance, negative consequences for social relations, and negative consequences for work and performance. However, PCA analysis proposed a different factor structure than the original scale, explaining 63.5 % of the total variance. Instead of two factors addressing the negative consequences (one in relation to work performance and the other to social consequences), PCA suggests subsuming all items addressing the negative outcomes under one factor. In addition, the four items addressing the concept of withdrawal should be split into two factors, one comprising the items SA01 and SA02, and another with the items WD01 and WD02 (see Figure 1).

With CFA, we tested whether the hypothesized model fits the data and if the factorial structure of the model can be assumed to be valid for the population. This means we test whether the relationships and the structure we arranged by the model coincide with the relationships seen in the sample. The model fit can be verified by a number of criteria that have been established for CFA. A very popular index is Chi-square (χ^2), but it is very sensitive to sample size and always leads to the rejection of the model for higher sample sizes (Brown, 2006). Therefore, it should always be reported in combination with other indices, such as the standardized root mean square residual (SRMR), root mean square error of approximation (RMSEA), Tucker-Lewis index (TLI), and the comparative fit index

(CFI). Nevertheless, Byrne (1989) recommends that the value of χ^2 divided by the degrees of freedom (CMIN/*df*) should have a value below 2. Furthermore, Hu and Bentler (1999) proposed cutoff values for the RMSEA should be close to .06 (according to Browne and Cudeck (1993), below .08 at a minimum), the cutoff value of the SRMR should be close to .08 (according to Weston and Gore (2006), below .10 at a maximum), and the TLI and the CFI should be close to .95, but definitely not below .90 (Hu & Bentler, 1999). Comparing these criteria with the model suggested by Hahn and Jerusalem (2010), no satisfactory model fit could be achieved.

Because the model structure proposed by PCA was different from the original model, the new factor structure, as well as the original one, was analyzed with CFA, which is used to test the validity of the proposed factor structure. Whereas the original model did not fit any of the above-mentioned criteria (χ^2 (147) = 366.45, $p < .001$; CMIN/*df* = 2.49; CFI = .84; TLI = .81; RMSEA = .09, 90 % confidence interval (CI) [.08, .10]; SRMR = .10), the factor structure proposed by the PCA revealed much better results and, with a few changes in the number of items, a good model fit (χ^2 (99) = 150.757, $p < .001$; CMIN/*df* = 1.523; CFI = .95; TLI = .94; RMSEA = .05, 90 % confidence interval (CI) [.04, .07]; SRMR = .07). One item addressing the factor tolerance as well as two items of the negative outcomes had to be deleted to achieve an optimal model fit. The new model explains 61.11 % of the total variance.

Although the model fits the above-mentioned criteria, factor tolerance seems to be a very weak factor of Facebook addiction. In addition, the literature suggests that other factors and items are important in order to explain Facebook addiction. In particular, aspects of mood modification as well as intrinsic motivations are missing in the Internet addiction scale of Hahn and Jerusalem (2010) although were shown to be important by several subsequent research studies (Balakrishnan & Shamim, 2013; Lee et al., 2012; Masur et al., 2014). To check whether other items might be more suited to measure Facebook addiction and should therefore be integrated into an addiction scale, ten additional items were included in the questionnaire. These were extracted from other addiction scales, such as the BFAS (Andreassen et al., 2012), the GPIUS2 (Lee et al., 2012), or revealed by the literature (Balakrishnan & Shamim, 2013; Ryan et al., 2014).

Three of the ten items were excluded from further analysis as they had shown weak inter-item correlations. A PCA with the remaining seven items revealed a slightly different factor structure. An additional factor comprising five items was necessary to integrate the new items into the scale. The items underlying this factor seemed to address the topic of mood modification, which is in line with the current literature. The other three items fit the negative outcomes. CFA as well as an analysis of scale reliability led to the final Facebook addiction model presented

in Figure 2. The standardized factor loadings of all 18 items of the new Facebook addiction scale are above .30 and statistically highly significant ($p < .001$). Nevertheless, Facebook addiction explains only a small proportion of the variance of the factors' loss of control (22 % of the variance) and tolerance (11 % of the variance). In addition, Hahn and Jerusalem (2010) reported the factor tolerance to be a weak factor. Therefore, further research is needed to verify whether this factor is indeed one of the components of Facebook addiction. Either weak factor loadings might be due to item selection or this factor might be of less importance to measuring Facebook addiction and therefore should be removed from future scales.

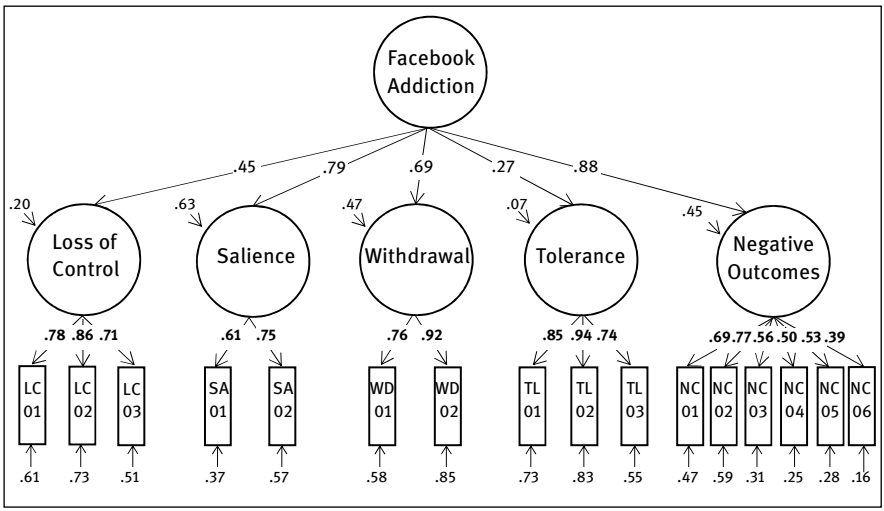

Figure 1: Standardized Model Resulting from a Confirmatory Factor Analysis of 16 Items Measuring Facebook Addiction (Based on Hahn and Jerusalem (2010)). Factor Loadings (in Bold) and Error Variances are Assigned to Each Indicator and Factor.

However, by adding the factor of mood modification and with some modifications in the factor of negative outcomes, the model fit could be improved. The factor mood modification is comprised of the items "I would be bored without Facebook," "I think less about the problems I have in real life when I am on Facebook," "I use Facebook to actively form the image that others perceive of myself," and "I feel vindicated by getting lots of likes and comments," which also represent the motives of passing time, escapism, self-presentation, and self-esteem. In addition, one new item, "I have less time for hobbies since I am using Facebook," was added, and three items addressing the negative outcomes had to be dropped to achieve a better model fit. The confirmative factor analysis of the new 6-factor

model shows a better model fit with χ^2 (129) = 180.654, p < .001; CMIN/df = 1.40; CFI = .96; TLI = .95; RMSEA = .05, 90 % confidence interval (CI) [.03, .06]; SRMR = .07). The new model comprising 18 items can be assumed to constitute a good scale for measuring Facebook addiction in this sample and explains 68.74 % of the total variance.

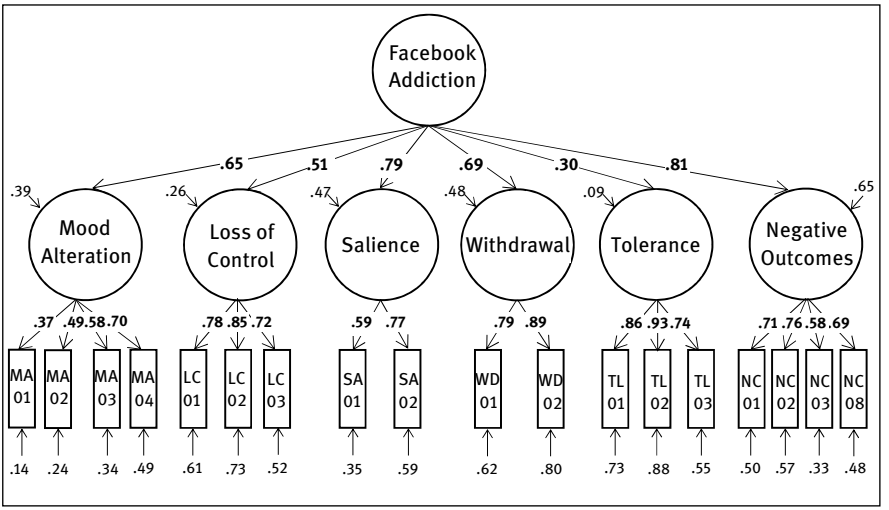

Figure 2: New Standardized Model with 18 Items Including the Factor Mood Modification. Factor Loadings (in Bold) and Error Variances are Assigned to Each Indicator and Factor.

In addition, the new scale displays acceptable internal consistencies (see Table 1). Although the subscales of salience and mood modification indicate poor values of *α = 0.60, as PCA and CFA support this factor structure, it can be assumed the poor internal consistencies are* due to item selection. In the case of the factor salience, the scale should be extended with further items because a construct of only two items is weak, whereas the items of the subscale mood modification should be better directed to measure only one concept because they seem to measure different aspects for now.

Table 1: Addiction Scale with Mood Modification Items.

Items	*α*	*M*	*SD*
Loss of control	**.82**		
I often catch myself saying: 'Just a few more minutes' and then I cannot stop. (LC01)		1.90	0.95
I often spend more time than I originally have planned. (LC02)		2.23	1.03
I often tried in vain to reduce my time spend on Facebook. (LC03)		1.58	0.79
Salience	**.60**		
I think about Facebook during all of my online activities. (SA01)		1.24	0.50
My thoughts circle around Facebook, even though I am not online at all. (SA02)		1.11	0.35
Withdrawal	**.81**		
If I'm not online for a longer time, I get nervous and uneasy. (WD01)		1.26	0.56
I get irritated and dissatisfied if I cannot be on Facebook. (WD02)		1.14	0.43
Tolerance	**.88**		
Meanwhile, I spend more time on Facebook than at the beginning. (TL01)		2.25	1.07
The time I spend on Facebook has steadily increased in comparison with the beginning. (TL02)		1.96	1.00
My need for spending more time on Facebook increased. (TL03)		1.61	0.80
Mood Alternation	**.60**		
I would be bored without Facebook. (MA01)		3.24	0.94
I think less about my problems in real life when I am on Facebook. (MA02)		1.44	0.73
I use Facebook to actively form the image that others perceive of myself. (MA03)		1.69	0.93
I feel vindicated by getting lots of likes and comments. (MA04)		2.32	0.98
Negative Outcomes	**.77**		
I already had trouble at work/school/college, because I was active on Facebook to often instead of working/learning. (NC01)		1.19	0.60
My working/learning performance has suffered under my Facebook usage. (NC02)		1.15	0.48
I often neglect my duties in order to spend more time on Facebook. (NC03)		1.23	0.55
I have less time for hobbies since I am using Facebook. (NC08)		1.15	0.52
Facebook Addiction Scale	**.83**	19.71	7.01

The results of this analysis as well as previous literature suggest it is reasonable to believe there are six core components of Facebook addiction (Andreassen et al., 2012). Therefore, we maintain the proposed addiction scale for further analysis. According to Hahn and Jerusalem (2010), a person is addicted to the Internet if

an average answer of "I agree" (3) on all 20 items is reached. Since our research presents an 18-item scale to measure Facebook addiction, an equivalent value of 54 must be reached for a subject to be classified as addicted to Facebook. Moreover, Hahn and Jerusalem (2010) specified a value range for being at high risk of becoming addicted to the Internet. The scale range for risk they proposed corresponds to an average item value of 2.5, equivalent to a value of at least 45 on our Facebook addiction scale.

At-Risk Participants

By applying the cutoff scores noted above, one participant (0.5 %) could be classified as addicted to Facebook, and five (2.4 %) participants appeared to be in danger of becoming addicted. These participants are the same individuals who ranked the highest according to the scale proposed by Hahn and Jerusalem (after it was modified to fit the sample; see Figure 1). However, declaring these participants as addicted might be rash, because clinical testing is needed to make a firm diagnosis.

Nevertheless, the participants with the highest values are analyzed further on below as they might give some indication of other aspects to be considered when measuring Facebook addiction. In total, 15 participants were analyzed because their values on the addiction scale are very close to each other. Reasons for Facebook usage, Facebook activities, and the duration of their use as well as the point of time when Facebook is used are all considered related to excessive Facebook use (Ryan et al., 2014). Therefore, it is presumed that participants who may be at risk display differences in these aspects, compared with the whole sample.

Regarding usage motives the motives of loneliness, escapism, and self-presentation especially were reported to be strongly related to Facebook addiction (Balakrishnan & Shamim, 2013; Masur et al., 2014). In total, 35 participants (17 %) selected these to be reasons of their Facebook use and four out of 35 participants are in the highest 15. Thus, 3 % of the participants who use Facebook because they feel lonely tend to use Facebook excessively. Escapism ("I think less about my problems in real life when I am on Facebook") was reported by 10 % of all participants and 7 % of the at-risk participants to be a reason for their Facebook usage. Furthermore, 40 % of the participants at risk use Facebook to increase their online popularity, but only 22 % of all participants selected that reason. Whereas loneliness and self-presentation were reported to be a reason for Facebook usage by a higher proportion of the at-risk group than from among the entire sample, the proportion of people who mentioned escapism as a reason is the reverse. Only a very small number of people agreed with the motive of escapism, which could

be reasoned from the small number of participants that could be classified as being addicted to Facebook in our sample, but that should be tested in future research.

All participants use Facebook in order stay in contact with people they know from real life, to get news from these people as well as to stay in contact with people whom they meet less often in real life, for example, because they live too far apart from each other. However, 73 % of the 15 addicted and at-risk participants state they use Facebook to share content quickly, in contrast to only 30 % of all participants who report this as a reason for Facebook use. Furthermore 27 % of participants with addictive tendencies use Facebook to improve their position in society, make up for real-life relationships, and to publish selfies, whereas concerning the entire sample, less than 5 % considered these to be reasons to use the site.

Beside the reasons for Facebook usage, the duration as well as point-of-use time are presumed to be related to excessive Facebook use. Notwithstanding which activity was asked about, at-risk participants stated they use all activities longer than average. The most significant differences in the amount of time used for an activity between those at risk and the entire sample were found for "browsing photos" at 27 %, "sharing posts or photos" at 25 %, and "posting photos" at 21 %. However, the activities that represent the highest amount of time spent are "reading posts," "browsing photos," "browsing profiles," and "chatting." When considering the point-of-use time, Facebook is mostly used "after work, university, or school," "during breaks," or "before going to sleep." About 40 % of the at-risk participants reported accessing Facebook "during the night" as well as "while in traffic," which is a very high number, compared with 11 % ("during the night") and 7 % ("while in traffic") for the entire sample.

In addition, the Pearson correlations between the above-mentioned criteria and the Facebook addiction scale support the assumption that some usage reasons, activities, as well as the point of time when Facebook is used are all related to Facebook addiction. We present the highest significant Pearson correlations between the reasons for Facebook use and Facebook addiction (see Table 2). The results confirm the above-mentioned salience shown by the highest 15 at-risk participants regarding usage reasons, since "making up for real-life relationships," "publishing selfies," and "increasing position in society" indicate the highest correlations with Facebook addiction.

Table 2: Correlations Between Facebook Addiction and Usage Reasons.

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Facebook addiction	1								
2. Getting news from friends	.320**	1							
3. Experiencing group membership	.295**	.139	1						
4. To amuse oneself	.230**	.271**	.075	1					
4. Increasing online popularity	.284**	.125	.220**	.156*	1				
5. Increasing position in society	.331**	.148*	.412**	.112	.509**	1			
6. Making up for real life relationships	.382**	.088	.220**	.073	.517**	.435**	1		
7. Being bored	.308**	.234**	.047	.429**	-.020	.044	.060	1	
8. Sharing content	.248**	.152*	.138	.229**	.153*	.187**	.147*	.124	1
9. Publishing selfies	.354**	.076	.266**	.126	.394**	.330**	.864**	.115	.104

** p < 0.01

Table 3: Correlations Between Facebook Addiction and Activities.

	1.	2.	3.	4.	5.	6.
1. Facebook addiction	1					
2. Reading posts	.358**	1				
3. Liking	.211**	.356**	1			
4. Browsing photos	.329**	.399**	.315**	1		
5. Browsing profiles	.262**	.252**	.254**	.688**	1	
6. Posting photos	.249**	.268**	.277**	.179*	,073	1

** p < 0.01

Table 4: Correlations Between Facebook Addiction and Point-of-Use Time.

	1.	2.	3.	4.	5.	6.	7.
1. Facebook addiction	1						
2. During breaks	.334**	1					
3. After work/university/school	.385**	.420**	1				
4. During meeting friends	.419**	.302**	.216**	1			
5. When participating in traffic	.331**	.204**	.153*	.418**	1		
6. Before going to bed	.357**	.188**	.366**	.336**	.146*	1	
7. During the night	,351**	.147*	.190**	.317**	.436**	.342**	1

** $p < 0.01$

Regarding the activities used by participants, only five could be found to indicate significant correlations with Facebook addiction. Of these, "reading posts" and "browsing photos" indicate correlations higher than .30. Thus, specific activities seem to be less important in explaining Facebook addiction.

All points-of-use time correlate significantly and highly with Facebook addiction (see Table 4). Using Facebook during meetings with friends is especially related to our Facebook addiction scale. However, surprisingly, also using Facebook after work/university/school shows a high Pearson correlation with Facebook addiction, but could result from 88 % of participants having reported using Facebook during those hours.

Discussion

Our proposed Facebook addiction scale considers a person addicted to Facebook if he or she has a scale value of 54 or higher. This corresponds to an average answer of "Agree" (3) for all 18 items of the scale. Based on this guideline, in our study, only one participant would be considered addicted. Hahn and Jerusalem (2010) defined not only the group of Internet addicts, but also the group of at-risk users. Those vulnerable users have a scale value between 45 and 53 on our Facebook addiction scale; therefore, they have an average item value of at least 2.5. Taking into consideration the value for participants at risk, this study would have four participants who are vulnerable users according to Hahn and Jerusalem (2010). However, Hahn and Jerusalem totally disregard the aspect of mood modification, which several other researchers found important when

measuring online behavioral addictions. We believe there would be a better internal consistency if some items were removed and if the two subscales for negative consequences were merged into one. Finally, the best results with CFA could be achieved by adding the factor mood modification. However, further studies are needed to verify whether this result is due to our specific sample or can be applied in general.

The participants at risk showed differences toward the entire sample for usage motives of loneliness and self-presentation, but not for the motive of escapism. In addition, the reasons for Facebook usage, the duration of using specific activities, as well as the point of time indicated significant correlations with Facebook addiction. However, the correlations for Facebook activities are very low, indicating these played a less important role. Point-of-use time seems to be of greater importance to Facebook addiction; this should be analyzed in future studies. One must bear in mind, however, that several factors play important roles in diagnosing an addiction, and possibly not all could be detected by the applied models. Thus, measuring psychological problems with standardized scales is questionable in general and is one of this study's limitations. Future research as well as clinical testing should be used to analyze the extent to which the aspects we presented should be integrated into Facebook addiction scales and whether cutoff points to define addiction might be reasonable to apply.

Further limitations of this study are the questionnaire distribution via Facebook posts and shares, in Facebook groups as well as Facebook forums. The number of excessive Facebook users might therefore be higher than that found among the general population. Furthermore, the number of participants in general is not representative and quite low for scale validations. In addition, it may be questionable whether all participants answered the questions truthfully and objectively. This process would need further validation as well.

Nevertheless, what we could demonstrate is that Facebook addiction remains a very complex construct. A few core components, which had already been mentioned in the literature, were confirmed by this study. Most especially, the aspects of loss of control, mood modification, salience, tolerance, withdrawal, and conflict were found to be of importance in measuring Facebook addiction, although the concept of tolerance seems to be one of lesser importance. Thus, the proposed scale admits for improvement, but brings together many aspects and components already shown by other studies, and therefore helps to unify the different research findings in terms of Facebook addiction.

Conclusion

In sum, the aim of this study was to explore the phenomenon of Facebook addiction and identify factors for excessive Facebook usage. We were able to confirm the assumption that further aspects are related to Facebook addiction and should be integrated into addiction scales, and we also demonstrated some participants are in danger of becoming addicted to Facebook. Thus, the study of Hahn and Jerusalem (2010) may be a good starting point to use in detecting vulnerable users who are likely to develop an Internet addiction, but their scale is insufficient for determining whether a person is addicted to either Facebook or the Internet itself. Further factors, such as usage motivations, also must be considered. Discovering more of these indicators should comprise the work of future studies.

Although a few participants received exceptionally high scores on our Facebook addiction scale and indicated some notable abnormalities concerning Facebook addiction, we reject classifying them as addicted to Facebook since further clinical testing is needed to confirm this classification. However, we do feel we can describe the at-risk participants from our study as excessive or extreme Facebook users whose usage, in turn, might lead to addictive behavior. To diagnose an addiction, the participants would need to be interviewed privately, so more details could be uncovered and the factors influencing excessive usage examined more closely.

Future studies might also use the model presented in this study to determine addiction to other popular applications, such as Tumblr, Twitter, or Instagram, and compare these with the results of Facebook addiction. Such studies could verify whether it is indeed reasonable to believe that users become addicted to specific platforms or whether the classification of being addicted to specific social media activities would be a more suitable label. Facebook is still the most popular SNS in Germany, but this situation could change with the emergence of new services or the improvement of existing ones. Nevertheless, to whichever service the topic of addiction is linked, with the increasing importance of social media in society and culture, the issue of behavioral disorders rises in proportion, and certainly is one that deserves further study. Current research is, as yet, far away from ensuring any such disorders can or will ever become treatable.

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