

**Intensity Of Facebook Use Is Associated With Lower Self-Concept Clarity: Cross-
Sectional And Longitudinal Evidence**

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Abstract

- (1) Background. Social networking sites such as Facebook provide individuals with opportunities to express and gather information relevant to their self-concept. Previous theoretical work yielded contrasting assumptions about a potential link between individuals' Internet use and their *self-concept clarity*, that is, individuals' perception of a clear and internally consistent self-concept content.
- (2) Aim. Focusing on social networking sites, our aim was to provide cross-sectional as well as longitudinal evidence regarding the relationship between individuals' feelings of connectedness to Facebook (*Facebook intensity*) and self-concept clarity.
- (3) Method. Two cross-sectional studies ($N_1 = 244$; $N_2 = 166$) and one longitudinal study ($N_3 = 101$) are presented. Independent samples of adolescents, adults, and students from Austria participated. The statistical procedures included hierarchical regression analyses (Studies 1 and 2) and a cross-lagged panel analysis (Study 3).
- (4) Results. The studies provided consistent evidence for a negative relationship between Facebook intensity and self-concept clarity. Moreover, the longitudinal study showed that Facebook intensity predicted a decline in self-concept clarity over time whereas a reverse pathway was not supported.
- (5) Limitations. Future research should examine the content of the self-concept and should continue searching for specific Facebook activities that might explain the decline in self-concept clarity.
- (6) Conclusions. Our results suggest that an intense attachment to Facebook contributes to an inconsistent and unclear self-concept.

Keywords: Facebook, self-concept clarity, cross-lagged panel analysis, unity hypothesis, fragmentation hypothesis

Intensity Of Facebook Use Is Associated With Lower Self-Concept Clarity:**Cross-Sectional And Longitudinal Evidence**

As of December 2015, over 1.5 billion people actively use Facebook at least once in a month, with over 1 billion daily active users on average (Facebook, 2016). Within a one-minute time-span on Facebook users request a total of 100,000 new friends, give 3,125,000 likes, send 150,000 messages, and upload about 240,000 photos (Ahmad, 2014). The popularity of social networking sites (SNSs) has fueled questions among social scientists and the general public regarding the antecedents, correlates, and consequences of using these platforms. Of particular interest have been questions about the relationship between using SNSs and the user's *self*, that is, the knowledge, attitudes, and evaluations that an individual has about him- or herself (the "me" in William James' terms, cf. Swann & Bosson, 2010). Users of SNSs have ample opportunities for communicating information about themselves, getting related feedback from communication partners, gathering information about others, and providing feedback themselves (Appel, Mara, & Weber, 2014). These activities appear to be a potentially relevant source for the content of the self (Who am I? How do I feel about myself?). Moreover, these activities might affect the structure of the self as well (How sure am I about my own characteristics? Are my characteristics consistent?). Focusing on structural aspects of the self, the aim of the current work was to shed light on the relationship between individuals' feelings of connectedness to Facebook (*Facebook intensity*) and their perception of a clear and internally consistent self-concept (*self-concept clarity*). After an integration of the (diverging) theory and findings connected to this relationship, the results of three studies with three independent

samples are reported. Our empirical approach extends previous studies, as we focused on SNSs and used a well-established indicator of connectedness to Facebook, the Facebook Intensity Scale (Ellison, Steinfield, & Lampe, 2007). We additionally examined particular Facebook activities and usage patterns. Importantly, we provide longitudinal evidence to disentangle causal influences underlying the association between the intensity of Facebook use and the clarity of the users' self-concept.

Self-Concept Clarity

Individuals strive for a firm sense about who they are (Fiske, 2010). At the same time, individuals differ with respect to how clearly and confidently the contents of their self-concept are defined, and to what extent the self-concept is internally consistent and temporally stable. Individual differences in this regard have been investigated under the term of *self-concept clarity* (Campbell et al., 1996). Self-concept clarity (SCC) is a structural feature of the self-concept and it is conceptually distinct from the particular attributes people ascribe to themselves or how they feel about themselves. SCC is conceived as a 'self-opinion' (Conley, 1984), an individual difference that is useful to measure as a state or as a trait, because it is susceptible to environmental influences but it shows also substantial stability over time (Campbell et al., 1996). The standard measure to assess SCC is the *Self-Concept Clarity Scale*, a self-report instrument with established psychometric properties (Campbell et al., 1996; Stucke, 2002). In recent years, studies associated higher SCC with higher psychological adjustment (Campbell, Assanand, & Di Paula, 2003) and well-being (Church et al., 2014), better adaptation to stress (Ritchie, Sedikides, Wildschut, Arndt, & Gidron, 2011), better body image (Vartanian & Dey, 2013), and higher explicit self-esteem (Brandt & Vonk, 2006).

Communication is considered to be a key to achieve a clear sense of oneself. Individuals learn about themselves by observing their own (communicative) behavior (*self-perception theory*, Bem, 1972). Moreover, others' reactions to one's behavior are an important source for developing a firm self-concept (*looking glass self*, Cooley, 1902; *perceived appraisals*, Kenny & DePaulo, 1993). In their attempt at establishing a firm self-concept, individuals can profit from other people's reactions on their appearance and behavior. A longitudinal study conducted with Dutch adolescents (Frijns & Finkenauer, 2009), for example, showed that adolescents who openly communicated with their parents (i.e., kept less secrets) indicated higher self-concept clarity after a six months delay (self-concept clarity did not predict communication with parents at a later point of time, see also van Dijk et al, 2014). However, communication may as well be related to an unclear sense of oneself. The more students engaged in intimate discussions with their peers and talked about their evaluations of others (i.e., tended to gossip), the lower their SCC (Watson, 2011). This is in line with research showing that social comparison processes – both upward and downward social comparison – are associated with an unclear sense of self (cf. Butzer & Kuiper, 2006; Vartanian & Dey, 2013).

Self-Concept Clarity in the Digital Age: Competing Predictions

Today much of the communication of adolescents and adults is conducted over the Internet, which provides ample access to means of self-presentation and self-disclosure, and to getting self-relevant feedback from others. Moreover, Internet applications provide individuals with the opportunity to communicate more or less anonymously, and to select which aspects of the self they wish to reveal. Thus, it is an intriguing question how online communication relates to users' SCC. There are basically two competing hypotheses

regarding the influence of online activities on the clarity of the user's self-concept – the *fragmentation hypothesis* and the *self-concept unity hypothesis* (cf. Valkenburg & Peter, 2011).

The fragmentation hypothesis dates back to the early days of the Internet when chatrooms, bulletin boards, and multiuser dungeons (MUDs) were among the most popular applications. In these applications users were represented only by nicknames, which facilitated taking on different identities. MUDs typically required users to adopt a certain non-self identity as part of a role-playing game. Social scientists observed that individuals indeed used the Internet to experiment with different identities that were only loosely tied to their identity in the offline world (e.g., Reid, 1998; Turkle, 1995). The extent to which users engaged in experimenting with different identities is a matter of some debate (cf. Subrahmanyam & Šmahel, 2011), but it seems safe to say that even in the earlier days of the Internet, pretending to be someone completely else (e.g., pretending to have the opposite sex) was not very common (Gross, 2004; Subrahmanyam & Šmahel, 2011).

In contrast to the early applications, SNSs such as Facebook require individuals to build an online representation of the user's true offline identity; pretending to be someone completely else is considered a norm violation. Still, users can and do present different facets of themselves that may more or less represent their 'true self'. Michikyan and colleagues (Michikyan, Dennis, & Subrahmanyam, 2014; Michikyan, Subrahmanyam, & Dennis, 2014) showed that users most often wish to express their real self on Facebook (e.g., "how I am in real life"), but other facets are communicated as well, such as the ideal self ("to show aspects of who I want to be"). The authors further identified three forms of 'false self', that are expressed on Facebook, that is, for the sake of exploration ("try-out

many aspects of who I am much more than I can in real life”), to deceive (“try to be someone other”), and to impress and compare with others (“I try to impress others with the photos I post of myself”). In many instances a Facebook activity arguably reflects a mixture of these different forms of representing oneself on Facebook. Likewise, Facebook users in a study by Toma and Carlson (2015) perceived their profiles to be more positive than their actual selves on some dimensions (e.g., “outgoing”, “adventurous”, but also “relaxed”). On other dimensions they perceived their Facebook profiles to be accurate (e.g., “creative”, “friendly”, “physically attractive”) and they felt their profiles came across more negative than their actual selves on even other dimensions (“reliable”, “intelligent” or “deep”). Negative self-images on Facebook were attributed to postings by friends, which are difficult to control, but add to a Facebook profile.

According to the fragmentation hypothesis, the salience of many possible selves, and the heterogeneity of self-expressions – and others’ feedback in response to these different facets – impair the development of a consistent and temporally stable self-concept (cf. Reid, 1998). Consequently, the fragmentation hypothesis predicts that more intense use of Facebook should predict lower self-concept clarity.

The *self-concept unity hypothesis* emphasizes the overlap between offline and online selves. With respect to Facebook, a highly cited study indicates that Facebook profiles provide valid information on the users’ personality, as observers could gauge users’ real personality – rather than their ideal personality – just by knowing their Facebook page (Back et al., 2010). In other contexts, however, the overlap between online and offline self might be smaller (Gosling & Mason, 2015), because it is unlikely that individuals ever meet in person, such as in online gaming portals (Graham & Gosling 2013), or the incentive to

express one's ideal self is particularly large, such as on dating websites (Ellison et al. 2012). In line with the self-concept unity hypothesis recent research reconstructed Facebook activities as means for self-affirmation (Toma, 2013; Toma & Hancock, 2013). Self-affirmation theory posits that individuals have a need for self-integrity and self-worth and that in everyone's life many incidents challenge this positive view of oneself (Steele, 1988). Given these challenges and threats, individuals construct the world in a way to preserve self-integrity. Applied to Facebook activities, this theoretical framework suggests that users are motivated to present themselves in a positive, yet honest manner (Toma, 2013; Toma & Hancock, 2013). Thus, flattering postings about oneself are conceived as something that is an integral part of the "true self", rather than a dislocated "ideal self" or "false self". From a self-affirmation perspective, engaging in Facebook activities contributes to users' feelings of self-integrity (Toma & Hancock, 2013). According to the *self-concept unity hypothesis* Facebook users tend to communicate aspects of the true self to a large number of other individuals. These interaction partners in turn provide information to validate one's self-concept, which leads to a firm sense of oneself (cf. Calvert, 2002). Thus, more intense use of Facebook should predict higher self-concept clarity.

Initial Empirical Evidence and Open Questions

In recent years, a substantial number of studies focused on the link between Internet and Facebook use and self-content measures, most notably between Facebook use and self-esteem and well-being. The findings have been mixed with some indicating positive and some indicating negative relationships (e.g., Kim & Lee, 2011; Kross et al., 2013; see Huang, 2010, for a meta-analysis of early studies). Recent research suggest that

for users who do not actively engage in producing content but rather prefer to read others' postings and comments, Facebook use is related to lower self-esteem whereas more positive associations were observed for more active usage patterns (Chou & Edge, 2012; große Deters & Mehl, 2013; Krasnova, Wenninger, Widjaja, & Buxmann, 2013; Verduyn et al., 2015). Active versus passive usage patterns might as well contribute to more rather than less SCC, because acts of self-presentation (e.g., posting comments and photos, commenting on things) appear to be a key for deriving self-relevant feedback that can facilitate the validation of the self-concept. On a more cautionary note, however, activities like changing one's profile picture frequently, or even actively pretending to be someone else might indicate and perpetuate low rather than high SCC.

Empirical evidence on the relationship between Internet use and self-concept clarity is limited. In a cross-sectional study among Canadian undergraduates, Matsuba (2004) reported negative relationships of SCC with the time spent online and pathological Internet use. Moreover, SCC was associated with the motives to use the Internet for communication, and for entertainment. Valkenburg and Peter (2008) focused on SCC as a potential consequence of identity experiments online. A cross-sectional survey on Dutch adolescents found a significant negative correlation between SCC and engaging in such experiments, whereas SCC was positively associated with the variety of communication partners. Both relationships were small in size and the latter vanished when observed as part of a larger structural equation model. Third, a cross-sectional study was conducted in Israel with adolescents in 7th to 9th grade (Israelashvili, Kim, & Bukobza, 2012). SCC was unrelated to the hours surfing the Internet, but negatively related to Internet usage as indicated by the extent they engaged in a variety of Internet-related activities such as using

chats, games, discussion groups, or exploring new websites. Moreover, SCC exhibited a negative association with the level of Internet addiction. Finally, a cross-sectional survey conducted with adolescents in Barbados (Davis, 2013) showed that SCC was negatively linked to a self-conceived measure of online identity expression and identity exploration, but positively linked to friendship quality and mother relationship quality.

Overall, these findings have a common tenor in pointing at a *negative* relationship between Internet use and SCC. This pattern is in line with the fragmentation hypothesis and in contrast to the unity hypothesis. However, the findings are limited in key regards: First, no prior study focused on SNSs. At the time two of the studies were conducted (Matsuba, 2004; Valkenburg & Peter, 2008), engaging in SNSs was a much less common activity than today and the measures of both other studies applied to Internet activities as a whole. As outlined above, in contrast to applications such as chatrooms, video gaming portals or dating websites, SNSs have been described as facilitating a greater overlap between offline and online selves. Thus, the association between intensive use of Facebook and self-concept clarity could differ from earlier research that did not focus on SNSs. Second, the cross-sectional data of these studies allow the possibility of alternative explanations of the results found. Possibly, the associations are due to the tendency of individuals with low SCC to search for self-relevant information by means of online communication and Facebook use. This is basically the reverse causality of the causal path expected from the fragmentation hypothesis. Third, the findings are based on single-item measures or ad hoc scales of Internet use. The use of validated measures would strengthen the evidence.

Overview and Predictions

The general aim of the current set of studies was to examine and disentangle the relationship between the intensity of Facebook use and SCC. We used a well-established measure of Facebook intensity, the *Facebook Intensity Scale* (Ellison et al., 2007), which was developed “to tap the extent to which individuals are emotionally connected to Facebook, and the extent to which Facebook is integrated into individuals’ daily lives“ (p. 1150). Since its development it has been used in a large number of studies on the antecedents, corollaries and consequences of Facebook use (e.g., Clayton, Osborne, Miller, & Oberle, 2013; Pabian, De Backer, & Vandebosch, 2015; Valenzuela, Park, & Kee, 2009). This approach adds to the prior studies on Internet use and SCC which frequently involved measures with unknown reliability and validity.

Based on this Facebook intensity measure, our first aim was to examine whether the negative relationship between Internet use and SCC translates to the use of SNSs, and Facebook in particular. To that end, data from two independent samples were collected (Studies 1 and 2). In Study 2 we further examined particular activities and usage patterns on Facebook, including identity shifts (pretending to be someone else). Information on the prevalence of these activity patterns contributes to the literature on identity exploration (cf. Subrahmanyam & Šmahel, 2011). We further examined relationships between these activities and SCC. Our second aim was to provide initial evidence on the causal patterns underlying the relationship between Facebook intensity and SCC, based on a short-term longitudinal design (Study 3).

Study I

Method

Sample and procedure. A convenience sample of 238 volunteers was recruited in a mid-sized Austrian city by research assistants. All ethical requirements for conducting empirical survey research were met. Among the volunteers, 13 had no Facebook account and were therefore excluded from further analyses; one participant reported that he had not answered the questionnaire seriously. The remaining sample consisted of 224 participants (62.9 % women). About two thirds of the sample accessed the questionnaire over the Internet, one third worked on paper-and-pencil questionnaires. The sample consisted predominantly of adolescents ($n = 66$ were between 14 and 18 years old) and young adults (137 were between 19 and 26 years old, 34 participants were 27 or older). The participants' age ranged from 14 to 48 years ($M = 21.27$ years; $SD = 5.80$).

Measures. The measures reported here were administered as part of a larger survey. The means, standard deviations, and zero-order correlations of the variables are displayed in Table 1.

Self-concept clarity. This construct was measured with the 12-item Self-Concept Clarity Scale (Campbell et al., 1996, sample item "I spend a lot of time wondering what kind of person I really am", reverse-coded, German adaptation: Stucke, 2002). Five-point response scales were provided (1 = *not true at all* to 5 = *completely true*). Higher mean scores indicated higher clarity. The reliability of this scale was good, as indicated by a Cronbach's alpha of .81.

Facebook intensity. We assessed this construct with the help of a German language version of the Facebook Intensity Scale (Ellison et al., 2007).¹ The six items (sample item: “Facebook is part of my everyday activity“) went with five-point scales ranging from 1 = *strongly disagree* to 5 = *strongly agree* and showed a good Cronbach’s alpha reliability of .83. Higher mean scores indicated a more intense relation to Facebook.

Facebook access frequency. As a second indicator of Facebook usage, we assessed how often participants went online to check Facebook. A twelve-point scale was provided that ranged from 0 = *less than once a week* to 11 = *12 times per day or more often*.

Results and Discussion

Based on the prior research that addressed Internet use more broadly, a negative relationship between Facebook intensity and SCC was expected. Our hypothesis was examined with the help of a hierarchical regression analysis with SCC as the criterion. Age and gender were entered first in the equation, followed by Facebook intensity entered second. The demographic variables yielded a significant effect, $F(2, 221) = 13.05$, $p < .001$, $R^2 = .11$, which can be attributed to a significant influence of age, $B = 0.03$, $SE_B = 0.01$, $\beta = .27$, $p < .001$, whereas gender was unrelated to SCC, $B = -0.02$, $SE_B = 0.08$, $\beta = -.01$, $p = .84$. Facebook intensity turned out to be a significant predictor of SCC, $B = -0.16$, $SE_B = 0.05$, $\beta = -.23$, $p < .001$, $\Delta R^2 = .05$. Thus, controlled for age and gender, more intensive use of Facebook predicted less self-concept clarity. We further inspected higher-order interactions to examine whether this relationship varied with respect to participants’

¹ Originally, the Facebook Intensity Scale included two additional items with an open-ended response format (Ellison, et al., 2007). Only the six rating-scale items were used in the current studies.

gender or age. The three two-way and the three-way interactions yielded no significant result (all t s < |1.43|, all p s > .15).

Extending prior research on Internet use and SCC, we focused on the most popular SNS, Facebook, using a reliable and valid set of items. Our findings are in line with the fragmentation hypothesis and consistent with earlier studies that identified a negative association between SCC and measures of compulsive Internet use, Internet addiction, engaging in identity experiments online, and popular Internet activities (Davis, 2013; Israelashvili et al., 2012; Matsuba, 2006; Valkenburg & Peter, 2008). Our rather diverse group of adolescents and adults allowed us to examine whether participants' age influenced the results, however, neither age nor gender moderated the core relationship.

Study II

Questions regarding the relationship between identity and Internet use are particularly pertinent for the group of adolescents (cf. Arnett, 1995). In this age group the development of a coherent self-concept is an important task, and adolescents belong to the Internet's most avid users (Subrahmanyam & Šmahel, 2011). The aim of our second study was two-fold. We aimed at replicating the findings from Study 1 with a different sample, in a different setting (see for example Benoit & Holbert, 2008, on the importance of replication). This time, our particular focus was on adolescents, as establishing a firm sense of one's self is especially important for this age group (Valkenburg & Peter, 2011). Our second aim was to extending the set of variables examined in the first study, and we further asked for particular Facebook activities. We were interested in the prevalence of these activities and their relationships to SCC.

Method

Sample and procedure. Two hundred and six students were recruited at secondary schools in a mid-sized Austrian city and answered the questionnaire in class. All ethical requirements for conducting empirical survey research at schools were met. Among the students, 184 returned the completed questionnaire and indicated that they had answered the questions sincerely. Eighteen students had no Facebook account. The remaining sample consisted of 166 participants (108 female) aged 14 to 20 years ($M = 16.39$ years; $SD = 1.36$).

Measures. *Self-concept clarity* and *Facebook intensity* were measured with the same scales as in Study 1 and showed good reliabilities, as indicated by a Cronbach's alpha of .79 (self-concept clarity) and .83 (Facebook intensity). We further assessed *Facebook access frequency* like in Study 1. Seventeen additional items were included, that asked about the typical activities they engage in on Facebook (e.g., changing the profile picture, uploading pictures/videos, reading comments others wrote in response to one's postings, to act as if one was somebody else, see Table 2). The items went with 5-point scales ranging from 1 = *not at all true* to 5 = *completely true*. Among the Facebook activity items, 'playing with different identities' and 'playing games' were extremely uncommon among our participants, 147 (88.6%) had the lowest possible score on 'playing with different identities' (for similar results see for example Valkenburg & Peter, 2008), 130 (78.3%) had the lowest possible score on 'playing games'. To avoid spurious results, both variables were excluded from further analyses. Table 2 provides the complete list of activities/usage patterns along with means, standard deviations, and zero-order-correlations.

Results and Discussion

To examine our main hypothesis, we ran a hierarchical regression analysis. SCC served as criterion and demographic variables (age and gender) were entered first, Facebook intensity was entered in a subsequent step. The demographic variables, taken together, had no significant effect on SCC, $F(2,163) = 2.17, p = .12, R^2 = .03$, with age being a significant single predictor variable, $B = 0.07, SE_B = 0.04, \beta = .16, p = .047$. Importantly, Facebook intensity was a significant predictor of SCC, $B = -0.12, SE_B = 0.05, \beta = -.19, p = .02, \Delta R^2 = .03$. More intense use of Facebook predicted less self-concept clarity. In order to test whether or not this relationship was moderated by participants' gender or age, higher-order interactions were examined. Neither one of the three two-way, nor the three-way interaction reached significance (all $ts < |1.14|$, all $ps > .26$).

To examine the role of the Facebook activities on SCC, over and above the influence of Facebook intensity, the 15 Facebook activities were entered in the regression equation as an alternative fourth step. The variables together made a marginally significant contribution in explaining self-concept clarity $F(15, 144) = 1.60, p = .08, \Delta R^2 = .13$. Among the 15 activities only two contributed significantly ($\alpha = .05$) to the model. Those were "Look at others' reactions to my postings (e.g., status updates, links)", $B = -0.10, SE_B = 0.05, \beta = -.21, p = .03$, and "Just browse and like, nothing else", $B = -0.10, SE_B = 0.05, \beta = -.22, p = .03$. Of note, even if all 15 activities were entered into the equation, the predictive power of the Facebook Intensity Scale approached significance, $B = -0.11, SE_B = 0.06, \beta = -.16, p = .08$.

Focusing on a sample of adolescents, we again found a negative association between Facebook intensity and SCC, for both genders, and irrespective of participants'

age. In line with expectations (see also Verduyn et al., 2015), two rather passive specific modes of using Facebook were negatively related to self-concept clarity. The results of our cross-sectional studies are in contrast to the self-concept unity hypothesis, which assumes that intense use of SNSs and related applications allows users to develop a particularly clear sense of their selves (cf. Valkenburg & Peter, 2011). However, due to the cross-sectional character of these studies we are hesitant to interpret the data as a support for the fragmentation hypothesis, which posits that the intense use of SNSs hinders rather than assists people's strivings for a clear self-concept. Individuals with low SCC might be more strongly attracted to Facebook and other SNSs (as compared to individuals with higher SCC), because they find the opportunities for self-presentation and receiving feedback from others on Facebook to be particularly attractive. In order to disentangle these competing causal pathways, a longitudinal study was conducted.

Study III

Although both previous studies concordantly demonstrate that Facebook intensity predicted SCC, causal interpretations of these results are inappropriate, because both studies adopted cross-sectional designs. Therefore, this study was based on a short-term longitudinal research design that assessed both constructs at two measurement occasions. Using cross-lagged panel analyses (McArdle & Nesselroade, 2014) this design provides information on causality, that is, whether Facebook intensity influences SCC or, rather, SCC influences Facebook intensity.

Method

Sample and procedure. The participants were students recruited from an introductory course in consumer behavior at an Austrian university. They answered the

questionnaire in class and were invited to answer the same questions three months later. The second questionnaire was administered online. Participants received extra credit for participation. Of the 122 students who participated at both points of time, fourteen had no Facebook account and five had missing values on the relevant items. They were not included in the analyses. Two additional participants indicated that they had not seriously answered the questions. The remaining sample consisted of 101 persons (62 women) with an age range of 19 to 37 years (at T1: $M = 22.37$; $SD = 3.34$).

Measures. *Facebook intensity* and *self-concept clarity* were assessed with the same scales as in both previous studies. Reliabilities (Cronbach's alpha) were satisfactory for both scales at both points of time (Facebook intensity: $\alpha_{T1} = .81$, $\alpha_{T2} = .84$; self-concept clarity: $\alpha_{T1} = .83$, $\alpha_{T2} = .89$).

Statistical analyses. The associations between Facebook intensity and SCC across the two measurement occasions were examined using cross-lagged panel analyses (cf. McArdle & Nesselroade, 2014) in Mplus 7 (Muthén & Muthén, 1998-2012) with a robust maximum likelihood estimator. In line with the previous studies all models acknowledged gender and age as control variables. All analyses modeled the two constructs as latent factors. To create more parsimonious measurement models, we did not analyze individual item scores, but created three item parcels following the item-to-construct balance technique (Little, Cunningham, Shahar, & Widaman, 2002). Because meaningful interpretations of longitudinal models require invariant measurement models (Little, 2013; Little, Preacher, Selig, & Card, 2007), longitudinal factorial invariance was investigated for each construct by comparing a model with factor loadings for a given parcel constrained to be equal over time to a model without equality constraints. Following prevalent

recommendations (Little et al., 2007), these models also included autocorrelations among the residuals of a given parcel, which accounts for the systematic variance associated with each parcel.

The goodness of fit of these models was evaluated using the *Comparative Fit Index* (CFI) and the *Root Mean Square Error of Approximation* (RMSEA). In line with conventional standards (e.g., Hu & Bentler, 1999; Schermelleh-Engel, Moosbrugger, & Müller, 2003), models with a CFI > .90 and a RMSEA < .10 are interpreted as "acceptable", and CFI \geq .95 and RMSEA \leq .05 as "good" fitting.

Results and Discussion

Longitudinal measurement invariance was examined in two steps. First, we fitted an unconstrained longitudinal latent factor model for each construct to the data that included one latent factor at each measurement occasion. The respective models for Facebook intensity, $\chi^2(5) = 4$, CFI = 1.00, RMSEA = .00 [.00, .10], and SCC, $\chi^2(5) = 2$, CFI = 1.00, RMSEA = .00 [.00, .09], showed good fits to the data. In the next step, the factor loadings were constrained across time. The respective models did not fit worse than the unconstrained models, $\Delta\chi^2(2) = 0.08$, $p = .96$ for Facebook intensity, and $\Delta\chi^2(2) = 5.39$, $p = .07$ for SCC. This confirms the assumption of invariant measurement structures; the meaning of both constructs did not change over time.

In light of the invariant measurement models, we fitted the cross-lagged models presented in Figure 1 to the data. The model showed a good fit to the data, $\chi^2(52) = 62$, CFI = 1.00, RMSEA = .00 [.00, .04]. Overall, the demographic variables showed only rather marginal effects on Facebook intensity and SCC: age predicted Facebook intensity at the first measurement occasion, $B = -0.07$, $SE_B = 0.02$, $\beta = -.29$, $p < .001$, and SCC at the

second measurement occasion, $B = -0.03$, $SE_B = 0.01$, $\beta = -.15$, $p = .03$, whereas gender predicted SCC at the first measurement occasion, $B = 0.12$, $SE_B = 0.06$, $\beta = .22$, $p = .04$. All other paths of gender or age on SCC and Facebook intensity were not significant, all $ps > .24$. With regard to the focal constructs, both showed considerable stability across time, $B = 1.02$, $SE_B = 0.06$, $\beta = .95$, $p < .001$, for Facebook intensity, and $B = 0.82$, $SE_B = 0.14$, $\beta = .68$, $p < .001$, for SCC. Importantly, Facebook intensity predicted changes in SCC over time, $B = -0.18$, $SE_B = 0.09$, $\beta = -.22$, $p = .04$. In contrast, SCC was not associated with respective changes in Facebook intensity, $B = 0.03$, $SE_B = 0.09$, $\beta = .02$, $p = .74$.

Thus, the results demonstrate that more intensive use of Facebook predicted less self-concept clarity over time, whereas the reverse effect could not be corroborated. This finding supports the fragmentation hypothesis, indicating that intensive use of Facebook contributes to a more diffuse sense of one's self.

General Discussion

Social networking sites such as Facebook offer plenty of possibilities to provide, share, and obtain information that is relevant for one's own view of oneself. The focus of our work was on the relationship between Facebook intensity (i.e., the emotional connection to Facebook and its relevance in people's daily lives, cf. Ellison et al., 2007) on the one hand and self-concept clarity (i.e., the extent to which one's self-concept is perceived to be internally consistent and temporally stable, cf. Campbell et al., 1996) on the other. One theoretical perspective, the self-concept unity hypothesis, assumes that the more intense the connection to Facebook, the better individuals know about themselves, due to the vast opportunities for self-presentation and receiving self-relevant feedback through Facebook and other means of computer-mediated communication (cf. Valkenburg & Peter,

2011). In contrast, the fragmentation hypothesis suggests that the more intense the connection to Facebook, the more confused individuals are about themselves, because the multi-faceted expressions of the self and heterogeneous feedback complicate the development of a clear self-concept. Prior results were somewhat supportive of the fragmentation hypothesis, as negative relationships between several Internet use indicators and SCC were found with cross-sectional designs (Davis, 2013; Israelashvili et al., 2012; Matsuba, 2006; Valkenburg & Peter, 2008). These prior studies did not focus on social networking sites. Do these findings translate to the use of Facebook?

With our first two studies, both cross-sectional as well, we provided evidence for a negative link between Facebook intensity and SCC. Moreover, the contribution of specific Facebook activities was examined. Adopting a completely different identity was very rare, which reflects the difference between the use of Facebook and the use of applications that were popular in the early days of the Internet, such as anonymous chatrooms or MUDs (cf. Turkle, 1995). The negative links between SCC and ‘Focusing on others’ reaction to postings’ and ‘Just browsing and liking’ are in line with recent evidence suggesting that the passive use of Facebook might have particularly deleterious effects on users’ self. However, due to the cross-sectional methodology, the relationships observed might as well have been the result of selective exposure, that is, the more individuals are unclear about themselves, the more intense their affiliation with Facebook.

Our third study provides evidence on the causal mechanisms underlying the relationship between SCC and Facebook intensity (this is one of only two longitudinal studies we are aware of in which any Internet-related variable and the clarity of one’s self-

concept was connected).² Based on a cross-lagged panel analysis we found that higher Facebook intensity predicted lower SCC at a later point of time. The reverse causal relationship was not supported by our data, higher SCC was unrelated to Facebook intensity at a later point of time. Thus, it appears that a strong attachment to Facebook impedes the development of a firm sense of oneself.

Limitations and future research

Despite the contribution of our studies, the limitations and open questions associated with our research need to be noted. First, our focus was on SCC, a structural feature of the self-concept. Our research is silent on the content of the self-concept, for example on the influence of Facebook intensity on self-ascribed attributes (e.g., thoughtful, sportive, artistic) or self-esteem (see for example Johnston et al., 2013; Steinfield, Ellison, & Lampe, 2008; Toma, 2013; Toma & Haddock, 2013; Verduyn et al., 2015). Although a positive link between SCC and explicit (but not implicit) self-esteem was repeatedly found (see Brandt & Vonk, 2006, for an overview), we believe that it is important to stick to the conceptual separation between SCC and self-concept content variables. We believe that

² The only other study (Yang & Brown, 2016) was published after the present studies were conducted. In two cross-sectional mediation models they showed that the intentional use of Facebook for self-presentation (sample item “When I posted or shared things on Facebook, I rarely thought about its consequences”, reverse coded) was positively related to general self-reflection (sample item “I frequently examine my feelings“), which was in turn negatively related to SCC. In a longitudinal model, higher SCC was predicted by higher self-esteem at an earlier point of time. Others’ supportive reactions to the participants’ Facebook activities (sample item “I felt supported by the feedback”) was found to be unrelated to SCC cross-sectionally and longitudinally.

theoretical models and empirical studies that connect patterns of SNS use with both self-concept clarity and self-esteem or well-being could provide intriguing insights. In a study using experience sampling, Kross and colleagues (Kross et al., 2013) showed that the amount of Facebook use (item “How much have you used Facebook since the last time we asked?”) predicted a decline in affective well-being. Given our findings, the reduction in self-concept clarity could be a process explaining this effect.

Second, it needs to be stressed that self-reported SCC does not equal an *accuracy* of the self-concept. In fact, SCC is positively related to tendencies of self-deception and the self-reported clarity might in part be due to a positive illusion of self-concept unity (Brandt & Vonk, 2006)—a positive illusion that intense Facebook users might have problems to uphold. Third, although Study 2 included specific activity measures, our research was focused on the Facebook Intensity Scale, which allows a reliable and valid measurement as well as a latent factor analysis. Its psychometric properties are well-established. Keeping in mind the problem of cumulated alpha errors in significance testing, this is preferable to multi-single-item sets of variables. However, the Facebook Intensity Scale cannot illuminate particular activities, or behavioral modes that can be made responsible for the observed decrease in SCC. Our additional findings show that pretending to be someone else – which could contribute to an unclear sense of the offline self – is rare on Facebook. Future research seems warranted that further examines the exact activities and stimuli which are responsible for decreases in SCC. Promising research avenues include the distinction between directed communication (interactions between the focal user and a friend) and consumption (Burke, Marlo & Lento, 2010), or between active and passive use (Verduyn et al., 2015). On a related note, social comparison processes (cf. Corcoran,

Crusius & Mussweiler, 2011) might be a crucial factor: People constantly compare themselves with others to gather information about their characteristics and abilities. These social comparisons are automatic whenever individuals are confronted with information about how other people behave, think, and feel - and can even occur outside conscious awareness (Mussweiler, Rüter, & Epstude, 2004). On SNSs individuals are constantly exposed to information about others (e.g., their current activities or achievements) and, thus, social comparisons are particularly likely. Indeed, Facebook intensity was associated with the frequency of social comparisons on Facebook (Lee, 2014). Comparison processes, in turn, were found to be associated with feelings of uncertainty about themselves (e.g., Butzer & Kuiper, 2006; Vartanian & Dey, 2013). This rationale connects to prior distinctions between directed communication and consumption (Burke, Marlo & Lento, 2010), or between active and passive use (Verduyn et al., 2015). Passive activities such as reading others' postings or browsing others' photos on Facebook should trigger these comparison processes more readily than more self-centered activities such as composing new status updates. Clearly, more research is warranted that explicitly addresses this mediating mechanism of social comparison processes.

Fourth, the longitudinal design of Study 3 allowed us to inspect relationships over several months, but future research might profit from more than two measurement occasions encompassing longer time spans. Facebook intensity showed higher stability estimates than SCC across the longitudinal design of Study 3. The interplay between the two constructs could be different when focusing on longer periods of time. A longer time-span, preferably several years, would likely yield larger variations in Facebook intensity. In

that sense future research might allow for a more nuanced identification of reciprocal processes (cf. Slater, 2007; 2015; Stiglbauer, Gnambs, Gamsjäger, & Batinic, 2013).

Finally, in order to provide evidence on causality, our third study was longitudinal, adding to the small, but growing literature that examined antecedents and consequences of SNS use over time (e.g., Kross et al., 2013; Saslow et al., 2013; Steinfield, Ellison, & Lampe, 2008; Teppers et al., 2014; Treppe & Reinecke, 2013; Verduyn et al., 2015). To date, too few of the available evidence are based on longitudinal studies. When experimental designs are inappropriate, only longitudinal data are able to shed light on the direction of potential causal pathways. Despite the virtue of longitudinal studies the unaccounted for influence of third variables can pose a problem. We cannot rule out the possibility that variations of a third and unaccounted for variable caused both Facebook intensity to increase and SCC to decrease. Future studies are encouraged to include control variables, such as users' personality or more state-like constructs such as loneliness which may change substantially even if the retest interval is short (cf. Cacioppo et al., 2000; Gnambs, 2014; Ryan & Xenos, 2011).

Conclusion

Facebook is – more or less so – part of the life of many adolescents and adults. Our research indicates that with an increasing connection to Facebook (Facebook intensity) individuals perceive their self-concept to be less clear and less coherent (self-concept clarity). This intriguing finding needs additional support in the years to come, including further research on its mechanisms and boundary conditions.

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Table 1

Study 1: Means (standard deviations) and zero-order correlations

	<i>M (SD)</i>	1	2	3	4	5
1 Gender	0.63 (0.48)	-				
2 Age	21.27 (5.80)	-.01	-			
3 Self-concept clarity	3.84 (0.62)	-.02	.32***	-		
4 Facebook intensity	2.83 (0.87)	.04	-.23**	-.29***	-	
5 Facebook access frequency	6.51 (2.70)	.04	-.31***	-.14*	.64***	-

Note. Gender was dummy-coded (0 = male, 1 = female). * $p < .05$; ** $p < .01$; *** $p < .001$

Table 2

Study 2: Means (standard deviations) and zero-order correlations

	<i>M (SD)</i>	1	2	3	4	5	6	7	8	9
1. Gender	0.65 (0.48)	-								
2. Age	16.39 (1.36)	.04	-							
3. Self-concept clarity	3.60 (0.63)	-.05	.15*	-						
4. Facebook intensity	2.94 (0.97)	.27***	.01	-.19*	-					
5. Facebook access frequency	7.96 (2.91)	.33***	-.02	-.20*	.51***	-				
6. Change profile picture	2.17 (1.03)	.26**	-.08	-.14	.24*	.21**	-			
7. Upload pictures / videos	2.47 (1.17)	.26**	-.03	-.04	.31***	.31***	.60***	-		
8. Share pictures / videos	1.93 (1.81)	-.02	-.04	-.12	.22**	.02	.19*	.25**	-	
9. Share links	1.81 (1.07)	-.04	.05	-.09	.14	.01	.15*	.23**	.61***	-
10. Look at others' reactions to my postings (e.g., status updates, links)	2.60 (1.28)	.07	.07	-.20**	.25**	.18*	.20*	.32***	.08	.20**
11. Look at others' reactions to photos I have uploaded (e.g., comments, likes)	3.28 (1.23)	.23**	-.01	-.08	.34***	.30***	.37***	.40***	.03	.07
12. Chatting / writing personal messages	4.04 (1.11)	.25**	-.14	-.12	.33***	.33***	.25**	.26**	.09	.10
13. Liking things others have uploaded	3.90 (1.10)	.33***	-.14	-.03	.34***	.35***	.20*	.24**	.15	.14
14. Commenting on things others have uploaded	2.89 (1.21)	.20**	.04	.00	.49***	.25**	.28***	.30***	.16*	.10
15. Coordinating offline activities / signaling participation	2.30 (1.24)	.03	-.01	-.04	.16*	.11	.11	.20*	.13	.16*
16. Being remembered about birthdays	3.14 (1.47)	.30***	.11	.08	.27**	.21**	.10	.10	-.02	.07
17. Poking	2.01 (1.23)	.14	-.08	-.10	.28***	.07	.22**	.20**	-.01	.04
18. Just browse and like, nothing else	3.27 (1.38)	.06	-.12	-.18*	.12	.09	-.13	-.17*	.13	.10
19. Just browse	2.61 (1.43)	-.15	.02	-.03	.00	-.02	-.18*	-.18*	.11	-.02
20. Try to reveal minimum information	3.26 (1.24)	-.10	.10	.09	-.23**	-.14	-.29***	-.40***	-.18*	-.15

TO BE CONTINUED ON THE NEXT PAGE

Note. Gender was dummy-coded (0 = male, 1 = female). * $p < .05$; ** $p < .01$; *** $p < .001$. The activities (rows/columns 6 to 20) were introduced as follows: “When I am on Facebook, the following activities are typical for me...”.

Table 2 (continued)

	10	11	12	13	14	15	16	17	18	19
1. Gender										
2. Age										
3. Self-concept clarity										
4. Facebook intensity										
5. Facebook access frequency										
6. Change profile picture										
7. Upload pictures / videos										
8. Share pictures / videos										
9. Share links										
10. Look at others' reactions to my postings (e.g., status updates, links)	-									
11. Look at others' reactions to photos I have uploaded (e.g., comments, likes)	.55***	-								
12. Chatting / writing personal messages	.17*	.32***	-							
13. Liking things others have uploaded	.19*	.37***	.48***	-						
14. Commenting on things others have uploaded	.15	.29***	.41***	.53***	-					
15. Coordinating offline activities / signaling participation	.18*	.11	.14	.16*	.14	-				
16. Being remembered about birthdays	.18*	.13	.16*	.29***	.25**	.34***	-			
17. Poking	.21**	.05	.22**	.22**	.34***	.19*	.30***	-		
18. Just browse and like, nothing else	.13	.07	-.08	.32***	.03	.01	.10	-.04	-	
19. Just browse	.04	-.04	-.17*	-.06	-.10	-.19*	-.08	-.07	.43***	-
20. Try to reveal minimum information	-.13	-.22**	-.21**	-.20*	-.30***	-.04	.06	-.11	.17*	.37***

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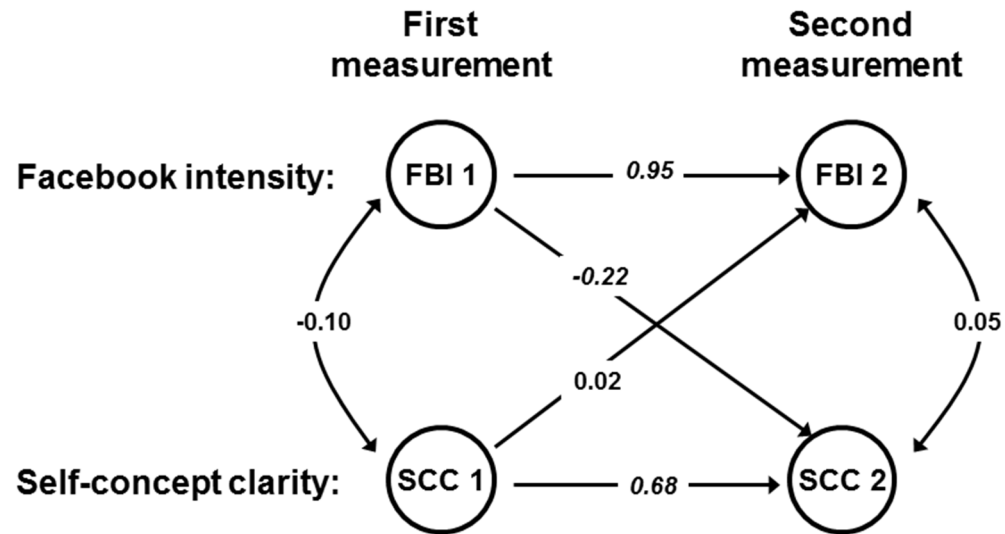


Figure 1. Cross-lagged model for Facebook intensity and self-concept clarity with standardized effects. Measurement models and control variables are not presented. Effects in italics are significant at $p < .05$.