Psychosocial consequences of adolescents' online communication
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CHAPTER 3

the concurrent and longitudinal relationships between adolescents’ use of social network sites and their self-esteem
ABSTRACT

The first aim of this study was to investigate the concurrent and longitudinal relationships between adolescents’ use of Social Network Sites (SNSs) and their self-esteem. The second aim was to investigate whether the valence of the feedback that adolescents receive on SNSs can explain these relationships. We conducted a three-wave panel study among 852 adolescents (10-15 years old). In line with earlier research, we found significant concurrent correlations between adolescents’ SNS use and their self-esteem in all three waves. The longitudinal results only partly confirmed these concurrent findings: Adolescents’ initial SNS use did not influence their self-esteem in subsequent years. In contrast, their initial self-esteem consistently influenced their SNS use in subsequent years. The valence of online feedback explained the relationship between SNS use and self-esteem, but only concurrently and not longitudinally. Results are discussed in terms of their methodological and theoretical implications.
Adolescence is a transitional phase characterized by significant psychosocial changes. An important developmental task that adolescents need to accomplish is to develop a sense of self (i.e., a view of who they are and who they want to become) and a valid evaluation of their self, that is, self-esteem. Self-esteem, the extent to which we appreciate our self, is one of the main predictors of psychological well-being (Baumeister, Campbell, Krueger, & Vohs, 2003), and acquiring an adequate level of self-esteem is crucial to adolescent development. Self-esteem is largely shaped through interactions with others, and, as a result, social interactions with peers play a central role in adolescents’ self-esteem development (Harter, 2012a).

A significant part of today’s adolescents’ interactions with close friends and peers occurs via social media and, in particular, via social network sites (Madden et al., 2013). Social network sites (SNSs) are designed to stimulate positive interactions between users, for example through their many options for positive interpersonal feedback, such as likes and comments on one another’s posts and messages. Because the interpersonal feedback on SNSs is typically more publicly visible and persistent than in face-to-face communication, it has been proposed that interpersonal feedback on such sites may have a higher impact on adolescents’ self-esteem than face-to-face interactions (boyd, 2010; Valkenburg & Peter, 2011).

Several studies have investigated the relationship between adolescents’ SNS use and their self-esteem. These studies have found that online communication in general, and SNS use in particular, are positively related to adolescents’ self-esteem (Apaolaza, Hartmann, Medina, Barrutia, & Echebarria, 2013; Gross, 2009; Valkenburg, Peter, & Schouten, 2006). However, although these earlier findings are rather consistent, the existing literature contains several important gaps. First, it particularly lacks studies based on longitudinal data, and, therefore, the direction of the relationship between SNS use and self-esteem largely remains unclear. Second, most studies have tested whether there is a relationship between SNS use and self-esteem, but not why. Therefore, knowledge about possible underlying mechanisms that may explain this relationship is lacking.

The aim of the current study is to address these two gaps in the literature. First, we will investigate the longitudinal relationship between adolescents’ social media use and their self-esteem, and compare this relationship with the cross-sectional findings that have been reported. Second, we will investigate an important underlying mechanism of the SNS use-self-esteem relationship, namely the extent to which adolescents receive positive feedback on SNSs.
Chapter 3

SNS use and self-esteem

Correlational studies into the relationship between online behaviors and adolescents’ self-esteem have focused on the frequency of SNS use (Apaolaza et al., 2013; Valkenburg et al., 2006), on different types of online communication, such as instant messaging or e-mail (Gonzales, 2014; Gross, 2009; Jackson et al., 2010), or on general Internet use (Kraut et al., 2002). Most of these studies found that these types of online behavior are related to higher levels of self-esteem. Studies focusing on more specific online behaviors, such as homepage and weblog creation, showed similar results (Schmitt, Dayanim, & Matthias, 2008).

The correlational results are supported by two experimental studies, which demonstrated that online communication caused increases in self-esteem (Gross, 2009; Shaw & Gant, 2002). The results are also supported by a study using experience sampling methods, which showed that individuals who engaged more often in text-based communication (e.g., texting, email) displayed increased levels of self-esteem six days later (Gonzales, 2014). Although the weight of evidence thus points to a positive relationship between different forms of online behavior and self-esteem, some studies have also yielded contradictory findings. However, these latter studies have typically focused on problematic online behavior, such as compulsive or addictive SNS or Internet use (Blomfield Neira & Barber, 2014; van der Aa et al., 2009).

While both correlational and experimental research have been based on the hypothesis that social media use influences self-esteem (Apaolaza et al., 2013; Valkenburg et al., 2006), a reversed hypothesis is also plausible. Specifically, it seems possible that adolescents who have higher levels of self-esteem use social media more often. After all, research has often found that people are more attracted to media and media content that are consistent with their personality traits (Valkenburg & Peter, 2013). Such trait-consistent media use may also apply to adolescents’ SNS use. Adolescents with higher self-esteem may be more comfortable connecting with their friends, which makes them not only more likely to seek out contact in face-to-face settings but also through SNSs (Kraut et al., 2002; Valkenburg & Peter, 2013).

In the present study, we investigate whether adolescents’ SNS use stimulates their self-esteem (Hypothesis 1a), and whether their self-esteem leads to changes in SNS use (Hypothesis 1b). As for self-esteem, we specifically focus on social acceptance self-esteem, that is, the extent to which adolescents feel accepted and liked by their friends, and feel successful in forming and maintaining friendships (Harter, 2012a). If there is one part of adolescents’ self-esteem that is likely to be affected by interactions with peers through SNSs, it is this sub-dimension of self-esteem.
Online feedback as an underlying mechanism

Similar to the causal direction of the relationship between SNS use and self-esteem, little is known about the mechanisms that underlie this relationship. One of such mechanisms suggested in earlier research is the feedback that adolescents receive online (O’Dea & Campbell, 2011). Interpersonal feedback is an important precursor of self-esteem (Leary, Tambor, Terdal, & Downs, 1995). Especially in adolescence, social acceptance and approval by peers play a vital role in predicting self-esteem (Harter, 2012a). Such feedback also plays a central role on SNSs (e.g., through likes and other positive comments). Compared to face-to-face feedback, online feedback is visible to more peers, and stays visible for a longer time (boyd, 2010). Therefore, feedback on SNSs is especially likely to influence adolescents’ social acceptance self-esteem.

Two experimental studies have provided support for the importance of online feedback for self-esteem. These studies showed that negative online feedback decreased self-esteem (Thomaes et al., 2010), whereas positive feedback increased self-esteem (Greitemeyer, Mügge, & Bollermann, 2014; Thomaes et al., 2010). In addition, a correlational study demonstrated that the valence of online feedback could explain the positive relationship between adolescents’ SNS use and their self-esteem (Valkenburg et al., 2006). In the present study, we investigate whether the mediating role of feedback found in previous research exists in both the concurrent and longitudinal relationships between SNS use and self-esteem. Based on earlier theories and research, we hypothesize that SNS use has a concurrent (Hypothesis 2a) and longitudinal (Hypothesis 2b) positive effect on social acceptance self-esteem through more positive feedback.

Method

Sample and procedure

In order to investigate the aims of the current study, we used three-wave panel survey data. After we received ethical approval from the sponsoring institution’s Institutional Review Board, a large, private research institute collected survey data at three time points between September 2012 and December 2014, with one-year intervals. The research institute recruited 516 families with at least two adolescents between 10 and 15 years old. For families with more than two children in this age group, only two participated in the study. Families were recruited in urban and rural regions across the Netherlands. Participants were included in our study if they used a SNS in at least one of the three waves, resulting in 852 adolescents in wave 1 (50.7% girls, $M_{\text{age}} = 12.5, SD = 1.36$), 783 adolescents in wave 2 (52% girls, $M_{\text{age}} = 13.5, SD = 1.34$) and 750 adolescents in wave 3 (53.1% girls, $M_{\text{age}} = 14.4, SD = 1.35$). Before administration of the survey, parental
consent and adolescents’ informed consent were obtained. We notified adolescents that the survey would be about media and how they feel and act in their daily lives, and that the answers would be analyzed anonymously.

Measures

**Social acceptance self-esteem**

Our social acceptance self-esteem scale was based on a subscale of the Self-Perception Profile for Adolescents (Harter, 2012b). The scale consisted of four items, for example: “I am popular among my peers” and “It is easy to like me.” Response options were 1 (completely not true), 2 (not true), 3 (a little not true, a little true), 4 (true), and 5 (completely true). We created a scale based on the average of the individual items. Cronbach’s alpha of the scale was .82 in wave 1 ($M = 3.42$, $SD = 0.81$), .83 in wave 2 ($M = 3.42$, $SD = 0.78$), and .86 in wave 3 ($M = 3.45$, $SD = 0.78$).

**SNS use**

Adolescents’ frequency of activity on SNSs was measured with five questions, which asked how often adolescents engaged in the following activities on SNSs: (1) “posting messages on your own profile page (e.g., status updates on Facebook),” (2) “posting pictures of yourself,” (3) “changing your profile picture,” (4) “reacting to messages that other people have posted on your profile,” and (5) “posting messages on profile pages of others.” Adolescents responded by choosing one of the following options: 1 (almost never), 2 (less than 1 time a week), 3 (2-3 times a week), 4 (every day), 5 (multiple times a day), and 6 (all the time). These items were averaged to create a scale, with higher scores indicating more frequent activity on SNSs. Cronbach’s alpha of this measure was .83 in wave 1 ($M = 1.98$, $SD = 0.91$), .83 in wave 2 ($M = 2.00$, $SD = 0.88$) and .82 in wave 3 ($M = 1.91$, $SD = 0.79$).

**Positive feedback**

The frequency of receiving positive feedback was measured with four items, two about messages and two about pictures: “How often do you get positive reactions to messages that you post on SNSs (on your own profile or on another’s profile)?” (a) “from good friends,” and (b) “from people you don’t know very well?” For receiving positive feedback to pictures we asked the same two questions. For all questions, the response options were: 0 (never), 1 (almost never), 2 (sometimes), 3 (often), and 4 (very often). We created an index, with higher scores indicating more frequently receiving positive feedback. Cronbach’s alpha of the scale was .78 in wave 1 ($M = 3.27$, $SD = 0.84$), .82 in wave 2 ($M = 3.44$, $SD = 0.80$), and .80 in wave 3 ($M = 3.54$, $SD = 0.80$).
Data analysis

In order to examine the longitudinal relationships between SNS use and social acceptance self-esteem, we tested autoregressive cross-lagged models with three data waves using structural equation modeling in Mplus. Models were estimated using maximum likelihood with robust error estimation (MLR) to correct for the clustered nature of our data (i.e., dependency within our data because of the two adolescents within one family).

We used the root mean square of approximation (RMSEA), the comparative fit index (CFI), and the Standardized Root Mean Residual (SRMR) to assess the models’ fit. Generally, RMSEA values smaller than .05 and a CFI exceeding .95 indicate good model fit, and RMSEA values between .05 and .08 and CFI values between .90 and .95 indicate acceptable model fit (Byrne, 2001) In addition, SRMR values close to .08 indicate acceptable model fit, and values below .08 indicate a good model fit (Hu & Bentler, 1999).

Results

Bivariate relationships

Table 1 shows the cross-sectional correlations between all study variables. The correlations between SNS use and self-esteem were positive in all three data waves. Furthermore, both the correlations between SNS use and feedback, and those between feedback and self-esteem were positive in all three data waves. Sex was negatively related to self-esteem (except in wave 1), positively to SNS use, and positively to feedback (except in wave 2). Finally, age was not related to self-esteem and inconsistently to SNS use. Because sex is related to both self-esteem and SNS use, all subsequent models were controlled for sex (0 = boys).
### Direct relationships between SNS use and self-esteem

In order to investigate the longitudinal relationships between SNS use and self-esteem, we tested a cross-lagged model that included adolescents’ SNS use and self-esteem at the three waves (see Figure 1). The model had an acceptable fit (RMSEA = .08, CFI = .98, SRMR = .02). Hypothesis 1a predicted that SNS use would have a positive effect on self-esteem. Results showed that SNS use did not significantly increase self-esteem from wave 1 to wave 2 ($b^* = .05$, $p = .099$, 95% CI: -.01, .10), and neither from wave 2 to wave 3 ($b^* = .07$, $p = .076$, 95% CI: -.01, .14), although both $p$-values were one-tailed significant ($p = .05$ and $p = .038$, respectively). Consistent with Hypothesis 1b, self-esteem increased SNS use over time, both from wave 1 to wave 2 ($b^* = .13$, $p < .001$, 95% CI: .07, .20), and from wave 2 to wave 3 ($b^* = .11$, $p = .002$, 95% CI: .04, .19).

#### Table 1. Zero-order correlation coefficients between all study variables

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<tbody>
<tr>
<td>1.</td>
<td>Self-esteem (wave 1)</td>
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<td>2.</td>
<td>Self-esteem (wave 2)</td>
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<td>3.</td>
<td>Self-esteem (wave 3)</td>
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<td>.63***</td>
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<td>4.</td>
<td>SNS use (wave 1)</td>
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<td>5.</td>
<td>SNS use (wave 2)</td>
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<td>6.</td>
<td>SNS use (wave 3)</td>
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<td>.56***</td>
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<td>7.</td>
<td>Feedback (wave 1)</td>
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<td>.11***</td>
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<td>8.</td>
<td>Feedback (wave 2)</td>
<td>.20***</td>
<td>.26***</td>
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<td>9.</td>
<td>Feedback (wave 3)</td>
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<td>10.</td>
<td>Sex (0 = boys)</td>
<td>-.04</td>
<td>-.09*</td>
<td>-.11**</td>
<td>.19***</td>
<td>.19***</td>
<td>.21***</td>
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<td>.08</td>
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<td>11.</td>
<td>Age</td>
<td>.01</td>
<td>.02</td>
<td>-.04</td>
<td>.23***</td>
<td>.09*</td>
<td>-.09*</td>
<td>.13***</td>
<td>.07</td>
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*Note.* 'p < .05, "p < .01, ""p < .001 (two-tailed).
Indirect effects through feedback

Our second hypothesis stated that feedback would mediate the relationship between SNS use and self-esteem. In a first step, we investigated whether feedback mediated the cross-sectional relationships between SNS use and self-esteem. To investigate Hypothesis 2a, we tested the direct and indirect effects cross-sectionally (i.e., per wave) in separate models. In all three data waves, the indirect effect from SNS use to self-esteem through positive feedback was significant (wave 1: $b^* = .10$, $p < .001$, 95% CI: .07, .14, wave 2: $b^* = .05$, $p < .001$, 95% CI: .02, .07, wave 3: $b^* = .09$, $p < .001$, 95% CI: .06, .12).

In a second step, we investigated whether feedback also acted as a mediator in the longitudinal relationship between SNS use and self-esteem. Although we did not find a consistent direct relationship between SNS use and self-esteem, SNS use could still indirectly predict self-esteem through feedback. Therefore, to investigate Hypothesis 2b, we examined a cross-lagged model that included SNS use, self-esteem, and positive feedback, each measured at all three waves. In this model, we specifically investigated the indirect effect of SNS use at wave 1 on self-esteem at wave 3 through feedback at wave 2.

The model had an acceptable fit (RMSEA = .08, CFI = .95, SRMR = .05). Hypothesis 2b was not supported by the results. SNS use at wave 1 was not significantly related to feedback at wave 2 ($b^* = -.02$, $p = .625$, 95% CI: -.09, .05). Furthermore, feedback at wave 2 was unrelated to self-esteem at wave 3 ($b^* = .05$, $p = .143$, 95% CI: -.02, .12).
longitudinal indirect effect of SNS use on self-esteem through positive feedback was also not significant ($b^* = -.001, p = .634, 95\% CI: -.004, .004$).

Discussion

The first aim of our study was to investigate the concurrent and longitudinal relationships between SNS use and adolescents’ social acceptance self-esteem. Consistent with earlier studies (e.g., Apaolaza et al., 2013; Gross, 2009; Valkenburg et al., 2006), we found a positive concurrent relationship between adolescents’ SNS use and their social acceptance self-esteem, which held in all three data waves of our study. Also consistent with earlier research (Greitemeyer, et al., 2014; Thomaes et al., 2010; Valkenburg et al., 2006), in each of the three data waves, this relationship could be explained by the amount of positive feedback adolescents received on SNSs. Many social network sites are designed to elicit positive feedback, and this positive feedback apparently accounts for the concurrent relationships between SNS use and self-esteem found in the present and earlier studies.

Contrary to Hypothesis 1a, we did not find conclusive longitudinal evidence for the assumption that adolescents’ SNS use increases their social acceptance self-esteem. In both the wave 1-2 and the wave 2-3 lags, we found small positive longitudinal relationships between SNS use and social acceptance self-esteem that were only one-tailed significant. In contrast, in both the wave 1-2 and wave 2-3 lag, we found stronger support for the reverse hypothesis (1b) that adolescents’ social acceptance self-esteem increases their SNS use. In addition, contradictory to our Hypothesis 2b, the positive feedback that adolescents received while using SNSs did not explain the hypothesized longitudinal relationships between SNS use and self-esteem.

The differences in the sizes of the cross-lagged paths can be explained both methodologically and theoretically. Methodologically, they may be due to differences in the stability coefficients between self-esteem and SNS use. As can be seen in the direct-effects model in Figure 1, the stability coefficients of self-esteem are higher than those of SNS use. These higher stability coefficients of self-esteem may explain why the cross-lagged direct paths from self-esteem to SNS use are higher than those from SNS use to self-esteem. After all, in our longitudinal analyses, outcomes were controlled for previous levels of these outcomes. As a result, high-stability outcomes are explained to a large extent by their equivalents in previous data waves, and so they inevitably leave less variance to explain for cross-lagged predictors. As argued by Adachi and Willoughby (2015), even very small cross-lagged effects should be considered meaningful when there is strong stability in the outcome variable and a moderate correlation between the predictor and the outcome measured at wave 1, as
is the case in the present study. After all, unlike concurrent relationships, cross-lagged predictive paths indicate change in the level of the outcome, and such change may reflect an ongoing cumulative effect that could become substantial over time (Adachi & Willoughby, 2015).

However, there is also a plausible theoretical explanation for the discrepancy in cross-lagged paths and the divergence between concurrent and longitudinal results. An important developmental task in adolescence is to develop a stable self-esteem, but in this turbulent period, self-esteem can fluctuate in both the shorter and longer term. To explain these two types of fluctuation, Rosenberg makes a distinction between barometric and baseline self-esteem instability in adolescence (Rosenberg, 1986). Barometric instability reflects short-term fluctuations in adolescents’ self-esteem that are due to, for example, their everyday positive and negative experiences. Baseline instability, in contrast, occurs slowly and over an extended period of time. It has been shown, for example, that during the high school years may steadily increase again (Trzesniewski, Donnellan, & Robins, 2003).

It is also theoretically conceivable that the relationships between SNS use, feedback, and self-esteem are more plausible in the shorter rather than in the longer term. SNSs are designed to elicit instant positive feedback (e.g., likes, positive comments), and it is, therefore, imaginable that this instant feedback leads to concurrent increases in self-esteem. However, one might wonder whether it is reasonable to expect that (a) SNS use will elicit changes in positive feedback in the longer term, and (b) leads to increases in self-esteem in the longer term. Positive feedback on their online behavior may influence adolescents’ self-esteem in the short term, but a year may simply be too long to find effects of SNS use on feedback and from feedback to self-esteem. Our results suggest that, if there are effects of SNS use on feedback and self-esteem, such effects can probably be best conceptualized as a concurrent, short-term process.

As our results also showed, the cross-lagged paths between SNS use and self-esteem more convincingly point from self-esteem to SNS use rather than from SNS to self-esteem. We found that adolescents high in self-esteem showed an increase in SNS use in subsequent waves. This reversed longitudinal relationship could be explained by the rich-get-richer hypothesis that has been found in several earlier Internet studies (Kraut et al., 2002; Valkenburg & Peter, 2011). These studies found that adolescents who are extraverted and who are at ease in social situations are especially likely to use social media. Consequently, for these adolescents, their social media use led to an even higher sociability.

It is plausible that this rich-get-richer effect also holds for the relationship between SNS use social acceptance self-esteem. After all, we did find small longitudinal effects from SNS use to self-esteem. These partly reciprocal relationships may point to a
phenomenon that has been called disposition-content congruity, which entails that certain dispositions (e.g., high self-esteem) can predispose individuals to use certain media content and technologies, which in turn can reinforce these dispositions (Kraut et al., 2002; Valkenburg & Peter, 2013). Future research should elaborate on our findings and identify the specific conditions under which SNS use and online feedback may or may not affect adolescents’ (and adults’) self-esteem.
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