

Preadolescents' and Adolescents' Online Communication and Their Closeness to Friends

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The 1st goal of this study was to investigate how online communication is related to the closeness of existing friendships. Drawing from a sample of 794 preadolescents and adolescents, the authors found that online communication was positively related to the closeness of friendships. However, this effect held only for respondents who primarily communicated online with existing friends and not for those who mainly talked with strangers. The 2nd goal was to refine 2 opposing hypotheses, the rich-get-richer and the social compensation hypotheses. Consistent with the rich-get-richer hypothesis, socially anxious respondents communicated online less often than did nonsocially anxious respondents. However, socially anxious respondents perceived the Internet as more valuable for intimate self-disclosure than did nonsocially anxious respondents, and this perception in turn led to more online communication. This result is consistent with the social compensation hypothesis. Online communication and closeness to friends increased with age. There was a curvilinear relationship between age and perceived value of the Internet for intimate self-disclosure, such that 15-year-olds were at the epitome of online self-disclosure. Girls were closer to friends and more socially anxious than were boys.

Keywords: Internet, instant messaging, self-disclosure, intimacy, friendship quality

In many ways, adolescents are the defining users of the Internet. They spend more time online than do adults, and they more often use online communication technologies, such as instant messaging (IM) and chat (Lenhart, Madden, & Hitlin, 2005). In recent years, the function of the Internet has changed considerably for adolescents. Whereas in 1999 they used the Internet primarily for entertainment and information seeking (Valkenburg & Soeters, 2001), at present they predominantly use it for interpersonal communication. Some adolescents go online to form relationships with strangers (Wolak, Mitchell, & Finkelhor, 2003), but the vast majority seem to use the Internet to maintain their existing network of friends (Gross, 2004).

Despite adolescents' extensive use of the Internet to maintain friendships, research has not yet dealt with the question of how online communication affects adolescents' closeness to their existing friends. This lack of research is remarkable because forming and maintaining close friendships in adolescence are imperative to healthy cognitive, emotional, and social development (e.g., Newcomb & Bagwell, 1996). Therefore, the first aim of this survey study was to investigate whether and how preadolescents' and adolescents' online communication affects the closeness to their existing friends. Online communication is defined as the composite of the frequency, intensity, and rate with which preadolescents and adolescents use the Internet for chat and/or IM.

Few studies on the uses and effects of online communication have included preadolescents in their samples. This is surprising

because a rapidly growing number of preadolescents use the Internet for interpersonal interaction (Valkenburg, Schouten, & Peter, 2005). Moreover, in preadolescence, social comparison processes emerge, and concerns with interpersonal identity become acute (Harter, 1999). These developmental changes may increase preadolescents' vulnerability to interpersonal influences. Including both preadolescents and adolescents allowed us to explore developmental differences in the uses and consequences of online communication.

Online Communication in the Netherlands and the United States

The data used in this survey study were collected in the Netherlands. The online communication habits of Dutch adolescents are very similar to those of U.S. adolescents. In both the United States and the Netherlands, at least 75% of online adolescents use the Internet for IM (Lenhart et al., 2005; Qrius, 2005). In addition, in both the United States and the Netherlands, more than one in five adolescents now use audio or video while using IM (Lenhart et al., 2005; Qrius, 2005). Finally, like U.S. teenagers, Dutch adolescents increasingly use IM and other online technologies to post personal profiles to which other users can react (Lenhart et al., 2005).

There are also some differences between Dutch and U.S. adolescents' Internet use. First, the proportion of Dutch adolescents' home Internet access is somewhat higher than that in the United States. In October 2004, 87% of U.S. adolescents ages 12–17 years used the Internet at home, whereas at the same time 96% of Dutch adolescents in this age group had home access (Lenhart et al., 2005; Qrius, 2005). Second, in the United States, AOL Instant Messenger (from AOL) is the most popular IM system (Godwin-Jones, 2005), whereas Dutch adolescents predominantly use MSN Messenger (from Microsoft). Despite these minor differences, we

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believe that our findings on the uses and effects of Dutch adolescents' online communication validly generalize to U.S. adolescents.

Opposing Hypotheses on the Effects of Online Communication

Some authors have proposed that online communication hinders the closeness of adolescents' existing friendships (e.g., Locke, 1998). This *reduction* hypothesis is based on the following four assumptions: (a) The Internet motivates adolescents to form superficial online friendships with strangers; (b) online friendships with strangers are less beneficial for adolescents than existing offline friendships; (c) time spent with online strangers occurs at the expense of time spent with existing friends; and (d) as a result of assumptions 1, 2, and 3, the closeness to existing friends is reduced.

Other authors, by contrast, have suggested that the Internet stimulates the closeness of existing friendships among adolescents. Adherents of this *stimulation* hypothesis have often explained potential Internet effects with the Internet's reduced visual and auditory cues (e.g., McKenna & Bargh, 2000). The stimulation hypothesis is based on the following three assumptions: (a) The Internet's reduced cues encourage adolescents to disclose their inner feelings more easily than in real-life interactions (McKenna & Bargh, 2000); (b) intimate self-disclosure is an important predictor of reciprocal liking, caring, and trust (Collins & Miller, 1994); and (c) as a result of assumptions 1 and 2, Internet-enhanced intimate self-disclosure stimulates the closeness of adolescents' existing friendships.

The stimulation hypothesis was initially developed to explain relationship formation among strangers in chat rooms and newsgroup settings (e.g., McKenna, Green, & Gleason, 2002). As a result, the hypothesis at first largely relied on social psychological theories of relationship *formation* among unacquainted communication partners rather than relationship *maintenance* among existing friends. However, recent research has demonstrated that Internet-enhanced intimate self-disclosure is not limited to online communication between strangers; it also occurs during online communication between existing friends (Grinter & Palen, 2002; Leung, 2002; Schiano et al., 2002). Consequently, Internet-enhanced intimate self-disclosure may not only encourage relationship formation but may also stimulate relationship maintenance and, as a result, the closeness of existing friendships.

Not only do the reduction and stimulation hypotheses propose different effects of online communication, but the reasoning of the two hypotheses also focuses on different aspects of online communication. According to the reduction hypothesis, adolescents solely or primarily communicate with strangers, which reduces the time spent with existing friends, and, as a result, the quality of these friendships. The focus of the reduction hypothesis is *with whom* adolescents communicate online. Although the stimulation hypothesis does not deny the importance of the communication partner, its focus is on *how* adolescents communicate online. According to the stimulation hypothesis, the Internet encourages users to disclose themselves more easily and more intimately online, which in turn stimulates the closeness of friendships. As a result of the different predicted effects of the two hypotheses and their different foci, we centered on three issues. First, we investi-

gated whether online communication stimulates or reduces closeness with friends. Second, we focused on potential differences in the closeness of friends between respondents who use the Internet primarily to communicate with existing friends and those who use it primarily to talk with strangers. Finally, we studied how adolescents' perceptions about intimate online self-disclosure affect their closeness to existing friends.

Stimulation or Reduction?

Several studies have found that the Internet reduces social involvement and the quality of existing relationships (Kraut et al., 1998; Nie & Erbring, 2000). However, all of the studies that found reductive effects were conducted in the early stages of the Internet. The results of research published in the past few years seem to be more consistent with the stimulation than with the reduction hypothesis, although it should be noted that no research has specifically dealt with adolescents' closeness to their existing friends. For example, more recent studies have demonstrated that Internet use is positively related to the size of one's social circle (Kraut et al., 2002) and to the frequency of face-to-face interactions with existing friends (Kraut et al., 2002).

These discrepant results between early and later Internet-effects studies can be explained by several quantitative and qualitative changes in Internet use. In the second half of the 1990s, few adolescents had home access to the Internet. At the time, it was impossible to maintain one's social network on the Internet because the greater part of this network was not yet online. In the early stages of the Internet, adolescents' online contacts were clearly separated from their offline contacts. As a result, the time invested in online contacts reduced the time that could be invested in offline contacts. The negative relationship between Internet use and time spent with existing friends found in early Internet-effects studies can, therefore, be attributed to a displacement effect of the Internet.

In the past few years, however, the strict separation between online and offline contacts no longer exists, at least among adolescents (Lenhart et al., 2005). New technologies, such as IM, encourage communication with existing friends. A study by Gross (2004) demonstrated that 84% of IMing occurred with friends or best friends from school. As a result, adolescents' online and offline contacts now progressively seem to overlap. Because of these changes in Internet technology and use, the condition for a displacement effect no longer exists.

On the basis of this reasoning as well as on recent empirical findings concerning Internet effects on offline social involvement (e.g., Kraut et al., 2002), we hypothesized a stimulation effect of online communication on the closeness of adolescents' existing friendships. Our first hypothesis, which is modeled by means of Path 1 in Figure 1, predicted the following:

Hypothesis 1a: Online communication stimulates adolescents' closeness to existing friends.

Moderating Effect of Online Communication With Strangers

Although the majority of adolescents use the Internet to communicate with existing friends, online communication with strang-

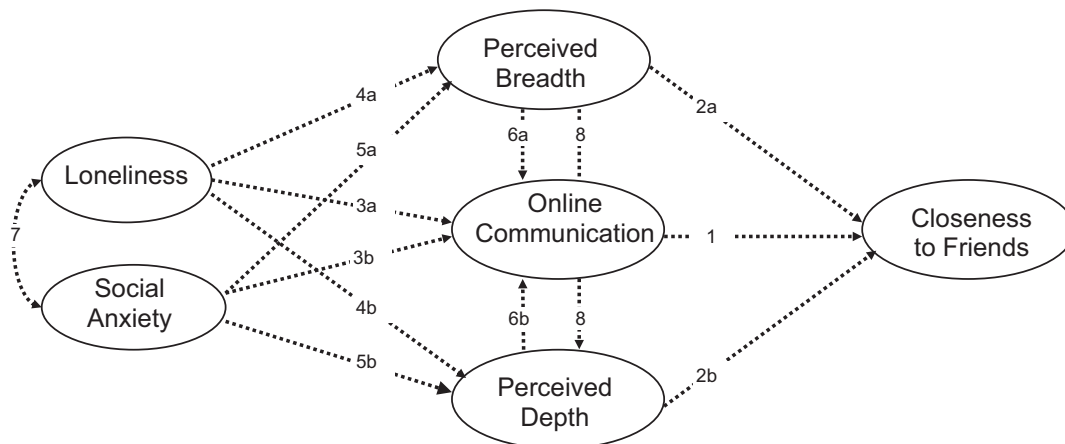


Figure 1. Hypothesized model on the relationships among loneliness, social anxiety, online communication, perceived breadth and depth of online communication, and closeness to friends. The names of the paths and the curved two-headed arrow (i.e., 1; 2a, b; 3a, b; 4a, b; 5a, b; 6a, b; 7; 8) refer to our subsequent research hypotheses and expectations.

ers is still a common phenomenon (Lenhart et al., 2005; Peter, Valkenburg, & Schouten, 2005). Communication with strangers most often occurs in public chat rooms, but it also regularly occurs via IM (Lenhart et al., 2005). Because adolescents often use several different communication technologies and in different ways, it made no sense to investigate the effects of chat and IM technologies separately. A better way was to ask adolescents whether they primarily communicate online with existing friends or with strangers. It is likely that an effect of online communication on the closeness of existing friendships depends on the communication partner with whom adolescents primarily talk. Although in Hypotheses 1a we hypothesized a stimulating effect of online communication on the closeness of friendships, we expected that this effect would hold only for adolescents who primarily communicate with existing friends on the Internet. Therefore, we hypothesized the following:

Hypothesis 1b (not visualized in Figure 1): The stimulation effect of online communication on the closeness of existing friends holds only for adolescents who use the Internet primarily to communicate with those existing friends.

Stimulation Effect of Perceived Breadth and Depth of Online Communication

Several studies have shown that online communication fosters intimate self-disclosure (Joinson, 2001; Tidwell & Walther, 2002). Because intimate self-disclosure is an important predictor of the quality of close relationships (Knapp & Vangelisti, 2000), it is conceivable that theories on the Internet and computer-mediated communication assign vital importance to the role of self-disclosure in online settings. Because online self-disclosure is an important focus of the stimulation hypothesis, we investigated adolescents' perceptions of the Internet's effectiveness as a means to disclose personal information.

We focused on adolescents' perceptions of online communication because we believed that such a focus was an important first

step in explaining effects of online communication. In contemporary media-effects research, it has been widely acknowledged that users' perceptions of a medium vary greatly and that these perceptions mediate or codetermine effects of that medium (e.g., Rubin, 2002). Theories on the effectiveness of organizational communication have also indicated that people's perceptions of the characteristics of media significantly influence how they use and benefit from these media (e.g., Carlson & Zmud, 1999).

Following Altman and Taylor's (1973) social penetration theory, we investigated respondents' perceptions of breadth and depth of online communication. Perceived breadth of online communication refers to the extent to which respondents experienced online communication to be more effective than offline communication in talking about a wide variety of topics. Perceived depth of online communication refers to the extent to which they experienced online communication to be more effective than offline communication in self-disclosing intimate information.

According to Altman and Taylor, both breadth (content areas of communication) and depth (intimacy level of communication) are important determinants of relationship maintenance (Knapp & Vangelisti, 2000). Breadth of communication provides interaction partners with an important means to uncover common topics and interests and in doing so, presents openings for more intimate communication. Depth, in turn, is essential for the development and maintenance of close relationships (Altman & Taylor, 1973).

It is currently unclear to what extent adolescents differ in their perceptions of the breadth and depth of online communication. Therefore, in a first step, we investigated potential differences in perceptions of online communication. In a second step, we investigated how adolescents' perceptions of online communication affect their closeness to friends. Our hypothesis, which is modeled by means of Paths 2a and 2b in Figure 1, was as follows:

Hypothesis 2: Adolescents who more strongly believe that online communication is effective in developing (a) breadth and (b) depth experience more closeness to their friends.

The Social Compensation Versus the Rich-Get-Richer Hypothesis

The second aim of our study was to investigate and refine two opposing hypotheses on the antecedents of online communication: the social compensation and the rich-get-richer hypotheses. Both the reduction and the stimulation hypothesis are silent about the antecedents of online communication. However, researchers have repeatedly requested that Internet effects studies take the antecedents of online communication into account and include these in more integrative Internet uses-and-effects models (e.g., Bargh, 2002). Recent research recognizes that, in particular, loneliness and social anxiety may affect adolescents' tendency to turn to online communication (Gross, Juvonen, & Gable, 2002; Kraut et al., 2002).

The social compensation hypothesis proposes that especially lonely and/or socially anxious adolescents, who have difficulty developing friendships in their real lives, turn to online communication. The reduced audiovisual cues of the Internet may help these adolescents to overcome the shyness and inhibition that they typically experience in real-life interactions (McKenna et al., 2002). In contrast, the rich-get-richer hypothesis holds that primarily nonlonely and/or extraverted adolescents turn to online communication. These adolescents, who already have strong social skills, may consider the Internet as just another venue to get in touch with peers (Kraut et al., 2002).

The results of the majority of studies focusing on the relationship between loneliness or social anxiety (or the conceptually related construct, introversion) and Internet use seem to support the rich-get-richer rather than the social compensation hypothesis. As for loneliness, two studies provided support for the rich-get-richer hypothesis (Moody, 2001; Weiser, 2001), and one (Amichai-Hamburger & Ben-Artzi, 2003) provided support for the social compensation hypothesis, although only among females; three additional studies found no significant relationship between loneliness and Internet use (Gross et al., 2002; Leung, 2002; Waestlund, Norlander, & Archer, 2001). As for social anxiety and introversion, two studies provided support for the rich-get-richer hypothesis (Peter et al., 2005; Waestlund et al., 2001), one supported the social compensation hypothesis (Amichai-Hamburger, Wainapel, & Fox, 2002), and two others produced nonsignificant results (Amichai-Hamburger & Ben Artzi, 2003; Scealy, Phillips, & Stevenson, 2002). On the basis of these research findings, we expected results in support of the rich-get-richer hypothesis. We investigated the following hypothesis, which is modeled by means of Path 3a and Path 3b in Figure 1:

Hypothesis 3: Lonely and socially anxious preadolescents and adolescents turn to online communication less often than do nonlonely and nonsocially anxious preadolescents and adolescents.

Mediating Role of Perceptions of Online Breadth and Depth

Although we hypothesized that loneliness and social anxiety are negatively related to online communication, we believe that the relationships between these variables are more complex than have been conceptualized in previous research. In our view, personality

characteristics may not only have a direct impact on preadolescents' and adolescents' tendency to use online communication, but they may also be mediated by respondents' perceptions of the breadth and depth of online communication.

Lonely and socially anxious preadolescents and adolescents typically feel nervous and distressed in self-disclosing in face-to-face interactions. Therefore, we expected that lonely and socially anxious preadolescents and adolescents would have more positive perceptions of the Internet's effectiveness to develop breadth and depth of communication, which in turn would positively influence their tendency to use online communication. These expectations, which are modeled by means of Paths 4a and 4b, 5a and 5b, and 6a and 6b in Figure 1, are summarized in the following hypothesis:

Hypothesis 4: In comparison with nonlonely and nonsocially anxious respondents, lonely and socially anxious respondents more strongly believe that online communication is effective in developing online breadth (Paths 4a, 5a) and depth (Paths 4b, 5b), and these perceptions in turn positively influence their tendency to use online communication (Paths 6a and 6b).

In addition to our specific research hypotheses, we have modeled two additional relationships in our model. First, we assumed that social anxiety and loneliness are positively related to one another because such a relationship has repeatedly been found in previous research (e.g., Gross et al., 2002). However, because there is as yet no decisive evidence for the causal direction of this relationship, we modeled covariance between these variables and no causal relationship (Path 7 in Figure 1). Finally, we expected that respondents' perceptions of the breadth of online communication would positively predict their perception of the depth of online communication. As discussed before, breadth of communication is believed to be a necessary prelude to more intimate dialogue (Knapp & Vangelisti, 2000). As a result of this assumption, we have modeled a causal path from perceived breadth to perceived depth of online communication (Path 8 in Figure 1).

Gender and Developmental Differences

Preadolescent and adolescent boys and girls may differ significantly with respect to some variables included in our model such as social anxiety and closeness to friends. Significant gender and age differences could imply that the model presented in Figure 1 does not equally hold for preadolescent and adolescent boys and girls. To identify whether there is reason to believe that our model would be different for boys and girls as well as for preadolescents and adolescents, we summarize below the research on age and gender differences with respect to all variables in our model.

Loneliness

The literature on developmental differences in adolescents' loneliness is indecisive. Some studies discerned a negative relationship between age and loneliness (Woodward & Frank, 1988), some found a positive relationship (Brage & Meredith, 1994), and yet others reported no significant relationship (Brennan & Auslander, 1979). Research findings on gender differences in loneliness are equally inconsistent: Some studies found that girls are

lonelier than boys (e.g., Woodward & Frank, 1988), whereas other studies reported no significant gender differences (e.g., Brage & Meredith, 1994). Because of these inconsistencies in the literature, we were not able to formulate expectations on the relationships among gender, age, and loneliness.

Social Anxiety

Girls generally report higher levels of social anxiety than do boys (Inderbitzen-Nolan & Walters, 2000; La Greca & Lopez, 1998). Girls are concerned about their social competence more often than are boys and attach higher importance to interpersonal relationships (Maccoby, 1990), which may explain their higher levels of social anxiety. We therefore expected a negative relationship between gender and social anxiety.

As for developmental differences in social anxiety, the results are less clear. Some studies reported no significant age differences between early and middle adolescents (e.g., La Greca, 1999). Other studies have suggested that social anxiety is more common in early and middle adolescence than in pre- and late adolescence (Inderbitzen-Nolan & Walters, 2000; Weems & Costa, 2005). This curvilinear relationship between age and loneliness could be explained by the increased self-consciousness in early and middle adolescence (Harter, 1999). Therefore, if there is a relationship between age and social anxiety, we expected this relationship to be curvilinear.

Online Communication

Studies of online communication among adolescents have consistently reported positive relationships between age and online communication (Lenhart et al., 2005). As for gender, many earlier studies on online communication found significant differences between the sexes (e.g., Kraut et al., 1998). However, more recent studies have suggested that these gender differences are not as sizeable as they once were (Gross, 2004; Lenhart et al., 2005; Valkenburg et al., 2005). As a result, we expected a positive age effect on online communication, but we did not anticipate any significant gender differences in online communication.

Breadth and Depth of Self-Disclosure

Girls generally show higher levels of breadth and depth in their offline communication than boys do (e.g., McNelles & Connolly, 1999). It has been suggested that levels of offline self-disclosure are lower in middle adolescence than in pre- and late adolescence. At this developmental stage, concern about interpersonal identity peaks, which may enhance difficulties in self-revelation (e.g., Hargie, Sounders, & Dickson, 1994). The gender and age differences in offline self-disclosure may have consequences for preadolescents' and adolescents' perceptions of the breadth and depth of online communication. Therefore, we explored whether and how gender and age are related to perceptions of the breadth and depth of online communication.

Closeness to Friends

Girls' and older adolescents' friendships are typically considered closer than those of boys and preadolescents (Buhrmester & Furman, 1987; McNelles & Connolly, 1999). During preadoles-

cence, exchanging intimacy gains significance, but it is not until adolescence that intimacy and emotional support are seen as essential in friendships (Aboud & Mendelson, 1996). We therefore expected that girls and older adolescents would feel closer to their friends than would boys and preadolescents.

Gender and Age Influences on Our Hypothesized Model

Gender and age seem to be either linearly or curvilinearly related to most variables in the model presented in Figure 1. As a result, our model may differ for boys and girls as well as for pre-, early, and middle adolescents. However, because there has been no earlier research on gender and developmental differences in the effects of online communication on preadolescents' and adolescents' closeness to friends, we investigated the following research question:

Research Question 1: To what extent does the model presented in Figure 1 hold for (a) boys and girls and (b) pre-, early, and middle adolescents?

Method

Sample

In March and April, 2004, we conducted a survey among 794 primarily White Dutch adolescents ages 10–16 years ($M = 13.31$; $SD = 1.50$), 51% boys and 49% girls. Of these adolescents, 665 (84%) reported that they used the Internet for IM or chat. The subsequent analyses were therefore based on this group. The adolescents were recruited from six elementary and secondary schools in the Netherlands. The 10- to 12-year-olds (19%) were recruited from two elementary schools. The 13- to 16-year-olds were sampled from four secondary schools. One secondary school represented lower secondary professional education and provided 16% of the secondary school sample. The remaining schools represented three levels of higher general secondary education. After we had obtained parental consent, we administered the questionnaires in the adolescents' classrooms. We made sure that the adolescents had sufficient privacy to fill in the questionnaire. Completing the questionnaire took about 15 min. Because some Dutch teachers object to privacy-sensitive survey questions about family income/socioeconomic status and education, we did not present children with questions about these variables. Although children with higher levels of education were somewhat overrepresented in our sample, the schools we selected covered all educational levels in the Netherlands.

Measures

Loneliness. Following earlier Internet studies (e.g., Gross et al., 2002; Kraut et al., 1998, 2002), we used the UCLA Loneliness Scale (Russell, 1996) to measure loneliness. We selected the 8 items with the highest item–total correlations from the 20-item UCLA Loneliness Scale (Items 3, 4, 7, 10, 13, 14, 16, 20; Russell, 1996). Three of these items had a positive wording (e.g., “I often feel close to people”), and 5 of them had a negative wording (e.g., “I often feel alone”). We conducted a principal components analysis on the 8 items, which led to a two-factor solution that explained 63% of the variance. The first factor was defined by the

5 items with a negative wording, and the second one was defined by the 3 items with a positive wording. Several earlier studies that used exploratory factor analysis on the UCLA Loneliness Scale also found two factors reflecting the direction of item wording (for a review, see Russell, 1996). However, a multidimensional factor structure can lead to serious problems in structural equation modeling (Kishton & Widaman, 1994). Therefore, we decided to use only the 5 items with a negative wording, which resulted in a Cronbach's alpha of .85 ($M = 1.78$, $SD = 0.78$).

Social anxiety. We used four items from the Social Avoidance and Distress—New People subscale of the Social Anxiety Scale for Adolescents developed by La Greca and Lopez (1998). La Greca and Lopez's subscale consists of six items whose scores resulted in a Cronbach's alpha of .78. However, because two of these items loaded less than .40 on the principal component that they helped to define, we used only the four remaining items of the original subscale. In our study, these four items loaded on one factor and resulted in a Cronbach's alpha of .82 ($M = 2.65$, $SD = 0.87$).

Perceived breadth and depth of online communication. We created four items to measure adolescents' perception of the breadth of online communication and five items to measure their perception of the depth of online communication. These nine items were simultaneously entered into a principal components analysis, which resulted in two factors that explained 57% of the variance. The first factor was represented by the five depth items (Cronbach's $\alpha = .82$; $M = 2.56$, $SD = 0.82$). The following is an example of a depth item: "On the Internet, I talk more easily about my inner feelings than in a face-to-face encounter." The remaining four depth items dealt with talking about secrets, concerns, being in love, and sex. The second factor was defined by the four breadth items (Cronbach's $\alpha = .71$; $M = 2.60$, $SD = 0.91$). The following are examples of the breadth items: "On the Internet, I talk more easily about different topics than during a face-to-face encounter" and "On the Internet, I more easily change topics than in a face-to-face encounter." Response categories for the breadth and depth items ranged from 1 (*entirely disagree*) to 5 (*entirely agree*).

Online communication. We used three items measuring the frequency, rate, and intensity of online communication: (a) "How many days of this week have you been online to chat?" (b) "On the last day that you were online, how many times did you chat?" and (c) "On the last day that you were online, how long did you chat?" The first two items required open-ended responses. Response categories for the third item ranged from 1 (*about 15 min*) to 7 (*three hours or more*). Responses to the three items were standardized and resulted in a Cronbach's α of .64 ($M = 0.00$, $SD = 0.74$).

In the Netherlands, children and adolescents use the English word *chat* for both IM and chat (in a public chat room). This is problematic because IM may be more often used to communicate with existing friends, whereas chat may be more often used to communicate with people adolescents have met on the Internet (Gross, 2004). We therefore also asked children *where* they usually chatted on the Internet. We presented them with the most popular IM technologies, chat rooms, and friend networking sites in the Netherlands in 2004 (e.g., MSN messenger, TMF chat, and the friend networking site CU2) and asked them whether they used these technologies.

Internet communication with strangers. The frequency with which adolescents used the Internet to communicate with strangers was measured with two items: "When I use the Internet for chat, I do this with people I only know from the Internet" and "When I use the Internet for chat, I do this with people I don't know at all." Response categories ranged from 1 (*never*) to 4 (*almost always*). These items were averaged to form a scale ($r = .28$; $M = 1.62$, $SD = 0.55$). Because communication with strangers was used as a grouping variable in our multigroup analysis (see Results section), we dichotomized this variable by means of a median split.

Closeness to friends. We used four items from the inventory of parent and peer attachment developed by Armsden and Greenberg (1987) to measure adolescents' closeness to friends. These items resulted in the highest factor loadings in a previous Dutch study based on the inventory (Van Ammers et al., 1998). The selected items were "When my friends know that something is bothering me, they ask me about it," "I tell my friends about my problems and troubles," "My friends help me to understand myself better," and "When I am angry about something, my friends try to be understanding." The items loaded on one factor that explained 70% of the variance (Cronbach's $\alpha = .86$; $M = 3.51$, $SD = 0.89$).

Results

Descriptive Statistics

Of all 794 respondents, 61% of the preadolescents (10- to 11-year-olds) and 88% of the adolescents (12- to 16-year-olds) used the Internet for online communication. There were no significant gender differences: 85% of girls and 83% of boys reported using the Internet for online communication. When respondents were online, on average they used chat or IM for approximately 1 hr. Virtually all respondents (97%) indicated use of MSN Messenger. In addition, 18% reported using TMF chat, and 8% communicated with others on the most popular Dutch friend networking site in spring 2004 (i.e., CU2).

Of those who used the Internet for chat or IM, a great majority (88%) indicated that they "often" or "almost always" communicated with preexisting, offline friends. Online communication with preexisting friends was positively related to MSN use ($r = .32$, $p < .01$) and negatively to chat room use ($r = -.20$, $p < .01$, with TMF chat and $r = -.16$, $p < .01$, with another chat service). IM and chat use were not at all mutually exclusive activities. For example, of the 97% IM users, 13% also used TMF chat, and 24% also used another online communication technology (e.g., a friend networking site).

The respondents varied greatly in their perceptions of the effectiveness of online communication in developing breadth and depth of communication. As for online breadth, 25% perceived online communication as more effective than offline communication in discussing a variety of topics. As for online depth, 30% perceived online communication as more effective than offline communication in self-disclosing intimate information.

Zero-Order Correlations Between the Variables Included in the Model

Table 1 provides the zero-order correlation matrix of the variables included in the model as presented in Figure 1, as well as

Table 1
Zero-Order Correlations Among All Variables in the Study

Variable	1	2	3	4	5	6
1. Online communication						
Group 1						
Group 2						
2. Perceived online breadth						
Group 1	.11*					
Group 2	.05					
3. Perceived online depth						
Group 1	.17***	.46***				
Group 2	.06	.47***				
4. Closeness to existing friends						
Group 1	.23***	.03	.12*			
Group 2	.05	.02	.14*			
5. Loneliness						
Group 1	.01	.26***	.21***	-.12*		
Group 2	.00	.19**	.18**	-.21**		
6. Social anxiety						
Group 1	-.08	.27***	.21***	.04	.23***	
Group 2	-.11	.28***	.38***	.03	.28***	
Gender (girl = 0)	-.01	-.01	-.04	-.40***	.05	-.15**
Age	.17**	-.12**	.04	.11**	-.04	.04
Age square	-.05	-.03	-.13**	-.06	.08*	-.07

Note. Group 1 = adolescents who primarily talk with existing friends online; Group 2 = adolescents who primarily talk with strangers online.
* $p < .05$. ** $p < .01$. *** $p < .001$.

their correlations with gender and age. The first row of each variable that is included in the model represents the correlations for the group of adolescents who primarily communicated with existing friends online ($n = 391$); the second row represents the group of adolescents who primarily communicated with strangers online ($n = 247$). Online communication was positively related to the closeness of friendships. However, this result held only for respondents who primarily talked with preexisting friends online, not for those who primarily communicated with strangers.

Both loneliness and social anxiety were positively related to respondents' perceptions of the breadth and depth of communication. Expressed percentagewise, 32% of the lonely adolescents perceived online communication as more effective than offline communication in talking about a wide variety of topics, in comparison with only 19% of the nonlonely respondents. In addition, 35% of the lonely respondents perceived online communication as more effective than offline communication in self-disclosing intimate information, in comparison with only 25% of the nonlonely adolescents. The same differences were found for socially anxious and nonsocially anxious respondents (32% vs. 18% for perceived online breadth and 36% vs. 23% for perceived online depth). Finally, respondents' perceived online depth, but not their perceived online breadth, was related to the closeness of their friends.

Relationships of Gender and Age With the Variables in the Model

As expected, girls were significantly more socially anxious and closer to friends than were boys (see Table 1). However, gender was not significantly related to online communication, to loneliness, or to perceptions of online breadth and depth. As expected, age was positively related to online communication and to close-

ness with friends. It was negatively related to perceived online breadth. Contrary to our expectations, age was not related to social anxiety. Finally, age was curvilinearly related to perceptions of depth of online communication. An additional analysis of variance showed that in particular 15-year-olds (41%) perceived online communication as more effective than offline communication in self-disclosing intimate information, $F(6, 664) = 3.29, p < .01, \eta^2 = .03$.

Testing the Model

The hypotheses on the relationships among the variables in our hypothesized model were investigated with the Structural Equation Modeling program of AMOS 5.0 (Arbuckle, 2003). The six variables in our model involved latent constructs. In SEM, latent constructs are estimated from one or more observed variables or indicators. For five latent constructs in our model (i.e., social anxiety, loneliness, perceived breadth and depth of online communication, and closeness to friends), we created two indicators. The first indicator was formed by averaging participants' responses to the odd items on the particular scale and the second indicator by averaging their responses to the even items on the particular scale. The latent construct online communication was estimated from the three items measuring the frequency, rate, and intensity of online communication.

For reasons of graphical parsimony, we do not present the measurement model (i.e., the six factor-analytic models). However, all factor-analytic models adequately represented the data. The factor loadings in the factor-analytic models of social anxiety, loneliness, closeness to friends, and perceived breadth and depth of online communication were all above .74. The factor loadings in the factor-analytic model of online communication were all above

.53. In total, our model as presented in Figure 1 counted 13 observed variables; $13(13 + 1)/2 = 91$ data points; 39 parameters to be estimated; and, therefore, 52 degrees of freedom (i.e., the difference between data points and parameters to be estimated).

To investigate our hypotheses, we proceeded in two steps. First, we tested whether the hypothesized model in Figure 1 fit the data. Then, we checked whether we could improve the model's fit by adding or removing theoretically meaningful paths from the hypothesized model. If this were the case, then one or more of our hypotheses would have to be rejected. We used three indices to evaluate the fit of our models: the chi-square test, the comparative fit index (CFI), and the root mean square error of approximation (RMSEA). A good model fit is indicated by a nonsignificant chi-square value, a RMSEA value less than .05, and a CFI value close to .95 (Byrne, 2001). It must be noted that the chi-square test often seriously underestimates the model fit in the case of larger samples (Byrne, 2001).

The fit of our hypothesized model was acceptable, $\chi^2(52, N = 665) = 87.76, p < .001, CFI = .989, RMSEA = .032$, with the 90% confidence interval (CI) of the RMSEA being between .020 and .044. However, the modification indices indicated that the model could be improved significantly by adding a negative path from loneliness to closeness to friends. Because this relationship is theoretically valid (e.g., Larose, Guay, & Boivin, 2002), we decided to add this path. The resulting AMOS output indicated that three paths assumed in our hypothesized model had to be removed: Path 3a from loneliness to online communication, Path 4b from loneliness to perceived depth of online communication, and Path 2a from perceived breadth of online communication to closeness to friends.

After removal of these three nonsignificant paths, we subjected our model to another test. The modified model fit the data very well, $\chi^2(54, N = 665) = 66.44, p = .12, CFI = .996, RMSEA = .019$, with the 90% CI of the RMSEA ranging from .000 to .032. The modifications resulted in a significant chi-square decrease compared with the starting model, $\chi^2_{\text{change}}(2, N = 665) = 21.32, p < .001$. Because the modifications of the model were theoretic-

cally meaningful and resulted in a better fitting and more parsimonious model, we accepted the model as an adequate description of the data. Figure 2 presents the observed final model. The reported coefficients are standardized betas. The final model explained 10% of variance of the dependent variable, closeness to friends.

Our Hypothesis 1a, which predicted that online communication would positively predict adolescents' closeness to peers, was supported (see Path 1; $\beta = .17, z = 3.13, p < .01$). Hypothesis 1b, which predicted that this result would hold only for adolescents who would primarily communicate with friends, is tested in the next section by multigroup analysis.

Hypothesis 2 was supported partially: Only the path from perceived online depth to closeness to friends proved to be significant (Path 2b; $\beta = .16; z = 3.48, p < .001$), but not the path from perceived online breadth to closeness to friends (Path 2a; *ns*).

Our third hypothesis, which stated that loneliness and social anxiety would be negatively related to online communication, was supported only for social anxiety (Path 3b; $\beta = -.22, z = -3.65, p < .001$) but not for loneliness (Path 3a; *ns*).

Hypothesis 4 was partially supported. As Figure 2 shows, loneliness predicted adolescents' perceived breadth of online communication (Path 4a; $\beta = .20, z = 4.22, p < .001$) but not their perceived depth of online communication (Path 4b; *ns*). However, social anxiety positively predicted both perceived online breadth (Path 5a; $\beta = .30, z = 5.94, p < .001$) and depth (Path 5b; $\beta = .16, z = 3.51, p < .001$). Consistent with the second half of Hypothesis 4, perceived breadth (Path 6a; $\beta = .16, z = 2.09, p < .05$) and depth (Path 6b; $\beta = .22, z = 3.04, p < .01$) were both positive predictors of online communication.

Testing the Moderating Effect of Communication with Strangers

Hypothesis 1b predicted a moderating effect of online communication with strangers on whether online communication affects close-

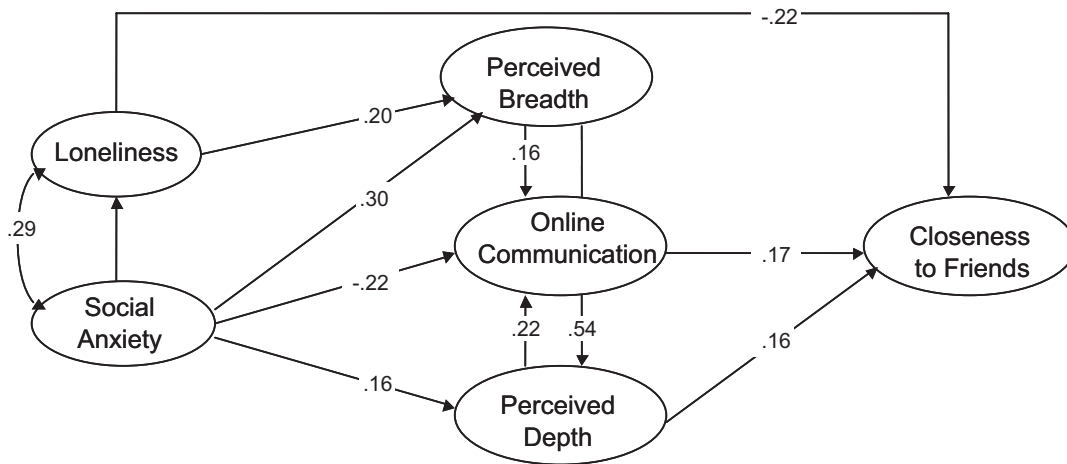


Figure 2. Structural equation model of the relationships among loneliness, social anxiety, online communication, perceived breadth and depth of online communication, and closeness to friends. The ovals represent latent constructs estimated from at least two indicators; coefficients represent standardized betas and are significant at least at $p < .01$.

ness to friends. To investigate this hypothesis, we first dichotomized the variable communication with strangers by means of a median split. Then we performed a multigroup analysis with the dichotomized variable communication with strangers as the grouping variable. The unconstrained model for the two groups fit the data well, $\chi^2(108, N = 665) = 120.20, p = .20, CFI = .996, RMSEA = .013$, with the 90% CI for RMSEA being between .000 and .025. Imposing the cross-group constraints for the measurement and the structural models led to a significant chi-square improvement, $\chi^2_{\text{change}}(17, N = 665) = 27.30, p = .05$. To further study which structural paths specifically differed for the two groups, we analyzed the invariance of each structural path separately while retaining the specified equality constraints of previously found invariant parameters (i.e., the measurement weights; Byrne, 2001). In line with Hypothesis 1b, the only structural path that differed significantly between the groups was the path from online communication to closeness to friends, $\chi^2_{\text{change}}(8, N = 665) = 17.46, p = .03$. For respondents who talked predominantly with preexisting friends, online communication increased their closeness with friends ($\beta = .29, z = 3.68, p < .001$). However, for respondents who primarily talked with strangers, online communication had no impact on their closeness to friends ($\beta = .04, z = .46, ns$).

Testing for Age and Gender Differences

To investigate our research question, we tested whether our model held for boys and girls as well as for pre- (10- to 11-year-old), early (12- to 13-year-old), and middle (14- to 16-year-old) adolescents. We performed two multiple-group analyses, one with gender and one with age as the grouping variable (Arbuckle, 2003). The unconstrained model for girls and boys fit the data well, $\chi^2(108, N = 665) = 123.50, p = .15, CFI = .995, RMSEA = .015$, with the 90% CI for RMSEA being between .000 and .026. Imposing the cross-group constraints for the measurement and the structural models led to a small but significant chi-square improvement, $\chi^2_{\text{change}}(17, N = 665) = 29.67, p = .03$. However, further separate analyses of each structural weight following the procedure described above resulted in no significant chi-square changes.

The unconstrained models for the three age groups also yielded a good fit, $\chi^2(162, N = 665) = 178.17, p = .18, CFI = .995, RMSEA = .012$. The 90% CI for RMSEA was between .000 and .022. Constraining both the measurement weights and the structural weights did not lead to a significant chi-square change, $\chi^2_{\text{change}}(34, N = 665) = 33.58, p = .49$. This suggests that the model found for the whole group also held for preadolescents, early adolescents, and middle adolescents.

Discussion

The first aim of this survey study was to investigate how online communication is related to the closeness of preadolescents' and adolescents' existing friendships. We found little support for the reduction hypothesis. The core assumption of this hypothesis is that preadolescents and adolescents use the Internet mainly to communicate with strangers. Our results demonstrated that this assumption does not hold for the majority of young Internet users: 88 percent of our respondents used the Internet primarily to maintain their existing network of friends, a result that is consistent with several recent survey studies (Gross, 2004; Lenhart et al., 2005). Our findings suggest that, although several early Internet-effects

studies reported reductive effects of Internet use on social involvement variables (e.g., Kraut et al., 1998), the reduction hypothesis may, in its generality, no longer be plausible to explain Internet effects on the closeness of existing friendships.

Consistent with the stimulation hypothesis, we found that respondents who communicated online more often felt closer to their existing friends. However, this result held only for respondents who used the Internet primarily to communicate with existing friends, not for those who used it to communicate with strangers. The positive relationship between online communication and closeness to existing friends held for boys and girls, as well as for preadolescents (10–11 years), early adolescents (12–13 years), and middle adolescents (14–16 years). Because our results are stable across all developmental stages, in the remainder of this discussion, we use the term *adolescents* to refer to both preadolescents and adolescents.

We found that 30% of the adolescents perceived online communication as more effective than offline communication in self-disclosing intimate information. Those adolescents also experienced more closeness to their existing friends than did adolescents who did not perceive online communication as deeper than offline communication, a result that is in line with the stimulation hypothesis. The effect of perceived online depth on closeness to friends was just as large as the effect of online communication on closeness to friends. Adolescents' perceptions of online breadth did not directly affect the closeness to friends. However, perceived online breadth was indirectly related to the closeness of friendships via adolescents' perceptions of online depth. This result is in line with general interpersonal communication research, which recognizes that breadth of communication is an important precursor of the depth of communication (Knapp & Vangelisti, 2000).

The Social Compensation and the Rich-Get-Richer Hypotheses

The second aim of this study was to expand on two hypotheses that explain which types of adolescents feel attracted to online communication. The social compensation hypothesis assumes that mainly lonely, introverted, or socially anxious adolescents turn to online conversation, whereas the rich-get-richer hypothesis assumes that primarily extraverted adolescents use the Internet for online communication. Our findings were most obvious in the case of socially anxious adolescents: Those adolescents turned less often to the Internet than nonsocially anxious adolescents, a result that lends support to the rich-get-richer hypothesis.

However, when we took adolescents' perceptions of online communication into account, a different pattern of results emerged. In comparison with nonsocially anxious adolescents, socially anxious adolescents more strongly believed that online communication is effective for developing breadth and depth of communication. Specifically, 36% of socially anxious adolescents (vs. 23% of nonsocially anxious adolescents) believed that the Internet is more effective than face-to-face communication to communicate about intimate topics. These stronger perceptions of online communication, in turn, increased adolescents' tendency to turn to online communication as well as their closeness to friends.

This pattern of result is in agreement with the social compensation hypothesis. An explanation might be that socially anxious adolescents have more difficulty disclosing in offline settings than

do their nonsocially anxious peers (Meleshko & Alden, 1993). Therefore, they may particularly perceive online communication, with its reduced auditory and visual cues, as more effective than offline communication to talk about intimate topics. As a result, particularly for socially anxious adolescents, it is not online communication per se that is important for social interaction and relationship maintenance but rather its greater opportunities for intimate self-disclosure.

In conclusion, the rich-get-richer hypothesis was valid when we investigated main effects of personality characteristics on online communication. The social compensation hypothesis was valid when we modeled adolescents' perceptions as mediating variables between personality characteristics and online communication. The latter result suggests that personality characteristics shape adolescents' perceptions of online communication, which subsequently influence their tendency to turn to online communication as well as their closeness to friends. Taken together, our findings clearly point to the importance of identifying and investigating the underlying mechanisms of the uses and effects of online communication. Therefore, an important starting point for future theory and research into the effects of the Internet is to abandon simple main effects models. Instead, future research should concentrate on why, with whom, and about what adolescents communicate online.

Our study concentrated on online communication, defined as the composite of the frequency, intensity, and rate with which adolescents use the Internet for IM and/or chat. We found that adolescents who used IM talked primarily with existing, offline friends, whereas adolescents who communicated in chat rooms less often communicated with existing friends. However, IM and chat uses are not mutually exclusive activities on the Internet. At least 25% of adolescents who used IM also used one or more other types of online communication technologies. Therefore, future research on online communication should not exclusively concentrate on IM or chat: A sizeable number of adolescents not only use IM on a daily basis but also regularly visit public chat rooms and friend networking sites, where they may meet strangers and potential new friends.

Our study has demonstrated that online communication affects friendships that also exist in the offline world. This finding advances our understanding of the role of online communication in the social lives of adolescents. Previous research has focused on adolescents' social life on the Internet and dealt with issues such as the formation of online friendships (e.g., Peter et al., 2005). Our study investigated the effects of online communication on existing, offline friendships. Not only does this examination shed new light on why findings of more recent Internet research diverge from the results of Internet studies conducted in the 1990s, but it also suggests that researchers are entering a new phase in Internet research in which they are seeing that the offline world is affected by online communication.

We specifically asked adolescents about their online communication with friends they had met online versus friends they already knew from, for example, their school or sports club. However, it turned out to be very difficult to distinguish between these two types of friends. Not only do young people regularly communicate online with their existing friends, but they also regularly establish friendships that originate online and then develop offline. The latter type of friendship has been referred to as a mixed-mode friendship (Walther & Parks, 2002). Although we have no statistics on the closeness of mixed-mode friendships, anecdotal evi-

dence shows that these relationships can be very personal. Concurring with Walther and Parks (2002), we believe that mixed-mode relationships pose many challenges for current theoretical approaches as well as for future research into the social consequences of the Internet.

Limitations of the Study and Implications for Future Research

Our study has at least two limitations. First, we focused on a positive effect of online communication, namely an increased closeness of friendships. This positive effect of online communication has been attributed to mechanisms such as enhanced self-disclosure (e.g., McKenna & Bargh, 2000; Walther & Parks, 2002), which may improve relationship maintenance. However, the same deliberating or disinhibiting mechanisms of online communication that have presumably led to the positive outcomes in our study can also have negative effects, such as flaming and cyberbullying. Although these negative outcomes were beyond the focus of this study, they deserve our full attention in future research.

A second limitation of our study relates to the fact that the assumptions in our model were tested with cross-sectional data. There is a vital need for causal-correlational research in order to investigate the longitudinal relationships between online communication and the quality of adolescent relationships. Not only are longitudinal designs able to adequately distinguish causation from covariance, but they are also preeminently suitable to explore the underlying mechanisms by which online communication influences adolescents' social relationships.

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