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Gender differences in online and offline self-disclosure in pre-adolescence and adolescence

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Although there is developmental research on the prevalence of *offline* self-disclosure in pre-adolescence and adolescence, it is still unknown (a) how boys' and girls' *online* self-disclosure develops in this period and (b) how online and offline self-disclosure interact with each other. We formulated three hypotheses to explain the possible interaction between online and offline self-disclosure: the displacement, the rich-get-richer, and the rehearsal hypothesis. We surveyed 690 pre-adolescents and adolescents (10–17 years) at three time points with half-year intervals in between. We found significant gender differences in the developmental trajectories of self-disclosure. For girls, both online and offline self-disclosure increased sharply during pre- (10–11 years) and early adolescence (12–13 years), and then stabilized in middle and late adolescence. For boys, the same trajectory was found although the increase in self-disclosure started 2 years later. We found most support for the rehearsal hypothesis: Both boys and girls seemed to use online self-disclosure to rehearse offline self-disclosure skills. This particularly held for boys in early adolescence who typically have difficulty disclosing themselves offline.

Self-disclosure – the sharing of personal thoughts, feelings, and experiences – is an important hallmark of adolescent friendships (Berndt, 2002). Self-disclosure has been associated with several beneficial friendship skills and features, including friendship initiation skills (Buhrmester, Furman, Wittenberg, & Reis, 1988), emotional closeness (Camarena, Sarigiani, & Petersen, 1990; McNelles & Connolly, 1999; Rose, 2002), emotional support (Simpkins, Parke, Flyr, & Wild, 2006), friendship satisfaction (Reisman, 1990), and friendship quality (Rose, 2002). More specifically, adolescents often identify mutual disclosure of intimate topics as a vital characteristic of high-quality friendships, as well as one of their highest rewards (Buhrmester & Prager, 1995).

While research on self-disclosure between adolescent friends has long been confined to offline settings, such as face-to-face or telephone conversations, this is no longer justified for the present generation of adolescents. In most Western countries, the Internet has become an important vehicle for communication between close friends (e.g., Lenhart, Madden, & Hitlin, 2005; Valkenburg & Peter, 2007a). Most adolescents

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use the Internet, and in particular instant messaging (IM) and social networking sites (SNSs) to maintain their friendships, share intimate thoughts, feelings, and experiences with these friends (e.g., Boneva, Quinn, Kraut, Kiesler, & Shklovski, 2006; Grinter & Palen, 2002; Gross, 2004; Schouten, Valkenburg, & Peter, 2007).

Against this backdrop, it is striking that research has largely ignored online self-disclosure during adolescence. Even the most basic questions have not been investigated: For example, how does the development of online and offline self-disclosure vary for boys and girls in different developmental periods? Do gender differences, which are consistently found for offline self-disclosure, also hold for online self-disclosure? The main aim of our study is to provide initial answers to these questions. By comparing the prevalence of online and offline self-disclosure, we are able to investigate how boys' and girls' online and offline self-disclosure develops during pre-adolescence and adolescence and how both types of self-disclosure interact with each other.

Offline self-disclosure

Because research on online self-disclosure is still scarce, we will use studies that focused on offline self-disclosure as a starting point to formulate our hypotheses. Offline self-disclosure can be defined as the sharing of thoughts, feelings, and experiences, with close friends in face-to-face-settings. Current theories of offline self-disclosure agree that self-disclosure serves several important functions in adolescence (e.g., Derlega & Grzelak, 1979; Buhrmester & Prager, 1995). The overarching goal in adolescence is the distancing from parents and the development of a new adult identity through interaction with peers (e.g., Steinberg & Morris, 2001). However, to interact effectively with peers, adolescents need to learn, practise, and rehearse when and how to disclose personal information to them.

Effective self-disclosers are able to consider (a) the appropriateness and acceptability of the disclosure in the specific situation (e.g., not too much), (b) the timing of the disclosure (e.g., not too soon), and (c) the responsiveness, perspective, and appropriateness of the recipient (e.g., not to an untrustworthy person). Effective self-disclosers know the norms of self-disclosure and are able to stick to them: They know what, how, when, and to whom to self-disclose (Knapp & Vangelisti, 2000). Adolescents who are unable to stick to the norms of self-disclosure are lonelier and unhappier than their peers who are able to do so (e.g., Franzoi & Davis, 1985; Stokes, 1987).

Self-disclosure is an important skill that is needed for initiating and deepening relationships (Derlega & Berg, 1987). One important function of self-disclosure is social validation: Through self-disclosure to friends, adolescents get feedback that can help to determine the appropriateness of their beliefs, attitudes, and behaviours and, thus, to validate their identity. Another important function is intimacy development: By sharing their fears and worries with friends, adolescents may not only get rid of pent-up feelings of distress, but may also implicitly invite their friends to provide emotional support (Buhrmester & Prager, 1995). This support, in turn, is an important determinant of the quality of friendships (e.g., Reis & Shaver, 1988).

Developmental differences in offline self-disclosure

Although it is assumed that offline self-disclosure to friends increases from middle childhood to late adolescence (e.g., Buhrmester & Prager, 1995), results from studies that investigated the exact development of offline self-disclosure during this period have been mixed. Some studies found no developmental differences in offline self-disclosure

(e.g., Shulman, Laursen, Kalman, & Karpovsky, 1997; Simpkins *et al*., 2006), other studies reported a positive and linear relationship between age and offline self-disclosure (e.g., Bauminger, Finzi-Dottan, Chason, & Har-Even, 2008; Schouten *et al*., 2007), and yet other studies observed non-linear relationships (e.g., McNelles & Connolly, 1999; Papini, Farmer, Clark, Micka, & Barnett, 1990).

In the studies that found non-linear relationships, two types of relationships have been suggested, a U-shaped relationship (e.g., Hargie, Tourish, & Curtis, 2001; Sinha, 1972) and an elongated S-shaped relationship (e.g., Buhrmester & Prager, 1995). A U-shaped relationship implies that self-disclosure is lower in early and middle adolescence than in pre- and late adolescence. In an elongated S-shaped relationship, self-disclosure increases during pre- and early adolescence, but levels off in middle adolescence.

The somewhat inconsistent research evidence about the relationship between developmental level and offline self-disclosure is further complicated by the different age groups used in the various studies. Hardly any study has compared self-disclosure levels of a pre-adolescent sample (9- to 11-year-olds) with an adolescent sample (12- to 18-year-olds; Berndt & Hanna, 1995). Most studies have only compared levels of self-disclosure across a limited age range or across a dispersed (and limited) number of discrete age groups. Moreover, the comparison and integration of earlier research findings is hindered by the fact that cut-off points for discrete age groups, which were based on a continuous age variable, differed across studies.

In summary, there is no decisive evidence for the exact relationship between age and offline self-disclosure. On the basis of earlier literature, three hypotheses seem plausible: (a) a linear hypothesis, which predicts that self-disclosure gradually increases from pre-adolescence to late adolescence, (b) a U-shaped hypothesis, which predicts that self-disclosure is lower in early and middle than in pre- and late adolescence, and (c) an elongated S-shaped hypothesis, which predicts that self-disclosure increases from pre-adolescence to middle adolescence after which it stabilizes.

Gender differences in offline self-disclosure

A recent review by Rose and Rudolph (2006) suggested that there are consistent gender differences in offline self-disclosure to friends: Adolescent girls self-disclose more than boys do. This gender difference in self-disclosure is in accord with various other studies that investigated gender differences in intimacy and friendships (Galambos, 2004). For instance, it has been widely accepted that girls are more focused on intimate close friendships, whereas boys spend more time in larger groups and base their friendships on shared activities.

In addition to a main effect of gender, two interaction effects of gender and age on offline self-disclosure have been observed. Rose and Rudolph's review (2006) has suggested that gender differences in offline self-disclosure are robust in adolescence, but not in pre-adolescence. In other words, differences in offline self-disclosure between boys and girls emerge only in adolescence. In addition, the developmental increase in offline self-disclosure seems to start earlier for girls (around age 10–11) than for boys (around age 13–14; Buhrmester & Prager, 1995).

Online self-disclosure

As shown above, *offline* self-disclosure to friends fulfils important functions in adolescence. At the same time, many adolescents use the Internet for self-disclosure to

their friends. As a result, the time is ripe to assess how *online* self-disclosure develops during adolescence and how it relates to offline self-disclosure. In this study, online self-disclosure refers to the sharing of intimate thoughts, feelings, and experiences with close friends while using IM. We opted for IM (and not for other tools, such as SNSs) for two reasons. First, at the time of data collection, IM was the most popular online tool among adolescents. More than 90% of adolescents use IM (Schouten *et al*., 2007; Valkenburg & Peter, 2009) whereas only 25% were a member of an SNS at the time. Secondly, IM is predominantly used to communicate with existing friends, and to share intimate information with these friends (e.g., Boneva *et al*., 2006; Grinter & Palen, 2002; Gross, 2004; Schouten *et al*., 2007). Although SNSs are also predominantly used by adolescents to maintain their existing friendships, their use of these sites at the first data wave was still too rare to yield valid results in a representative sample.

The popularity of online self-disclosure among adolescents can be explained by several interrelated factors. First, as discussed, adolescents have an enhanced need for self-disclosure and self-presentation and, thus, for staying in contact with their peers. At the same time, however, they can also be shy and self-conscious (Elkind & Bowen, 1979). Although they wish to practise their self-disclosure skills, they may feel awkward to disclose themselves in face-to-face settings (Harter, 1999). Secondly, because of this shyness and self-consciousness, adolescents may at times prefer a more 'protected' environment, in which they can feel less inhibited to reveal their feelings, worries, and vulnerabilities. IM provides them with such an environment. Online communication is typically characterized by reduced visual (e.g., appearance) and auditory (e.g., voice) cues (Walther, 1996). An important consequence of these reduced cues is that online communication partners may become less concerned about how others perceive them and thus may feel fewer inhibitions in disclosing themselves (e.g., Joinson, 2001; Tidwell & Walther, 2002; Walther, 1996).

Developmental differences in online self-disclosure

As discussed above, earlier literature does not allow us to make exact predictions about the development of *offline* self-disclosure in pre-adolescence and adolescence. However, the problems seem to multiply when it comes to specifying relationships between age and *online* self-disclosure. The lack of (developmental) research on online self-disclosure makes it hard to predict how online self-disclosure changes in this period. The only study to date that focused on online self-disclosure (Schouten *et al*., 2007) found a moderate positive linear correlation between age and online self-disclosure. However, this study did not investigate non-linear relationships.

Gender differences in online self-disclosure

The relationship between gender and offline self-disclosure is well documented. Girls generally disclose more than boys. It is an open question, however, to what extent gender affects adolescents' *online* self-disclosure. Because girls are more avid users of IM and SNSs, it is likely that girls use these technologies more often for self-disclosure (e.g., Lenhart, Madden, McGill, & Smith, 2007). Furthermore, whereas girls make use of these sites to invest in their current friendships, boys are more likely to seek out new friendships through SNSs (Lenhart & Madden, 2007). As a result of these differences in Internet use, girls can be expected to report more online self-disclosure than boys. To our knowledge, the only study that investigated gender differences in online self-disclosure

indeed found that girls self-disclosed online more than boys did (Schouten *et al*., 2007). However, Schouten *et al*. did not test gender by age interactions. Thus, it is still unclear whether gender differences are more distinct in adolescence than in pre-adolescence, as is observed for offline self-disclosure.

Online and offline self-disclosure: Displacement or supplementation?

There are at least three possible hypotheses on the relationship between online and offline self-disclosure. The displacement hypothesis predicts that online self-disclosure occurs at the expense of offline self-disclosure. More specifically, this hypothesis states that, over time, adolescents' online self-disclosure leads to a decline in offline self-disclosure because time spent on online self-disclosure cannot be spent on offline self-disclosure (see Valkenburg & Peter, 2007b). In data-analytic terms, this hypothesis thus implies a *negative* causal effect of online self-disclosure on offline self-disclosure.

Two other hypotheses both predict *positive* relationships between online and offline self-disclosure, albeit in opposite causal directions. The rich-get-richer hypothesis argues that adolescents who are strong offline self-disclosers use IM just as another venue to share intimate thoughts, feelings, and experiences with their close friends (see Valkenburg & Peter, 2007a). In data-analytic terms, this hypothesis predicts a positive longitudinal effect from offline self-disclosure on online self-disclosure. In contrast, the rehearsal hypothesis assumes that adolescents, especially those who are shy and self-conscious, experience IM as an environment in which they can relatively safely rehearse their self-disclosure skills, which may improve their ability to self-disclose also offline. This hypothesis thus predicts a positive causal effect of online self-disclosure on offline self-disclosure.

Current study

Based on previous theories and research on offline (e.g., Buhrmester & Prager, 1995; McNelles & Connolly, 1999) and online self-disclosure (Schouten *et al*., 2007), we expected that both online and offline self-disclosure to friends would increase between pre-adolescence and adolescence. To investigate this expectation more precisely, we investigated the validity of the linear, U-shaped, and elongated S-shaped hypotheses both for online and offline self-disclosure and for boys and girls.

With respect to gender, we expected that girls engage in more online and offline self-disclosure than boys. Furthermore, the two interaction effects between gender and age that have been found for offline self-disclosure (Buhrmester & Prager, 1995; Rose & Rudolph, 2006) were also expected to hold for online self-disclosure. We studied gender differences by comparing the mean levels of offline and online self-disclosure. In addition, following the study of Schouten *et al*. (2007), we investigated gender differences in adolescents' preferences for online versus offline self-disclosure.

Finally, we compared the validity of the displacement, rich-get-richer, and rehearsal hypothesis. To do so, we studied adolescents' preferences for both types of self-disclosure in three data waves with cross-lagged autoregressive models.

Method

Sample

This longitudinal study is based on a sample of 690 Dutch adolescents between 10 and 17 years of age (50% girls; 50% boys). The adolescents were surveyed on three occasions,

with half-year intervals in between. Sampling and fieldwork were done by Qrius, a Dutch market research institute that specializes in large-scale studies among youth. Respondents were recruited from an existing online panel managed by Qrius. Qrius had sampled the respondents in all parts of the Netherlands resulting in a representative sample. The education level of our sample did not deviate from official statistics in the Netherlands (CBS, 2005): 52% of the children were at a lower pre-vocational level, 25% at a senior general secondary education level, and 23% at a pre-university education level.

In the first data wave, which took place in May and June 2006, 1,158 adolescents were surveyed. In the second data wave, which took place in November and December 2006, 812 (70%) adolescents participated again. In the third wave, which took place in May and June 2007, 690 adolescents (85%) participated. In total, 468 respondents were lost in the two waves (attrition rate 45%), partly because they left the online panel, partly because they failed to return the questionnaire or a completed questionnaire. In all three waves, respondents were reminded twice by email, once by surface mail, and were finally offered an extra bonus of 5 euros, in addition to the 3 euros that they received for filling in the questionnaires. Despite these measures, the attrition rate could not be further reduced.

We checked whether the adolescents who did not complete the second and third survey systematically differed from those who did. Boys did not drop out more often than girls did, F (1, 1150) = 0.03, p = .78. Adolescents who had dropped out were somewhat older (M = 13.94 years, SD = 2.25) than those who remained in the panel (M = 13.42 years, SD = 2.28; F [1, 1150] = 14.29, p < .001). However, in the third wave, respondents were still equally distributed across age groups: 10–11-year-olds: 26%; 12–13-year-olds: 24%; 14–15-year-olds: 26%; 16–17-year-olds: 24%. Finally, adolescents who dropped out reported similar levels of offline self-disclosure as those who remained in the study, t(1,156) = 1.61, *ns*. However, their level of online self-disclosure was slightly higher (M = 2.37, SD = 0.75) than those who did not drop out (M = 2.20; SD = 0.80; t[1,049] = 3.30, p < .05).

Procedure

Prior to the implementation of the survey, institutional approval, parental consent, and adolescents' informed consent were obtained. Adolescents were notified that the study would be about the Internet, emotions, and friendships and that they could stop participation at any time they wished. Moreover, they were asked to complete the questionnaire in privacy. Finally, we explained that there was no possibility for the principal investigators to identify who had filled in the questionnaire. We further explained that the research agency would provide us only with a number code for the respondents with which we could link the measurements of the three waves. The questionnaire contained items to measure the use and consequences of online communication, such as the quality of existing friendships, social competence, self-esteem, and well-being. This survey focuses only on the development of online and offline self-disclosure. On average, it took respondents 15 min to complete the questionnaire in each wave.

Measures

Age

Participants were divided into four age groups to reflect the developmental stages of pre-adolescence (10- and 11-year-olds: N = 182, M = 10.57 years, SD = 0.56), early

adolescence (12- and 13-year-olds: $N = 166$, $M = 12.54$ years, $SD = 0.61$), middle adolescence (14- and 15-year-olds: $N = 179$, $M = 14.54$ years, $SD = 0.55$), and late adolescence (16- and 17–year-olds: $N = 163$, $M = 16.51$ years, $SD = 0.50$).

Online self-disclosure

Our measure was based on earlier scales that included items to measure intimate self-disclosure (Jourard, 1971; Miller, Berg, & Archer, 1983). It has been successfully used in two earlier Dutch studies on online self-disclosure (Schouten *et al*., 2007; Valkenburg & Peter, 2009). In these studies, the scale showed internal consistency. It also had construct validity in the sense that it was positively related with variables with which it should theoretically correlate, such as age, gender, and friendship quality.

Respondents were asked: 'When you are using IM on the Internet, how much do you usually tell your close friends[1] about . . . ' (1) ' . . . your personal feelings', (2) ' . . . the things you are worried about', (3) ' . . . your secrets', (4) ' . . . being in love', and (5) ' . . . moments in your life you are ashamed of'. Items were measured on a 5-point scale ranging from 1 (*I tell nothing about this*) to 5 (*I tell everything about this*). In all three data waves, the five items loaded on one factor, which explained 68% of the variance at wave 1, 66% of the variance at wave 2, and 70% of the variance at wave 3. Cronbach's alpha was .88 at wave 1 ($M = 2.21$; $SD = 0.76$), .87 at wave 2 ($M = 2.28$; $SD = 0.71$), and .89 at wave 3 ($M = 2.37$; $SD = 0.75$).

We did not differentiate between the gender of the recipient of the self-disclosure. An earlier study (Schouten *et al*., 2007) did investigate differences in self-disclosure in cross-sex and same-sex relationships. They found that, both among boys and among girls, same-sex and cross-sex self-disclosure were significantly correlated with each other ($r =$ .43 to .58). This held for both online and offline self-disclosure. In addition, age affected same-sex and cross-sex self-disclosure similarly for boys and girls, which means that both boys and girls reported more same- and cross-sex self-disclosure as they grew older. The study by Schouten *et al*. thus suggests that a differentiation of self-disclosure in terms of the recipients' gender may not provide many new insights. Because, additionally, differences in same- and cross-sex self-disclosure were not the aim of the present study, we measured adolescents' general tendency to self-disclose to their close friends.

Offline self-disclosure

We adjusted the items used to measure adolescents' online self-disclosure to offline settings (see Schouten *et al*., 2007). We asked adolescents: 'We also like to know how much you tell about yourself in personal meetings with your close friends. How much do you tell in face-to-face meetings about . . . ' (1) ' . . . your personal feelings', (2) ' . . . the things you are worried about', (3) ' . . . your secrets', (4) ' . . . being in love', and (5) ' . . . moments in your life you are ashamed of'. Items were measured on a 5-point scale ranging from 1 (*I tell nothing about this*) to 5 (*I tell everything about this*). In all three data waves, the five items loaded on one factor, which explained 76% of the variance at wave 1, 74% of the variance at wave 2, and 74% of the variance at wave 3. Cronbach's alpha was .92 at wave 1 ($M = 2.49$; $SD = 0.93$), .92 at wave 2 ($M = 2.53$; $SD = 0.83$), and .91 at wave 3 ($M = 2.58$; $SD = 0.87$).

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[1] *The word friend ('vriend') has another meaning in Dutch than the same word in English. The meaning of 'vriend' resembles the meaning of 'close friend' in English. We therefore translated 'vriend' into 'close friend'.*

Results

Age and gender differences in online and offline self-disclosure

The first aim of our study was to investigate how online and offline self-disclosure develop in pre-adolescence and adolescence, and how this differs for boys and girls. To investigate potential main and interaction effects of age and gender, we first averaged adolescents' scores on online and offline self-disclosure over the three waves. Then, we conducted a repeated measures analysis of variance (ANOVA) with one within-subject variable – type of self-disclosure (online vs. offline self-disclosure) – and two between-subjects variables – gender and age. Figure 1 depicts online and offline self-disclosure across the four age groups for boys and girls separately. Table 1 presents the means and standard deviations for all cells resulting from the analysis. The different superscripts in the table indicate which cells differ from each other within rows and columns.

The repeated measures ANOVA yielded three main effects: for age, $F(3, 682) = 17.81$, $p < .001$, ${}_{p}\eta^2 = .07$; for gender, $F(1, 682) = 50.84$, $p < .001$, ${}_{p}\eta^2 = .07$; and for type of self-disclosure, $F(1, 682) = 182.91$, $p < .001$, ${}_{p}\eta^2 = .21$. It also yielded three interaction effects: for gender $*$ type of self-disclosure, $F(1, 682) = 21.83$, $p < .001$, ${}_{p}\eta^2 = .03$; for age $*$ type of self-disclosure, $F(3, 682) = 3.53$, $p < .05$, ${}_{p}\eta^2 = .02$; and for gender $*$ age, $F(3, 682) = 4.05$, $p < .01$, ${}_{p}\eta^2 = .02$. The analysis yielded no significant three-way interactions.

The two main effects for gender and age indicated that both online and offline self-disclosure were higher for girls than for boys [see the averaged self-disclosure scores (i.e., the mean of online and offline self-disclosure) of boys versus girls in Table 1]. A significant linear contrast estimate (LCE) showed that older adolescents reported more self-disclosure than younger adolescents (LCE = .30, $p < .001$). The main effect for type of self-disclosure indicated that overall adolescents self-disclosed more offline ($M = 2.53$, $SD = 0.71$) than online ($M = 2.29$, $SD = 0.61$). However, all these main effects are difficult to interpret because the analyses also yielded significant interactions. Follow-up analyses were conducted to further explore the observed interaction effects.

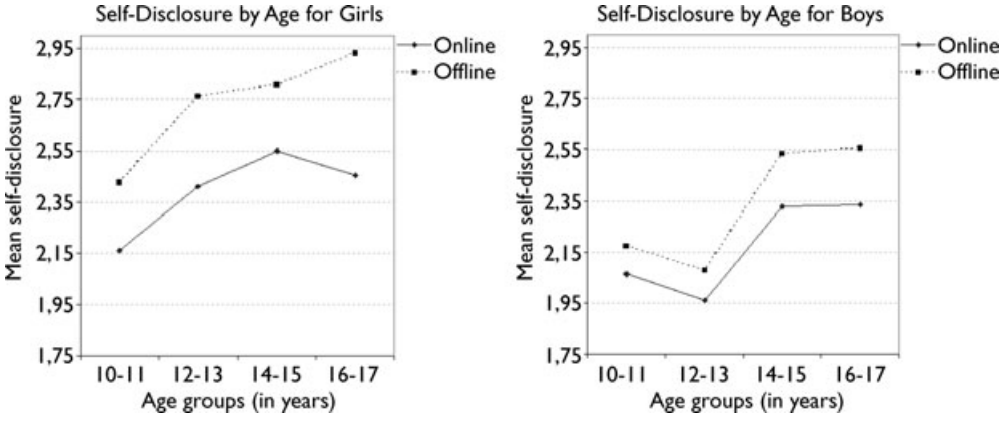

Figure 1. Mean development of online and offline self-disclosure for boys and girls by age group. The scales of both types of self-disclosure range from 1 (*I tell nothing about this*) to 5 (*I tell everything about this*).

Table 1. Online, offline, and averaged self-disclosure by age and gender

	Age groups (in years)	*N*	Online self-disclosure Mean (*SD*)	Offline self-disclosure Mean (*SD*)	Averaged self-disclosure* Mean (*SD*)
Girls	10–11	95	2.16 (0.49)^{a}	2.42 (0.58)^{ay}	2.29 (0.49)^{a}
	12–13	76	2.41 (0.60)^{by}	2.76 (0.65)^{by}	2.59 (0.58)^{b}
	14–15	87	2.55 (0.62)^{by}	2.81 (0.66)^{by}	2.68 (0.59)^{b}
	16–17	89	2.45 (0.59)^{b}	2.93 (0.70)^{by}	2.69 (0.58)^{b}
	Total	347	2.39 (0.59)^{y}	2.72 (0.67)^{y}	2.56 (0.58)^{y}
Boys	10–11	87	2.07 (0.51)^{a}	2.17 (0.64)^{ax}	2.12 (0.53)^{a}
	12–13	90	1.96 (0.54)^{ax}	2.08 (0.52)^{ax}	2.02 (0.47)^{a}
	14–15	92	2.33 (0.69)^{bx}	2.53 (0.77)^{bx}	2.43 (0.68)^{b}
	16–17	74	2.33 (0.58)^{b}	2.56 (0.67)^{bx}	2.45 (0.59)^{b}
	Total	343	2.18 (0.60)^{x}	2.34 (0.69)^{x}	2.26 (0.60)^{x}
Whole sample	10–11	182	2.11 (0.50)^{a}	2.29 (0.62)^{a}	2.20 (0.51)^{a}
	12–13	166	2.20 (0.62)^{a}	2.45 (0.69)^{a}	2.33 (0.61)^{a}
	14–15	179	2.44 (0.66)^{b}	2.67 (0.73)^{b}	2.56 (0.64)^{b}
	16–17	163	2.39 (0.59)^{b}	2.73 (0.71)^{b}	2.56 (0.60)^{b}
	Total	690	2.29 (0.61)	2.53 (0.71)	2.41 (0.61)

Note. *Averaged self-disclosure reflects the mean of online and offline self-disclosure. For all row cells, offline self-disclosure differs significantly from online self-disclosure at least at $p < .05$. ^{a,b,c} age groups in column cells within gender groups that have different superscripts differ significantly from each other at least at $p < .05$; ^{x,y} boys and girls in column cells within the same age group that have different superscripts differ from each other at least at $p < .05$.

Gender ∗ type of self-disclosure

Comparison of the effect sizes of the gender effect showed that although girls reported more self-disclosure than boys, the effect size for gender difference for offline self-disclosure ($F(1, 682) = 62.95$, $p < .001$, ${}_{p}\eta^2 = .08$; $M_{girls} = 2.72$, $SD = 0.67$ vs. $M_{boys} = 2.34$, $SD = 0.69$) was twice the size of the effect observed for online self-disclosure ($F(1, 682) = 25.40$, $p < .001$, ${}_{p}\eta^2 = .04$; $M_{girls} = 2.39$, $SD = 0.60$ vs. $M_{boys} = 2.18$, $SD = 0.60$). Rose and Rudolph's (2006) suggestion that gender differences in self-disclosure emerge only in adolescence and are absent in pre-adolescence received only partial support. As expected, during pre-adolescence girls and boys reported similar levels of online disclosure; however, pre-adolescent girls reported more offline self-disclosure than boys. Finally, the difference between online and offline self-disclosure was smaller for boys (mean difference $= -0.16$, $t[346] = -6.49$, $p < .001$) than for girls (mean difference $= -0.33$, $t[342] = -12.17$, $p < .001$). As Table 1 shows, especially among pre- and early adolescent boys, the difference in online and offline self-disclosure was small.

Age ∗ type of self-disclosure

Follow-up polynomial contrasts were calculated to explore the differences in age trends for online and offline self-disclosure. A linear increase across adolescence was observed for offline self-disclosure (LCE $= .36$, $p < .001$). Online self-disclosure increased linearly

but seemed to level off in older age groups (LCE = .25, $p < .001$, and cubic contrast estimate = −.11, $p < .05$; see Table 1).

Gender ∗ age

The gender by age group interaction indicated that age effects for averaged self-disclosure were different for boys and girls. A main effect of age was observed for boys, $F(3, 343) = 12.00$, $p < .001$, ${}_{p}\eta^2 = .10$, and for girls, $F(3, 339) = 9.38$, $p < .001$, ${}_{p}\eta^2 = .08$ (see Table 1). Follow-up post hoc tests (Bonferroni corrected) showed that among boys, 10–11-year-olds did not differ from the 12–13-year-olds, and 14–15-year-olds did not differ from 16–17-year-olds. All other groups differed significantly from each other (p's < .01), revealing an increase from pre- and early adolescence to mid- and late adolescence. For girls, the 10–11-year-olds differed significantly from the other three age groups (p's < .01), but no other age effects were observed. In sum, both boys and girls showed a sharp increase in self-disclosure, but at a different point of time in their development. For girls the increase in self-disclosure occurred from pre-adolescence (10–11 years) to adolescence (12+ years), for boys the increase occurred from early adolescence (12–13 years) to mid-adolescence (14–15 years).

Adolescents who disclose more online than offline

The previous comparisons indicated that the mean levels of offline self-disclosure were generally higher than the mean levels of online self-disclosure. However, a comparison of means does not necessarily indicate that all adolescents disclose more offline than online. After all, the interaction effect for gender and type of self-disclosure revealed that the differences between online and offline self-disclosure were smaller for boys than for girls.

To investigate individual differences in preferences for self-disclosure, we conducted an additional analysis to investigate the difference scores between online and offline self-disclosure. More specifically, we investigated how many adolescents disclose more online than offline. To do so, we first subtracted the offline self-disclosure scores from the online self-disclosure scores. This led to a variable that ranged from −2.07 to + 1.29, which already indicated that a certain percentage of adolescents self-disclose more online than offline. We then calculated the standard error (SE) of this variable (i.e., the estimated standard deviation of the error of the measurement method). This SE (0.019) was multiplied with 1.96 to create a 95% confidence interval (CI) (−0.03724 to 0.03724) for the middle score of the new categorical variable. The newly formed variable had three levels: (a) the lowest score to −0.03724 (= adolescents who disclose more offline than online), (b) −0.03724 to 0.03724 (= adolescents with equal levels of online and offline self-disclosure), and (c) 0.03724 to the highest score (= adolescent who disclose more online than offline).

This new variable revealed that 64% of adolescents self-disclosed more offline than online. In addition, 10% self-disclose as much online as offline. Finally, 26% self-disclose more online than offline. This preference for online self-disclosure was higher among boys (30%) than among girls (22%), $\chi^2\ (2, N = 690) = 6.34$, $p < .05$. This is in line with the aforementioned interaction effect of gender ∗ type of self-disclosure that revealed that the mean differences between online and offline self-disclosure were smaller for boys than for girls. Our analyses showed that the tendency to disclose online was strongest for

boys in early adolescence (12–13-year-olds): 40% of the boys in this age group disclosed more online than offline.

Interactions between online and offline self-disclosure

A second aim of our study was to investigate how online and offline self-disclosure interacted in pre-adolescence and adolescence. To do so, we formulated three hypotheses: the displacement, rich-get-richer, and rehearsal hypothesis. In data-analytical terms, each of these hypotheses predicted a different longitudinal relationship between online and offline self-disclosure. The displacement hypothesis predicted a negative longitudinal effect of online self-disclosure on offline self-disclosure. The rich-get-richer hypothesis predicted a positive longitudinal effect from offline self-disclosure on online self-disclosure. Finally, the rehearsal hypothesis predicted a positive effect of online self-disclosure on offline self-disclosure.

To assess the longitudinal relationships between online and offline self-disclosure, we investigated a cross-lagged autoregressive model as presented in Figure 2. The model in Figure 2 was tested with structural equation modelling using AMOS 7.0. All variables in the model represent latent constructs, which were estimated from two manifest indicators (for reasons of parsimony, we did not present the manifest variables in Figure 2). For all latent constructs, two item parcels served as indicators. These item parcels were created using a procedure suggested by Russell, Kahn, Spoth, and Altmaier (1998). We allowed error terms of the same indicators to correlate over time. We also allowed for correlations between the disturbance terms of online and offline self-disclosure within the same data wave.

We used two indices to evaluate the fit of our models: the root mean square error of approximation (RMSEA) and the comparative fit index (CFI). A good model fit is expressed in an RMSEA value close to .06 and a CFI value close to .95 (Byrne, 2001). For conventional reasons, we also report the χ^2 value. However, in case of large samples the χ^2 test is often unreliable because it seriously underestimates the model fit (Byrne, 2001).

Our observed model, as presented in Figure 2, fits the data well, χ^2 (31, $N = 690$) = 124.89, $p < .001$, CFI = .986, RMSEA = .066 (90% CI: .054–.079). The coefficients in the model all represent standardized betas. As Figure 2 shows, from wave 1 to wave

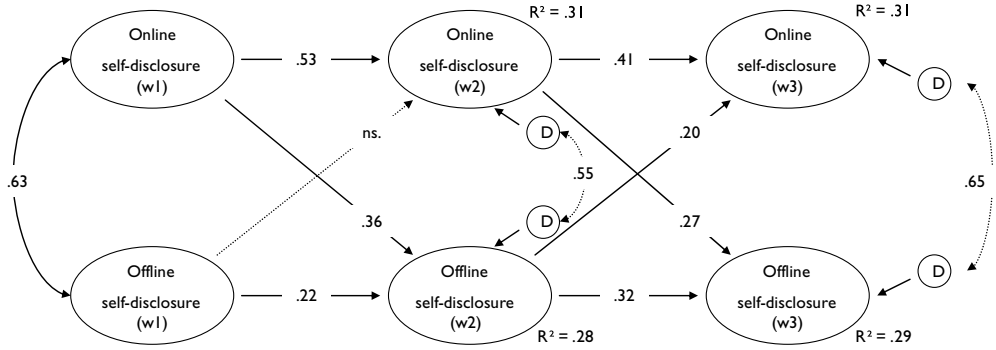

Figure 2. Cross-lagged model on the longitudinal relationships between online and offline self-disclosure. *Note*: *D* = disturbance term of latent variables. All coefficients are correlations or beta coefficients that are significant at least at $p < .05$.

2, only the path from online self-disclosure (wave 1) to offline self-disclosure (wave 2) was significant, whereas the path from offline self-disclosure (wave 1) to online self-disclosure (wave 2) was not significant. These results yield support for only the rehearsal hypothesis, and not for the displacement and rich-get-richer hypotheses. From wave 2 to wave 3 both cross-lagged paths were significant. These results provide support for the rehearsal and, partially, also for the rich-get-richer hypothesis.

To investigate whether the cross-lagged and stability coefficients differed for boys and girls, we conducted a multi-group analysis with gender as the grouping variable. The unconstrained model for the two gender groups yielded a good fit, χ^2 (62, $N = 690$) = 153.57, $p < .001$, CFI = .986, RMSEA = .046 (90% CI: .037–.058). Constraining the four cross-lagged paths did not lead to significant chi-square changes, indicating that the paths found for the whole group were not moderated by gender. Furthermore, constraining the stability coefficients between waves for online and offline self-disclosure did not lead to significant chi-square changes. Thus, stability coefficients did not differ between boys and girls.

Discussion

The first aim of this study was to investigate whether the development of online and offline self-disclosure would vary for boys and girls of different ages, and whether gender differences that have been found for offline self-disclosure would also hold for online self-disclosure. In line with Buhrmester and Prager (1995), we found that for boys and girls, an elongated S-shaped curve was the best way to describe the developmental trajectories of self-disclosure. For girls both online and offline self-disclosure increased sharply from pre- (10–11 years) to early adolescence (12–13 years) and stabilized in middle and late adolescence. For boys, the increase in self-disclosure started 2 years later from early (12–13 years) to middle adolescence (14–15 years), after which it stabilized.

The observed gender differences in self-disclosure trajectories are in line with important physical and psychosocial changes that occur during early adolescence. Both physically and psychosocially, girls mature earlier than boys, which could explain the reported gender differences in self-disclosure. For boys and girls, their self-disclosure showed a sharp increase just after puberty. Puberty, which starts about 2 years earlier for girls than for boys, is a time of great physical and emotional change, including emotional instability, romantic attraction, enhanced sexual interest, and feelings of awkwardness and embarrassment (Dahl, 2004). Both boys and girls may wish to share these newly experienced impulses and concerns with a same-sex friend, and this enhanced need is clearly reflected in our data.

Another variable that could explain the observed gender differences in self-disclosure is ego development, that is, how an individual perceives and interprets personal experiences and interpersonal relationships (Loevinger, 1998). Around the age of 13, adolescents are said to move from the self-protective to a conformist stage of ego development. This step in development is marked by a move from a somewhat opportunistic and instrumental view of relationships to a more socially conventional one. Conforming adolescents have a strong need to belong, and become more aware of other people's perceptions and feelings. Conforming adolescents engaged in more self-disclosure than those who were still at the self-protective stage (Hennighausen, Hauser, Billings, Schultz, & Allen, 2004). Because girls arrive at the conformist stage earlier than boys, girls' self-disclosure may increase earlier than boys' self-disclosure.

In general, we found that offline self-disclosure was higher than online self-disclosure. However, the imparity between offline and online self-disclosure did differ between boys and girls. First, the interaction effect of gender and type of self-disclosure showed that, although boys and girls differed significantly in their offline self-disclosure, they differed less in their online self-disclosure. In two out of four age groups (i.e., 10–11-year-olds and 16–17-year-olds), there was no significant difference in the level of online self-disclosure between boys and girls. In the other two groups, the gender differences in online self-disclosure were significant but smaller in size than those in offline self-disclosure.

The same interaction effect also revealed that the difference between online and offline self-disclosure was smaller for boys than for girls. This result was confirmed by our follow-up analyses in which we calculated difference scores between online and offline self-disclosure. Both the mean comparisons and the difference scores revealed that boys engaged in more online than offline self-disclosure than girls. For example, in early adolescence, around 40% of the boys disclosed as much or more online than offline. After age 13, particularly offline self-disclosure showed a sharp increase among boys. This suggests that early adolescent boys in particular turn to online self-disclosure when their need for self-disclosure starts to develop. They may benefit from online communication to practise their self-disclosure skills, which they can later utilize in offline situations.

Interaction between offline and online self-disclosure

A second aim of our study was to compare the validity of three hypotheses to explain the interaction between online and offline self-disclosure: the displacement, rich-get-richer, and rehearsal hypothesis. We found most support for the rehearsal hypothesis. Both in wave 1 and wave 2, online self-disclosure stimulated offline self-disclosure in the subsequent wave. This result is in line with several earlier studies that have shown that adolescents use the Internet as a relatively safe place where they can rehearse their self-disclosure and self-presentation skills (e.g., Valkenburg & Peter, 2008, 2009).

The rich-get-richer hypothesis, which predicted a stimulating effect of offline self-disclosure to online self-disclosure, was supported only by the wave-2–3 cross-lagged paths. In the first wave, offline self-disclosure did not stimulate online self-disclosure. A possible explanation is that rich-get-richer effects are more visible among adolescents who are more experienced Internet users. Future research should reinvestigate the validity of the rich-get-richer hypothesis. After all, if online friendships become more common and increasingly start to overlap with offline friendships, rich-get-richer effects may also originate online rather than offline. In other words, online self-disclosure with online friends may also transfer to, and enrich, offline self-disclosure with these friends. Although we did not find evidence for these reciprocal effects in our study, in future research such effects may be more plausible.

Finally, no support was found for the displacement hypothesis: Engaging in online self-disclosure did not lead to less disclosure in face-to-face settings. Both pre-adolescents and adolescents and both boys and girls predominantly use IM to keep in touch with their existing friends. For both boys and girls, offline self-disclosure was higher than online self-disclosure, which is in line with findings by Schouten *et al*. (2007).

Conclusions, limitations, and suggestions for future research

We presented descriptive results on the normative developmental trajectories of two types of self-disclosure using a longitudinal data set. According to Berndt (2004, p. 212),

the declining acceptance of stage theories in developmental psychology 'has been accompanied by a dramatic decrease in the investigation of normative development, or how children's thinking, behavior, and relationships typically change with age'. In line with this observation, research in the area of social development has focused almost exclusively on determining the correlates and consequences of self-disclosure in the past decade. However, research on the normative development of social and intimacy-related variables should not be ignored. In our view, such research can be vital for understanding differences in causal effects among different age groups.

Still, some limitations of our study need to be mentioned. First, our study did not investigate whether and how gender of the close friends affected adolescents' online and offline self-disclosure. We found significant gender differences in both online and offline self-disclosure, but we did not investigate the effects of gender of the partner on self-disclosure. Future research should elaborate on our findings and focus on both the gender of the discloser and the recipient on the amount and intimacy of online and offline self-disclosure.

Secondly, we focused on IM and ignored SNSs. In the past years, the use of SNSs has increased dramatically among adolescents. About 73% of US adolescents (Lenhart, Purcell, Smith, & Zickuhr, 2010) are members of an SNS, and the same percentage holds for Dutch teens. Like IM, SNSs are predominantly used by adolescents to maintain their existing friendships, and they may, therefore, be suitable to investigate self-disclosure to friends. However, in the Netherlands, teens' IM use still far surpasses their SNS use (Sikkema, 2009). Moreover, IM and SNS use seem to overlap to a great extent, because the majority of teens (58%) often send instant messages to their friends through SNSs (Lenhart *et al.*, 2010). When the first wave of the current study was fielded, in 2006, less than 25% of Dutch children were a member of an SNS (Valkenburg, Peter, & Schouten, 2006) compared to 90% of adolescents who used IM.

The permanent change of adolescents' online environment is a serious problem in longitudinal designs. On the one hand, one has to keep key variables constant over time in such designs, but on the other hand, adolescents' media environment is changing so rapidly that it is extremely difficult to keep these variables constant. It is a challenge for future researchers to create items and scales that validly measure adolescents' online behaviour but that are not too dependent on the online tools that are most popular at the moment of data collection.

Although we have observed age and gender differences in self-disclosure, our study did not investigate how these differences affect intimacy and closeness of friendships. Research on gender differences in self-disclosure often assumes that boys and girls differ in their pathways to intimacy (McNelles & Connolly, 1999). For girls, intimate self-disclosure seems to be the primary pathway to intimacy development and close friendships (Radmacher & Azmitia, 2006), whereas for boys shared activities and behaviour (e.g., non-emotional support, joking) and self-disclosure are all important routes to intimacy development. The focus of our study was self-disclosure, defined as the expressive route to intimacy development and close friendships. Future research should investigate the differential contribution of online and offline self-disclosure to intimacy development. It should also include a broader range of mechanisms in addition to self-disclosure that may stimulate intimacy and the closeness of friendships (for examples, see McNelles & Connolly, 1999; Radmacher & Azmitia, 2006).

In summary, our results suggest that many pre-adolescents and adolescents use the Internet to disclose personal information to their friends, and that their online self-disclosure may encourage offline self-disclosure over time. They also suggest that

research on adolescent social development can no longer ignore the crucial role of the digital space in which adolescents try out and validate their identities. A substantial number of today's adolescents spend more time on the Internet than on any other activity (e.g., Lenhart & Madden, 2007). They also often disclose personal information and develop relationships through the Internet (e.g., Peter, Valkenburg, & Schouten, 2005; Schouten *et al*., 2007). Therefore, the dynamics of adolescents' social development, including age and gender differences, can only be understood if we integrate these profound changes in their media environment into interpersonal theories and research on adolescence.

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