



**Universiteit Utrecht**

**Dutch Adolescents Online: Testing for Bidirectional Relationships  
Between Adolescents' Time Spent on Social Internet Activities and Their  
Quality of Offline Friendships**

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# **Dutch Adolescents Online: Testing for Bidirectional Relationships Between Adolescents' Time Spent on Social Internet Activities and Their Quality of Offline Friendships**

## **Abstract:**

*The present study addresses the bi-directional associations between time spent on the popular social Internet activities instant messaging (IM), chatting, using social network sites (SNS) and playing massive multiplayer online games with the quality of offline friendships. The study included cross-sectional samples of Dutch adolescents between the ages 11-19 (N= 4071 in 2009, N= 3758 in 2010, N=3179 in 2011) and a longitudinal sample (N= 1122) of adolescents who participated in 2009 and 2010. Results showed that time spent on instant messengers and social network sites was positively associated with quality of offline friendships. Against our expectations, results from longitudinal regression analyses indicated that this association seems to result from the fact that higher friendship quality predicts more subsequent time spent on IM and SNS, whereas more time spent on IM and SNS does not seem to enhance friendship quality. Chatting in chat rooms and massive multiplayer online gaming showed no relationship with offline friendship quality.*

## **Abstract (Nederlands):**

*Deze studie focust zich op de bi-directionele verbanden tussen enerzijds de tijd gependeed aan sociale Internet activiteiten 'instant messaging' (IM), chatten, het gebruiken maken van sociale netwerk sites (SNS) en het spelen van massive multiplayer online games en anderzijds de kwaliteit van offline vriendschappen. De studie bevatte drie cross-sectionele steekproeven van Nederlandse adolescenten tussen de 11-19 jaar (N= 4071 in 2009, N= 3758 in 2010, N=3179 in 2011) en een longitudinale steekproef (N= 1122) bestaande uit adolescenten die in 2009 en 2010 hebben geparticipeerd. De resultaten toonden aan dat de tijd die adolescenten besteden aan het gebruik van instant messengers en sociale netwerk sites positief samenhangt met offline vriendschapskwaliteit. Tegen onze verwachtingen in bleek uit longitudinale regressie-analyses dat deze associatie lijkt voort te komen uit het feit dat de bestede tijd aan IM en SNS niet resulteert in een hogere vriendschapskwaliteit, maar dat een hoge offline vriendschapskwaliteit leidt tot een hogere mate van gebruik van IM en SNS. Chatten in chatboxen en het spelen van massive multiplayer online spellen toonden geen samenhang met offline vriendschapskwaliteit.*

The question whether the Internet influences social relationships with important others has become increasingly relevant as the Internet keeps expanding. With 93% of American teens between the ages 12-17 spending time online in 2010 (PEW Internet & American Life Project, 2010), adolescents form one of the most active groups online. During adolescence, maintaining relationships with peers becomes more important as relations grow more intimate (Paul & White, 1990). Low quality of friendships in adolescence is associated with academic underachievement and unemployment (Woodward & Ferguson, 2000) and with loneliness and social dissatisfaction (Parker & Asher, 1993). Hence, the influence of Internet usage on adolescents' friendships has been widely studied.

One of the first longitudinal studies on this subject controversially found that Internet usage was associated with decreases of social involvement and well-being (Kraut et al, 1998). Other studies also found that adolescents' time spent on the Internet was associated with losing contact with their social environment (Nie & Erbring, 2000) and that extensive Internet usage among teenagers was linked to spending less time with friends and family and a lower reported desire for face-to-face contact with family members (Soo Shim, 2007). These results can be understood within the framework of the 'time-displacement hypothesis': Internet users replace offline social activities with spending time online. As a result social involvement would decrease and friendship quality would deteriorate.

However, nowadays the assumption that Internet usage does not have negative implications on social lives of its users seems favourable, for this assumption has found support from various studies. Both a longitudinal study and a meta-analysis found no effects of Internet usage on the social interaction of children and adolescents (Cole, 2000; Shklovski, Kiesler & Kraut, 2006 respectively). Other studies found positive effects of Internet usage on the quality of friendships: a follow-up study by Kraut et al. (1998) found that all negative effects of the Internet usage had dissipated three years later, and that Internet usage had positive effects on communication, social involvement and well-being (Kraut et al, 2002). Other positive findings included that Internet usage would reinforce communication between adolescents, friends and family and that the Internet was primarily used to maintain existing friendships (Bargh & McKenna, 2003; Lee & Kuo, 2002).

Thus, empirical support has been found for negative, positive and no effects of Internet usage on the quality of existing friendships, with the majority of the studies supporting a positive effect (Valkenburg & Peter, 2009a). The major differences between the results of these studies are broadly understood as a consequence of homogenising Internet usage (Gordon, Juang & Syed, 2007). Internet usage encompasses many different activities, with each of them having their own characteristics and functions. Valkenburg & Peter (2009a) distinguished Internet activities that involved communicating with other people, and activities that cannot be qualified as 'social'. In line with their distinction, this study focuses exclusively on four popular social Internet activities, i.e.

instant messaging (IM), chatting in chatrooms, using social network sites (SNS) and playing massive multiplayer online games (MMO gaming) and their effect on the offline quality of adolescent friendships.

### ***Online Communication, Offline Stimulation***

Based on the results of recent studies, this study assumes that in correspondence with the 'majority of studies' (Valkenburg & Peter, 2009a), Internet usage will have a positive effect on offline social relationships. This assumption is best understood within the framework of the *stimulation-hypothesis*; positive effects of Internet usage on friendships are reached through online communication with important others. Communicating with important others will stimulate well-being, which will result in enhanced friendship quality. Because a vast majority of adolescents report that staying in touch with existing friends is their predominant motivation to use the Internet (Lenhart, Madden & Hitlin, 2005), the assumption that Internet usage would stimulate friendships seems feasible.

Instant messaging is a social Internet activity that has often been tested in light of the stimulation-hypothesis. Because adolescents report that their motivation to use instant messengers like MSN, ICQ and Facebook Messenger is to maintain existing friendships (Gross, 2004; Lee & Sun, 2009), multiple studies have been conducted in order to study the effects of IM on friendship. Valkenburg & Peter (2007a; 2007b) found that Dutch adolescents who communicated via IM felt closer to their existing friends. Additionally, time spent on IM was found to be positively related to the time spent with existing friends (Valkenburg & Peter, 2007b; Wong, 2008). In support of these cross-sectional findings, longitudinal evidence also seems to favour the stimulation-hypothesis. Blais et al (2008) found that Canadian adolescents who used instant messengers would report a higher quality of friendships one year later. Also, Dutch studies found that more time spent on instant messengers would predict an increase in quality of friendships (Selfhout et al, 2009; Valkenburg & Peter, 2009a). Therefore, the first hypothesis presumes that **time spent on IM will have a positive effect on the experienced quality of offline friendships (hypothesis 1).**

In contrast to instant messaging, chatting in chat rooms has not gained much attention in studies targeting offline friendships. Typically, chatting in chat rooms involves personal communication with strangers through anonymous nicknames. Although a longitudinal study did find that usage of chat rooms stimulated subsequent friendship quality (McKenna, Green & Gleason, 2002), more recent cross-sectional (Valkenburg & Peter, 2007a; 2007b) and longitudinal (Blais et al, 2008) studies seem to conclude that usage of chat rooms does not influence friendship quality. In contrast, these studies did find positive effects of instant messaging on friendship quality. Valkenburg

& Peter (2009a) explain these differences by the fact that chatting in chat rooms often involves communication with strangers, whereas IM is mainly used in order to maintain contact with existing friends. Communication with friends seems to involve more self-disclosure of personal information, which is associated with maintaining existing friendships (Schouten, Valkenburg & Peter, 2007). Considering that chatting in chat rooms often seems not involve close friends, the second hypothesis states that **there is no effect of time spent on chatting on the experienced quality of offline friendships (hypothesis 2).**

Social network sites like Facebook have grown rapidly over the last few years. SNS typically revolve around building a social network online out of personal profiles, and seem to fit the stimulation-hypothesis; studies indicate that SNS are predominantly used to maintain existing friendships (Ellison, Steinberg & Lampe, 2007; Subrahmanyam, Reich, Waechter & Espinoza, 2008) and additionally 2 out of 3 users make offline plans with friends through SNS (Lenhart & Madden, 2007). Although SNS might be an important tool in the maintenance of adolescent friendships, research on the effect of using SNS on friendship quality is still surprisingly scarce. Cross-sectional studies found that communication on Facebook positively predicted both the closeness of offline friendships among American adolescents (Ledbetter et al, 2010) and the friendship quality among SNS users from Hong Kong (Wong, 2008). Additionally, Ellison, Steinfeld & Lampe (2007) found that Facebook usage predicted both bonding- (with close others) and bridging (with strangers) social capital. As far as we know, no longitudinal studies tested the long-term effect of SNS usage on friendship quality. In line with the cross-sectional findings and with the stimulation-hypothesis, the third hypothesis states that **time spent on SNS will have a positive effect on the experienced quality of offline friendships (hypothesis 3).**

Massive Multiplay Online games are online games which are built to enhance social interaction and stimulate cooperative playing (Ducheneaut & Moore, 2004). Multiple studies have included MMO gaming in relation to well-being (Trepte, Reinecke & Juechems, 2012), but few have targeted offline social implications of playing. Results were mixed, as Williams (2006) found that MMO gaming was associated with a decrease in bonding social capital and face-to-face interactions with friends, whereas a longitudinal and a cross-sectional study found that playing MMO games had positive effects, but the benefits only had social consequences online, not offline (Zhong, 2011; Huvila, Holmberg & Wulff, 2010 respectively). However, MMO gaming does seem to fit the stimulation-hypothesis as studies have found that one third of the players knew a quarter or more of their fellow players in real life, that a substantial amount of gamers played with their family members or friends and additionally, that many gamers reported that they frequently communicated with MMO players outside of the game (Kolo & Baur, 2004; Cole & Griffiths, 2007; Longman, O'Connor & Obst, 2009 respectively). These numbers seem to indicate that new offline friends are made by

gaming or that MMO games might be used as social platforms by known others to communicate while gaming. These notions are supported by Shen & Williams (2011), who concluded that players were actively motivated to use MMO games on the Internet for social purposes. Although these findings fit within the framework of the stimulation-hypothesis, the majority of the studies in relation to effects on friendships seem to suggest that playing MMO games has merely social implications online. Therefore, the fourth hypothesis predicts that **there is no effect of time spent playing MMO games on the experienced quality of offline friendships (hypothesis 4).**

In contrast to studies that have focused exclusively on usage of Internet activities as predictor of friendship quality, several studies have tested whether usage of social Internet activities resulted from having close or rather unsatisfying friendships. Most results seem to fit within two challenging frameworks. The *rich-get-richer* hypothesis predicts that especially individuals who are socially competent will be drawn to social Internet activities, and will gain more social benefits from communicating online. For instance, in the case of using social network sites this hypothesis has found support by the finding that young SNS users who reported more positivity in their closest friendship were more likely to be using SNS at later ages (Mikami et al, 2010). In contrast, the *poor-get-richer* hypothesis predicts that individuals who struggle socially will be drawn to using social Internet activities and will benefit from this communication, in order to compensate for their lack of social involvement offline. This hypothesis has been backed up by Steinfeld, Ellison & Lampe (2008) who found that adolescents with lower self-esteem would gain more benefits of Facebook usage than adolescents with higher self-esteem. Overall, the *rich-get-richer* hypothesis seems to find the most empirical support (Valkenburg, 2007a; Kim, LaRose & Peng, 2009).

#### ***Unidirectional or Bidirectional Relationships?***

Most of the support in favour of positive effects from social Internet activities to offline friendship quality is based on cross-sectional data. These results leave room for speculation concerning the causal direction of these relationships: do adolescents who spent much time on IM and SNS enhance their offline friendships, or do adolescents who already have satisfying and close friendships spend more time on IM and SNS? Cross-sectional studies do not add to our understanding of the causality of the found associations. To our knowledge, only two longitudinal studies have tested the bidirectional relationship between a social Internet activity and offline friendship quality. Valkenburg & Peter (2009a) and Blais et al. (2008) have tested both friendship quality as outcome and as a predictor of IM usage. Both found IM to predict subsequent friendship quality, whereas offline friendship quality did not predict IM usage. In line with these results, the fifth hypothesis predicts that **the social Internet activities will more accurately predict the quality of friendship than vice versa.**

By looking bidirectionally at the relationships between the usage of four popular social Internet activities and the experienced quality of friendships, this study tries to make a scientific relevant contribution to fill a gap of knowledge. Because most insights regarding Internet use are based on cross-sectional data, this study might add to our knowledge on predictors and consequences of Internet usage because of the availability of longitudinal data. By studying developments rather than merely associations, this study will help to better understand the possible effects of the use of particular Internet functions on adolescents' quality of friendships and vice versa.

In summary, this study aims to investigate the relationships between IM, chatting, SNS and playing MMO games on the one hand, and the experienced quality of offline friendships on the other hand. A positive effect of IM and SNS usage on the experienced quality of friendships is expected (hypotheses 1 & 3), whereas no effect is expected from chatting in chat rooms and playing MMO games on friendship quality (hypotheses 2 & 4). Additionally, all relationships will be tested bidirectional in order to test the expectation that the social Internet activities will more accurately predict the offline quality of friendship than vice versa (hypothesis 5).

## **Methods**

### ***Sample and Procedure***

This study is based on data collected by IVO Rotterdam, who started a longitudinal study called 'Monitor Internet en Jongeren' in 2006. This study focuses on the data collected in the years 2009 (T1), 2010 (T2) and 2011 (T3). The first wave resulted in 4071 filled in questionnaires from adolescents between the ages of 11 and 19 years old, coming from ten different high schools across the Netherlands. The second wave consisted of 3758 filled in questionnaires. The third wave consisted of 3179 filled in questionnaires. The longitudinal sample included 1122 filled in questionnaires of adolescents who were included in both the first and the second wave of data collection (non-response= 72.4%). Table 1 shows demographic information regarding the three waves.

Table 1

*Number of Participants, Gender and Mean Age for the Respondents of Each Wave*

<b>Year (wave)</b>	<b>Participants</b>	<b>Gender (%)</b>	<b>Mean age</b>
2009 (T1)	4071	50,2 male 49,8 female	14,48 (SD= 1,11)
2010 (T2)	3758	48,6 male 51,4 female	14,31 (SD= 1,01)
2011 (T3)	3179	48,3 male 51,7 female	14,22 (SD= 1,06)
2009-2010 (longitudinal)	1122	48,1 male 51,9 female	13,74 (SD= 0,71)

Prior to the data collection, all schools granted their permission to administer the questionnaire. Parents' permission was gathered by means of passive informed consent. That is, parents received a letter in which they were informed that their child's school was participating in a study on Internet use and well-being and that the questionnaire would be administered during school hours. This letter provided parents an option to retract permission to let their children participate in this study.

Data collection consisted of written questionnaires filled out in the classroom setting. To administer the questionnaires in class, teachers received careful instructions about the coordination of the survey, including guidelines to guarantee the privacy of participants while filling out the questionnaire.

### **Measures**

*Instant Messaging (IM), Chatting, using Social Network Sites (SNS) and Massive Multiplay Online (MMO) Gaming;* time spent per week on each of these social Internet activities was measured by two questions: (1) the number of days per week and (2) how long on a given day adolescents would engage in using MSN, chatting in chat rooms, using social network sites and playing online games with others. Answers were given on a 5- (how often) and 7-point (how long) scale, ranging from 1= *never* to 5 = *(almost) every day* and 1= *never* and 7= *eight hours or more* respectively.

*Quality of Offline Friendships:* the experienced quality of offline friendships was measured by a Dutch version of Buhrmester's Support Scale of the Network of Relationship Inventory (Furman & Buhrmester, 1985), translated by Valkenburg & Peter in 2007. The Dutch version distinguishes two

scales to measure the quality of online and offline friendships. The quality of offline friendships was measured by nine questions about friends in real life, for example: "How often do you think you get along well with your friends?" Answers were given on a 5- point scale, ranging from 1= *never* to 5= *very often*. The internal consistency of this scale is high ( $\alpha = .89$ ) at T1.

Each analysis included the demographics *Age, Gender, Ethnicity* and *Level of Education* to control for confounding effects. Information about age was provided by the school administration, whereas the information on other demographics was obtained by self-report.

### ***Strategy of Analysis***

In a first step, independent sample t-tests and One way ANOVA's were executed to test for significant differences in age, gender, ethnicity and level of education between demographic groups. Pearson's correlations were calculated to examine the bivariate associations between IM & SNS, chatting in chat rooms and playing MMO games with quality of offline friendships for each of the three waves.

In order to test the hypotheses, linear regression analyses were performed after the conditions of regression were met. Dependent variables that were not normally distributed were dichotomized and analyzed with logistic regression analyses. Potential confounders were taken into account by adding age, gender, ethnicity and the level of education to Step 1 of each analysis. Along with these control variables, we controlled for the scores on the dependent variable on T1 in all longitudinal analyses.

In order to test the first four hypotheses, which carry the expectation to find positive relations between the hours spent per week on IM and SNS with the quality of offline friendships and no relation for chatting and MMO gaming, three cross-sectional and one longitudinal analyses were performed. Multivariate linear regression was used to establish whether independent variables IM, chatting, SNS and MMO gaming would predict the dependent variable quality of offline friendships within the same year. In a next step, a longitudinal analysis was performed to establish whether the hours spent per week on the four social Internet activities in 2009 would predict the quality of offline friendships in the next year (T1-T2).

In order to test the fifth hypothesis, which states that social Internet activities more accurately predict the offline quality of friendship than vice versa, the opposite relationships were tested by running cross-sectional (T1, T2 and T3) and longitudinal (T1-T2) univariate regression analyses. Linear regression was used to establish whether the independent variable offline quality of friendships would predict the usage of instant messengers and social network sites within the same

year and subsequent year (T1-T2). The same analyses were run with chatting and MMO gaming as dependent variables, but due to the absence of a normal distribution both variables had to be dichotomized (users and non-users) and were therefore analyzed with logistic regression analyses.

## Results

Table 2

*Means and Standard Deviations for the Hours Spent per Week on the Social Internet Activities and the Quality of Offline Friendships for Each Wave*

Social Internet Activity	2009 (T1)		2010 (T2)		2011 (T3)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
1. Instant Messaging	9.53	11.5	8.40	10.68	11.30	15.07
2. Chatting	0.64	3.87	0.42	2.99	1.07	5.82
3. Social Network Sites	6.67	9.76	6.98	9.53	9.71	12.67
4. MMO Gaming	3.56	8.89	3.40	8.46	4.06	10.29
5. Quality of Offline Friendships	3.78	0.71	3.86	0.62	3.83	0.63

Of the participants, 99,6% reported using the Internet and 99,6% reported that they had access to the Internet at home. Almost all participants communicated online, particularly with instant messenger (86.6% at T1, 81.9% at T2 and 82.0% at T3) and via social network sites (77.7% at T1, 79.0% at T2 and 80.1% at T3). A minority reported that they participated in chat rooms (11.2% at T1, 10.5% at T2 and 10.7% at T3) or that they participated in massive multiplayer online games (36.5% at T1, 35.1% at T2 and 32.8% at T3). Table 2 shows the means and standard deviations of the hours spent per week on each of the social Internet activities, and of the quality of offline friendships reported in each year.

Table 3 shows the distribution of the demographic variables among adolescents in 2009 (T1). Adolescents who spent the most time on instant messaging, had a low level of education, were older and were more often females and non-Dutch. Chatting adolescents significantly more often had a low level of education and were more often male. Students who spent the most time on social network sites, had a low level of education, were older and were more often female and non-Dutch. Massive multiplayer online gamers had a low level of education and were more often male. In addition, adolescents who reported a higher quality of offline friendships significantly more often had a high level of education and more often were female and Dutch.

Table 3:  
Differences in Means on the Demographics for Each Social Internet Activity and the Quality of Offline Friendships in 2009 (N=4071)

Demographics	Social Network			Quality of Offline	
	Instant Messaging M (SD)	Chatting M (SD)	Sites M (SD)	MMO Gaming M (SD)	Friendships M (SD)
Age (%)					
11-14 (40.1 %)	7.60 <sup>a</sup> (10.47)	0.60 (3.60)	6.00 <sup>a</sup> (9.08)	3.40 (8.53)	3.75 (0.71)
14-17 (58.0 %)	10.74 <sup>b</sup> (11.85)	0.67 (4.09)	7.16 <sup>b</sup> (10.19)	3.64 (9.02)	3.80 (0.70)
17-20 (1.4 %)	11.46 <sup>b</sup> (13.70)	0.52 (2.73)	5.56 (9.60)	4.39 (11.77)	3.80 (0.66)
Gender (%)					
Males (50.2 %)	7.91 <sup>a</sup> (10.91)	0.88 <sup>a</sup> (4.59)	4.80 <sup>a</sup> (8.47)	6.46 <sup>a</sup> (11.32)	3.53 <sup>a</sup> (0.74)
Females (49.8 %)	11.15 <sup>b</sup> (11.85)	0.39 <sup>b</sup> (2.98)	8.56 <sup>b</sup> (10.58)	0.66 <sup>b</sup> (3.61)	4.03 <sup>b</sup> (0.58)
Ethnicity (%)					
Dutch (88.7 %)	8.55 <sup>a</sup> (10.58)	0.59 (3.62)	6.34 <sup>a</sup> (9.06)	3.44 (8.44)	3.80 <sup>a</sup> (0.67)
Non-Dutch (11.3 %)	13.07 <sup>b</sup> (13.81)	0.76 (4.42)	7.73 <sup>b</sup> (11.73)	3.95 (10.09)	3.69 <sup>b</sup> (0.81)
Level of Education (%)					
VMBO (41.3 %)	11.45 <sup>a</sup> (13.57)	1.01 <sup>a</sup> (5.24)	8.27 <sup>a</sup> (11.86)	4.17 <sup>a</sup> (10.40)	3.68 <sup>a</sup> (0.82)
Havo/VWO (58.7 %)	8.19 <sup>b</sup> (9.57)	0.37 <sup>b</sup> (2.48)	5.55 <sup>b</sup> (7.78)	3.14 <sup>b</sup> (7.63)	3.85 <sup>b</sup> (0.61)

Note. Different superscripts indicate a significant difference between means of at least  $p < .05$ .

Table 4

*Pearson's Correlations of the Social Internet Activities and the Offline Quality of Friendships in 2009 (T1) and 2010 (T2)*

Social Internet Activity	1	2	3	4	5
1. Instant Messaging	<b>.654**</b>	.155**	.706**	.124**	.146**
2. Chatting	.190**	<b>.167</b>	.156**	.234**	-.026
3. Social Network Sites	.681**	.169**	<b>.540**</b>	.021	.182**
4. MMO Gaming	.097**	.288**	.005	<b>.498**</b>	-.093**
5. Quality of Offline Friendships	.183**	-.037*	.200**	-.097**	<b>.494**</b>

Note. Correlations for Time 1 are below the diagonal. Correlations for Time 2 are above the diagonal. The diagonal (in bold) shows the correlations between Time 1 and Time 2.

\*  $p < .05$ .

\*\*  $p < .01$ .

Table 5

*Pearson's Correlations of the Social Internet Activities and the Offline Quality of Friendships in 2010 (T2) and 2011 (T3)*

Social Internet Activity	1	2	3	4	5
1. Instant Messaging	<b>.518**</b>	.261**	.646**	.166**	.131**
2. Chatting	.155**	<b>.033</b>	.246**	.288**	.006
3. Social Network Sites	.706**	.156**	<b>.494**</b>	.162**	.141**
4. MMO Gaming	.124**	.234**	.021	<b>.402**</b>	-.097**
5. Quality of Offline Friendships	.146**	-.026	.182**	-.093**	<b>.534**</b>

Note. Correlations for Time 2 are below the diagonal. Correlations for Time 3 are above the diagonal. The diagonal (in bold) shows the correlations between Time 2 and Time 3.

\*  $p < .05$ .

\*\*  $p < .01$ .

Table 6

## Summary of Multivariate Regression Analyses for the Social Internet Activities Predicting the Quality of Offline Friendships

Step	2009 (N= 3755)			2010 (N= 2786)			2011 (N= 2675)			2009-2010 (N= 1045)		
	B	SE B	$\beta$	B	SE B	$\beta$	B	SE B	$\beta$	B	SE B	$\beta$
1. Constant	2.57	0.15	-	2.77	0.16	-	2.52	0.15	-	1.70	0.35	-
Age	0.02	0.01	.03*	0.02	0.01	.03	0.03	0.01	.05**	0.02	0.02	.02
Gender	0.47	0.02	.34***	0.42	0.02	.34***	0.45	0.02	.36***	0.27	0.04	.21***
Ethnicity	-0.02	0.01	-.04**	-0.02	0.01	-.05**	-0.02	0.01	-.04*	-0.03	0.01	-.07**
Level of Education	0.14	0.02	.10***	0.12	0.02	.10***	0.14	0.02	.11***	0.06	0.04	.05
Quality of Offline Friendships at T1	-	-	-	-	-	-	-	-	-	0.39	0.03	.42***
$R^2$	.13***			.13***			.15***			.29***		
2. Instant Messaging	0.01	0.00	.10***	0.00	0.00	.08**	0.00	0.00	.05*	0.00	0.00	0.01
Chatting	-0.01	0.00	-.06***	-0.00	0.00	-.02	-0.00	0.00	-.02	0.00	0.01	0.00
Social Network Sites	0.01	0.00	.10***	0.01	0.00	.09**	0.00	0.00	.08**	-0.00	0.00	0.00
MMO Gaming	0.00	0.00	.03	0.00	0.00	0.05*	0.00	0.00	0.03	-0.00	0.00	-0.00
$\Delta R^2$	.03***			.02***			.01***			.00		

\*  $p < .05$ .\*\*  $p < .01$ .\*\*\*  $p < .001$ .

Table 7

## Summary of Univariate Logistic Regression Analyses for the Quality of Offline Friendships Predicting the Time Spent On Chatting and MMO Gaming

Step	2009 (N= 3822 <sup>1</sup> , N= 3837 <sup>2</sup> )		2010 (N= 2851 <sup>1</sup> , N= 2844 <sup>2</sup> )		2011 (N= 2748 <sup>1</sup> , N= 2744 <sup>2</sup> )		2009-2010 (N= 1059 <sup>1</sup> , N= 1056 <sup>2</sup> )	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
<b>Chatting<sup>1</sup></b>								
1. Age	0.92	0.83- 1.02	0.93	0.83- 1.06	0.91	0.80- 1.03	1.04	0.76- 1.43
Gender	1.56***	1.27- 1.91	1.40**	1.10- 1.79	1.28*	1.00- 1.64	1.74*	1.11- 2.73
Ethnicity	0.91	0.71 - 1.16	1.17	0.80- 1.69	0.87	0.63- 1.21	1.47	0.72- 2.96
Level of Education	1.49***	1.21 - 1.82	1.01	0.79- 1.29	2.04***	1.59- 2.62	1.52	0.98- 2.37
Chatting at T1	-	-	-	-	-	-	0.16***	0.10- 0.25
Nagelkerke R <sup>2</sup>	.02***		.01*		.03***		.13***	
2, Quality of Offline Friendships	0.96	0.83- 1.11	1.57***	1.26- 1.97	1.16	0.94- 1.43	1.29	0.92- 1.81
Δ Nagelkerke R <sup>2</sup>	.00		.01***		.00		.01	
<b>MMO Gaming<sup>2</sup></b>								
1. Age	0.82***	0.76- 0.89	0.87**	0.80- 0.96	0.87**	0.79- 0.94	0.89	0.70- 1.13
Gender	9.15***	7.81- 10.73	11.37***	9.37- 13.80	8.73***	7.21- 10.57	7.72***	5.39- 11.07
Ethnicity	1.04	0.86- 1.25	0.91	0.70- 1.18	0.79	0.62- 1.01	1.20	0.75- 1.92
Level of Education	0.96	0.82- 1.12	0.97	0.81- 1.17	1.16	0.96- 1.40	0.96	0.68- 1.34
MMO gaming at T1	-	-	-	-	-	-	0.13***	0.09- 0.18
Nagelkerke R <sup>2</sup>	.29***		.33***		.28***		.49***	
2, Quality of Offline Friendships	1.01	0.90- 1.13	1.25**	1.07- 1.46	1.15	0.99- 1.33	1.26	0.99- 1.60
Δ Nagelkerke R <sup>2</sup>	.00		.00**		.00		.00	

\* p &lt; .05. \*\* p &lt; .01. \*\*\* p &lt; .001.

Table 8

## Summary of Univariate Regression Analyses for the Quality of Offline Friendships Predicting the Time Spent on IM and SNS

Step	2009 (N= 3833 <sup>1</sup> , N= 3816 <sup>2</sup> )			2010 (N= 2852 <sup>1</sup> , N= 2825 <sup>2</sup> )			2011 (N= 2724 <sup>1</sup> , N= 2731 <sup>2</sup> )			2009-2010 (N= 1066 <sup>1</sup> , N= 1054 <sup>2</sup> )		
	B	SE	$\beta$	B	SE	$\beta$	B	SE	$\beta$	B	SE	$\beta$
<b>Instant Messaging<sup>1</sup></b>												
1. Constant	-15.77	2.58	-	-16.44	2.90	-	-8.83	3.74	-	3.48	4.99	-
Age	1.67	0.17	.15***	1.61	0.19	.15***	1.61	0.26	.12***	0.14	0.36	.01
Gender	3.48	0.36	.15***	2.90	0.39	.14***	4.70	0.54	.16***	0.77	0.50	.04
Ethnicity	0.77	0.11	.11***	0.77	0.14	.10***	1.26	0.19	.12***	-0.00	0.17	.00
Level of Education	-3.25	0.36	-.14***	-2.34	0.40	-.11***	-7.61	0.56	-.25***	-1.98	0.50	-.09***
Instant Messaging at T1	-	-	-	-	-	-	-	-	-	0.63	0.02	.64***
$R^2$	.08***			.06***			.10***			.44***		
2. Quality of Offline Friendships	2.75	0.27	.17***	2.77	0.34	.16***	2.68	0.47	.11***	1.05	0.37	.07**
$\Delta R^2$	.02***			.02***			.01***			.01**		
<b>Social Network Sites<sup>2</sup></b>												
1. Constant	-0.88	2.22	-	-1.11	2.59	-	6.40	3.19	-	-3.26	4.64	-
Age	0.40	0.15	.04**	0.32	0.17	.03	0.46	0.22	.04*	0.49	0.33	.04
Gender	3.94	0.31	.20***	4.02	0.35	.21***	3.71	0.46	.15***	1.74	0.48	.10***
Ethnicity	0.23	0.09	.04*	0.16	0.13	0.02	0.11	0.17	.01	-0.07	0.16	-.01
Level of Education	-2.84	0.31	-.14***	-1.98	0.35	-.10***	-5.79	0.48	-.23***	-1.81	0.48	-.10***
Social Network Sites at T1	-	-	-	-	-	-	-	-	-	0.50	0.03	.51***
$R^2$	.06***			.06***			.07***			.31***		
2. Quality of Offline Friendships	2.36	0.23	.17***	2.36	0.30	.15***	2.44	0.40	.12***	0.79	0.36	.06*
$\Delta R^2$	.03***			.02***			.01***			.00*		

Note. The first N reports the included respondents for the analyses predicting instant messaging (1), and the second N reports the respondents included for the analyses predicting time spent on social network sites (2).

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

Tables 4 and 5 show the Pearson's correlations for the social Internet activities and quality of offline friendships at T1, T2 and T3. Quality of offline friendships showed consistent (at T1, T2 and T3) significant positive correlations with instant messaging and using social network sites. In addition, quality of offline friendships showed consistent significant negative correlations with massive multiplayer online gaming and a significant negative correlation with chatting at T1. The (bold) correlations at the diagonal in Table 4 are intercorrelations of the variables at T1 with the corresponding ones at T2. Table 5 shows the correlations of the variables at T2 with the corresponding ones at T3. These intercorrelations are all above .40 with the exception of chatting, indicating that except for chatting, the use of the different social Internet activities over the years is fairly stable. Of all social Internet activities, instant messaging was used most frequently, followed by using social network sites, MMO gaming and chatting at both T1, T2 and T3.

#### ***Prediction of the Quality of Offline Friendships by the use of Social Internet Activities***

Multivariate linear regression analyses for the cross-sectional data of T1, T2 and T3 showed a consistent significant effect of gender, ethnicity and level of education on the offline quality of friendships (see Table 6). In agreement with the aforementioned statistical tests, adolescents who reported to enjoy a relative high quality of offline friendships had higher educations, were more often female and more often had a Dutch ethnic background.

In agreement with the first hypothesis, the cross-sectional results consistently display that the hours spent on instant messaging and social network sites show a positive relationship with the offline quality of friendships. With the exception of T1 ( $\beta = -.06, p < .001$ ), chatting showed no relationship with the quality of offline friendships. Massive multiplayer online gaming showed no relationship with the quality of offline friendships, except the fact that MMO gaming did cross-sectionally relate to the quality of offline friendships at T2 ( $\beta = .00, p < .05$ ). These cross-sectional findings are all in support of the first, second, third and fourth hypotheses. In the longitudinal model, the positive relationship between IM and SNS and the quality of offline friendships did not remain significant.

#### ***Prediction of the Use of Social Internet Activities by the Quality of Offline Friendships***

The opposite directions of the relationships between social Internet activities and the offline quality of friendships were analyzed with univariate logistic- and linear regression analyses. Logistic

regression analyses for the cross-sectional data of T1, T2 and T3 revealed a consistent significant effect of gender on both chatting and MMO gaming (see Table 7). In addition, age showed to contribute significantly to the prediction of the hours spent per week on MMO gaming; the older an adolescent was, the more time was spent on MMO gaming. In line with the results of the multivariate linear regression analyses presented in Table 6, the quality of offline friendships showed no cross-sectional relationship with time spent on chatting and MMO gaming. The quality of offline friendships at T2 did significantly predict both time spent on chatting and MMO gaming at T2, but other cross-sectional and longitudinal analyses showed no significant effects.

The predictions of time spent on IM and SNS by the quality of offline friendships, were analyzed with univariate linear regression analyses. The cross-sectional data of T1, T2 and T3 showed consistent significant effects of age, gender, ethnicity and level of education on the time spent on IM per week (see Table 8). In line with the aforementioned statistical tests, adolescents who reported to spend relatively more time on instant messaging were lower educated, significantly older, more often females and had a non-Dutch ethnic background. In addition, gender and level of education consistently showed significant effects on the time spent on SNS. As expected, adolescents who reported to spend much time on SNS were more often females and lower educated. Other background variables did not show consistent results.

Longitudinal predictions of IM and SNS usage by the quality of offline friendships showed that adolescents who reported to spend much time at IM were often lower-educated, whereas adolescents who preferred to spend time using SNS were more often lower-educated and female. In addition to these significant contributions of level of education and gender, the quality of offline friendships significantly predicted the time spent on IM and SNS longitudinally. These significant longitudinal findings indicate that in the found relationship, between the IM and SNS at the one hand and the quality of offline friendships at the other hand, the hours spent per week on IM and SNS are rather a result of a high offline friendship quality than vice versa.

## **Discussion**

The present study showed that, in agreement with the first and third hypothesis, time spent on instant messaging and using social network sites was cross-sectionally associated with the quality of offline friendships. Although these results seem to be in line with studies that support the stimulation-hypothesis (Blais et al, 2008; Valkenburg & Peter, 2007a; 2007b; 2009a), our longitudinal analyses showed that the hours spent on IM and SNS did not predict the quality of offline friendships

in the next year. In contrast, the quality of offline friendships did predict IM and SNS usage in the next year. Thus, the results seem to indicate that IM and SNS usage does not influence adolescents' offline friendship quality, whereas offline friendship quality does positively influence IM and SNS usage.

As mentioned before, to our knowledge only two studies have tested bidirectionality in the relationship between Internet usage and friendship quality. Although the results of both these studies and our study seem to indicate that the relationship between the usage of IM and friendship quality is rather unidirectional than bidirectional, the results of these studies are in contrast with the findings of the present study. Blais et al. (2008) and Valkenburg & Peter (2009a) found that time spent on instant messaging predicted subsequent friendship quality, whereas our results showed the opposite: the time spent on instant messaging and using social network sites is a consequence rather than a predictor of offline friendship quality. Considering the nature of this relationship, the results lead to the interpretation that adolescents who enjoy close friendships will more actively seek to participate in online communication via instant messengers and social network sites than adolescents who lack close friendships. This contradicts the fifth hypothesis that carried the expectation that Internet usage would to be a stronger predictor of the quality of offline friendships, than vice versa.

Because the data showed that adolescents who already have close friendships are drawn to instant messaging and using social network sites, the results of this study seem to align with the *rich-get-richer hypothesis*. This hypothesis states that particularly individuals who are already socially competent will seek to use the Internet, in order to gain additional opportunities to socialize. The results thereby lack longitudinal support for the hypothesis that IM and SNS use stimulate friendship quality offline. Therefore, no conclusions can be drawn as to whether the higher degree of online contact through instant messengers and social network sites has any benefits („rich”) for the adolescents with closer friendships. This finding is in agreement with Selfhout et al (2008), who also did not find evidence that IM usage had beneficial effects, but did find that Dutch adolescents who reported a high quality of friendships would spend more time on IM than adolescents who reported lower friendship quality.

These results leave the question as to why adolescents with close friendships more often communicate online, as they do not seem to gain additional benefits from using IM and SNS. A feasible explanation would be that adolescents who enjoy close friendships report such a stable and high friendship quality, that changes in friendship quality can no longer be measured. Such a 'ceiling-effect' could cause the analyses to inaccurately indicate that IM and SNS usage have no effect on friendship quality, because the changes in friendship quality between times can no longer be measured. In addition, usage of IM and SNS might not be beneficial because it might replace face-to-

face communication; Schouten, Valkenburg & Peter (2007) found that conversations regarding intimate topics such as sexuality and love are rather discussed online by about one in three adolescents. This finding can be interpreted as a result of the fact that the Internet offers adolescents extra security by offering enhanced controllability of self-presentation (Valkenburg & Peter, 2009b). Socially competent adolescents could shift intimate conversations from face-to-face to instant messengers and social network sites as part of maintaining existing friendships, thereby increasing their time spent on IM and SNS without gaining benefits with regard to friendship quality.

Although this study has replicated the findings of cross-sectional studies with regard to IM and SNS use, the longitudinal results differ from previous findings with regard to IM. This study indicates that previous cross-sectional findings concerning the positive relationship between instant messaging and friendship quality, might have to be interpreted from a perspective in which socially adequate adolescents are drawn to use IM instead of usage of instant messengers leading to closer friendships. This contradicts the findings of Valkenburg & Peter (2009a), who concluded that IM usage would enhance friendships. These differences could possibly be the result of the fact that Valkenburg & Peter have used data from adolescents in 2006, whereas this study has used more recent data. Instant messengers and social network sites might only influence friendship quality of new or curious users temporarily. This hypothesized temporary increase of Internet usage is called 'beginners fascination' and has previously been used in attempt to describe a rise and decline in the number of adolescent compulsive Internet users; as more households acquired Internet access over the years, Internet has become less spectacular resulting in a decline of Internet usage as Internet has integrated into the lives of adolescents (Van Rooij et al, 2008). Considering that the number of Dutch households with Internet access has expanded from 80% in 2006 to 91% in 2010, Internet usage or more specifically the use of instant messengers and social network sites might have integrated into the lives of adolescents, thereby explaining the differences between the results of Valkenburg & Peter (2009a) and our study. Another explanation is that because more adolescents spend time online nowadays, adolescents increasingly use IM to talk to other users who they do not consider friends, due to the fact that the selection of individuals that adolescents are able to communicate with has become wider. Research (Centraal Bureau voor de Statistiek, 2011a) shows that the number of 12-25 years-olds who report to use Internet on a daily basis has increased from 76% of the youngsters in 2006, to 89% in 2009. Additionally, the average time spent by adolescents on IM also increased between 2009-2011 (see Table 2), which fits this notion. Such a development could explain why IM usage seems to influence subsequent friendship quality in 2006, but not in 2009.

The results concerning social network sites are innovative considering the absence of previous longitudinal evidence. Time spent on SNS did not predict enhanced friendships, but closer

friendships were predictive of more time spent on SNS. This seems to confirm the notion that social network sites are mainly used to maintain existing friendships (Ellison, Steinberg & Lampe, 2007; Subrahmanyam et al, 2008) and will therefore be more often used by adolescents who enjoy close friendships. In agreement with the longitudinal findings of this study, Lenhart & Madden (2007) found that especially girls were drawn to SNS usage. Lenhart & Madden found that girls used SNS to reinforce pre-existing relationships, whereas boys used social network sites more often to flirt and make new friends.

As expected, no relationship was found between the hours spent per week on chatting and the offline quality of friendships. Both cross-sectional and longitudinal analyses showed no direct relation between the two variables with the exception of one cross-sectional association, which is in line with the findings of Valkenburg & Peter (2007b). The results support the concept that chatting does mainly involve communication with strangers, resulting in having no positive or negative effects on offline friendships. Additionally, the availability or the absence of close friendships do also not seem to predict more or less time spent on chatting.

Also within the range of expectations, was the absence of a relation between the time spent MMO gaming and friendship quality offline. With the exception of one cross-sectional positive association with friendship quality, the time spent playing MMO games showed no relationship with the quality of friendships. Because this study merely focuses on the offline friendship quality in relation to time spent on MMO gaming, no conclusions can be drawn as to whether MMO gaming has any positive social outcomes online, as supported by Zhong (2011) and Huvila et al (2010).

Despite various strong aspects of this study such as the large samples of adolescents, the longitudinal design and the excellent population representativity, several limitations have to be taken into account as well. First of all, the questions regarding time spent on social Internet activities, may have been interpreted in different ways. The main questions regarding the time spent on each social Internet activity, were posted under the heading 'These questions concern the usage of Internet'. Adolescents may not distinguish, for instance, spending time on MSN on a computer with spending time on eBuddy on their mobile phones (with the same e-mail address), though the questionnaire does later on ask specific questions regarding time spent on social applications on mobile phones. These possible differences in the construal of the question may have caused a discrepancy in the reported meetings and the actual amount of time spent on social Internet activities one had. A second limitation of this study is that the data are based on self-reports of adolescents. Measures of Internet usage of different social Internet activities and friendship quality came from the same source, namely the adolescent, thereby increasing the risk of consistency and social desirability motives (Podsakoff & Organ, 1986). Finally, although precautions were made to guarantee anonymity, a lack of anonymity may have caused underreporting of Internet usage,

particularly among heavy users who spend much time online. To overcome this issue in future research, multi-informant data might prove more reliable, especially when gathered among peers.

In sum, this study has shed new light on the relationship between adolescents' time spent on each social Internet activity and the offline implications for friendships. The results showed that time spent on each of the social Internet activities, does not seem to influence the friendship quality offline. Therefore, this conclusion challenges both the concept of a general negative effect (Kraut et al, 1998) and a general positive effect of Internet usage on adolescents' social life. Additionally, based on the findings of this study, it might prove a valuable asset to further study the reverse relationship, considering the finding that adolescents with closer friendships will spend more time on IM and SNS. Although it is not clear whether this increased time spent on IM and SNS has additional benefits, our results indicated that especially adolescents who report high friendship quality are drawn to usage of IM and SNS, thereby supporting the rich-get-richer hypothesis rather than the poor-get-richer hypothesis. This opens a lot of new opportunities for research, for new questions arise regarding why adolescents with close friendships are drawn to instant messaging and using social network sites, and regarding which specific purpose these social technologies serve in the lives of adolescents. Additionally, mobile Internet usage is rapidly rising in the Netherlands, as data traffic has multiplied almost tenfold between 2008 and 2010 (Centraal Bureau voor de Statistiek, 2011c). Instant messengers like eBuddy and Facebook Messenger and social network sites like Facebook all have mobile applications, hence the accessibility and possibly the usage of social Internet activities seem to keep on increasing. It will be interesting to continue investigating the relationship between social Internet activities and friendship quality, as the availability of social Internet application is surpassing mere computers.

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