EMPIRICAL RESEARCH

Adolescents Online: The Importance of Internet Activity Choices to Salient Relationships

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Abstract The purpose of this study was to determine whether using the Internet for different activities affects the quality of close adolescent relationships (i.e., best friendships and romantic relationships). In a one-year longitudinal study of 884 adolescents (Mean age = 15, 46% male), we examined whether visiting chat rooms, using ICQ, using the Internet for general entertainment, or participating in online gaming predicted changes in the quality of best friendships and romantic relationships. Multiple regression analyses indicated that Internet activity choice influenced later relationship quality in both best friendships and romantic relationships. Using instant messaging (ICQ) was positively associated with most aspects of romantic relationship and best friendship quality. In contrast, visiting chat rooms was negatively related to best friendship quality. Using the Internet to play games and for general entertainment predicted decreases in relationship quality with best friends and with romantic partners. These findings reflect the important and complex functions of online socialization for the development and maintenance of relationships in adolescence.

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Introduction

The Internet has become part of the daily lives of most North American adolescents. In 2001, national surveys in Canada (Media Awareness Network 2001), and in the U.S. (Lenhart et al. 2001) revealed that 70% of adolescents were Internet users. In their day-to-day lives, adolescents use the Internet for school work, entertainment, and to communicate with others (Media Awareness Network 2005). While some adolescents use the Internet to meet and communicate with strangers (Wolak et al. 2003), most use the Internet to communicate with known-others (Gross 2004; Valkenburg and Peter 2007). Within this reality, it remains unclear whether the Internet fosters the formation and maintenance of high quality relationships (Valkenburg and Peter 2007) or whether it isolates young people or otherwise decreases the quality of their social relationships (Kraut et al. 1998).

Despite the pervasiveness of Internet-based activities in adolescents' lives, little is known about the longitudinal impact of these different activities on existing relationships, particularly on salient adolescent relationships such as best friendships and romantic relationships. The dearth of research in the area is striking given the importance of best friendships (e.g., Clark and Ayers 1988; Furman and Buhrmester 1992; Sholte et al. 2001) and romantic relationships (e.g., Feiring 1999; Hartup 1993) to adolescent social adjustment. Because best friendships and romantic relationships develop increasing significance in adolescence, the impact of Internet-based activities, which have also recently emerged as an important aspect of adolescent life, is of particular interest. Therefore, the goal of this study was to examine how different Internet-based activities, including entertainment and socializing with strangers (i.e., on chat rooms) and known-others (i.e., through instant

messaging such as ICQ), affect best friendships and romantic relationships.

Overview of Adolescent Internet Use

Internet use is common and widespread among North American youth. In 2000, 9 out of 10 Canadian teenagers aged 15–19 who were surveyed reported having used the Internet (Statistics Canada 2001). Similarly, in 2001, 73% of American teens aged 12–17 were Internet users (Lenhart et al. 2001). Internet use studies reveal that the most popular uses for the Internet are to send and read email (92%), surf or have fun (84%), visit entertainment sites (83%), send instant messages (74%), and look for information on hobbies (69%) (Lenhart et al. 2001). The types of activities in which adolescents engage appear to differ by age and sex (Media Awareness Network 2005). While 28% of Grade 4 students talk to friends on instant messaging, 70–80% of Grade 7–11 students communicate with friends on instant messaging. Conversely, the number of students who play games on the Internet decreases from 89% in Grade 4 to 63% in Grade 11. The study also noted that the most commonly endorsed activities for girls were school work (75%), instant messaging (68%), games (68%), and music (65%). For boys, the most commonly endorsed activities were playing games (85%), school work (68%), music (66%), and instant messaging (63%). Social communication and entertainment clearly appear as popular activities among adolescents, despite some age and sex differences. The current study seeks to determine the impact of these activities on existing salient relationships.

The popularity of instant messaging among adolescents—with more than 20% using instant messaging as the principle method of communication with friends (Lenhart et al. 2001)—may be due to the fact that Internet-based communication removes the physical aspect of interpersonal communication and brings the focus of communication to the personality or intellect of the communicating individuals. In fact, adolescents report that they are better able to be their "true selves" when communicating on the Internet than when communicating face-to-face (Bargh et al. 2002; Lenhart et al. 2001). The increased amount of self-disclosure reflected in these statements likely has an impact on salient adolescent relationships such as best friendships and romantic relationships.

Best Friendships, Romantic Relationships, and the Internet

Best friendships and romantic relationships are important in adolescence (Hartup 1993; Hartup and Stevens 1997;

Feiring 1999) and are therefore susceptible to the influence of pervasive Internet-based activities. In addition to receiving emotional support (Connolly et al. 2004), adolescents are able to experiment with identities and social strategies within their close relationships (Hartup and Stevens 1997). The Internet is a likely venue in which adolescents can more easily exercise these functions of their close relationships (e.g., Lenhart et al. 2001; Subrahmanyam et al. 2006).

Internet technology presents mechanisms by which adolescents can simultaneously have several private conversations at once. The mere increase in opportunities to communicate with close friends increases the likelihood that adolescents will fulfill the functions of their close relationships. In addition, adolescents report that they are more able to communicate their true feelings on the Internet compared to other modes of communication (Lenhart et al. 2001) perhaps due to the limited availability of other social cues (Sproull and Kiesler 1986). Through these less direct but more intimate interactions on the Internet, adolescents are better able to experiment with social skills, identities, and strategies that may prove more risky in a face-to-face context (Maczewski 2002; Turkle 1997).

The greater opportunities for experimentation through the increased number of interactions and more intimate self-disclosure are likely responsible for the widespread use of instant messaging among adolescents and may affect the quality of the most salient relationships in adolescence. In fact, 48% of American adolescent Internet users surveyed believed that the Internet improved their social relationships (Bargh et al. 2002; Lenhart et al. 2001). For this reason, we examined the impact of Internet-based activities on romantic relationships and best friendships in adolescence.

Do Internet-based Activities Hinder or Improve Salient Relationships?

Early research of Internet use among adults and teens in American households indicated that the Internet was associated with subsequent reduction in family communication, declines in the size of social relationship networks, and increases in loneliness (Kraut et al. 1998; Nie and Erbring 2002). These early findings supported the *reduction* hypothesis whereby online communication impedes further development of pre-existing friendships in adolescents (e.g., Locke 1998). This hypothesis has been proposed based on the assumption that the time spent communicating with strangers enables adolescents to form superficial and therefore less beneficial friendships than those that could be made in a "real world" context. The

time that an adolescent may take to create and maintain these less beneficial friendships would be time that is taken away from available time resources spent on creating and maintaining "real world", or theoretically more beneficial friendships. The reduction hypothesis therefore proposes that, as a result of forming less beneficial friendship at the expense of the more beneficial "real world" friendships", a reduction of existing friendship quality will be noted.

Early Internet studies, which supported the reduction hypothesis, were conducted in the late 1990s as the Internet was an emerging technology for most North American households, and few people had regular access to the necessary technology. Therefore, it was less likely that Internet users would communicate with known-others, and more likely that they communicated with strangers (Gross 2004). With greater and more widespread Internet access, adolescents became increasingly able to communicate with their pre-existing friends. As the Internet became more familiar to adolescents, later studies began to refute the early findings supporting the reduction hypothesis (Valkenburg and Peter 2007).

More recent research is beginning to support the *stimulation* hypothesis, which proposes that using Internet-based communication may stimulate relationship formation with strangers (McKenna et al. 2002) and also improve the quality or closeness of relationships with known-others. This hypothesis stipulates that the arms-length nature of communicating on the Internet allows for more intimate self-disclosure, which leads to increased relationship quality with both strangers in chat rooms and existing friendships (McKenna and Bargh 2000). The hypothesis was proposed to explain relationship formation with strangers on chat rooms (McKenna et al. 2002). More recently, Valkenburg and Peter (2007) found that adolescents who communicate with their friends online more often feel closer to their existing friends than those that communicate online less often. The effects in the study by Valkenburg and Peter (2007) were only maintained for those adolescents who mainly communicate with existing friends, or known-others, and not for those who mainly communicate with strangers. This finding, in light of early studies examining what was likely communication with strangers, suggests that communicating with known-others may have a beneficial impact while communicating with strangers may have no impact or a negative impact on relationship quality.

Other research indicates differential impacts of different Internet-based activities, suggesting perhaps that some activities may serve reduction purposes whereas others may serve stimulation purposes. For example, a study on the overall mental health of adolescent computer users found that boys who used computer technology to communicate with others reported higher levels of social support than boys who did not (Ho and Lee 2001). However, those boys who used computer technology to play games reported lower levels of social support than those who did not.

Hypotheses

This study seeks to examine whether different Internet activity choices affect best friendship and romantic relationship quality in adolescents. Within the literature examining the functions of Internet use in adolescent development, there is support for both reduction and stimulation hypotheses. In other words, some studies have demonstrated that Internet activities *reduce* the quality of existing relationships (e.g., Kraut et al. 1998) while others have concluded that Internet activities can serve to *stimulate* relationship quality (Valkenburg and Peter 2007). In light of findings by Ho and Lee (2001) on computer activities, we propose that different Internet-based activities serve different functions in adolescents' socialization, based on the groups with whom adolescents are engaging in those activities. According to the stimulation theory and consistent with the findings of Valkenburg and Peter (2007), we hypothesize that using the Internet to communicate with known-others (i.e., through ICQ[1] instant messaging technology) will have a beneficial impact on relationship quality. That is, using ICQ will reduce conflict and alienation, and increase trust and communication, commitment, as well as intimacy and companionship in both best friendships and romantic relationships. However, communication with strangers (i.e., using chat rooms) may displace socialization activities that would otherwise happen with known-others. Communicating with strangers on the Internet may also lead an adolescent to feel closer and more intimate with online socialization partners, due to the reduced social cues of the technology (McKenna and Bargh 2000), which may subsequently reduce the quality of the pre-existing best friendships and romantic relationships by replacing these relationships. We hypothesize that visiting chat rooms will increase conflict and alienation, and decrease trust and communication, commitment, and intimacy and companionship in pre-existing relationships, consistent with the reduction hypothesis.

As reflected in the findings of Ho and Lee (2001) on using the computer to play games, many Internet activities that do not have an explicit social purpose may

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[1] ICQ was introduced in 1996 as a personal communication technology that enabled peer-to-peer contact through the Internet. It was the "one of the first internet wide instant messaging services" (ICQ 2007). As the first popular messaging system (Descy 2007), ICQ has been described as more commonly used than email for young people in the late 1990s and early 2000s (Leung 2001).

nevertheless have an impact on salient relationships. Using the Internet for general entertainment and playing video games often represents activities that adolescents do alone in their bedrooms (Roberts et al. 1999) which may result in less time spent developing friendship quality. "Entertainment" on the Internet can reflect a wide range of potentially solitary activities, including personal research and information seeking, gambling, and consuming anti-social media. Similarly, Internet games are often solitary activities and frequently contain violent themes (e.g., Bayraktar and Gun 2007; Children Now 2001). Engaging in such activities may not only reduce the amount of time otherwise used to socialize with friends, both in face-to-face and online environments, but they may also foster ideals and values that counter good relationship-building skills. Their consumption may therefore have a negative impact on relationship quality. Consistent with the reduction hypothesis, we predict that using the Internet for general entertainment and for playing games will increase conflict and alienation and reduce trust and communication, commitment, and intimacy and companionship in best friendships and romantic relationships.

Method

Procedure

This one-year study spanned from March 2001 to May 2002. The data were collected as part of a larger study aiming to study the influence of media consumption on adolescents' relationships. Schools in both rural and urban Canadian centers participated. Letters of information and consent forms were sent to the parents of all students in interested secondary schools. Only those students who provided both parental consent and independent assent to participate in the study were included as participants. Participants completed questionnaires in their classrooms, cafeteria, or other location reserved for data collection during the time of the study.

In the original sample, 1,142 students participated at Time 1 and 910 participated at Time 2. Attrition was observed at 23% where 884 students who participated at the first time of the study also participated during the second year of the study. Leaving the target school, and failing to obtain parental consent for Time 2 were the most common reasons for attrition. There were no significant differences between students who dropped out of the study and those who stayed on key variables. However, students who dropped out of the study were older ($M = 15.70$, SD $= 1.13$) than those who stayed in the study ($M = 15.18$, SD $= .92$), $F_{1,1623} = 83.61$, $p < .05$. This finding is consistent with older students graduating from

secondary school and therefore not being able to participate in our study at Time 2.

Sample

Only the 884 students who completed the study at both times were included in our sample. Of those students, 407 were male and 477 were female. In the first year of the study, participants ranged from 14 to 18 years of age ($M = 15$, SD $= 1$) and were in Grades 9–11 ($M = 10$, SD $= 1$). The ethnic composition of the sample was comparable to the ethnic composition described in the 2001 Canadian Census Data (Statistics Canada 2003). The sample comprised: 76% European–Canadian, 7% Asian–Canadian, 7% African/Caribbean–Canadian, 4% South-Asian–Canadian, 1% Latin–American–Canadian, 2% Native Canadian, and 3% other.

Measures

Demographics

Developed by Connolly and Konarski (1994), *The Focus on You Questionnaire* was used to collect demographic information. Adolescents indicated their age, ethnic origin, sex, and grade level.

Internet Use

The *Teen Media Questionnaire* was initially developed by Craig et al. (unpublished) to assess adolescent media consumption, including use of the Internet for various activities. One small sub-section of the questionnaire in which a list of Internet activities was outlined was used for the purpose of this article. Adolescents were requested to use a checkmark to indicate whether they participated (i.e., "yes" or "no") in each of the six activities. The activities listed were: "ICQ", "entertainment", "chat rooms", "online games", "personal web page", and "specific websites". As adolescents tend to use the Internet primarily for entertainment and communication (e.g., Bayraktar and Gun 2007), we conceptualized "ICQ" and "chat room" as communication media (as they serve to interact with others) while "online games" and "entertainment" were conceptualized as entertainment media, as their function is to entertain, and may only indirectly involve socialization with others. The latter two activities (personal web page and specific websites) were not included in our analyses as they are difficult to categorize as either communicating with others, or entertainment. Each of the remaining items

(i.e., "ICQ", "entertainment", "chat rooms", and "online games") was used as our predictor variables in our analyses.

Relationship Quality

A combination of items from the *Network Relations Inventory* (NRI; Furman and Buhrmester 1985) and the *Inventory of Parent and Peer Attachment* (IPPA; Armsden and Greenberg 1987) assessed the quality of relationships with romantic partners and with same-sex best friends. The resulting questionnaire featured 15 statements that assessed the quality of the relationship with best friends and 15 statements that assessed the quality of the relationship with current romantic partners. Adolescents rated the degree to which each statement described their relationship with both best friends and romantic partners on a 5-point scale ranging from "Almost never or never true" to "Almost always or always true". Items indicating "alienation and conflict" were reverse-coded so that *higher* scores indicated positive relationship quality and *lower* scores indicated increased levels of "alienation and conflict". Best friendship and romantic relationship quality subscales included "trust and communication" (three items each such as "I tell my best friend everything"), "commitment" (three items each such as "I feel sure that this relationship with my romantic partner will last no matter what"), "alienation and conflict" (six items each such as "My best friend and I get on each other's nerves"), and "intimacy and companionship" (three items each such as "I go to places and to enjoyable things with my boyfriend/girl-friend). Reliability for the friendship quality subscales in this sample at Time 1, as measured by Cronbach's Alpha, was satisfactory: .88 for "trust and communication", .82 for "commitment", .89 for "alienation and conflict", and .76 for "intimacy and companionship". Reliability for the romantic relationship quality subscales in this sample at Time 1, as measured by Cronbach's Alpha, was satisfactory: .92 for "trust and communication", .80 for "commitment", .83 for "intimacy and companionship", and .88 for "alienation and conflict".

Results

Using ICQ (instant messaging) was the most highly endorsed Internet activity (57% of the sample), with general entertainment falling second (34%), games falling third (23%) and chat rooms being the least highly endorsed (17%) (see Table 1).

The average reported relationship quality for both friendships and romantic relationships was relatively high,

Table 1 Frequency count and percentage of sample who endorse participating in each Internet activity

Variable	Response	Frequency	Percent of sample
ICQ	Yes	709	57
	No	544	43
Chat room	Yes	213	17
	No	1040	83
General entertainment	Yes	425	34
	No	828	66
Games	Yes	292	23
	No	961	77

Table 2 Descriptive statistics for relationship quality variables

	Variable	Mean	SD
Best friendship	Alienation and conflict	3.57	.89
	Commitment	4.07	.90
	Communication and trust	3.66	1.12
	Intimacy and companionship	3.89	.84
Romantic relationship	Alienation and conflict	3.56	.89
	Commitment	3.01	1.25
	Communication and trust	3.42	1.23
	Intimacy and companionship	3.89	.99

3–4 on a scale of 1–5. Descriptive statistics for these outcome variables can be found in Table 2. See Table 3 for correlations among each key variable.

We conducted multiple hierarchical regressions to investigate the effects of activity choice on best friendships and on romantic relationships. In each of the regression models, sex and age were entered as control variables in the first step to ensure that we were controlling for the sex and age differences that can be observed on social adjustment variables (e.g., Buhrmester and Furman 1987; McNelles and Connolly 1999) and Internet use (e.g., Gross 2004; Kraut et al. 1998). We also entered the dependent variable at Time 1 into the first step to ensure that the effects that were observed were in fact over time, and not an artifact of the correlations at one time. In addition, regressions were all computed in the reverse order, whereby social adjustment variables at Time 1 (i.e., quality of romantic relationships and friendship) were used to predict Internet use (i.e., using the Internet to communicate with known others, using the Internet to communicate with strangers, using the Internet for entertainment activities) 1 year later. None of the reverse of these models included social adjustment variables as significant predictors ($p < .05$). The following results, therefore, are unidirectional.

Table 3 Correlations among key variables

	Age T1	ICQ T1 (yes/no)	Chat room T1 (yes/no)	Entertainment T1 (yes/no)	Online games T1 (yes/no)	Romantic conflict & alienation T2	Romantic commitment T2	Romantic trust & communication T2	Romantic intimacy & companionship T2	Friend conflict & alienation T2	Friend commitment T2	Friend trust & communication T2	Friend intimacy & companionship T2
Age T1	1.00	.02	−.04	−.01	−.11**	−.10**	.10**	.14**	.17**	−.03	.02	.03	.01
ICQ T1 (yes/no)	.02	1.00	−.02	−.10**	−.03	.03	.08**	.16**	.19**	.03	.16**	.21**	.17**
Chat room T1 (yes/no)	−.04	−.02	1.00	.10**	.13**	−.03	.04	.01	.01	−.04	−.01	.05	−.04
Entertainment T1 (yes/no)	−.01	−.10**	.10**	1.00	.16**	.02	−.02	−.03	−.05	.02	−.06	−.03	−.05
Online games T1 (yes/no)	−.11**	−.03	.13**	.16**	1.00	−.01	−.06	−.05	−.05	−.06	−.05	−.13**	−.03
Romantic conflict & alienation T2	−.10**	.03	−.03	.02	−.01	1.00	.00	−.10**	−.05	.37**	.01	−.07*	.01
Romantic commitment T2	.10**	.08**	.04	−.02	−.06	.00	1.00	.72**	.62**	.03	.15**	.17**	.06
Romantic trust & communication T2	.14**	.16**	.01	−.03	−.05	−.10**	.72**	1.00	.66**	.03	.17**	.25**	.15**
Romantic intimacy & companionship T2	.17**	.19**	.01	−.05	−.05	−.05	.62**	.66**	1.00	.08*	.25**	.20**	.25**
Friend conflict & alienation T2	−.03	.03	−.04	.02	−.06	.37**	.03	.03	.08*	1.00	.13**	.05	.02
Friend commitment T2	.02	.16**	−.01	−.06	−.05	.01	.15**	.17**	.25**	.13**	1.00	.59**	.60**
Friend trust & communication T2	.03	.21**	.05	−.03	−.13**	−.07*	.15**	.25**	.20**	.05	.59**	1.00	.54**
Friend intimacy & companionship T2	.01	.17**	−.04	−.05	−.03	.01	.06	.15**	.25**	.02	.60**	.54**	1.00

* $p < .05$, ** $p < .01$

Best Friendships

Social Activities

We conducted four hierarchical regressions to examine whether using the Internet for instant messaging (ICQ) or chat rooms at Time 1 predicted the quality of best friendships 1 year later, including "alienation and conflict", commitment, "trust and communication", and "intimacy and companionship". Age, sex, and the friendship quality variable at Time 1 were entered as controls into the first step of each linear regression, while using instant messaging and visiting chat rooms were included on step 2. Our dependent variables were "alienation and conflict", commitment, "trust and communication", and "intimacy and companionship" perceived in the best friendship. Results are presented in Table 4.

For "alienation and conflict", the model at step 1 was significant $F_{3,879} = 63.39$, $p < .001$. At step 2, the change in R^2 indicated that the new model including Internet activities had a better fit, $\Delta F_{2,877} = 4.53$, $p = .011$, accounting for an additional 1% of the variance. The new model indicated that being a girl, not having "alienation and conflict", and using instant messaging predicted increases in "alienation and conflict" (a decrease in friendship quality), $F_{5,877} = 40.15$, $p < .001$.

For commitment, the model at step 1 was significant $F_{3,880} = 67.72$, $p = .000$. At step 2, the change in R^2 indicated that the new model including Internet activities had a better fit, $\Delta F_{2,878} = 8.97$, $p < .001$, accounting for an additional 2% of the variance. The new model indicated that being a girl, having commitment, and using instant messaging predicted increases in commitment 1 year later, $F_{5,878} = 44.96$, $p < .001$.

For "trust and communication", the model at step 1 was significant $F_{3,878} = 124.40$, $p < .001$. At step 2, the change in R^2 indicated that the new model including Internet activities had a better fit, $\Delta F_{2,876} = 3.69$, $p = .025$, accounting for an additional 1% of the variance. The new model indicated that being a girl, having "trust and communication", and using instant messaging predicted increases in "trust and communication" 1 year later, $F_{5,876} = 101.57$, $p < .001$.

For "intimacy and companionship", the model at step 1 was significant $F_{3,880} = 87.80$, $p < .001$. At step 2, the change in R^2 indicated that the new model including Internet activities had a better fit, $\Delta F_{2,878} = 4.11$, $p = .017$, accounting for an additional 1% of the variance. The new model indicated that being a girl, having "intimacy and companionship", and using instant messaging and not using chat rooms (i.e., chat room negatively predicts "intimacy and companionship") predicted increases in "intimacy and companionship" 1 year later, $F_{5,878} = 54.69$, $p < .001$.

Table 4 Best friendship quality as predicted by Internet social activities

	Model adjusted R^2	Standardized coefficient beta	S.E.	T
Alienation and conflict	.19**			
Age		−.01	.03	−.31
Sex		.15**	.06	4.67
Alienation & conflict Time 1		.38**	.03	12.19
ICQ (Instant messaging)		.05	.06	1.60
Chat rooms		−.08*	.08	−2.44
Commitment	.20**			
Age		−.01	.03	−.36
Sex		.14**	.06	4.28
Commitment Time 1		.36**	.03	11.43
ICQ (Instant messaging)		.12**	.06	3.79
Chat rooms		−.05	.08	−1.65
Trust and communication	.36**			
Age		.03	.03	1.22
Sex		.18**	.07	5.87
Trust & communication Time 1		.48**	.03	15.68
ICQ (Instant messaging)		.08**	.06	2.72
Chat rooms		.01	.08	.08
Intimacy and companionship	.23*			
Age		−.01	.03	−.18
Sex		.13**	.05	4.10
Intimacy & companionship Time 1		.42**	.03	13.77
ICQ (Instant messaging)		.06*	.05	2.05
Chat rooms		−.06***	.07	−1.83

* $p < .05$, ** $p < .01$, *** $p < .10$

Entertainment Activities

We conducted four hierarchical regressions to examine whether using the Internet for general entertainment or games at Time 1 predicted the quality of best friendships 1 year later, including "alienation and conflict", commitment, "trust and communication", and "intimacy and companionship". Age, sex, and the friendship quality variable at Time 1 were entered as controls into the first step of each linear regression, while using the Internet for general entertainment or games were included on step 2.

Table 5 Best friendship quality as predicted by Internet entertainment activities

	Model adjusted R^2	Standardized coefficient beta	S.E.	T
Alienation and conflict	.18			
Age		−.00	.03	−.06
Sex		.16*	.06	4.98
Alienation & conflict Time 1		.37**	.03	12.09
General entertainment		.01	.06	.32
Online games		.02	.07	.75
Commitment	.19*			
Age		−.01	.03	−.17
Sex		.15**	.06	4.74
Commitment Time 1		.37**	.03	11.99
General entertainment		−.08*	.06	−2.61
Online games		.02	.07	.55
Trust and communication	.36			
Age		.03	.03	1.13
Sex		.18	.07	5.82
Trust & communication Time 1		.49**	.03	16.42
General entertainment		−.01	.07	−.38
Online games		−.02	.08	−.76
Intimacy and companionship	.23***			
Age		.00	.03	.04
Sex		.14**	.05	4.40
"Intimacy & companionship" Time 1		.43**	.03	14.28
General entertainment		−.07*	.05	−2.26
Online games		.03	.07	.93

* $p < .05$, ** $p < .01$, *** $p < .10$

Our dependent variables were "alienation and conflict", commitment, "trust and communication", and "intimacy and companionship" perceived in the best friendship. Results are presented in Table 5.

For "alienation and conflict" and "trust and communication", the change in R^2 at step 2 indicated that the new model including Internet activities did not have a better fit than the models at step 1 which only included age, sex, and friendship quality at Time 1.

For commitment, the model at step 1 was significant $F_{3,880} = 67.72$, $p < .001$. At step 2, the change in R^2

indicated, with a trend-level significance, that the new model including Internet activities had a slightly better fit, $\Delta F_{2,878} = 3.42$, $p = .03$, accounting for an additional 1% of the variance. The new model indicated that being a boy, not having commitment, and using the Internet for general entertainment predicted decreases in commitment 1 year later, $F_{5,878} = 42.23$, $p < .001$.

For intimacy/companionship, the model at step 1 was significant $F_{3,880} = 87.80$, $p < .001$. At step 2, the change in R^2 indicated, with a trend-level significance, that the new model including Internet activities had a slightly better fit, $\Delta F_{2,878} = 2.77$, $p = .06$, accounting for an additional 1% of the variance. The new model indicated that being a boy, not having prior "intimacy and companionship", and using the Internet for general entertainment predicted decreases in "intimacy and companionship" 1 year later, $F_{5,878} = 54.00$, $p < .001$.

Romantic Relationships

Similar to the best friend analyses, we conducted multiple hierarchical regressions to investigate the effects of activity choice on romantic relationships. For these analyses, however, only adolescents who reported being involved in a romantic relationship during their time in secondary school were included. This sub-sample included 610 adolescents (43% male), ranging in age from 14 to 18 at Time 1. Multiple analyses of variance indicated some significant differences between this sub-sample and the whole sample used in previous analyses. Namely, small but significant differences were identified in the age of participants ($F_{1,608} = 22.54$, $p < .05$), friendship commitment ($F_{1,608} = 10.84$, $p < .05$), friendship "trust and communication" ($F_{1,608} = 25.42$, $p < .05$), and friendship "intimacy and companionship" ($F_{1,608} = 20.60$, $p < .05$). Secondary school adolescents who reported being involved in a romantic relationship were on average .25 years older and reported slightly higher levels of friendship commitment (Daters: $M = 4.15$, Non-daters: $M = 3.97$), "trust and communication" (Daters: $M = 3.78$, Non-daters: $M = 3.42$), and "intimacy and companionship" (Daters: $M = 4.03$, Non-daters: $M = 3.80$) than non-daters. No differences were noted for friendship "alienation and conflict". These differences between the sub-sample of daters and non-daters are not unexpected. The odds of being in a romantic relationship increase with age (Darling et al. 1999), as does relationship quality (Buhrmester and Furman 1987; McNelles and Connolly 1999). Because we are already controlling for age in our regression models, no further controls were entered into the equations.

Social Activities

We conducted four hierarchical regressions to examine whether using the Internet for instant messaging or chat rooms at Time 1 predicted the quality of romantic relationships 1 year later, including "alienation and conflict", commitment, "trust and communication", and "intimacy and companionship". Age, sex, and the romantic relationship quality variable at Time 1 were entered as controls into the first step of each linear regression, while using instant messaging and visiting chat rooms were included on step 2. Our dependent variables were "alienation and conflict", commitment, "trust and communication", and "intimacy and companionship" perceived in the romantic relationship. Results are presented in Table 6.

For "alienation and conflict", the change in R^2 at step 2 indicated that the new model including Internet activities did not have a better fit than the models at step 1 which only included age, sex, and romantic relationship quality at Time 1.

For commitment, the model at step 1 was significant $F_{4,600} = 27.42$, $p < .001$. At step 2, the change in R^2 indicated, with a trend-level significance, that the new model including Internet activities had a better fit, $\Delta F_{2,598} = 2.99$, $p = .05$, accounting for an additional 1% of the variance. The new model indicated that being older, having commitment at Time 1, and using instant messaging predicted increases in commitment 1 year later, $F_{5,598} = 17.76$, $p < .001$.

For "trust and communication", the model at step 1 was significant $F_{3,605} = 64.17$, $p < .001$. At step 2, the change in R^2 indicated that the new model including Internet activities had a better fit, $\Delta F_{2,603} = 8.97$, $p < .001$, accounting for an additional 2% of the variance. The new model indicated that having prior "trust and communication", and using instant messaging predicted increases in "trust and communication" 1 year later, $F_{5,603} = 43.11$, $p < .001$.

For "intimacy and companionship", the model at step 1 was significant $F_{3,606} = 43.22$, $p < .001$. At step 2, the change in R^2 indicated that the new model including Internet activities had a better fit, $\Delta F_{2,604} = 8.01$, $p < .001$, accounting for an additional 3% of the variance. The new model indicated that having "intimacy and companionship", and using instant messaging predicted increases in "intimacy and companionship" 1 year later, $F_{5,604} = 29.74$, $p < .001$.

Entertainment Activities

We conducted four hierarchical regressions to examine whether using the Internet for general entertainment or

Table 6 Romantic relationship quality as predicted by Internet social activities

	Model adjusted R^2	Standardized coefficient beta	S.E.	T
Conflict and alienation	.10			
Age		−.10*	.04	−2.64
Sex		−.03	.07	−.71
Conflict and alienation Time 1		.30**	.04	7.57
ICQ (Instant messaging)		.05	.07	1.23
Chat rooms		−.05	.09	−1.24
Commitment	.12*			
Age		.08*	.05	1.98
Sex		.03	.10	.71
Commitment Time 1		.33**	.04	8.52
ICQ (Instant messaging)		.09*	.10	2.39
Chat rooms		.03	.13	.67
Trust and communication	.26**			
Age		.07***	.05	1.90
Sex		.02	.09	.56
Trust & communication Time 1		.47**	.04	13.05
ICQ (Instant messaging)		.15**	.09	4.08
Chat rooms		−.03	.12	−.83
Intimacy and companionship	.19**			
Age		.14**	.04	3.70
Sex		.07***	.08	1.72
Intimacy & companionship Time 1		.36**	.04	9.74
ICQ (Instant messaging)		.15**	.08	3.88
Chat rooms		−.03	.10	−.72

* $p < .05$, ** $p < .01$, *** $p < .10$

online gaming at Time 1 predicted the quality of romantic relationships 1 year later, including "alienation and conflict", commitment, "trust and communication", and "intimacy and companionship". Age, sex, and the romantic relationship quality variable at Time 1 were entered as controls into the first step of each linear regression, while using the Internet for general entertainment or games were included on step 2. Our dependent variables were "alienation and conflict", commitment, "trust and communication", and "intimacy and companionship"

Table 7 Romantic Relationship Quality as predicted by Internet entertainment activities

	Model adjusted R^2	Standardized coefficient beta	S.E.	T
Conflict alienation	.10			
Age		−.10*	.04	−2.57
Sex		−.04	.07	−.87
Conflict/ Alienation Time 1		.29**	.04	7.47
General entertainment		.04	.08	1.14
Online games		−.03	.09	−.76
Commitment	.13*			
Age		.07***	.05	1.76
Sex		.03	.10	.83
Commitment Time 1		.33**	.04	8.68
General entertainment		−.07***	.11	−1.76
Online games		−.08*	.13	−2.01
Trust and communication	.24*			
Age		.07***	.05	1.79
Sex		.03	.09	.79
Trust & communication Time 1		.47**	.04	13.12
General entertainment		−.6	.10	−1.61
Online games		−.07***	.12	−1.87
Intimacy and companionship	.18***			
Age		.14**	.04	3.70
Sex		.09*	.08	2.40
Intimacy & companionship Time 1		.37**	.04	10.03
General entertainment		−.08*	.08	−2.26
Online games		.01	.10	.17

* $p < .05$, ** $p < .01$, *** $p < .10$

perceived in the romantic relationship. Results are presented in Table 7.

For the "alienation and conflict" model, the change in R^2 at step 2 indicated that the new model including Internet activities did not have a better fit than the model at step 1 which only included age, sex, and romantic relationship "alienation and conflict" at Time 1.

For commitment, the model at step 1 was significant, $F_{3,600} = 27.43$, $p < .001$. The F change at step 2 indicated that the model at step 2 had a better fit than the model that included age, sex, and commitment, $\Delta F_{2,598} = 3.95$,

$p = .020$, accounting for an additional 1% of the variance. The new model indicates that not having prior commitment, and going online for general entertainment and to play games predicted decreases in commitment 1 year later, $\Delta F_{5,598} = 18.20$, $p < .001$.

The model for "trust and communication" was also significant step 1, $F_{3,605} = 64.17$, $p < .001$. At step 2, the change in F indicated that the new model had a better fit than the model including only age, sex, and "trust and communication" at time 1, $\Delta F_{2,603} = 3.39$, $p = .034$, accounting for an additional 1% of the variance. The new model indicates that having low levels of prior "trust and communication", and playing online games (trend level prediction) predict decreases in communication 1 year later, $F_{5,603} = 40.17$, $p < .001$.

Similarly, for "intimacy and companionship", the model at step 1 was significant, $F_{3,606} = 43.22$, $p < .001$. The model was also significant at step 2 $F_{5,604} = 27.09$, $p < .001$, accounting for an additional 1% of the variance. The change in F indicated that the new model including entertainment activities was a slightly better fit than the model including only age, sex, and prior "intimacy and companionship", $\Delta F_{2,604} = 2.56$, $p = .079$. The new model indicates that being a boy, having low levels of prior "intimacy and companionship", and using the Internet for general entertainment predicted decreases in "intimacy and companionship" 1 year later.

Discussion

The aim of this study was to determine whether different Internet-based activities had different impacts on close social relationships in adolescence, namely best friendships and romantic relationships. We hypothesized that using the Internet to communicate with known-others (i.e., instant messaging) would increase romantic relationship and best friendship quality, consistent with the stimulation hypothesis. Consistent with the reduction hypothesis, we suggested that using the Internet to communicate with strangers (i.e., chat rooms) and for entertainment (i.e., general entertainment and games) would reduce romantic relationship and best friendship quality. Our results supported these hypotheses. See summary table (Table 8). Our findings are particularly interesting given that they were noted in one direction only. In other words, Internet use at Time 1 predicted relationship quality at Time 2 but relationship quality at Time 1 did not predict Internet use at Time 2. Such directionality in our regression analyses suggests that Internet activity choices precede changes in relationship quality.

Consistent with the stimulation hypothesis, we found that using instant messaging (ICQ), and therefore using the

Table 8 Summary of the direction of relationships between Internet activities and relationship quality variables

	Best friendship				Romantic relationship			
	ICQ	Chat	Entertainment	Game	ICQ	Chat	Entertainment	Game
Conflict & alienation (reverse coded)		−						
Commitment	+		−		+		−	−
Trust & communication	+				+			−
Intimacy & companionship	+	−	−		+		−	

Internet to communicate with known-others, had a positive effect on most aspects of best-friendship and romantic relationship quality. These findings replicate others that indicate better relationship quality for those adolescents who use instant messaging to communicate with friends compared to those who do not (Valkenburg and Peter 2007). Instant messaging allows for more opportunities to communicate with known-others than does the telephone, due to the possibility of multiple simultaneous private conversations. It also allows for more intimate self-disclosure because of the removal of physical aspects of communication (Joinson 2001; McKenna and Bargh 2000). Together, these two features of instant messaging are likely agents of positive changes in best friendship and romantic relationship quality. Adolescents who use instant messaging reported increased commitment, "intimacy and companionship", and "trust and communication" 1 year later, over and above the amount of commitment, "intimacy and companionship", and "trust and communication" reported in the first phase of the study. These findings are particularly striking because they are consistent across best friendships and romantic relationships.

Interestingly, reports of using instant messaging did not have an effect on "alienation and conflict" within best friendships or romantic relationships. Although spending time communicating with close others is associated with improvements in the positive aspects of their relationships, it does not seem to influence negative aspects of these relationships. This finding is not very surprising given that adolescents use instant messaging to contact those that they are close to (e.g., Subrahmanyam et al. 2006). They are therefore more likely to use instant messaging to connect positively with their best friends or romantic partners and not to engage in conversations that would somehow strain the relationship or alienate the adolescent from his or her best friend or romantic partner. In addition, it is unlikely that adolescents who communicate with friends online feel alienated from their friends as they use multiple means (e.g., online and face-to-face) to communicate with them on a fairly regular basis. Due to the multiple means of communication, best friends and romantic partners are more likely to feel changes in positive qualities as opposed

to changes in "alienation and conflict". Therefore, communication on the Internet through instant messaging appears to maintain or improve the positive aspects of best friendships or romantic relationships (e.g., "trust and communication") but does not affect "alienation and conflict" status within these relationships.

Conversely, we found that visiting chat rooms was related to increased "alienation and conflict" and decreased "intimacy and companionship" within best friendships. This finding supports the reduction hypothesis. Visiting chat rooms represents a means of communicating mostly with strangers in a public forum, as opposed to communicating with known-others like best friends in a private instant messaging forum (Gross 2004). Using chat rooms may displace the amount of time adolescents will spend using instant messaging to communicate with their best friendships and also the amount of time they spend doing enjoyable things together (as is reflected in the items of the "intimacy and companionship" scale). However, as most adolescents multi-task while on the Internet and combine multiple conversations with multiple individuals at one time (Gross 2004; Lenhart et al. 2001), it is more probable that chat rooms are serving to create relationships with strangers that may in some way create tension in the best friendship. Because chat rooms are structured differently than instant messaging, adolescents using that technology may present themselves in different ways when communicating in chat rooms than in instant messaging (e.g., Bayraktar and Gun 2007; Subrahmanyam et al. 2006). These differences in presentations may cause strain in the best friendship. In addition, the increased ambiguity, and accompanying anonymity associated with computer-mediated communication, can most often result in increases in positive feelings and liking towards the person with which an individual is communicating (Tidwell and Walther 2002). Adolescents who visit chat rooms may feel more drawn to communicate with strangers that appear more "likeable" than their best friends who have evident flaws in face-to-face interactions. Choosing to communicate through chat rooms with these strangers may therefore cause tension in the best friendship, cause them to spend less enjoyable time together, and increase feelings of "alienation and conflict" within those friendships over time.

Our hypothesis that entertainment activities would have a negative impact on relationship quality was supported. Using the Internet for general entertainment reflected declines in levels of commitment and "intimacy and companionship" within best friendships and romantic relationships. Similarly, using the Internet to play games was associated with subsequent decreases in romantic relationship commitment and "trust and communication". These declines support the reduction hypothesis. Using the Internet for general entertainment and gaming might displace the types of activities that serve to maintain and improve healthy relationships, as noted by Kraut et al. (1998). Research confirms that video game play can fulfill some of the needs that are otherwise met through friendships, such as companionship, and therefore reduce the need for socialization with friends to obtain companionship (e.g., Colwell and Kato 2003). Also, because the terms "general entertainment" and "online games" were non-specific, adolescents who endorsed these items may in fact be engaging in antisocial forms of entertainment (e.g., visiting hate web-sites, playing violent video games, gambling, etc.) that may foster the development of aggression as opposed to the skills necessary for the maintenance of healthy best friendships and romantic partnerships (e.g., Colwell and Payne 2000). The strength in these findings is reflected in the fact that they are consistent across both types of relationships.

Sex of the participant was entered as a control variable in our analyses. In many analyses, it played a significant role in predicting the outcome variable, and may therefore have a more important impact in the reduction and stimulation hypotheses than we previously considered. Early studies noted that girls spent more time socializing on the Internet than did boys (Kraut et al. 1998). However, later studies report that the sex gap has narrowed and that, currently, boys and girls communicate online with the same frequency (Gross 2004). Nevertheless, the importance that is placed on Internet-based communication may vary by sex. In other words, although boys and girls seem to communicate with friends at the same rate, this online communication may serve a different function for girls compared to boys as reflected in the greater amounts of intimacy reported in female friendships (Aukett et al. 1988; Blyth and Foster-Clark 1987). For example, if girls place more importance on their relationships than do boys, they may be more likely to see Internet-based communication as a supplement to other types of communication which helps to maintain this highly valued aspect of their lives. The increased use of Internet-based communication such as instant messaging may then lead to increased levels of relationship quality.

Other researchers have found support for "rich get richer" phenomena over the Internet (Valkenburg and Peter 2007). Because girls already report higher levels of relationship quality than do boys (Claes and Poirier 1993), the Internet likely adds to this quality and allows for girls to further expand on their socialization, thus increasing their relationship quality even further. Perhaps girls are not more likely to use the Internet to maintain friendships but are more likely to benefit from the positive effects Internet communication has on their relationships than are boys Further investigation into this issue is warranted.

While previous research indicates that the Internet, overall, serves either stimulation or reduction purposes, our findings suggest that different activities on the Internet may serve different functions. Our results support early research findings suggesting that the Internet can reduce social contact and contribute to isolation (Kraut et al. 1998) but also later findings suggesting that the Internet can contribute to improvements in positive relationship qualities (e.g., Valkenburg and Peter 2007). The relationships among these variables is only noted when Internet activities are used to predict relationship quality. Initial relationship quality did not predict subsequent changes in Internet activity choices, which suggests that Internet activity choices contribute somewhat to subsequent changes in relationship quality. These findings are particularly remarkable as they indicate changes in relationship quality over and above the level of quality reported in the first year of our study. Although small, the changes found in our analyses represent significant increases or decreases that are related to using the Internet either to communicate with strangers or known others, or for entertainment.

Limitations and Implications for Future Research

This study is not without limitations. There were some significant differences between adolescents who were dating and those who were not dating. Namely, daters endorsed significantly higher levels of "trust and communication", commitment, and "intimacy and companionship" within their best friendships than did non-daters. Adolescents who were dating were also on average three months older than those who were not dating. Thus, the dating adolescents may have had greater time to develop these qualities or may be more skilled within their best friendships. Daters also may have experienced a greater level of best friendship quality when involved in romantic relationship because of the differential values present within their heterosexual relationships. Also, daters in the study may have changed dating partners between Time 1 and 2. It therefore may have been useful to study only those adolescents who were involved in the same relationship between Time 1 and 2. However, the number of romantic relationships that remained stable over the course of the year is very small, because of the unstable

nature of adolescent dating relationships (Brown et al. 1999). An analysis of only those relationships would severely limit our ability to identify the subtle influence of Internet use.

Our data was collected through single-source self-report questionnaires. Without other sources to corroborate the responses, it is difficult to determine the validity of the responses given by the adolescents themselves. Although information from other sources may have proven helpful, our study was primarily concerned with aspects of adolescents' life (i.e., activities online and perceived relationship quality) that are largely subjective and personal.

The list of Internet-based activities presented in our questionnaire was quite limited. The aim of the original study was not to study Internet media specifically and therefore did not include an exhaustive list of possible Internet activities. Nevertheless, the activities that were included did represent the most commonly listed activities by North American adolescents at the time (Media Awareness Network 2001). In addition, the inclusion of ICQ at the expense of all other forms of instant messaging may represent a limitation. However, ICQ was the first popular instant messaging system (Descy 2007). In 2001, the time our study was conducted, ICQ itself was described as being more popular than email for many students (Leung 2001). Our sample therefore captured the majority of students who used instant messaging technology. Finally, it was impossible to ensure that adolescents who endorsed using ICQ were using this technology to chat with known-others while adolescents who endorsed visiting chat rooms were doing so to chat with strangers. However, research suggests that conversations that occur in chat rooms primarily involve strangers (Subrahmanyam et al. 2006), whereas adolescents use instant messaging to communicate with known-others (Gross 2004). It is important to note that Internet technology is evolving at such a rapid pace, and that technologies available to adolescents are constantly changing. This rapid change therefore limits the generalizability of our findings to today's youth. It is important to conduct ongoing research to examine the functions of these trends. We are presently conducting ongoing studies to examine more specific and current forms of Internet use to determine the relative importance of Internet activities on social functioning.

Although many longitudinal relationships were identified between Internet activities and relationship quality variables, the amount of variance accounted for by our Internet variables was modest. Significant predictions accounted for as little as 1% of the variance. Therefore, the findings do not indicate dramatic changes in social adjustment over the course of 1 year. However, such subtle social changes in variance may be practically and theoretically important. As indicated by Lansford et al. (2003), small variance in regression models may still represent important findings, given the nature of regression analyses. Also, this study was conducted over the course of 1 year, a time span that may be too long to capture more dramatic effects that may exist, particularly as technology evolves so quickly and as adolescent romantic relationships tend to be short-term (Brown et al. 1999). Nonetheless, subtle changes in the quality of one's salient relationships may exert changes in other areas of adolescent development. What is especially interesting about these findings is that they are unidirectional. The opposite model—does relationship quality affect Internet activity choices 1 year later?—was not significant. Therefore, our conclusions that Internet activity choices impact relationship quality, and do so in a consistent fashion across relationships, are further strengthened. Because adolescents develop in complex social worlds, their social development is certainly influenced by an infinite number of variables. Our findings have identified some of those factors that are either harmful or beneficial to adolescent social development.

Finally, some of the associations observed within the present study may be affected by individual differences. In future work on the Internet and adolescent social adjustment, researchers may want to examine the association between online activity and relationship quality from a person-oriented approach to examine the heterogeneity among adolescents in the impact of Internet use. As proposed by Bergman and Magnusson (1997), an approach that focuses on patterns of individual characteristics as opposed to single variables may be more appropriate to research that seeks to identify the processes involved in individual functioning, such as the Internet communication and overall social adjustment. However, our study is unique in that we capture the effects of Internet activities on Canadian adolescents from diverse environments that reflect the Canadian population specifically.

Conclusion

With this study, we examined the longitudinal association between Internet activity choices and relationship quality over a one-year period in Canadian adolescents. Internet activity choice influenced later relationship quality in both best friendships and romantic relationships. Although instant messaging (ICQ) was positively associated with most aspects of romantic relationship and best friendship quality, visiting chat rooms and entertainment activities were either not related or negatively related to best friendship quality and to romantic relationship quality. These findings reflect the important function of online socializing for the development and maintenance of salient

relationships in adolescence. The Internet is now a significant aspect of the educational, social, and recreational experiences of adolescents. From a developmental perspective, there is still much to be learned about the impact of Internet activities on the social adjustment and relationship qualities of adolescents.

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Wendy M. Craig is a Professor in the Department of Psychology at Queen's University. In recognition of her work on bullying and victimization, She won an Investigator Award from the Canadian Institute of Health Research. Dr. Craig has published widely on topics of bullying and victimization, peer processes, sexual harassment and aggression in girls. As a Canadian representative, Dr. Craig works with the World Health Organization and UNICEF conducting research and promoting healthy relationships. Dr. Craig is leading Promoting Relationships and Eliminating Violence Network (PREVNet), a national strategy to stop bullying in Canada.

Debra Pepler is a Distinguished Research Professor in Psychology at York University and a Senior Associate Scientist at The Hospital for Sick Children. Together with Dr. Wendy Craig, Dr. Pepler is leading Promoting Relationships and Eliminating Violence Network (PREVNet), a Networks of Centres of Excellence—New Initiative (http://www.prevnet.ca). Her major research program examines the prosocial and antisocial behaviour of children and adolescents, particularly in the school and peer contexts. The seminal aspect of this research comprised naturalistic observations of interactions among school-aged peers with remote microphones and video cameras. Her current research in this area examines aggression and victimization among adolescents with a focus on relationship problems and solutions.

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