


Provided for non-commercial research and education use.
Not for reproduction, distribution or commercial use.

	Volume 46, issue 1, January 2009	ISSN 0191-8869
PERSONALITY AND INDIVIDUAL DIFFERENCES		
AN INTERNATIONAL JOURNAL OF RESEARCH INTO THE STRUCTURE AND DEVELOPMENT OF PERSONALITY, AND THE CAUSATION OF INDIVIDUAL DIFFERENCES		
Editors-in-Chief Dr T. VERNON, Canada Dr S. B. G. EYSENCK, London		Founding Editor Professor H. J. EYSENCK*
Contents:		
General Papers: M.I. Ibáñez, J. Moya, C. Ávila, M. Moro and G. Orret B.R. Myall, D.W. Hine, A.D.G. Marks, E.B. Thorsteinsson, M. Brechman-Toussaint and C.A. Samuels V. Zeigler-Hill and E.M. Myers L. Wright, S.M. Hardie and K. Wilson C.R. Glenn and E.D. Klonsky S.R. Jones, C. Fernyhough and D. Meads L. Rice and P.M. Markey N. Haslam, J. Whelan and B. Bastian	1 The International Society for the Study of Individual Differences (ISSID) 3 Temperamental traits in mice(II): Consistency across apparatus 8 Assessing individual differences in perceived vulnerability in older adults 14 Is high self-esteem a path to the White House? The implicit theory of self-esteem and the willingness to vote for presidential candidates 20 Handedness and behavioural inhibition: Left-handed females show most inhibition as measured by BIS/BAS self-report 25 Social context during non-suicidal self-injury indicates suicide risk 30 In a dark time: Development, validation, and correlates of the Durham hypnagogic and hypnopompic hallucinations questionnaire 35 The role of extraversion and neuroticism in influencing anxiety following computer-mediated interactions 40 Big Five traits mediate associations between values and subjective well-being	
<i>[Continued on outside back cover]</i>		
<small>Person, Individ. Diff. is indexed/abstracted in: ASSIA, Curr. Cont. Soc. & Behav. Sci., PASCAL-CNRS Data, Psychol. Abstr., PsycINFO, PsycLIT, Res. Alert, Soc. Sci. Cit. Indx. Also covered in the abstract and citation database SCOPUS®. Full text available on ScienceDirect®.</small>		
<small>ISSN 0191-8869 46(1) 1-74 (2009)</small>		
OFFICIAL JOURNAL OF THE INTERNATIONAL SOCIETY FOR THE STUDY OF INDIVIDUAL DIFFERENCES (ISSID)		

This article appeared in a journal published by Elsevier. The attached copy is furnished to the author for internal non-commercial research and education use, including for instruction at the authors institution and sharing with colleagues.

Other uses, including reproduction and distribution, or selling or licensing copies, or posting to personal, institutional or third party websites are prohibited.

In most cases authors are permitted to post their version of the article (e.g. in Word or Tex form) to their personal website or institutional repository. Authors requiring further information regarding Elsevier's archiving and manuscript policies are encouraged to visit:

<http://www.elsevier.com/copyright>



Contents lists available at ScienceDirect

Personality and Individual Differences

journal homepage: www.elsevier.com/locate/paid

The role of extraversion and neuroticism in influencing anxiety following computer-mediated interactions

Lindsay Rice, Patrick M. Markey *

Department of Psychology, Villanova University 800 Lancaster Avenue, Villanova, PA 19085, USA

ARTICLE INFO

Article history:

Received 24 April 2008

Received in revised form 13 August 2008

Accepted 27 August 2008

Available online 7 October 2008

Keywords:

Personality

Internet

Anxiety

ABSTRACT

With the increasing popularity of the internet, online interpersonal interactions have become a popular method of communication. The current study examined whether individuals with certain personality characteristics felt less anxious after communicating via computer-mediated communication (CMC) than after face-to-face (FtF). To examine this issue, 80 female participants (M age = 18.88, SD = 1.10) completed a personality assessment and then interacted with a confederate for 15 min either using CMC or FtF. After the interaction, participants' current level of anxiety was assessed. Results indicated that participants tended to be less anxious after the CMC than after a FtF interaction. Subsequent analyses found that this effect was moderated by participants' extraversion and neuroticism. Specifically, introverted and neurotic participants tended to be more anxious communicating FtF than communicating using CMC whereas extraverts and stable participants tended to experience low amounts of anxiety irrespective of the interaction type.

© 2008 Elsevier Ltd. All rights reserved.

1. Introduction

Paralleling the growth of internet use in recent years, various forms of computer-mediated communication (CMC) has become a very popular source of interpersonal interactions. With the growing popularity of CMC (e.g., emailing, chat rooms, social websites, and instant messaging), it is important to examine various personality variables that may alter the experience of communicating via the internet. For example, it seems probable that those individuals who feel anxious during face-to-face interactions may find that they are at ease when communicating using CMC. To this end, the current study is interested in whether or not individuals with specific personality characteristics feel more or less anxious when communicating via CMC than face-to-face (FtF).

With the rising use of CMC for daily interactions, researchers have started to examine the possible negative psychological effects of CMC. For example, it has been suggested that because internet activities interfere with other social activities it can lead to addiction (Brenner, 1997). Previous research also suggests that relationships which are entirely based on CMC do not provide the same intimacy level as FtF relationships (Parks & Roberts, 1998). Increases in internet usage have also been linked to declines in communication with family and friends and overall smaller social circles for the user (Kraut et al., 1998). Finally, college students who frequently use the CMC to talk with their friends are likely

to have poorer academic performance and higher self-reported internet dependency than their peers who do not frequently use CMC (Kubey, Lavin, & Barrows, 2001).

In contrast to the findings that internet use can have negative psychological effects, other research suggests that internet use can be positive. Those individuals who use the internet frequently to socialize with their peers have been found to report equal depth in both CMC relationships and FtF relationships to those individuals that use the internet less frequently (Peris et al., 2002). Gross, Juvonen, and Gable (2002) found that adolescents who use instant messaging as a form of communication often chat with peers they see in their day-to-day life thereby encouraging these relationships to grow. Not only can CMC build deeper friendships, but Green et al. (2005) found that female participants who conversed with a stranger in a CMC environment reported more happiness and better moods than female participants who conversed with a stranger FtF.

In sum, past research suggests that CMC can sometimes be a positive experience (Brenner, 1997; Kraut et al., 1998; Kubey et al., 2001; Parks & Roberts, 1998) and can sometimes be a negative experience (Green et al., 2005; Gross et al., 2002; Peris et al., 2002). It has been suggested (e.g., Amichai-Hamburger & Ben-Artzi, 2000) that these seemingly conflicting findings may have occurred because much of this research failed to consider whether or not personality moderates the effect of CMC. Consistent with this notion, past correlational research indicates that the traits of extraversion and neuroticism might impact CMC. Research by Amichai-Hamburger and Ben-Artzi (2000) found that women

* Corresponding author. Tel.: +1 610 519 4743; fax: +1 610 519 4269.
E-mail address: patrick.markey@villanova.edu (P.M. Markey).

who are introverted and neurotic are likely to utilize the internet in order to chat and join discussion groups. Building upon this research it was later found that neurotic women seem to utilize the internet more often in order to overcome feelings of loneliness (Amichai-Hamburger & Ben-Artzi, 2003). Similarly, research suggests that introverted and neurotic individuals are more likely to express their “true selves” during CMC than during FtF interactions (Amichai-Hamburger, Wainapel, & Fox, 2002). Furthermore, various other studies have found that constructs related to extraversion and neuroticism (e.g., shyness, social anxiety) are also linked to CMC use and its various outcomes (e.g., Curtis, 1997; McKenna, 1998; Ward & Tracey, 2004).

It seems likely that the environment created by CMC encourages introverts and neurotic individuals to feel more at ease when conversing. Introverted and neurotic individuals might feel at ease when interacting via CMC because it provides a sense of anonymity. These individuals might also be attracted to the substantial control of the interaction afforded by CMC which allows a person to respond at their own leisure, the ability to edit what is said, and the capability to simply end the interaction at any time.

In order to build upon previous literature examining CMC and personality, the current study experimentally manipulated how participants interacted with a stranger (CMC or FtF) in order to examine if these forms of communication differentially affected a participant's anxiety. More importantly, it was also examined whether or not extraversion and neuroticism moderated the effect of interaction type on participants' anxiety. Because previous research suggests that extraversion and neuroticism are important characteristics to consider when examining females' usage of CMC (Amichai-Hamburger & Ben-Artzi, 2000; Amichai-Hamburger & Ben-Artzi, 2003) the current study examined the interactions of female dyads. Based on previous research, it is hypothesized that during a FtF interaction, extraversion will be negatively related to anxiety (i.e., introverts will be more anxious during FtF interactions than extraverted individuals) but during CMC, extraversion will be unrelated to anxiety. It is also expected that during FtF interaction, neuroticism will be positively related to anxiety (i.e., neurotic individuals will be more anxious during FtF interactions than stable individuals) but during CMC this relationship will be greatly reduced.

2. Method

2.1. Participants

Eighty female undergraduates (M age = 18.88, SD = 1.10) enrolled in general psychology courses were recruited for the study. Participants completed the study individually. For completion of the study, the participants were awarded one research credit hour to help fulfill a course requirement.

2.2. Procedure

In order to assess the traits of extraversion and neuroticism subjects completed the big five inventory (BFI; John & Srivastava, 1999). The BFI is a 44-item questionnaire used to assess each of the five traits contained within the five-factor model of personality (extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience; alphas ranged between .75 and .87). Although participants completed the entire BFI only the extraversion and neuroticism scales were utilized in the current research.¹

¹ As would be expected, analyses conducted on the other FFM scales found that none of them significantly predicted anxiety or moderated the effect of interaction type.

Following completion of the BFI, participants were informed that they would be interacting with another participant for 15 min. Each participant was randomly assigned to one of two interaction conditions. Participants in the first condition interacted with the confederate (a female undergraduate research assistant) over CMC while participants in the second condition interacted FtF with the confederate. In both situations the confederate was blind to the extraversion and neuroticism scores of the participants. Subsequent analyses revealed that participants in the CMC group did not differ from participants in the FtF group in terms of their age (M = 19.01 and M = 18.88, respectively, $t(78)$ = 1.35, p = .18), extraversion (M = 3.77 and M = 3.60, respectively; $t(78)$ = 1.12, p = .25), or neuroticism (M = 2.64 and M = 2.83, respectively; $t(78)$ = 1.48, p = .14).

Condition 1: computer-mediated communication (CMC): Participants in this condition were informed they would be talking with another participant utilizing the America Online Instant Messenger (AIM) program. AIM allows users to chat one-on-one in real time through computers. The participant was given a brief tutorial if she was unfamiliar with the program. The participant was then told she had 15 min to “talk” with the other participant (actually a confederate) through AIM using the screen name ‘participant 26’. The experimenter then left the room. During this time the participant was allowed to discuss any topic she desired. If the conversation lulled (defined as 30 s with no response), the confederate drew from a list of pre-scripted questions to restart the conversation (e.g., What classes are you taking this semester? What did you do over the summer?). Once 15 min had passed, the experimenter returned to the room for the final portion of the study.

Condition 2: face-to-face (FtF): After completion of the questionnaires, a female confederate was brought into the room to join the participant. The participants were told that the confederate was another participant also completing the study. Both participant and confederate were instructed to talk freely for 15 min. The experimenter then left the room. In the event that the conversation lagged, which was defined as 30 s of no conversation, the confederate drew from a list of memorized scripted questions which were also used in the CMC. After 15 min had passed the confederate was escorted from the room by the experimenter.

After the interaction portion was completed, the participant completed the tense-arousal scale from the UWIST Mood Adjective Checklist (Matthews, Jones, & Chamberlain, 1990). Using a two-factor structure of mood, the tense-arousal scale conceptually represents high levels of both energetic arousal and tense-arousal (i.e., anxiety; Matthews et al., 1990). The tense-arousal scale consists of 16 adjectives (e.g., anxious, stressed, and relaxed) that participants use to indicate how they are currently feeling (α = .77) on a 4-point Likert type scale. Mean scores on the tense-arousal scale could range from 1 to 4 with high scores reflecting high levels of anxiety (Gold, MacLeod, Frier, & Deary, 1995).

3. Results

To address the first aim of the study an independent t -test was used to determine whether or not interaction type (FtF versus CMC) affected the amount of anxiety a participant reported at the end of the interaction. Results indicated that participants reported significantly ($t(79)$ = -3.47, p < .01; r = .37) more anxiety at the conclusion of a FtF interaction (M = 2.10, SD = .47) than at the conclusion of a CMC (M = 1.80, SD = .25).

To address the second aim of the study analyses were conducted to determine whether or not extraversion and neuroticism interacted with interaction type when predicting anxiety. A hierarchical regression analysis was next computed to examine whether or not extraversion and neuroticism moderated the effect of interaction type on anxiety. In this analysis, Interaction type,

Table 1
Multiple regression analysis predicting anxiety

	B	SE B	β
Step 1	$R^2 = .33^{**}$		
Interaction type (IT)	.33	.08	.42 ^{**}
Extraversion (E)	-.45	.05	-.42 ^{**}
Neuroticism (N)	.07	.06	.12
Step 2	$R^2 = .47^{**}$ $\Delta R^2 = .14^{**}$		
IT \times E	-.31	.10	-.41 ^{**}
IT \times N	.27	.13	.27 [*]

$n = 80$.
* $p < .05$.
** $p < .01$.

Extraversion and Neuroticism were entered in the first step and the two-way interactions of Interaction type \times Extraversion and Interaction type \times Neuroticism were entered in the second step. To reduce issues associated with multicollinearity, extraversion and neuroticism scores were centered and interaction type was dummy coded (0 = CMC; 1 = FtF) before computing their interactions (Cohen & Cohen, 1983). As predicted, both of these traits significantly interacted with interaction type (see Table 1). Figs. 1 and 2 present graphical representations of these interactions derived by calculating simple regression equations corresponding to individuals scoring at the mean, two standard deviations above the mean, and two standard deviations below the mean (Aiken & West, 1991). The simple slopes presented in these regression equations

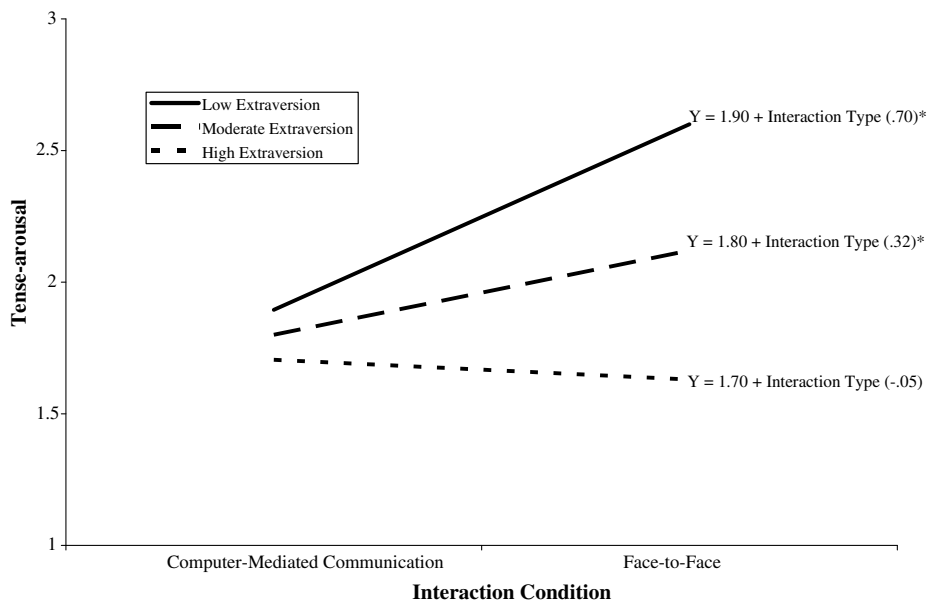


Fig. 1. Interaction between extraversion and interaction type when predicting anxiety after an interaction. A graphic representation of the regression equation: tense-arousal = 1.8-.08 (Extraversion) +.32 (Interaction type) -.31 (Extraversion \times Interaction type).

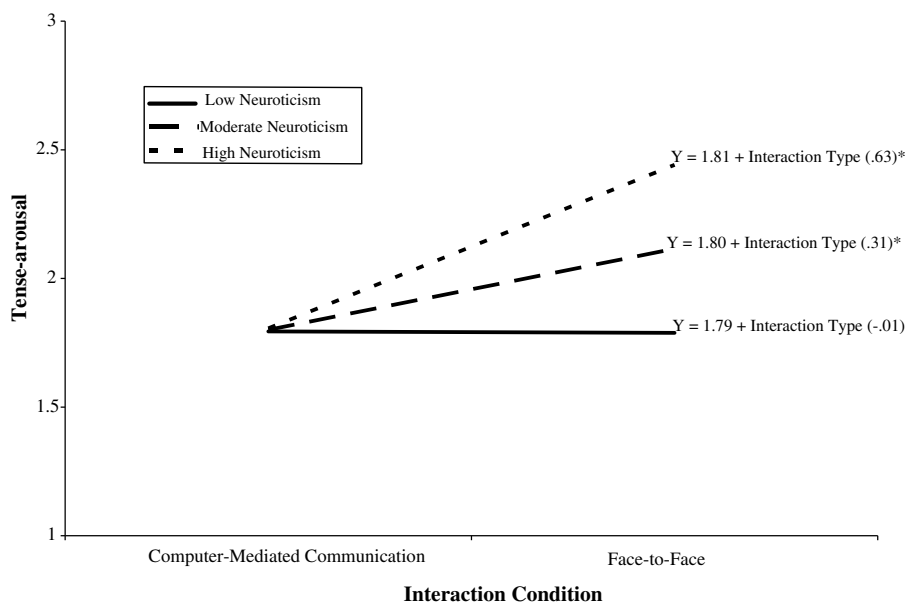


Fig. 2. Interaction between neuroticism and interaction type when predicting anxiety after an interaction. A graphic representation of the regression equation: tense-arousal = 1.8 + .01 (Neuroticism) +.31 (Interaction type) +.27 (Neuroticism \times Interaction type).

reflect the predicted anxiety experienced after FtF and CMC interactions for participants with high ($M = 1.63$, $M = 1.70$, respectively), moderate ($M = 2.12$, $M = 1.80$, respectively), and low levels ($M = 2.60$, $M = 1.89$, respectively) of extraversion and for participants with high ($M = 2.44$, $M = 1.80$, respectively), moderate ($M = 2.11$, $M = 1.80$, respectively), and low levels ($M = 1.78$, $M = 1.79$, respectively) of neuroticism.

Significance tests of the simple slopes (Aiken & West, 1991) presented in Fig. 1 reveal that participants with low and moderate levels of extraversion tended to be more anxious after communicating FtF than when using CMC ($t(76) = 3.31$, $p < .05$; $t(76) = 3.44$, $p < .05$). However, participants with high levels of extraversion did not have different levels of anxiety in the two conditions ($t(76) = .06$, $p > .05$). Significance tests of the simple slopes presented in Fig. 2 reveal that participants with high and moderate levels of neuroticism tended to be more anxious after communicating FtF than when using CMC ($t(76) = 2.00$, $p < .05$; $t(76) = 3.18$, $p < .05$). However, participants with low levels of neuroticism had similar levels of anxiety in both the FtF condition and the CMC condition ($t(76) = .14$, $p > .05$).

4. Discussion

Previous correlational research has found that extraversion and neuroticism are related to both the use of CMC and various outcomes associated with its use (e.g., Amichai-Hamburger & Ben-Artzi, 2000; Curtis, 1997; McKenna, 1998; Ward & Tracey, 2004). In order to better understand the potential impact of CMC the current study first examined whether or not interaction type (FtF versus CMC) affected the amount of anxiety a person experienced after interacting with a stranger. Results indicated that, in general, individuals tended to feel less anxious after conversing via CMC than FtF. It seems likely that CMC may be less anxiety provoking than FtF interactions since it provides a sense of anonymity and because it allows one to better control the pace and speed of the interaction.

It was next examined whether or not extraversion and neuroticism moderated the effect of interaction type on participants' anxiety. As predicted, extraversion significantly moderated the effect of communication type. Introverts tended to be more anxious following a FtF interaction than after a CMC; whereas extraverts tended to display relatively low levels of anxiety in both FtF interactions and CMC. Such a finding is consistent with previous research that has suggested shy and introverted individuals tend to utilize CMC to start online relationships more often than other individuals (Amichai-Hamburger & Ben-Artzi, 2000; McKenna, 1998; Ward & Tracey, 2004). It seems probable that the anonymity provided by CMC reduces the anxiety that an introvert normally experiences during a FtF interaction. Such a reduction of anxiety might encourage introverted individuals to explore CMC as a potential avenue for social interactions (Ward & Tracey, 2004). It is equally likely that introverts might generally be more anxious than extraverts and that utilizing CMC allows introverts the ability to act in a manner consistent with their "true selves" (Amichai-Hamburger et al., 2002) thus reducing their overall anxiety.

Additionally, as predicted, neuroticism significantly moderated the effect of communication style. Specifically, neurotic participants tended to be more anxious following a FtF interaction than after a CMC; whereas participants scoring low on neuroticism tended to exhibit low levels of anxiety in both FtF interactions and CMC. Consistent with this finding, past research suggests women who are neurotic tend to utilize the internet for social services more often than women who are emotionally stable (Amichai-Hamburger & Ben-Artzi, 2000; Amichai-Hamburger & Ben-Artzi, 2003). Additionally, individuals who display high anxiety in social

situations also show greater amounts of internet use overall (Shepherd & Edelmans, 2005) than individuals who are more stable. It seems likely that the nature of CMC allows these individuals the ability to control the interaction (i.e., edit comments, control the speed of an interaction) and act in a manner consistent with their personality (Amichai-Hamburger et al., 2002) thereby reducing the amount of anxiety neurotic individuals experience.

Although these findings are consistent with our hypotheses, they should be considered in the context of the study's limitations. First, because the current sample consisted entirely of female university undergraduates it is unknown if these findings would generalize to males or to an older population. Of course, because young adults often utilize CMC this age group is an ideal age to study. Second, it seems likely that the use of female confederates may have lessened participants' anxiety because they were conversing with someone of the same gender. Third, the laboratory design utilized in the current study might limit how well these results generalize outside the laboratory when individuals are allowed to freely select who they want to interact with and if the CMC is actually occurring in their own home. Finally, it is unclear how well these findings would generalize to different social relationships (e.g., job interview, potential romantic partners, student–teacher interactions) where different topics would likely be discussed.

With millions of people using CMC to make friends, find romantic partners, and conduct business, understanding the psychological consequences of CMC are as important as understanding FtF interactions. This study presents an important step in not only understanding the relation between CMC and anxiety, but also how stable characteristics moderate this relation. It is hoped that future studies will expand these findings by examining a variety of different social interactions and a multitude of different psychological outcomes such as loneliness, social skills, and closeness with interaction partner, and happiness.

Acknowledgements

The authors would like to thank the research assistants from the Interpersonal Relations Laboratory at Villanova University.

References

- Aiken, L., & West, S. (1991). *Multiple regression: Testing and interpreting interactions*. Thousand Oaks, CA, US: Sage Publication.
- Amichai-Hamburger, Y., & Ben-Artzi, E. (2000). The relationship between extraversion and neuroticism and the different uses of the internet. *Computers in Human Behavior*, 16, 441–449.
- Amichai-Hamburger, Y., & Ben-Artzi, E. (2003). Loneliness and internet use. *Computers in Human Behavior*, 19, 71–80.
- Amichai-Hamburger, Y., Wainapel, G., & Fox, S. (2002). "On the internet no one knows. I'm an introvert": Extroversion, neuroticism, and internet interaction. *CyberPsychology & Behavior*, 5, 125–128.
- Brenner, V. (1997). Psychology of computer use: XLVII. Parameters of internet use, abuse and addiction: The first 90 days of the internet usage survey. *Psychological Reports*, 80T, 879–882.
- Cohen, J., & Cohen, P. (1983). *Applied multiple regression: Correlational analysis for the behavioral sciences*. Hillsdale, NJ: Erlbaum.
- Curtis, P. (1997). Mudding: Social phenomena in text-based virtual realities. In S. Kiesler (Ed.), *Culture of the internet* (pp. 121–144). Mahwah, NJ: Lawrence Erlbaum Associates Publishers.
- Gold, A. E., MacLeod, K. M., Frier, B. M., & Deary, I. J. (1995). Changes in mood during acute hypoglycemia in healthy participants. *Journal of Personality and Social Psychology*, 68, 498–504.
- Green, M. C., Hilken, J., Friedman, H., Grossman, K., Gasiewski, J., Adler, R., et al. (2005). Communication via instant messenger: Short- and long-term effects. *Journal of Applied Social Psychology*, 35, 445–462.
- Gross, E. F., Juvonen, J., & Gable, S. L. (2002). Internet use and well-being in adolescence. *Journal of Social Issues*, 58, 75–90.
- John, O. P., & Srivastava, S. (1999). The big five trait taxonomy: History, measurement, and theoretical perspectives. In L. A. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and research* (2nd ed., pp. 102–138). New York: Guilford.

- Kraut, R., Patterson, M., Lundmark, V., Kiesler, S., Mukophadhyay, T., & Scherlis, W. (1998). Internet paradox: A social technology that reduces social involvement and psychological well-being? *American Psychologist*, *53*, 1017–1031.
- Kubey, R. W., Lavin, M. J., & Barrows, J. R. (2001). Internet use and collegiate academic performance decrements: Early findings. *Journal of Communication*, *51*, 366–382.
- Matthews, G., Jones, D. M., & Chamberlain, A. G. (1990). Refining the measurement of mood: The UWIST mood adjective checklist. *British Journal of Psychology*, *81*, 17–42.
- McKenna, Y. A. (1998). *The computers that bind: Relationship formation on the internet*. Unpublished doctoral dissertation, Ohio University.
- Parks, M. R., & Roberts, L. D. (1998). "Making MOOsic": The development of personal relationships on line and a comparison to their off-line counterparts. *Journal of Social and Personal Relationships*, *15*, 517–537.
- Peris, R., Gimeno, M. A., Pinazo, D., Ortet, G., Carerro, V., Sanchez, M., et al. (2002). Online chat rooms: Virtual spaces of interaction for socially oriented people. *Cyberpsychology and Behavior*, *5*, 43–51.
- Shepherd, R., & Edelmann, R. J. (2005). Reasons for internet use and social anxiety. *Personality and Individual Differences*, *39*, 949–958.
- Ward, C. C., & Tracey, T. J. (2004). Relation of shyness with aspects of online relationship development. *Journal of Social and Personal Relationships*, *21*, 611–623.