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Face to Face Versus Facebook: Does Exposure to Social Networking Web Sites Augment or Attenuate Physiological Arousal Among the Socially Anxious?

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Abstract

The present study tested two competing hypotheses about the effect of Facebook exposure on the physiological arousal level of participants who then encountered the stimulus person in a face-to-face situation. Facebook exposure may attenuate later arousal by providing increased comfort and confidence, but it is also possible that Facebook exposure will augment arousal, particularly among the socially anxious. Participants completed a measure of social anxiety and were exposed to a stimulus person via Facebook, face to face, or both. Galvanic skin response was recorded during the exposures to the stimulus person. Results were consistent with the augmentation hypothesis: a prior exposure on Facebook will lead to increased arousal during a face-to-face encounter, particularly for those high in social anxiety.

Introduction

Facebook, the largest of the social networking sites, recently reported that their members had eclipsed 950 million users.[1] As the use of social networking sites has grown, so too has interest in the function these Web sites serve for their users. Studies using self-report methods have consistently shown that social networking use is primarily motivated by the need to connect with others.[2–4] Social networking sites' ability to facilitate healthy social interactions has been a topic of debate, however, among scientists and laypeople alike. For example, social network users have reported that their social interaction needs are being met,[3] while there is also evidence that Internet communication is perceived to be less useful in building relationships than face-to-face communication and may even lead to lessened well-being.[5] Of particular concern is the role that social networking sites play for the socially anxious, and whether the social benefits outweigh the potential harm for this group.

Studies suggests that socially anxious individuals prefer online over face-to-face communication.[6,7] Relatively early research indicated that there may be a substantial benefit to computer-mediated communication for the socially anxious, as it allows for social interaction in a safe space due its relative anonymity and absence of distance barriers in reaching similar others.[8] This in turn can lead to increased feelings of confidence and self-efficacy that will help improve offline interactions.[8,9] Furthermore, the Internet provides a place for introverted individuals to express their true selves, a process necessary for psychological well-being.[10] On the other hand, it has been found that preference for online social interaction among the socially anxious is related to negative outcomes.[6] In addition, the quickly changing nature of Internet interactions makes it important to study the relationship in a current context. Many of the above studies that discussed the benefits of Internet communication were done using participants who developed online relationships via chatrooms, where extended, anonymous conversations would frequently occur. We are instead concerned with today's Facebook interactions, which not only lack anonymity but also consist mainly of brief "status updates." The majority of college-aged Facebook users, in fact, report that although they check the site several times a day, they are more likely to engage in "lurking," or viewing other people's profiles without comment, than to post something themselves or engage in conversation with others.[11] Therefore, even if socially anxious Facebook users are online frequently, the changing nature of these interactions may mean that they are likely not benefitting from their Internet activity in the way people did in the previous decade.

The current tendency for people to use Facebook to "lurk" (or "creep") on other people's profiles raises the question of what such activities do to change later face-to-face interactions, particularly among the socially anxious. We focus on

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the effects of a brief Facebook encounter on physiological arousal, specifically galvanic skin response (GSR). We test two competing hypotheses. Facebook exposure may serve to attenuate the arousal among the socially anxious when they come face to face with the stimulus person due to the potential for Facebook encounters to build confidence and provide an initial "safe" space. However, Facebook use is highly related to self-presentational motivations[12] that are also largely responsible for social anxiety.[13] In addition, recent attention has focused on the negative effects elicited by Facebook-related social comparisons.[14] Facebook may thus act as a negative social prime, which could be activated during a face-to-face interaction. A competing hypothesis would therefore be that a prior Facebook exposure would serve to augment the arousal among the socially anxious during a face-to-face encounter.

Method

Participants

Participants were 26 female undergraduate students, aged between 18 and 20 years, who elected to participate in the study in exchange for course credit. Female participants were used exclusively in order to match the sex of the participant with that of the stimulus person. Females were selected because, compared to males, they are more likely to be Facebook users[15] and experience greater social anxiety.[16]

Materials and procedure

Approximately one week before reporting for the experimental session, participants completed the Interaction Anxiousness Scale (IAS)[17] as a measure of social anxiety. The scale has 15 items, with responses ranging from 1 = "not at all characteristic" to 5 = "very characteristic."

Participants reported individually for the laboratory portion of the experiment, which was ostensibly a study on facial recognition. The experimenter explained that they were interested in the physiological changes that accompany the examination of faces. GSR was used as the measure of physiological arousal, following the procedure recommended by Bradley.[18] Participants washed and dried their hands and were fitted with GSR-200 GSR equipment (Iworx Systems, Inc., Dover, NH). Electrodes were placed on the distal segment of the ring and index fingers on the participants' left hand. They were instructed to keep their hands gently lying on their lap and to refrain from moving unnecessarily. All participants were told that they would be memorizing the face of a fellow female student in preparation for a facial recognition task.

Participants were randomly assigned to one of four conditions. In the Facebook only condition, participants studied the stimulus person's face on a Facebook profile page. In the face-to-face only condition, participants studied the same person's face while she was in the same room. In the Facebook followed by face-to-face condition, participants were first exposed to the Facebook photos, followed by a live exposure to the stimulus person. In the face-to-face followed by Facebook condition, the order was reversed, with participants first seeing the stimulus person live and then scrolling through her Facebook pictures.

Participants in the Facebook only and face-to-face only conditions were told that they would have one chance to memorize the face, while participants in the two hybrid conditions were told that they would have two different opportunities. The Facebook exposure of the stimulus person consisted of a profile page with 26 personal, individual photos. Participants turned on the computer and looked through the photographs for 2 minutes, using their right hand to scroll through the pictures. For the face-to-face portion of the study, the experimenter informed the participants that the stimulus person would be present in the room, went to retrieve her, and asked her to sit at the opposite side of the participants' table. Participants were instructed to study her face but not interact with her. The stimulus person was instructed not to make direct eye contact with the participants because of confounding GSR effects.[19] Participants were instructed not to talk to the stimulus person and to behave as if a glass wall were separating them. The participants studied her face for 2 minutes, after which she exited the room.

Skin conductance levels were measured at several intervals throughout the procedure using an iWorx 214 Data Acquisition Unit and GSR-200 GSR amplifier (Iworx Systems, Inc.). During the Facebook portion of the procedure, measurements were taken when the computer was turned on and when the two minutes were over. For the face-to-face portion of the procedure, measurements were taken when the stimulus person was announced, when she sat down, and when the two minutes were over.

Once the exposure to the stimulus person ended, each participant was given a facial recognition task in which they were instructed to identify and circle the stimulus person in four different group pictures.

Results and Discussion

The mean score on the IAS was 40.30 ($SD = 8.62$). There were no significant differences between the randomly assigned groups on dispositional anxiety, $F(3, 42) = 1.10$, $p = 0.36$, and all group means were within one standard deviation of the total mean. Mean anxiety scores are shown in Table 1.

The amplitude of the event-related GSR served as the dependent measure for all analyses. Event-related amplitude is defined as the difference between tonic skin conductance at the time of stimuli presentation and the peak of the physiological response that follows measured in microvolts. Table 2 shows the mean scores.

Planned comparisons showed no significant difference between the two Time 1 Facebook arousal scores, $t(40) = 1.14$, $p > 0.20$, or the two Time 1 face-to-face arousal scores, $t(40) = 0.61$, $p > 0.50$, indicating group equivalence. A planned comparison conducted on Time 1 skin conductance levels

Table 1. Mean IAS Scores by Condition

Condition	n	*Mean IAS score*
Facebook	11	38.86 (7.77)
Face to face	13	40.23 (9.84)
Facebook + face to face	11	44.18 (8.07)
Face to face + Facebook	11	38.45 (8.24)

Standard deviations are in parentheses.
IAS, Interaction Anxiousness Scale.

Table 2. Mean Skin Conductance Scores

Condition	*Time 1*	*Time 2*
Facebook	0.08 (0.89)	
Face to face	0.80 (1.02)	
Facebook + face to face	0.53 (0.66)	1.80 (1.21)
Face to face + Facebook	1.03 (0.86)	1.13 (0.91)

Standard deviations are in parentheses.

showed that participants who were initially exposed to the stimulus person via Facebook had lower arousal levels ($M = 0.33$, $SD = 0.79$) than participants who saw her live ($M = 0.91$, $SD = 0.93$; $t(40) = 2.29$, $p < 0.05$). The act of viewing someone on Facebook thus appears to be a less arousing experience than a face-to-face encounter, even when such an encounter does not involve any interaction on the part of the participant.

A two-step approach was used in order to test the hypothesis that an initial exposure on Facebook would lead to a decrease (or increase) in arousal upon seeing the stimulus person live. First, a planned comparison showed that the arousal score on seeing the stimulus person face to face was higher if it occurred after seeing the person on Facebook first than if it occurred without an initial Facebook presentation, $t(40) = 2.36$, $p < 0.05$. Second, a dependent samples t test showed that arousal significantly increased from Time 1 to Time 2 for participants in the Facebook then face-to-face condition, $t(10) = 3.10$, $p < 0.05$. This is not likely due to the fact that the participants were simply surprised by a change in procedure, as the Time 1 and Time 2 arousal scores for participants in the face-to-face then Facebook condition did not differ significantly, $t(10) = 0.49$, $p > 0.60$.

In order to see if interpersonal anxiety moderated the relationship between arousal and the presence of an initial Facebook presentation of a stimulus person, we conducted a regression analysis using skin conductance scores of participants in the face-to-face condition and the Facebook then face-to-face condition. The predictor variable was the interaction term between IAS and condition (dummy coded so that 0 = "no initial Facebook exposure" and 1 = "initial Facebook exposure"), and the criterion variable was the arousal score when the live stimulus was present. The interaction term was a significant predictor of arousal, $\beta = 0.47$, $t = 2.48$, $p < 0.05$. As can be seen in Figure 1, the high arousal levels in the Facebook then face-to-face condition particularly occurred among those participants who were higher in interpersonal anxiety.

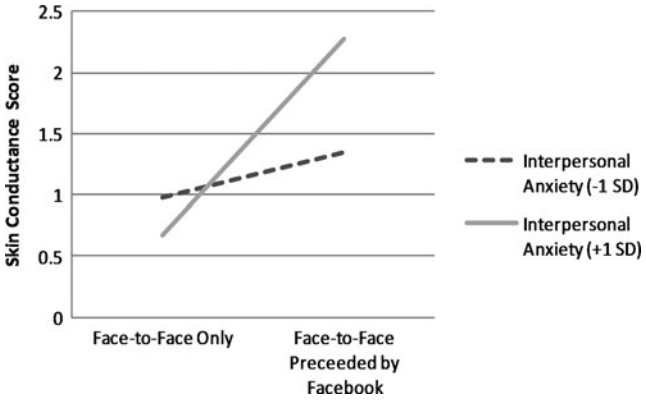

FIG. 1. Interaction between condition and interpersonal anxiety on skin conductance scores.

Overall, results support the augmentation of arousal hypothesis rather than the attenuation of arousal hypothesis. Facebook exposure to a stimulus person was related to heightened arousal when that person is encountered face to face, especially for those higher in social anxiety. One interpretation of these results is that Facebook is not necessarily a gentle introduction to a person that will lead to lessened arousal upon subsequently seeing her face to face. Facebook, in fact, may have adverse effects, especially for those higher in social anxiety. Facebook may prime self-presentation and social comparison concerns that would lead to heightened arousal when the stimulus person is present. Alternatively, the change from Facebook to real life may have led to arousal because the socially anxious participants preferred the relative safety of Facebook and felt agitated when the switch was made. This interpretation is consistent with research that has found that social anxiety relates to a preference for online over face-to-face interactions.[6,7] Whether it is a priming effect or an unwelcome stimulus change, the implication for socially anxious Facebook users is the same: initial Facebook exposure may not serve a protective function during a subsequent live exposure, but may lead to an increase in negative arousal.

However, physiological arousal can be associated with positive as well as negative emotions,[18] so we must therefore consider a second interpretation of the results. The electrodermal system, as measured by GSR, quantifies activation of the sympathetic nervous system (ANS). The electrodermal system is innervated solely by the fibers of the ANS, making it a valuable measure of this form of activation. It is not, however, indicative of the valence of the emotional response, as organisms demonstrate similar arousal to both negative and positive emotional states.[20] It is therefore possible that encountering someone live after a Facebook exposure may lead to an increase in positive rather than negative arousal. A previous exposure, for example, may lead to excitement and even a desire to engage when the live encounter occurs.

While both interpretations are possible, we favor the negative arousal interpretation due to the moderating role of social anxiety. If initial Facebook exposure had positive effects on the socially anxious, we think it is likely that these effects would manifest as arousal-reducing emotions, such as comfort or relief, and the attenuation hypothesis would have been supported. However, in order to interpret the valence of the heightened arousal more precisely, future research should incorporate additional dependent variables, including self-report measures.

An additional limitation is our ability to generalize to real world situations because participants were simply viewing a Facebook page, rather than networking through their own page. In addition, the face-to-face exposure was limited to a same-sex encounter without direct interaction. While we expect that using one's own Facebook page, opposite-sex encounters, or direct interactions would only serve to increase the arousal-heightening effect, further testing is required.

Because of its growing pervasiveness, the understanding of the advantages and disadvantages of Facebook interactions continues to be of considerable importance. Its influence on those who struggle with social anxiety is particularly critical.

Author Disclosure Statement

No competing financial interests exist.

References

1. Facebook Press Room. www.facebook.com/pres.php (accessed Aug. 15, 2012).
2. Cheung CMK, Chiu PY, Lee MKO. Online social networks: why do people use Facebook? Computers in Human Behavior 2011; 27:1337–1343.
3. Raacke J, Bonds-Raacke J. MySpace and Facebook: applying the uses and gratification theory to exploring friend-networking sites. CyberPsychology & Behavior 2008; 11:169–174.
4. Urista MA, Dong Q, Day KD. Explaining why young adults use MySpace and Facebook through uses and gratifications theory. Human Communication 2009; 12:215–229.
5. Schiffrin H, Edelman A, Falkenstern M, et al. The associations among computer-mediated communication, relationships, and well-being. CyberPsychology, Behavior, & Social Networking 2010; 13:299–306.
6. Caplan SE. Relations among loneliness, social anxiety, and problematic Internet use. CyberPsychology & Behavior 2007; 10:234–242.
7. Pierce T. Social anxiety and technology face-to-face communication versus technological communication among teens. Computers in Human Behavior 2009; 25:1367–1372.
8. McKenna KYA, Bargh JA. Plan 9 from cyberspace: the implications of the Internet for personality and social psychology. Personality & Social Psychology Review 2000; 4:57–75.
9. Campbell AJ, Cumming SR, Hughes I. Internet use by the socially fearful: addiction or therapy? CyberPsychology & Behavior 2006; 9:69–81.
10. Amichai-Hamburger Y, Wainapel G, Fox S. "On the Internet no one knows I'm an introvert": extroversion, neuroticism, and Internet interaction. CyberPsychology & Behavior 2002; 5:125–128.
11. Pempek TA, Yermolayeva YA, Calvert SL. College students' social networking experiences on Facebook. Journal of Applied Developmental Psychology 2009; 30:227–238.
12. Nadkarni A, Hofmann SG. Why do people use Facebook? Personality & Individual Differences 2011; 52:243–249.
13. Schlenker BR, Leary MR. Social anxiety and self-presentation: a conceptualization and model. Psychological Bulletin 1982; 92:641–669.
14. Jay M. Just say no to Facebook social comparisons! Psychology Today 2012. www.psychologytoday.com/blog/the-defining-decade/201203 (accessed January 4, 2013).
15. Duggan M, Brenner J. The demographics of social media users—2012. Pew Internet. http://pewinternet.org/Reports/2013/Social-media-users/Social-Networking-Site-Users/Demo-portrait.aspx (accessed May 3, 2013).
16. Weinstock LS. Gender differences in the presentation and management of social anxiety disorder. Journal of Clinical Psychiatry 1999; 60:9–13.
17. Leary MR. Social anxiousness: the construct and its measurement. Journal of Personality Assessment 1983; 47:66–75.
18. Bradley MM. (2007) Emotion and motivation. In Cacioppo J, Tassinary L, Bernston G, eds. *Handbook of psychophysiology.* 2nd ed. New York: Cambridge University Press, pp. 602–642.
19. Nichols KA, Champness BG. Eye gaze and the GSR. Journal of Experimental Social Psychology 1971; 7:623–626.
20. Lang PJ, Bradley MM, Cuthbert BN. International affective picture system (IAPS): Technical manual and affective ratings. Technical report A-8 2008. Center for Research in Psychophysiology, University of Florida.

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