



# Social relationships and information dissemination in virtual social network systems: An attachment theory perspective



Erez Yaakobi<sup>a,\*</sup>, Jacob Goldenberg<sup>b</sup>

<sup>a</sup> Ono Academic College, Kiryat Ono, Israel

<sup>b</sup> Hebrew University, Israel

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## ABSTRACT

Web-based communication via social networking sites has become an integral method of communication, raising the question of whether the well-established Attachment Theory remains applicable to modern relationships. This communication shift is also likely to affect the information dissemination dynamic; i.e., how internal attachment working models relate to virtual modes of communication. Three studies (354 participants in total, median age 27) examined the applicability of Attachment Theory to web-based social network communications. Using self-report measures (Study 1) and an experimental simulation (Study 2), the results indicate that attachment security level predicts an individual's number of social ties and willingness to initiate web-based relationships. Secure individuals emerged as best situated to become social hubs. Study 3 reveals that a decrease in avoidance scores predicts an increased willingness to deliver information to others. Anxious participants exhibited less willingness to deliver highly threatening information but more willingness to deliver neutral information to others.

These findings support the applicability of attachment internal working models to predicting web-based social network communication, and suggest that Attachment Theory can be a predictor of the dynamics of web-based dissemination of information.

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## 1. Introduction

In recent years there has been a significant shift in the nature of social interactions from face-to-face to web-based social communication. Studies show that web use as an alternative and even a substitute for face to face communication is expanding rapidly (Ellison, Steinfield, & Lampe, 2007; Ross et al., 2009; Stern, 2008; Taylor, McMinn, Bufford, & Chang, 2010). Social media such as Facebook have affected social relationships in ways that researchers are only beginning to understand. Attachment Theory is one major way of analyzing social interactions. Attachment Theory describes the dynamics of long-term relationships and has been implemented extensively as a starting point for understanding human behavior.

Attachment Theory identifies different personality orientations that are manifested in individuals' internal working models and conceptualized in terms of anxiety and avoidance. These orientations have consistently been found to be associated with specific aspects of social relationships including such traits as relationship qualities, self-disclosure in group settings, social information

processing, the tendency to embrace or avoid close relationships, and threat regulation strategies, to cite only a few (Dwyer et al., 2010; Mikulincer & Shaver, 2007; Saferstein, Neimeyer, & Hagans, 2005; Shechtman & Rybko, 2004).

Most studies drawing on Attachment Theory have been premised on the examination of face-to-face communication. The recent communication paradigm shift to web-based social network communications calls for a re-examination of the applicability of Attachment Theory.

The three studies reported below were designed to contribute to this relatively unexplored area and address the fundamental question of whether Attachment Theory is applicable in the world of today's communications. These studies examine how the characteristics of different attachment orientations, including the secure attachment approach, interdependence tendencies, anxious attachment hyper-activation strategies for threat regulation, and avoidance attachment social avoidance tendencies manifest in web-based social network systems such as popularly used social media.

## 2. Attachment orientation

The study of attachment was pioneered by the work of Bowlby (1969, 1973, 1979, 1988). Bowlby's work examined and

\* Corresponding author. Address: School of Management, Ono Academic College, 104 Zahal Street, Kiryat Ono, Israel. Tel.: +972 509 099 567; fax: +972 3 634 2184.  
E-mail address: [dr.yaakobi@ono.ac.il](mailto:dr.yaakobi@ono.ac.il) (E. Yaakobi).

emphasized the importance and impact of early attachment behaviors between child and caregiver as the basis for an individual's relationship interactions throughout life. This led to the development of the concept of internal working models that can be applied to new social situations, and therefore guide individuals' social perceptions and behaviors with others throughout life (Feeney, Cassidy, & Ramos-Marcuse, 2008). Bowlby's theory was empirically confirmed by numerous studies showing that early attachments influence other relationships and can predict an individual's behavior and interpersonal functioning in adulthood (Diamond & Fagundes, 2008; Mikulincer & Shaver, 2007; Shaver, Collins, & Clark, 1996; Zimmermann, 2004). For example, there is extensive empirical evidence that early attachment orientations influence adults' relationships with friends (Berlin, Cassidy, & Appleyard, 2008; Feeney, 2008), adults' interactions with unfamiliar people (Roisman, 2006), and interactions with their peers (Allen, 2008).

Based on Bowlby's theory later developments by other researchers led to the current preferred reliable and valid measure of individual differences known as the Experiences in Close Relationships scale ("ECR") (e.g. Brennan, Clark, & Shaver, 1998), which categorizes individuals on two independent roughly orthogonal dimensions: (i) anxiety and (ii) avoidance. The anxiety dimension represents the extent to which individuals are concerned that a partner will not be available and responsive during their times of need. The avoidance dimension represents the extent to which individuals lack trust in their partners' goodwill and consequently strive to maintain behavioral independence and emotional distance from partners (Mikulincer & Shaver, 2007). Individuals who score low on either the attachment anxiety and/or the avoidant attachment dimensions are generally more secure and have a tendency to utilize constructive and effective affect-regulation strategies. On the other hand, individuals who score high on either or both of these dimensions tend to suffer from attachment insecurities and rely on hyper-activation or deactivation to cope with threats (Cassidy & Kobak, 1988).

High avoidance relationship patterns include maintaining interpersonal distance from others (Gillath et al., 2006), a tendency to be self-reliant, and fleeing from emotional situations (Mikulincer & Shaver, 2007). In contrast, individuals with high anxiety place a great deal of importance on relationships and are strongly motivated to form them; they have proximity goals and over-rely on proximity-seeking tendencies in their relationships, accompanied by ambivalence in relationships and high fear of abandonment by others (De-Witte & De-Houwer, 2008; Mikulincer & Shaver, 2007; Mikulincer, Shaver, Bar-On, & Ein-Dor, 2010).

Most of the studies that have examined attachment orientation and communication have examined face to face interactions. They found that avoidant (vs. secure) individuals have weaker communication skills with friends, as manifested for example, in withdrawal behaviors (Shomaker & Furman, 2009). These individuals are likely to have difficulty communicating openly and constructively about emotional topics, employ deactivating affect regulation strategies aimed at minimizing hurt and distress from others (Cassidy & Kobak, 1988; Dozier & Kobak, 1992) and exhibit a decreased willingness to self-disclose (Gillath et al., 2006; Shechtman & Rybko, 2004).

Empirical research has also shown that the level of security associated with individual working models was significantly correlated with social information processing (Dwyer et al., 2010). These authors found a relationship between lower levels of security and more maladaptive social information processing among early adolescent boys and girls. This was revealed, for example, in an increase in erroneous attributions to others' behaviors due to insecure attachments. Thus the goals of individuals with anxiety or avoidant models may also impact their decisions as to which and how much information to disseminate to others.

### 3. Social network communications and the web

Information dissemination studies have shown that social groups are structured around a small number of influential individuals with many friends who enjoy above-average social power and can sway the attitudes, opinions, decisions and actions of other group members. Highly influential individuals are characterized by one or a combination of three independent traits: strong social communication skills (e.g. charisma, empathy), expertise (in their field), and social connectivity (many social ties) (Goldenberg, Han, & Lehmann, 2010).

A social hub can be described as a person connected to a large number of other people in a network. Hub's extensive social connections can create an invisible yet powerful network of interpersonal communications that ultimately lead to significant changes in their social system including which information will be disseminated as a function of individual members' role as an information source (Goldenberg, Lehmann, Shidlovski, & Matser-Barak, 2006). A hub's central role in the dissemination and flow of information in social systems makes it crucial to identify and predict who is likely to become one. Goldenberg et al. (2010) argued that because these connections function as pathways on which socially relevant information is transmitted and shared, the quantity of ties represents a hub's social connectivity.

In a study that examined the association between personality and internet use based on Eysenck's personality dimensions, psychoticism was the only personality dimension related to establishing new relationships and having "internet only" friends, whereas extroversion was the only personality dimension related to maintaining long-distance relationships and supporting daily face-to-face relationships (Tosun & Lajunen, 2010). Correa, Hinsley, and de Zúñiga (2010) investigated the relationship between extraversion, emotional stability and openness to experiences of the Big-Five model and the use of social networking sites (in particular SMS). The authors found that although extraversion and openness to experiences were positively related to social media use, emotional stability was a negative predictor when controlling for socio-demographics and life satisfaction. These findings differed for gender and age. Extraverted men and women were both likely to be more frequent users of social media tools, but only men with greater degrees of emotional instability were more regular users. The relationship between extraversion and social media use was particularly strong among the young adult cohort. Conversely, being open to new experiences emerged as an important personality predictor of social media use for the more mature segment of the sample. Ross et al. (2009) found that the Big Five personality factor was weakly related to Facebook use. Based on Ross et al.'s study, Amichai-Hamburger and Vinitzky (2010) found a stronger connection between personality and Facebook behavior by measuring the user-information upload on Facebook.

Buote, Wood and Pratt (2009) showed that secure individuals had more off-line as well as on-line friends as compared to *insecure* (high on anxiety and/or avoidance) individuals. However, they did not test the applicability of Attachment Theory to online interactions or examine how the type of information disseminated affected the type of information each attachment orientation was willing to deliver to others.

Here it should be noted that there are distinct and material differences between non-face-to-face social systems such as web social systems such as social media, on one hand, and face-to-face human interactions, on the other. Non-face-to-face social systems are distinctive in that they afford their users a relatively anonymous medium as well as the provision of group venues where individuals can meet others with similar interests and values (Bargh & McKenna, 2004). Thus, the current research which examines the association between Attachment Theory and web-based social

communication can lead to a more complete understanding of the psychodynamics of relationships and information dissemination through such systems and contribute to researchers' understanding of the interplay between personality factors and modern communication networks.

#### 4. The current studies

The purpose of the three studies presented below was to fill the existing research gap, and extend previous attachment studies to web-based communication networks such as social media to evaluate the ability of attachment orientations to predict the dynamics of the individual relationships and dissemination of information in web-based social systems using both self-report and experimental settings.

The overarching hypothesis is that Attachment Theory remains applicable to web-based interactions and social networks. The specific hypothesis is that characteristics found to hold for each orientation in face to face communications will be valid in virtual relationships as well.

Namely, we expect that secure individuals will exhibit greater social ties and initiation of relations in web-based social networks, anxious individuals will manifest increased willingness to deliver non self-threatening information to others, and avoidant individuals will be less willing to deliver different types of messages but not to initiate non-emotional exchanges.

#### 5. Study 1

In Study 1, as an initial measure, we tested the applicability of Attachment Theory to web-based communications by investigating whether attachment orientations would predict the nature of people's relationships. We did so by examining the number of web-based social ties, the direction of initiation of these relationships (person/others), and the time spent on maintenance of such relationships. We hypothesized that the degree of attachment security would positively predict an individual's number of social connections and the number of initiated as well as non-initiated social connections. We also hypothesized that the anxiety score would positively predict the time spent on maintenance of relationships. This study also laid the groundwork for Studies 2 and 3 by mapping out the position of the various attachment orientations in the dissemination of information (i.e., the more ties individuals possess or initiate, the better positioned they are to participate in the dissemination of information).

##### 5.1. Method

###### 5.1.1. Participants

One hundred thirty-four BA and MBA students enrolled in a special business administration college in Israel (74 men and 60 women ranging in age from 19 to 53,  $mdn = 24$ ) volunteered to take part in the study. Fifty-eight percent identified themselves as secular and 42% as observant Jews. Sixty-five percent were in relationships and 35% were not. About half (57%) were undergraduates and 43% graduates. Over three quarters (86%) were employed and 14% were unemployed. No monetary compensation was provided.

###### 5.1.2. Materials and procedure

Participants were informed that they were taking part in a study of personality and social psychology and were tested in groups of 25–80. They were asked to complete two questionnaires and were instructed to work through the packet at their own pace but in the order of presentation.

Following a brief socio-demographic sheet, participants were asked to fill in a social communication questionnaire. In the five questions in this profile, a web social network was defined as a web-based social system that participants regularly used to communicate with each other (such as Facebook) and participants were asked to specifically relate to their social connections. The first question related to the participants' number of web social connections ("how many friends do you have on the web-based social network system"). Two questions examined the directionality of their existing social relationships: participants were asked to indicate how many people they had invited to be their friends and how many friendships others had initiated. Participants were told that the number of initiated + non-initiated friends needed to add up to the total number of people they were friends with on the website. Finally participants were asked to indicate the amount of time (hours) they had spent the previous week on the web social system maintaining relationships and the number of people they had initiated relationships with during the previous week. The two latter questions served to obtain further insights into their most recent relationship profile.

Next, participants completed the Experiences in Close Relationships (ECR) scale (Brennan et al., 1998) by rating the extent to which each item described their feelings and behaviors in close relationships on a 7-point scale ranging from "not at all" (1) to "very much" (7). Eighteen items assessed attachment anxiety (e.g., "I worry about being abandoned") and 18 assessed avoidance (e.g., "I prefer not to show a partner how I feel deep down"). The reliability and validity of the scales have been repeatedly demonstrated (beginning with Brennan et al., 1998; see Mikulincer & Shaver, 2007, for a review). In the present study, the Cronbach  $\alpha$  was .89 for the anxiety items and .82 for the avoidance items. Mean scores were computed for each participant on each scale, and the two scales were correlated,  $r(132) = .19, p = .027$ . After completing the ECR scale, participants were debriefed and thanked for their participation.

#### 6. Results and discussion

To examine the extent to which the degree of social connections and initiation of such interactions can be predicted from attachment measures, after controlling for the effects of the demographic variables, five hierarchical regression analyses for the social connections measures were conducted. In each regression the demographic variables were entered simultaneously in the first step of the equation. Attachment measures were entered in the second step and the Anxiety  $\times$  Avoidance interaction was entered in the third step of the equation (treated as Z-scores).

The results of these analyses appear in Table 1.

Entering Anxiety and Avoidance scores into the regression analysis after controlling for the demographics revealed that anxiety was positively correlated with the time spent the previous week in maintaining relationships via the web social network system, and for the number of people the participant initiated relationships in the last week (see Table 1). The avoidance score was not correlated with any of the dependent variables.

Entering the two-way Anxiety  $\times$  Avoidance interaction to the regression analysis after controlling for the demographic variable and anxiety and avoidance scores contributed significantly to the prediction of the number of web social connections, the number connections initiated by the participant, and the number of connections initiated with the participant by others (see Table 1).

Simple slope analyses (Aiken & West, 1991) revealed that avoidance was negatively associated with degree of web social connections only when anxiety was relatively low ( $-1$  SD),  $\beta = -.34, p = .004$ , but not when attachment anxiety was high ( $+1$

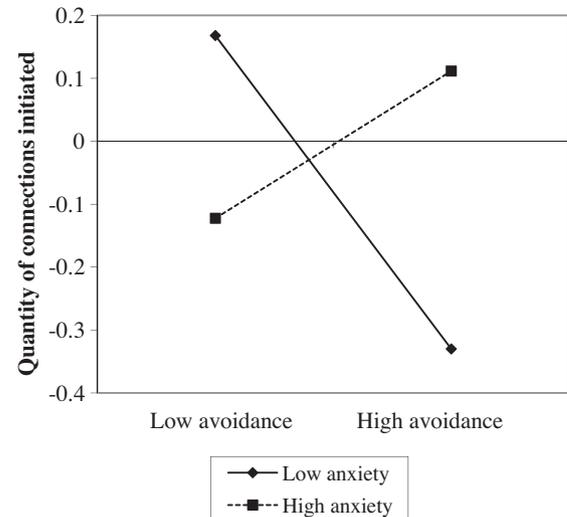
**Table 1**  
Hierarchical Regression Analysis Predicting Number and Initiations of Social Connections based on Attachment Measures (Study 1).

Measures	Number of connections $\beta$	Number of connections initiated by participants $\beta$	Number of connections not initiated by participants $\beta$	Time spent maintaining relationships in the previous week $\beta$	Number of people with whom the participants initiated relationships in the previous week $\beta$
<i>Step 1</i>					
Age	-.22*	-.21*	-.17**	-.01	-.14
Sex a	.03	-.08	.07	-.04	-.17
R <sup>2</sup> Change	.05*	.04	.04	.00	.04
<i>Step 2</i>					
Anxiety	-.04	.04	-.08	.22**	.28**
Avoidance	-.13	-.09	-.15	-.02	-.01
R <sup>2</sup> Change	.02	.01	.03	.05*	.08**
<i>Step 3</i>					
Anxiety × Avoidance	.26**	.19*	.24**	.08	.04
R <sup>2</sup> Change	.07**	.03*	.05**	.01	.00

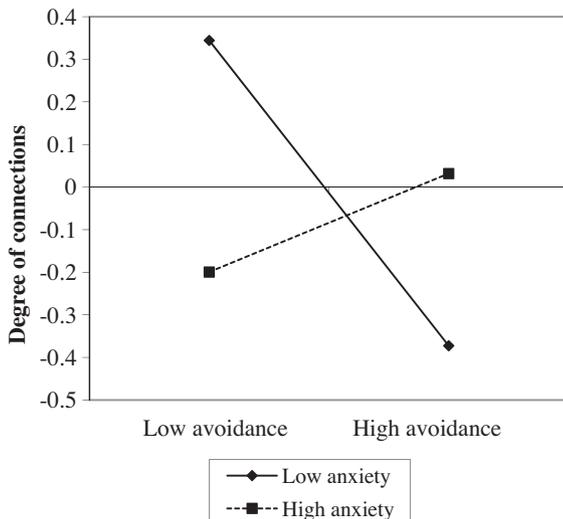
Notes: a Sex: 1 = male; 2 = female.  
\*  $p < .05$ .  
\*\*  $p < .01$ .

SD),  $\beta = .15, p = .24$  (see Fig. 1). Simple slope analyses (Aiken & West, 1991) regarding the initiation of web social connections revealed that avoidance was negatively associated with initiation of social connections via web social network systems only when anxiety was relatively low ( $-1$  SD),  $\beta = -.24, p = .046$ , but not when attachment anxiety was high ( $+1$  SD),  $\beta = .14, p = .27$  (see Fig. 2). With respect to social connections via web social network systems that were initiated by others, simple slope analyses (Aiken & West, 1991) revealed that avoidance was negatively associated with the quantity of non-initiation of social connections via web social network systems only when anxiety was relatively low ( $-1$  SD),  $\beta = -.33, p = .005$ , but not when attachment anxiety was high ( $+1$  SD),  $\beta = .10, p = .43$  (see Fig. 3).

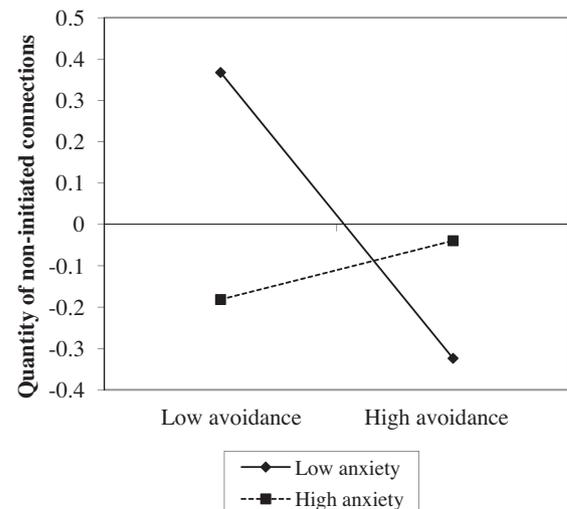
Study 1 thus provided evidence that different attachment orientations exhibit the same patterns of communications in web social network systems such as Facebook as they do in face-to-face social interactions, thereby confirming the extension and applicability of Attachment Theory to web-based communications regarding the nature of attachment orientation relationships. The findings also map out how attachment orientations are positioned in the social media network: more secure attachment orientations (low on anxiety and/or avoidance) have a greater tendency to become social hubs, as seen in their greater number of social network



**Fig. 2.** Quantity of initiations of web social connections based on attachment measures.



**Fig. 1.** Number of web social connections based on attachment measures.



**Fig. 3.** Quantity of non-initiated web social connections based on attachment measures.

connections, greater number of initiated connections, and greater number of non-initiated connections; anxious individuals reported more time investment in facilitating their relationships in such systems; and avoidant individuals are least likely to be social hubs as they are least likely to initiate social relationships, or receive social relationship requests initiated by others. These questionnaire findings were then explored in more detail in a behavioral simulation in Study 2.

## 7. Study 2

Study 2 examined whether the same results and thus the applicability of Attachment Theory regarding the nature of attachment orientations would be replicated in an actual web-based experimental behavioral simulation on Facebook. The study also tested how long it would take the various attachment orientations to initiate a non-emotional social tie and whether an individual's avoidance tendencies (which according to Attachment Theory prevents individuals from initiating social relationships) would be affected if initiation was perceived as a non-emotional exchange. We hypothesized that Attachment Theory would be confirmed as applicable to web-based communications, and specifically that the number of social ties (Facebook friends in this case) would be higher among more secure individuals. Differences between attachment orientations were also hypothesized to relate to the time it would take for individuals to initiate a non-emotional exchange. This involved asking the research assistant to be their first friend on Facebook as a prerequisite to participating in the experiment. We further hypothesized that individuals with high avoidance scores would initiate the initial message at the same rate as other participants because the interaction did not involve any emotional ties.

### 7.1. Method

#### 7.1.1. Participants

One hundred and six individuals (52 men and 54 women, ranging in age from 19 to 46,  $mdn = 29$ ) volunteered to take part in the study. Fifty-nine percent identified themselves as secular and 41% as observant. Sixty-eight percent were in relationships and 32% were not. Fifty-six percent were undergraduates and 44% graduates. Virtually all (95%) were employed and 5% were unemployed. No monetary compensation was provided.

#### 7.1.2. Materials and procedure

Participants were invited to participate in a simulation of web-based communication via Facebook lasting three weeks. They were told that the purpose of the experiment was to examine how different people communicate in web-based social network systems. The general instructions were identical to those in Study 1. After completing the demographics sheet, the participants took the ECR questionnaire. The Cronbach  $\alpha$ s in this sample were acceptable for the anxiety and avoidance scales (.89, .89 respectively). Then, participants were told that in the next three weeks they were to join a Facebook group which would be accessible only to them and no one else except for the research assistant, who could view, read, or text to the page. In order to preserve the participants' anonymity they were asked to choose a nickname, not upload a picture, and not use their own real names at any time. All participants were asked to open a new Facebook page (even participants who already had one) for purposes of the experiment. They also opened a new email account for this purpose. They were told that in order to join the group they would have to first invite the research assistant to be their friend and that the research assistant would accept their invitation that same day (defined as a

non-emotional social exchange because it functioned simply as a 'start button' for the study). They were told that after inviting the research assistant they would have no further communication with the research assistant and that they could then invite and or accept any other participant(s) into the group and engage in any other regular Facebook functions (e.g., post notes, write messages, make comments, etc.). The site was closed down after this three-week period. The number of friends was then tabulated for each participant as well as the length of time that elapsed before the research assistant was invited to be their friend. Finally, participants were debriefed and thanked for their participation.

## 8. Results and discussion

To examine whether the number of participants' web-based social network friendships and the time it took them to initiate relationships with the research assistant could be predicted from attachment measures after controlling for the effects of demographics, two hierarchical regression analyses for the different measures were conducted. In each regression, participants' demographics were entered simultaneously in the first step of the equation. We first entered 4 variables in the regression equation to examine the prediction of attachment above and beyond age, gender, degree (graduate/undergraduate), and observance. It was hypothesized and then confirmed, based on an initial correlational analysis, that degree would be related to the dependent variables since undergraduates and graduates are generally in different places in their lives and would therefore interact with web based social networks in a different manner. It was further hypothesized and then confirmed, based on an initial correlational analysis, that observance would be related to the dependent variables since religious people tend to favor values that promote conservation of social and individual order and, conversely, dislike values that promote openness to change and autonomy (Saroglou, Delpierre & Dernelle, 2004).

Attachment measures were entered in the second step and the Anxiety  $\times$  Avoidance interaction was entered in the third step of the equation. The results of these analyses appear in Table 2.

There was a significant contribution of anxiety (negative) but not avoidance in predicting number of friends. However, there was a significant contribution of avoidance (negative) but not

**Table 2**

Hierarchical Regression Analysis predicting the degree and time elapsed before initiating communication with research assistant (RA) based on Attachment Measures (Study 2).

Measures	Degree	Time to initiate the initial interaction with RA
	$\beta$	$\beta$
<i>Step 1</i>		
Age	-.02	-.06
Sex a	.11	-.12
Observance b	.42***	-.33**
Group c	-.35***	.04
R <sup>2</sup> Change	.25***	.12*
<i>Step 2</i>		
Anxiety	-.22*	.10
Avoidance	.02	-.36***
R <sup>2</sup> Change	.05*	.14***
<i>Step 3</i>		
Anxiety $\times$ Avoidance	-.13	-.19*
R <sup>2</sup> Change	.02	.04*
Total R <sup>2</sup>	.31***	.30***

Notes: a Sex: 1 = male; 2 = female. b Observance: 1 = Ultraorthodox; 2 = Traditional; 3 = Conservative; 4 = Secular. c Group: 1 = BA degree; 2 = MA degree.

\*  $p < .05$ .

\*\*  $p < .01$ .

\*\*\*  $p < .001$ .

anxiety in predicting the time it took participants to initiate interaction with the research assistant via the web social network system. Entering the two-way Anxiety  $\times$  Avoidance interaction contributed only to the prediction of the time it took for individuals to initiate communication with the research assistant. Simple slope analyses (Aiken & West, 1991) revealed that avoidance was negatively associated with the time for initiating communication with the research assistant only when anxiety was relatively high (+1 SD),  $\beta = -.52$ ,  $p = .0002$ , but not when attachment anxiety was low (–1 SD),  $\beta = -.25$ ,  $p = .06$  (see Fig. 4).

The findings in Study 2 supported the findings in Study 1 and the hypotheses that attachment orientation would relate to the degree of actual number of friends as well as participants' willingness to initiate relationships in web-based social network systems and would therefore provide evidence for the applicability of Attachment Theory to web-based social networks. Anxiety scores negatively predicted the actual degree number of social relationships, which is consistent with the findings of Study 1. Furthermore, highly avoidant tendencies, which have been found to lead to decreased willingness to initiate a relationship in face to face communications, were reduced or even eliminated when the communication was in an anonymous web-based social system and was a non-emotional exchange. In addition, anxious individuals were the slowest to initiate the non-emotional exchange. Study 3 was designed to further probe these web-based communication differences between attachment orientations.

## 9. Study 3

Study 3 was designed to examine the types of communication disseminated between existing social connections and specifically, the willingness of each of the different attachment orientations to deliver various types of information to others via Facebook. According to Attachment Theory, a major differentiating factor between orientations is how they cope with threats. Bowlby theorized that attachment tendencies come to the fore most clearly in times of threat.

We hypothesized that individuals' willingness to disseminate information would not only be associated with the number of social ties or initiation tendencies but would also be highly dependent on the level of threat linked to the communication. Specifically we hypothesized that (1) more secure individuals would be the most willing to deliver communications regardless of content

because of their use of constructive affect-regulation strategies when dealing with threats and their proximity seeking drive; (2) the anxiety score would negatively predict individuals' willingness to deliver highly threatening communications due to their fear of abandonment and rejection, as well as the perceived threat of delivering such communications; (3) the avoidance score would negatively predict individuals' willingness to deliver any type of communication due to their interest in maintaining emotional distance from others and avoiding social interactions.

### 9.1. Method

#### 9.1.1. Participants

One hundred and fourteen individuals (37 men and 77 women, ranging in age from 19 to 52,  $mdn = 27$ ) volunteered to take part in the study. Sixty-five percent identified themselves as secular and 35% as observant. Sixty-five percent were in relationships and 35% were not. Roughly half (47%) were undergraduates and 53% graduates. Eighty-eight percent were employed and 12% were unemployed. No monetary compensation was provided.

#### 9.1.2. Materials and procedure

The setting and the general instructions were identical to those in Study 1. Following a brief socio-demographic sheet (identical to the one used in Study 1) participants were instructed to indicate their willingness to deliver 11 different types of information to others via Facebook. Specifically, they were asked to indicate how many of their friends they would be willing to deliver each type of message on a scale ranging from 1 (I will keep this information to myself and not inform others about it) to 6 (I will deliver this information to all the people I know). The items were based on a pretest with a focus group that ranked messages as high threat, low threat or neutral as regards job security since all the participants in Study 3 were in the process of obtaining a degree geared toward job-oriented goals. In addition to currently attending college, all the participants in Study 3 had previously been employed and over 87% of were currently working. Participants then completed the ECR scale (as in Study 1). In this sample, the Cronbach  $\alpha$ s were acceptable for the anxiety and avoidance scales (.87, .83). Participants were debriefed and thanked for their participation.

## 10. Results and discussion

In order to examine the factorial structure of the willingness to deliver different types of information, we conducted a principal component analysis with direct oblimin rotation. Although the scale was constructed around three theoretical forms of entitlement (regarding three potential different threat levels of the information: neutral, low threat, and high threat), we first conducted an exploratory factor analysis to assess whether the items statistically split into the three theoretical factors. This analysis yielded the three major factors (eigenvalue  $> 1$ ) that accounted for 59.88% of the total variance. Factor 1 (33.27% of the explained variance) included 5 items (loading  $> .63$ ) assessing neutral information (e.g., "you saw a good movie," "you ate in a good restaurant"). Factor 2 (16.37%) included 4 items (loading  $> .63$ ) assessing low threat information (e.g. "new employees are going to join your department," "your organization is going to merge with another organization"). Factor 3 (10.23%) included 2 items (loading  $> .60$ ) assessing high threat information (e.g. "you heard that some workers are going to be fired on your team," "there will be dramatic downsizing in your organization"). The Cronbach alphas for the three expected factors ranged from .74 to .76. There was a low to medium correlation between the three factors (ranging from 0.17

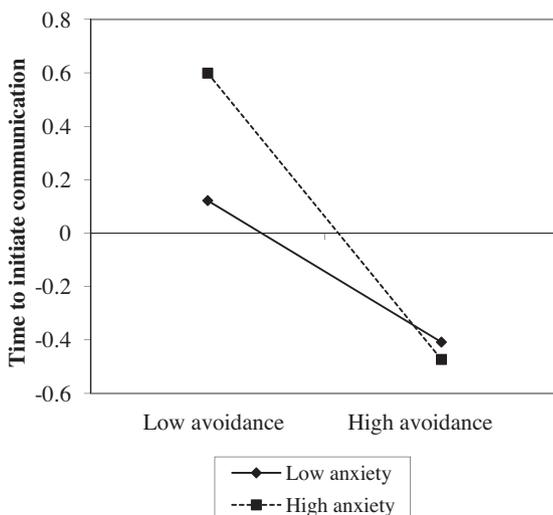


Fig. 4. Time to initiate communication with the research assistant based on attachment measures.

to 0.38) which may imply that some types are more related to others but can be treated as different in the analysis.

To examine whether the extent of an individual's willingness to deliver different types of messages could be predicted from attachment measures after controlling for the effects of the demographic variables, we conducted three hierarchical regression analyses for the different types of messages. In each regression, the demographic variables were entered simultaneously into the equation first. Attachment measures were entered in the second step and the Anxiety  $\times$  Avoidance interaction was entered in the third step of the equation. The results of these analyses appear in Table 3.

There was a negative association between anxiety scores and the willingness to deliver information to others about high-threat events (see Table 3) and a positive association between anxiety scores and the willingness to deliver information to others about leisure (neutral) events (see Table 3). There was also a negative correlation between avoidance scores and the willingness to deliver any kind of information (neutral, low threat, and high threat). Entering the two-way Anxiety  $\times$  Avoidance interaction did not contribute significantly to the prediction of any of the dependent measures.

The results of Study 3 provide further support for the hypothesized associations between avoidant individuals and their social withdrawal tendencies, and attachment-anxiety individuals and their social connectivity seeking (as found in Study 1) regarding neutral activities and a decreased willingness to deliver information to others which they perceive as highly threatening in web-based relationships. These results suggest that attachment internal working models are associated with the type of information people are willing to deliver to others via a web-based network system and the type of information that moderates individuals' willingness to deliver this information.

## 11. General discussion

Overall these three studies provide compelling evidence for the ways in which different attachment oriented individuals communicate in web-based systems. They lend weight to the hypothesis that the associations between attachment and face-to-face interactions can be extended to the world of web social networks. These results also suggest how Attachment Theory may characterize the dynamics underlying motivations for communication in web-based social network systems.

**Table 3**  
Hierarchical Regression Analysis predicting willingness to deliver different messages based on Attachment Measures (Study 3).

Measures	High-threat events	Low-threat events	Neutral events
	$\beta$	$\beta$	$\beta$
<i>Step 1</i>			
Age	-.22*	-.24*	-.04
Sex a	.01	.05	.16
R <sup>2</sup> Change	.05*	.07**	.03
<i>Step 2</i>			
Anxiety	-.20*	-.02	.25**
Avoidance	-.25**	-.34***	-.27**
R <sup>2</sup> Change	.10**	.11**	.13***
<i>Step 3</i>			
Anxiety $\times$ Avoidance	.06	-.02	.14
R <sup>2</sup> Change	.00	.00	.02

Notes: a Sex: 1 = male; 2 = female.

\*  $p < .05$ .

\*\*  $p < .01$ .

\*\*\*  $p < .001$ .

In so doing, we highlight the dynamics of information dissemination by the different attachment orientations in such systems by characterizing their likelihood of being prime players (social hubs) (Studies 1 & 2) and the type of information each are willing to deliver to others (Study 3) through web-based social systems.

Studies 1 and 2 indicate that Attachment Theory is applicable, in that attachment security level positively predicted an individual's number of social ties and willingness to initiate such web-based relationships (Study 1) and in a web-based experimental behavioral simulation (Study 2). Study 1 further accounts for secure individuals' position as best situated to become social hubs. Study 2 hints at a possible motivation that underlies avoidant individuals' initiation of relationships in such web-based social systems by alluding to the possibility that avoidant individuals' avoidance tendencies are reduced or even eliminated when the communication involves a non-emotional exchange (at least in such an anonymous web-based social system), and further confirms findings of anxious relationship ambivalence in that anxious individuals were the slowest to initiate the non-emotional exchange.

Study 3 similarly confirmed Attachment Theory predictions and investigated what types of information are more readily disseminated by the differing attachment orientations. It indicated that a decrease in avoidance scores predicted an increased willingness to deliver information to others. This may explain secure individuals' higher number of connections found in Studies 1 and 2 and serves to confirm avoidant individuals' relational withdrawal tendencies. The results also revealed that an increase in anxiety score predicted a decrease in the willingness to deliver information to others in such web-based network systems when the content of information was high-threat, as well as an increased willingness to deliver neutral information. These results may derive from their fear of abandonment and ambivalence toward relationships (Mikulincer et al., 2010) which is augmented when delivering high threat information and reduced when delivering neutral information. This finding shows that even in a web-based medium which has unique communication features such as better self-presentation management and more control over the time and pace of interaction, more anxious individuals are less willing to deliver high-threat messages. Facebook is a more distant medium and as such, anxious individuals may prefer more direct interaction to find comfort especially in times of threat. Anxious individuals' decreased willingness to deliver high threat messages can also be explained by findings that anxious people report low levels of trust toward partners and show high access to negative trust-related memories (Mikulincer, 1998).

The three studies reported here significantly contribute to Attachment Theory and research. First, they fill the existing gap in empirical research by extending the applicability of Attachment Theory to social network web-based communications by examining the association between individuals' attachment orientation and the likelihood of being a social hub in such systems. As such, the studies provide empirical evidence for the prediction of attachment orientation and dissemination of information framework based on the actual number of social ties in web-based social network systems, the initiation of such web-based relationships, and the initiation of such relationships by others. Second, the studies provide empirical evidence for the applicability of internal working models to web-based social network systems by characterizing the type of messages different attachment orientations are willing to disseminate in such systems both as resources of information and as reactors to different type of messages. The findings indicate that attachment orientations differ in their willingness to deliver different types of information depending on the type of information even in a non-face-to-face communication medium. The results also suggest that avoidant individuals remain less willing

to deliver (initiate) any interactions even in web-based systems. Finally, the findings provide a direction for further examination of how different attachment orientations may interpret different types of web communications.

Our findings are consistent with previous results regarding established attachment orientation tendencies. They confirm that just as secure individuals report better companionship with others in face-to-face relations (Saferstein et al., 2005) and better friendship qualities in general (Furman, 2001; Saferstein et al., 2005; Sibley & Liu, 2006) they are also more likely to become social hubs in web-based communication media, have more social ties and initiate and receive more web-based interactions. Our results are also consistent with previous findings regarding the greater self-disclosure of secure individuals (Gillath et al., 2006; Shechtman & Rybko, 2004; Welch & Houser, 2010). They are consistent with anxious individuals' patterns of proximity-seeking goals and behaviors (De-Witte & De-Houwer, 2008) with respect to their delivery and their ambivalent tendencies (Mikulincer et al., 2010) as they often fear negative consequences and subsequent abandonment.

Despite the unique features of web-based communication the patterns of attachment orientations previously found in face-to-face communication were observed in this study. Although the reactions of others are more predictable in web-based communication, and individuals may feel they have more control over such interactions and that they can manage their self-presentation better through Facebook, our findings for the different attachment orientations in the web-based medium are comparable to those extensively reported for face to face communication.

While our results offer new insights into individuals' interactions via web-based social networks, these studies have their limitations. One limitation is that in Study 3 we used self-report measures and not actual behaviors. While this is a limitation in one respect, we decided to use this methodology for the advantage it does provide, as a means to investigate the different attachment orientation perceptions regarding disseminating information in such a system. Nevertheless, future studies should examine whether behavioral intentions of delivering information in web-based systems, as predicted from attachment orientations, are also concretized in actual behaviors. A second limitation has to do with making contact with a research assistant of roughly the same age as the participants in Study 2. We used this operationalization as a means of creating a non-emotional exchange for students who were the participants in this experiment. However, this constituted a drawback since the generalization of such an operationalization to real-world social communication is limited. Future studies should use other operationalizations to extend the findings.

Another interesting research direction would be to investigate whether the decreased willingness of anxious individuals to deliver information that may be perceived as highly threatening to the self (Study 3) would also be found when the very act of informing another is also perceived as a way to provide a secure base or a "safe haven." Under these circumstances, anxious individuals may be more willing to deliver information to others because they may feel they may get support from others and their worries about rejection and abandonment may decrease in such circumstances. Finally, future studies should directly examine different attachment orientations' explicit and implicit attitudes toward using such systems for delivering and responding to the different messages, as well as the likelihood that such web-based systems can substitute for a face-to-face medium in the different attachment orientations.

## 12. Conclusion

This article strongly suggests that Attachment Theory is applicable to non-face-to-face, web-based social network

communications. It hence serves to expand our understanding of such communications. By both screening different attachment individuals' actual communication profiles, examining their actual behaviors in a simulation, and using self-report measures we contribute to the theoretical and practical understanding by findings indicating that attachment internal working models are universal to web-based social systems as well. These results may lead to a better understanding of the dynamics of information flow in such systems by different attachment orientations. These studies may also help to better understand individuals' motivations underlying the dissemination of information in web-based social network systems and the nature of such web-based relationships.

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