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Adult Attachment, Social Self-Efficacy, Self-Disclosure, Loneliness, and Subsequent Depression for Freshman College Students: A Longitudinal Study

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This longitudinal study examined whether social self-efficacy and self-disclosure serve as mediators between attachment and feelings of loneliness and subsequent depression. Participants were 308 freshmen at a large midwestern university. Results indicated that social self-efficacy mediated the association between attachment anxiety and feelings of loneliness and subsequent depression, whereas self-disclosure mediated the association between attachment avoidance and feelings of loneliness and subsequent depression. These relationships were found after controlling for the initial level of depression. A total of 55% of the variance in loneliness was explained by attachment anxiety, social self-efficacy, and self-disclosure, whereas 42% of the variance in subsequent depression was explained by the initial level of loneliness and depression. Implications of the findings for enhancing freshman adjustment are discussed.

Keywords: adult attachment, social self-efficacy, self-disclosure, loneliness and depression, freshman college students

According to Ainsworth and colleagues (Ainsworth, 1973, Ainsworth, Blehar, Waters, & Wall, 1978), significant life changes or transitions (e.g., beginning college or moving away from home) are likely to activate the attachment system and trigger attachment insecurity. Under low stress, the securely attached child is ready to separate from the caregiver, whereas under high stress the securely attached child actively seeks out and maintains contact with the attachment figure until comforted (Ainsworth et al., 1978). Similarly, for securely attached freshmen, leaving home for college is likely to be perceived as an opportunity for environmental exploration and mastery, whereas this may not be the case for freshmen who are insecurely attached. If their parents remain a secure base, students should continue to seek them out in situations of stress and view their parents as a source of support when needed. Therefore, securely attached freshmen should experience a higher level of social competence and lower levels of distress during this transition period (Kenny, 1987; Kenny & Rice, 1995). However, this adjustment pattern may not be the case for freshmen who are insecurely attached.

The first year of college is generally a stressful life period (Compas, Wagner, Slavin, & Vannatta, 1986), and most freshman college students experience some degree of acute loneliness and isolation (Berman & Sperling, 1991) and depression (e.g., Wolf, Scurria, & Webster, 1998). Indeed, Cutrona (1982) found that 75% of new freshman college students reported feeling lonely during their first 2 weeks at college. Research has shown not only that college student loneliness is positively associated with depression (Joiner, 1997; Russell, Peplau, & Cutrona, 1980) but also that students experiencing loneliness often do not possess the social skills or social competence necessary to begin and develop close interpersonal relationships (Jones, Hobbs, & Hockenbury, 1982). If the deficits in social competence experienced by lonely freshman college students can be identified, then ways of helping them enhance their social competencies in order to build satisfactory relationships might be developed, thereby decreasing feelings of loneliness and subsequent depression. In the present study, we were particularly interested in examining two indices of social competence: social self-efficacy and comfort with self-disclosure, which may constitute social competencies that protect freshmen from developing feelings of loneliness and subsequent depression during this stressful transition period.

Social self-efficacy refers to individuals' beliefs that they are capable of initiating social contact and developing new friendships (Gecas, 1989). Loneliness has generally been associated with negative feelings about interpersonal relationships (Jong-Gierveld, 1987). Lonely people have been judged to be less interpersonally competent than people who are not lonely (Jones et al., 1982; Spitzberg & Canary, 1985), and research has consistently shown a negative correlation between social skills and loneliness (DiTommaso, Brennen-McNulty, Ross, & Burgess, 2003; Riggio, 1986; Riggio, Watring, & Throckmorton, 1993; Segrin, 1993). Therefore, it appears that if freshmen can enhance their social self-efficacy, they may decrease their feelings of loneliness and subsequent depression.

Similarly, self-disclosure refers to individuals' verbal communication of personally relevant information, thoughts, and feelings

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in order to let themselves be known to others. Self-disclosure is an important tool that is used to get to know new people (Laurenceau, Feldman Barrett, & Pietromonaco, 1998) and can be used by freshmen to build friendships in a new environment. Research on self-disclosure has found that the ability to reveal one's thoughts and feelings to others is a basic social skill not only for developing interpersonal relationships (Altman & Taylor, 1973; Berscheid & Walster, 1978) but also for decreasing feelings of loneliness and subsequent depression. For example, self-disclosure is negatively correlated with feelings of loneliness (Berg & McQuinn, 1989; Mahon, 1982; Solano, Batten, & Parish, 1982; Stokes, 1987) and makes a unique contribution to loneliness after controlling for social network size, network multiplicity, and network density (Berg & McQuinn, 1989). Self-disclosure has also been found to contribute to loneliness after controlling for attributional style and perspective taking (Bruch, Kaflowitz, & Pearl, 1988). Additionally, lonely college students were less willing to disclose to others than those who were not lonely (Schwab, Scalise, Ginter, & Whipple, 1998). In particular, self-disclosure of emotions or distress is a more important predictor of relationship development than self-disclosure of only facts and information (Laurenceau et al., 1998). Emotional self-disclosure allows for core aspects of the self to be understood and validated by others, thereby facilitating the building of interpersonal connections and decreasing feelings of loneliness (Laurenceau et al., 1998). Therefore, when freshman college students feel comfortable self-disclosing their emotions or distress, opportunities are provided for them to decrease their feelings of loneliness and subsequent depression.

Theoretically, researchers have begun to argue that Bowlby's (1969, 1973, 1980, 1988) attachment theory can be applied to better understand the adjustment process for freshman college students (e.g., Kenny & Rice, 1995). Empirically, research has shown how attachment quality influences the first year of college students' adjustment (e.g., Kenny & Donaldson, 1992; Lopez & Gormley, 2002). Adult attachment is viewed in terms of two orthogonal dimensions, termed attachment anxiety and attachment avoidance (e.g., Brennan, Clark, & Shaver, 1998). These two adult attachment dimensions can be understood in terms of internal working models of self and others and the process of affect regulation. Individuals with high attachment anxiety are likely to fear rejection and abandonment, to hold negative working models of the self (for a review, see Pietromonaco & Feldman Barrett, 2000), and to use hyperactivation affect regulation strategies (e.g., exaggerate their emotions to obtain attention and support from others) to deal with their stress (for a review, see Lopez & Brennan, 2000; Mikulincer, Shaver, & Pereg, 2003). By contrast, individuals with high attachment avoidance are likely to fear intimacy and dependence, to hold negative working models of others (for a review, see Pietromonaco & Feldman Barrett), and to use deactivation affect regulation strategies (e.g., keep distance from others to protect from disappointment) to cope with stress (for a review, see Lopez & Brennan, 2000; Mikulincer et al., 2003).

Freshman college students with high attachment anxiety or attachment avoidance may have different deficits in their social competencies that contribute to loneliness and subsequent depression. Because others tend to inconsistently respond to their needs, freshman college students with high attachment anxiety may have low levels of social self-efficacy. They may be uncertain about others' availability and responsiveness, even though they need others to be responsive and available to them. This may cause them to feel less confident about their ability to engage in social interactions. Several studies have found that attachment security is related to different aspects of social competence, including social support seeking (Blain, Thompson, & Whiffen, 1993; Cutrona, Cole, Colangelo, Assouline, & Russell, 1994), higher levels of social adjustment and social self-efficacy (Rice, Cunningham, & Young, 1997), better social skills (DiTommaso et al., 2003; Riggio, Throckmorton, & Depaola, 1990), and better dating competence (Kenny, 1987). Mallinckrodt and Wei (2005) argued that enhancing social self-efficacy may be especially important for persons with high attachment anxiety. However, they found that individuals with high levels of both attachment anxiety and attachment avoidance showed deficits in their social self-efficacy. Theoretically, we would expect to find that freshmen with high attachment anxiety would have a deficit in their social self-efficacy because of their negative working model of the self. We did not specify a hypothesis regarding the relation of social self-efficacy with attachment avoidance, given that the working model of self for freshman college students with high attachment avoidance may or may not be positive and that such individuals are likely to have a broad range of perceptions about their social self-efficacy.

Conversely, freshman college students with high attachment avoidance tend to be compulsively self-reliant. They do not expect that others will be responsive if they disclose their distress to them. When they are young, individuals with high attachment avoidance often give up on revealing themselves to others in order to protect themselves from disappointment or hurt. This tendency usually extends into adulthood, leading those with high levels of attachment avoidance to use deactivating strategies to keep their distance from others. Therefore, we would expect that these individuals would be less likely to feel comfortable in disclosing their distress to others, even though mutual self-disclosure is a key factor in developing interpersonal connections and preventing loneliness. Empirically, research has provided evidence that people with high attachment avoidance disclose less to their partners (Collins & Read, 1990), disclose fewer intimate topics (Mikulincer & Nachshon, 1991) or personal disappointment topics (Kobak & Hazan, 1991), and view self-disclosure to others as aversive (Dion & Dion, 1985). Moreover, even when their partners disclose intimate topics to individuals with high attachment avoidance, there is no reciprocal increase in their own level of self-disclosure (Mikulincer & Nachshon, 1991). Therefore, we expected freshmen with high attachment avoidance to have deficits in their comfort level with self-disclosing their distress, which in turn may lead them to experience feelings of loneliness and subsequent depression. However, we did not expect to find that freshmen with high attachment anxiety would have deficits in their discomfort with self-disclosure given that they tend to use hyperactivation strategies to exaggerate their feelings of distress. In summary, social self-efficacy and comfort with self-disclosure were each expected to be unique mediators for freshmen with high attachment anxiety and high attachment avoidance, respectively, in predicting loneliness and subsequent depression (see Figure 1).

From the above review, it appears that there are relationships among attachment, social self-efficacy, comfort with self-disclosure, loneliness, and depression. In addition to the direct associations among these variables, a few studies have begun to

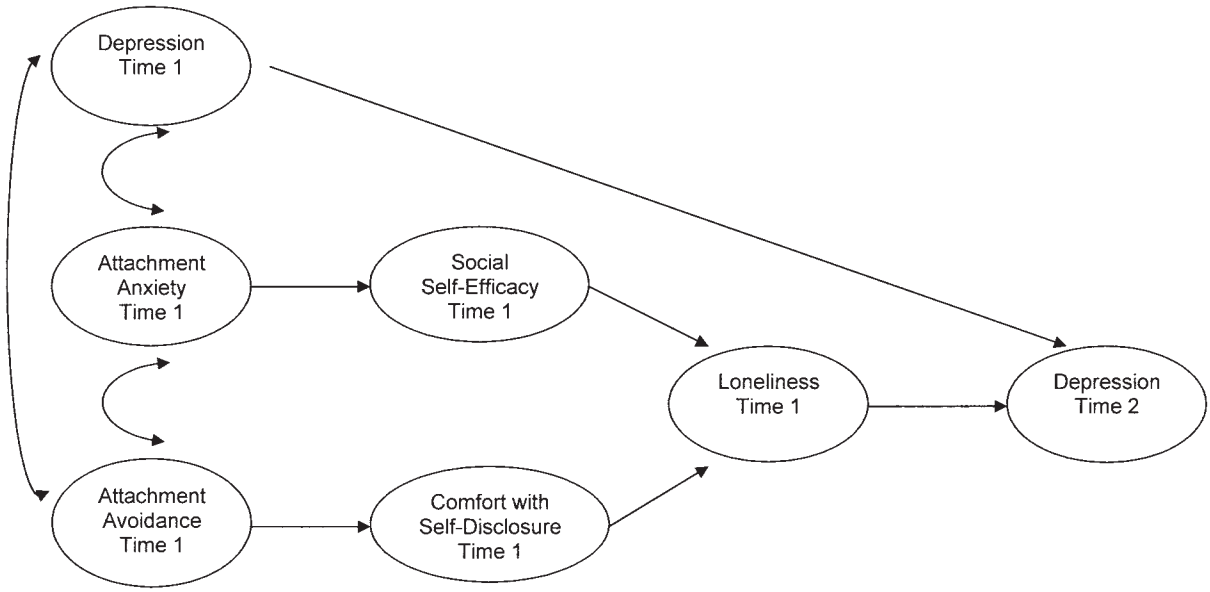

Figure 1. The hypothesized model.

provide empirical evidence of indirect or mediation effects. One study indicated that the facilitative component of self-disclosure (i.e., self-disclosure to one's partner and self-rated ability to elicit disclosure from others) mediates the relationship between secure attachment and relationship satisfaction (Keelan, Dion, & Dion, 1998). Another study indicated that social skills mediated the relationship between secure and fearful avoidance attachment (i.e., individuals high in both anxious and avoidant attachment) and social loneliness (DiTommaso et al., 2003). Researchers have also attempted to provide empirical evidence that loneliness mediates the association between social competence and future depression. For example, Boivin, Hymel, and Burkowski (1995) reported that loneliness mediated the relationship between social withdrawal or peer rejection and subsequent depressed mood for children. Similarly, Joiner (1997) found that loneliness mediated the relationship between shyness and depressive symptoms in a sample of college students.

The above review suggests that freshmen with high attachment anxiety could decrease their feelings of loneliness and subsequent depression through enhancing their social self-efficacy (but not comfort with self-disclosure), whereas freshmen with high attachment avoidance could decrease their feelings of loneliness and subsequent depression through increasing their comfort with self-disclosure (but not social self-efficacy). Because attachment anxiety and attachment avoidance are viewed as two relatively orthogonal dimensions, it is important to identify the unique social competence mediators of each form of attachment Clinically, if distinct mediators are found for each dimension of attachment, these mediators could be used as specific intervention tools to help freshmen with either high attachment anxiety and/or attachment avoidance to decrease their feelings of loneliness and subsequent depression. Therefore, we hypothesized that social self-efficacy would serve as a mediator for freshmen with high attachment anxiety in relation to feelings of loneliness and subsequent depression, whereas one's comfort level with self-disclosure would serve as a mediator for freshmen with high attachment avoidance in relation to feelings of loneliness and subsequent depression. We expected to find these relationships after controlling for the initial level of depression reported by participants.

Method

Participants

Initial sample (Time 1). Potential participants were contacted twice during the span of this study. Freshman students ($N = 3,411$) were first identified through the registrar's database at a large midwestern state university and were subsequently contacted via e-mail. Among the students who were initially contacted, 1,194 (35%) responded to the survey via the Internet at Time 1 (in October of the fall semester). However, 153 surveys were incomplete, and an additional 51 participants answered at least one of two validity items in a way suggesting that they were responding to the survey randomly or inattentively. Therefore, 990 (29%) usable surveys were obtained from the students who were originally solicited at Time 1.

Follow-up sample (Time 2). Of the 1,194 freshmen who responded to the Internet survey at Time 1, 1,089 (91%) provided their e-mail address in order to enter the incentive lottery drawing. These students were contacted to complete the Internet survey at Time 2 (March of the spring semester). A total of 446 (41%) of the freshmen responded to the Internet survey at Time 2. However, 69 surveys were incomplete, and an additional 26 participants answered at least one of two validity items in a way suggesting that they were responding to the survey randomly or inattentively. Thus, 351 (32%) students provided usable data.

Final sample (Times 1 and 2). When the data from Time 1 ($n = 990$) and Time 2 ($n = 351$) were merged, 43 of the students' university ID numbers (last six digits) could not be matched. These students were therefore not included in the analyses. The final group of 308 freshmen retained for analysis included 125 (41%) men and 183 (59%) women with a mean age of 18.31 years ($SD = 0.47$, range = 18–20 years). The survey contained an item that asked the students to indicate the "ethnic identification that best describes you." The sample was composed of 284 (92.0%) students who chose "Caucasian" in response to this item, 4 (1.3%) students who selected "African American," 7 (2.3%) students who self-identified as

"Asian American," 3 (1.0%) students who chose "Hispanic American," 1 (0.3%) student who selected "Native American," 4 (1.3%) students who chose "multiracial American," 4 (1.3%) students who indicated "International student," and 1 (0.3%) student who selected "other." With regard to the relationship status of the students, 207 (67%) were single, 96 (31%) were in a committed relationship, and 4 (1%) indicated a relationship status of "other" (one person did not indicate relationship status).

Instruments

The following section describes the measures that were included in the Time 1 and Time 2 surveys, along with the time at which each measure was administered to participants.

Attachment (Time 1). *The Experiences in Close Relationships Scale (ECRS; Brennan et al.*, 1998) was used to assess attachment. This is a 36-item self-report measure of adult attachment, derived from a comprehensive factor analysis of the major attachment measures used through 1998. Responses are given on a 7-point Likert scale ranging from 1 (*disagree strongly*) to 7 (*agree strongly*). The ECRS directs respondents to rate how they generally experience romantic relationships. The Anxiety subscale consists of 18 items assessing fear of abandonment, preoccupation with one's romantic partner, and fear of rejection. The Avoidance subscale, also composed of 18 items, assesses avoidance of intimacy, discomfort with closeness, and self-reliance. Brennan et al. (1998) reported coefficient alphas for the Anxiety and Avoidance subscales of .91 and .94, respectively. In the present study, coefficient alphas were .92 and .94 for the Anxiety and Avoidance subscales, respectively. Brennan, Shaver, and Clark (2000) reported that the test–retest reliabilities over a 3-week interval were .70 for each subscale. Anxiety and Avoidance subscales have been positively associated with depression and hopelessness (Wei, Mallinckrodt, Russell, & Abraham, 2004) as well as shame, depression, and loneliness (Wei, Shaffer, Young, & Zakalik, 2005).

Social self-efficacy (Time 1). Social self-efficacy was measured by the Social Self-Efficacy subscale (SSES) from the Self-Efficacy Scale (SES; Sherer et al., 1982). The SSES is a 6-item subscale that measures a belief in one's social competence. Participants respond using a 5-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Sherer et al. reported a coefficient alpha of .71 for the SSES; coefficient alpha was .76 for the SSES in the present study. Evidence of construct validity for the measure has been provided by significant correlations with measures of ego strength, interpersonal competency, and self-esteem (Sherer et al., 1982).

Comfort with self-disclosure (Time 1). The Distress Disclosure Index (DDI; Kahn & Hessling, 2001) was used to measure comfort with self-disclosure. The DDI is a 12-item scale designed to measure the degree to which a person is comfortable talking with others about personally distressing information. Items are rated on a 5-point Likert-type scale, with responses ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Kahn and Hessling suggested that the 12 DDI items load on a single factor. DDI scores have shown stable test–retest reliabilities across 2- and 3-month periods of .80 and .81, respectively (Kahn & Hessling, 2001). Internal consistency has been shown to be high across studies, ranging from .92 to .95 (Kahn, Lamb, Champion, Eberle, & Schoen, 2002). The internal consistency was .94 in the present sample. Regarding validity, Kahn and Hessling (2001) found that the DDI was positively associated with the Self-Disclosure Index (Miller, Berg, & Archer, 1983) and negatively associated with the Self-Concealment Scale (Larson & Chastain, 1990).

Depression (Times 1 and 2). The short version of the Center for Epidemiological Studies—Depression Scale (CES-D; Kohout, Berkman, Evans, & Cornoni-Huntley, 1993) was used to assess depression. This is an 11-item version of the CES-D measuring the frequency of depressive symptoms. Items are rated on a 4-point Likert scale that ranges from 0 (*rarely or none of the time [less than 1 day]*) to 3 (*most or all of the time [5–7 days]*) on the basis of the frequency with which participants have experienced that symptom during the previous week. Scores range between 0 and 33, with higher scores indicating a higher frequency of depressive mood and symptoms. Kohout et al. (1993) reported a coefficient alpha of .76 for the short version of the CES-D. In the present study, coefficient alpha was .85 at Time 1 and .83 at Time 2. Convergent validity has been established through positive correlations with the Depression subscale from the Depression, Anxiety, and Stress Scale (Wei, Vogel, Ku, & Zakalik, 2005).

Loneliness (Time 1). Loneliness was assessed with a short version of the UCLA (University of California, Los Angeles) Loneliness Scale (Version 3; Russell, 1996). The UCLA Loneliness scale was designed to detect variations in loneliness in everyday life. The short form of the UCLA Loneliness Scale contains 10 items (5 positive [nonlonely] and 5 negative [lonely] items, which are randomly distributed in the instrument). Respondents are asked to indicate on a scale ranging from 1 (*never*) to 4 (*always*) how often they feel as described in each item. Scores on the scale can range from 10 (lowest degree of loneliness) to 40. Russell reported that the short version of the UCLA Loneliness Scale appears to be reliable, with a coefficient alpha of .89 being found for a sample of public school teachers. Coefficient alpha was also .89 in the present study. In terms of validity, the short version of the UCLA Loneliness Scale was negatively associated with social support, which was measured by the Social Provisions Scale (Cutrona & Russell, 1987).

Procedure

The 3,411 students identified from the registration database were sent an e-mail inviting their participation in an Internet survey at Time 1, and 1,089 students were invited at Time 2. These students were contacted through the university's academic information technology center. Each student was assigned a randomly generated unique identifier (e.g., BODRE) in their individual e-mail message. The purpose of this identifier was to ensure that each participant would only respond once to the survey and that only participants who were selected to be in the pool of participants were able to participate in this study. To ensure anonymity, this unique identifier was not coded with the survey data nor was it connected to participant answers. The introductory e-mail message informed students that this study was about "factors related to freshmen's transition from home to college" and that it would require 30 to 40 min to complete the online survey. In return for participants' help, they could register for a drawing to receive either a $50 or $100 prize. The survey data were kept separate from the incentive entry list. To ensure that the survey data and the incentive entry list could not be linked, the entry list data were returned to the researchers from the university's academic information technology center in a random order.

Results

Creation of Measured Variables

Following Russell, Kahn, Spoth, and Altmaier's (1998) recommendations, we created three observed indicators or parcels for each of the latent variables of attachment anxiety, attachment avoidance, social self-efficacy, comfort with self-disclosure, and depression. To create these measured variables or parcels, we first conducted exploratory factor analyses on each scale, extracting a single factor using the maximum likelihood method of extraction. We then rank ordered the items on the basis of the absolute magnitude of their factor loadings and successively assigned triads of items, going from the highest to the lowest loadings, to each of the three parcels in order to equalize the average loadings of each parcel on the respective factor. For the UCLA Loneliness Scale, Russell (1996) found two factors consisting of positively and negatively worded items, respectively. Therefore, we created sep-

arate scores for the positively worded and negatively worded items from this scale and used these two measures as observed indicators for the loneliness latent variable.[1]

Descriptive Statistics

Before analyses were conducted, participants who completed the survey at both Time 1 and Time 2 were compared with participants who only completed the survey at Time 1 in terms of their gender, ethnicity, age, and the six variables measured at Time 1 (i.e., attachment anxiety, attachment avoidance, social self-efficacy, comfort with self-disclosure, loneliness, and depression). Because of the number of analyses, a Type I error rate of .01 was used for these analyses. Chi-square analyses indicated that there were no significant differences between the two groups of participants in terms of gender, $\chi^2(1, N = 988) = 1.68$, $p = .20$ or ethnicity, $\chi^2(7, N = 990) = 5.98$, $p = .54$. Independent sample t tests also indicated there was no significant difference between the groups in terms of age, $t(964) = 0.52$, $p = .61$, and the six variables assessed at Time 1 (all ps $> .01$). These results indicate that, at least in terms of these characteristics, the loss of participants over time did not appear to bias the sample. Moreover, we compared whether our samples from Times 1 and 2 were comparable to the sample of students invited to participate in the study in terms of their gender distribution. The results from the chi-square tests indicated that women (56% [Time 1] and 60% [Time 2]) were overrepresented in our final Time 1 and Time 2 samples relative to the proportion of women we invited to participate (45%). Conversely, men (44% [Time 1] and 40% [Time 2]) were underrepresented in our final Time 1 and Time 2 samples relative to the proportion of men we invited to participate (55%).

Table 1 presents the means, standard deviations, and zero-order correlations for the 20 observed variables. To test normality assumptions underlying the maximum likelihood procedure, we used the multivariate normality test to examine whether the data were normally distributed. The results indicated that the data were not multivariate normal, $\chi^2(2, N = 308) = 250.39$, $p < .01$. Therefore, the scaled chi-square statistic that adjusts for the impact of nonnormality, developed by Satorra and Bentler (1988), was used in subsequent analyses.

Method of Testing Indirect Effects

The following procedures were used to test the significance of the hypothesized indirect effects associated with the mediation model shown in Figure 1. First, the measurement model was tested for an acceptable fit to the data through a confirmatory factor analysis (Anderson & Gerbing, 1988). Second, the structural model was tested after an acceptable measurement model was developed. Third, a bootstrap procedure was used to evaluate the significance of the indirect effects. A number of methods have been suggested in the literature for testing indirect effects. MacKinnon, Lockwood, Hoffman, West, and Sheets (2002) evaluated 14 methods in terms of Type I error and statistical power. They found that the commonly used method recommended by Baron and Kenny (1986) for testing mediation had the lowest statistical power. Instead, MacKinnon et al. reported that testing the significance of the indirect effect, as discussed by Sobel (1982, 1988), provided a more powerful test of mediation. However, they also noted problems with the standard error associated with the test for the significance of the indirect effect provided by programs such as LISREL. Shrout and Bolger (2002) have suggested a bootstrap procedure (Efron & Tibshirani, 1993) as an empirical method of determining the distribution of parameter estimates in order to test the significance level of the indirect effects. We used this procedure to test the statistical significance of the indirect effects.

We used the maximum likelihood method in LISREL (Version 8.54; Jöreskog & Sörbom, 2003) to examine the measurement and structural models. Three indices were used to assess goodness of fit for the models (Hu & Bentler, 1999): the comparative fit index (CFI; values of .95 or greater indicate a model that fits the data well), the root-mean-square error of approximation (RMSEA; values of .06 or less indicate a model that fits the data well), and the standardized root-mean-square residual (SRMR; values of .08 or less indicate a model that fits the data well). As discussed above, the corrected scaled chi-square difference test (Satorra & Bentler, 2001) was used to compare nested models.

Measurement Model

An initial test of the measurement model resulted in an adequate fit to the data, scaled $\chi^2(148, N = 308) = 221.28$, $p < .01$, CFI = .99; RMSEA = .04 (90% confidence interval [CI] = .03, .05); SRMR = .04.[2] All of the factor loadings of the 20 measured variables on the latent variables were statistically significant ($p < .01$; see Table 2), indicating that the latent variables appear to have been adequately measured by their respective indicators. Moreover, Table 3 shows that the correlations among the independent or exogenous latent variables, the mediator latent variables, and the dependent latent variables were all statistically significant, with the exception of the association between attachment avoidance and attachment anxiety as well as between attachment avoidance and subsequent depression.

Structural Equation Model for Testing Indirect Effects

We hypothesized that attachment anxiety would contribute to loneliness and subsequent depression through the social self-efficacy mediator, whereas attachment avoidance would contribute

[1] We also tested the model using three parcels for the UCLA Loneliness Scale instead of the scores on the positively worded and negatively worded items. The change in the measurement specification for the UCLA Loneliness Scale did not lead to any major changes in the fit of the model to the data. Therefore, given the results presented by Russell (1996) regarding the factor structure of the measure, we decided to use scores on the positively worded and negatively worded items from the measure to operationalize the loneliness latent variable.

[2] To ensure that the nature of the depression construct was the same over time, we constrained the factor loadings of the measured indicators of depression from the first and second assessments to be identical. Also, to control for possible systematic error due to the repeated assessment of depression at Times 1 and 2, we allowed the measurement error between the identical measures of depression to be correlated over time. Thus, for example, we allowed the measurement error for the first measured indicator of depression from Time 1 to correlate with the measurement error for the same first measured indicator of depression at Time 2. This was also done for the second and third measured indicators of depression from Times 1 and 2.

Table 1
Means, Standard Deviations, and Correlations Among 20 Observed Variables

Variable	*M*	*SD*	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. Anxiety1 T1	23.02	6.70	.80	.79	.20	.15	.10	−.37	−.30	−.22	−.13	−.18	−.19	.49	.32	.33	.31	.36	.18	.23	.22
2. Anxiety2 T1	20.21	6.69		.79	.19	.13	.10	−.33	−.32	−.25	−.12	−.18	−.16	.45	.28	.31	.31	.35	.14	.21	.15
3. Anxiety3 T1	22.79	6.89			.10	.01	−.0	−.38	−.27	−.27	−.04	−.09	−.11	.47	.34	.33	.36	.34	.20	.29	.19
4. Avoid1 T1	18.24	6.94				.87	.86	−.15	−.19	−.18	−.38	−.36	−.36	.29	.30	.14	.14	.21	.02	.09	.01
5. Avoid2 T1	17.42	6.61					.87	−.12	−.14	−.18	−.37	−.34	−.32	.25	.27	.09	.08	.19	−.05	.02	−.01
6. Avoid3 T1	17.19	6.62						−.07	−.14	−.17	−.37	−.33	−.32	.25	.26	.06	.07	.15	−.03	.02	.00
7. SSES1 T1	6.53	1.79							.58	.54	.15	.16	.15	−.46	−.34	−.28	−.26	−.28	−.19	−.23	−.20
8. SSES2 T1	6.57	1.69								.59	.24	.22	.24	−.44	−.33	−.23	−.21	−.25	−.17	−.22	−.17
9. SSES3 T1	6.50	1.75									.21	.16	.20	−.35	−.33	−.20	−.25	−.23	−.09	−.16	−.15
10. DDI1 T1	13.69	3.39										.87	.88	−.35	−.44	−.18	−.20	−.27	−.17	−.20	−.22
11. DDI2 T1	13.51	3.46											.87	−.37	−.41	−.21	−.20	−.28	−.21	−.18	−.23
12. DDI3 T1	13.02	3.54												−.39	−.46	−.24	−.23	−.33	−.20	−.19	−.23
13. UCLA-P T1	12.34	2.92													.68	.50	.53	.56	.36	.43	.44
14. UCLA-N T1	9.24	2.94														.49	.52	.56	.38	.43	.42
15. CES-D1 T1	2.74	2.08															.66	.80	.53	.49	.45
16. CES-D2 T1	3.13	2.54																.67	.42	.60	.43
17. CES-D3 T1	1.57	1.68																	.43	.51	.49
18. CES-D1 T2	2.49	1.97																		.65	.73
19. CES-D2 T2	2.89	2.34																			.63
20. CES-D3 T2	1.34	1.49																			

Note. $N = 308$. T1 = Time 1; T2 = Time 2; Anxiety 1, 2, 3 = item parcels from the Anxiety subscale of the Experiences in Close Relationships Scale; Avoid 1, 2, 3 = item parcels from the Avoidance subscale of the Experiences in Close Relationships Scale; SSES 1, 2, 3 = item parcels from the Social Self-Efficacy subscale of the Self-Efficacy Scale; DDI 1, 2, 3 = item parcels from the Distress Disclosure Index; UCLA-P and UCLA-N = the positive and negative items from UCLA Loneliness Scale (Version 3, short form); CES-D 1, 2, 3 = item parcels from the Center for Epidemiological Studies—Depression Scale (short form). Absolute values of correlations greater than .11 were significant at $p < .05$; absolute values of correlations greater than .15 were significant at $p < .01$.

Table 2
Factor Loadings for the Measurement Model

Measure and variable	Unstandardized factor loading	*SE*	*T*[a]	Standardized factor loading
Attachment anxiety (T1)				
Anxiety1 T1	1.00[b]			.89[b]
Anxiety2 T1	.99	.04	24.00	.89**
Anxiety3 T1	1.02	.04	24.59	.88**
Attachment avoidance (T1)				
Avoidance1 T1	1.00[b]			.93[b]
Avoidance2 T1	.96	.03	30.87	.94**
Avoidance3 T1	.95	.03	30.36	.93**
Social self-efficacy (T1)				
SSES1 T1	1.00[b]			.75[b]
SSES2 T1	.98	.09	11.03	.78**
SSES3 T1	.94	.08	1.58	.73**
Comfort with self-disclosure (T1)				
DDI1 T1	1.00[b]			.94[b]
DDI2 T1	1.01	.03	32.03	.94**
DDI3 T1	1.03	.03	31.27	.93**
Loneliness (T1)				
UCLA-P T1	1.00[b]			.86[b]
UCLA-N T1	.94	.06	16.76	.80**
Depression (T1)				
CES-D1 T1	1.00[b]			.87[b]
CES-D2 T1	1.02	.06	16.72	.75**
CES-D3 T1	.81	.04	19.97	.90**
Depression (T2)				
CES-D1 T2	1.00[b]			.83[b]
CES-D2 T2	1.02	.06	16.74	.73**
CES-D3 T2	.81	.04	19.97	.87**

Note. $N = 308$. Anxiety 1, 2, 3 = item parcels from the Anxiety subscale of the Experiences in Close Relationships Scale; Avoidance 1, 2, 3 = item parcels from the Avoidance subscale of the Experiences in Close Relationships Scale; SSES 1, 2, 3 = item parcels from the Social Self-Efficacy scale; DDI 1, 2, 3 = item parcels from the Distress Disclosure Index; UCLA-P and UCLA-N = positively and negatively worded items, respectively, from UCLA Loneliness Scale (Version 3, short form); CES-D 1, 2, 3 = item parcels from the Center for Epidemiological Studies—Depression Scale (short form).
[a] The *T* values are distributed as a *z* statistic. Therefore, absolute values of 1.96 or greater are statistically significant, ($p < .05$, two-tailed test).
[b] These loadings were fixed to one so that the measurement model would be identified (i.e., to provide a scale of measurement for the factor loadings). Therefore, no significance test is reported for these loadings.
** $p < .01$.

to loneliness and subsequent depression through the comfort with self-disclosure mediator, after controlling for the initial level of depression (see Figure 1). The results indicated that the hypothesized structural model provided a good fit to the data, scaled $\chi^2(156, N = 308) = 265.60$, $p < .01$, CFI = .98; RMSEA = .05 (90% CI = .04, .06); SRMR = .08. Fifty-five percent of the variance in loneliness was explained by attachment anxiety, social self-efficacy, and comfort with self-disclosure, whereas 42% of the variance in subsequent depression was explained by initial levels of loneliness and depression.

Two alternative models were developed to examine the distinct mediation hypotheses (i.e., that social self-efficacy served as a

Table 3
Correlations Among the Latent Variables From the Measurement Model

Latent variable	2	3	4	5	6	7
1. Depression T1	.43**	.17*	−.37**	−.31**	.74**	.63**
2. Attachment anxiety T1		.13	−.45**	−.16*	.55**	.26**
3. Attachment avoidance T1			−.21**	−.40**	.35**	.01
4. Social self-efficacy T1				.27**	−.61**	−.27**
5. Comfort with self-disclosure T1					−.51**	−.27**
6. Loneliness T1						.59**
7. Depression T2						

Note. $N = 308$. Time 1 = T1; Time 2 = T2.
* $p < .05$. ** $p < .01$.

mediator for attachment anxiety and that comfort with self-disclosure served as a mediator for attachment avoidance). The first alternative model was used to examine whether social self-efficacy was a distinct mediator for attachment anxiety. The path from attachment avoidance to social self-efficacy was added to determine whether this path significantly improved the fit of the model. The results for the first alternative structural model showed a good fit to the data, scaled $\chi^2(155, N = 308) = 287.30$, $p < .01$, CFI = .98; RMSEA = .05 (90% CI = .04, .06); SRMR = .07. However, when the hypothesized structural model was compared with the first alternative model, a nonsignificant scaled chi-square difference, $\Delta\chi^2(1, N = 308) = 3.28$, $p = .07$, indicated that adding this path did not significantly improve the fit of the model to the data. Similarly, the second alternative model was used to examine whether comfort with self-disclosure was a distinct mediator of attachment avoidance. The path from attachment anxiety to comfort with self-disclosure was added to determine whether this path significantly improved the fit of the model. The results for the second alternative structural model also showed a good fit to the data, scaled $\chi^2(155, N = 308) = 264.32$, $p < .01$, CFI = .98; RMSEA = .05 (90% CI = .04, .06); SRMR = .07. Once again, however, a nonsignificant scaled chi-square difference, $\Delta\chi^2(1, N = 308) = 1.53$, $p = .22$, indicated that adding this path did not significantly improve the fit of the model to the data. Therefore, these two alternative models provided empirical support for the distinct mediator hypotheses regarding the different attachment dimensions.

Although the hypothesized structural model provided an adequate fit to the data, the modification indices indicated that the structural model could be improved if a direct path from attachment anxiety to loneliness was added. The results for a model adding this path also indicated a good fit to the data, scaled $\chi^2(155, N = 308) = 242.97$, $p < .01$, CFI = .99; RMSEA = .04 (90% CI = .03, .05); SRMR = .06. When the hypothesized structural model was compared with this modified structural model, a significant scaled chi-square difference, $\Delta\chi^2(1, N = 308) = 8.82$, $p < .01$, indicated that adding this path significantly improved the fit of the model to the data. Therefore, this modified structural model was used in the bootstrap procedure described below to test the significance of the indirect effects (see Figure 2).

Testing the Significance of the Indirect Effects

There are several steps to the bootstrap procedure. First, 1,000 bootstrap samples ($n = 308$) were created from the original data by random sampling with replacement. Second, the structural model was run 1,000 times with these bootstrap samples using the LISREL program, yielding 1,000 estimates of each path coefficient. Third, output from these 1,000 estimates of each path coefficient yielded values that were used in computing four indirect effects. First, we computed the indirect effect of attachment anxiety on loneliness through social self-efficacy after controlling for the initial level of depression by multiplying together the 1,000 pairs of path coefficients (a) from attachment anxiety to social self-efficacy and (b) from social self-efficacy to loneliness. Second, we calculated the indirect effect of attachment avoidance on loneliness through comfort with self-disclosure after controlling for the initial level of depression by multiplying 1,000 pairings of path coefficients (a) from attachment avoidance to comfort with self-disclosure, and (b) from comfort with self-disclosure to loneliness. Third, we computed the indirect effect of attachment anxiety on subsequent depression through social self-efficacy and loneliness after controlling for the initial level of depression by multiplying 1,000 triads of path coefficients (a) from attachment

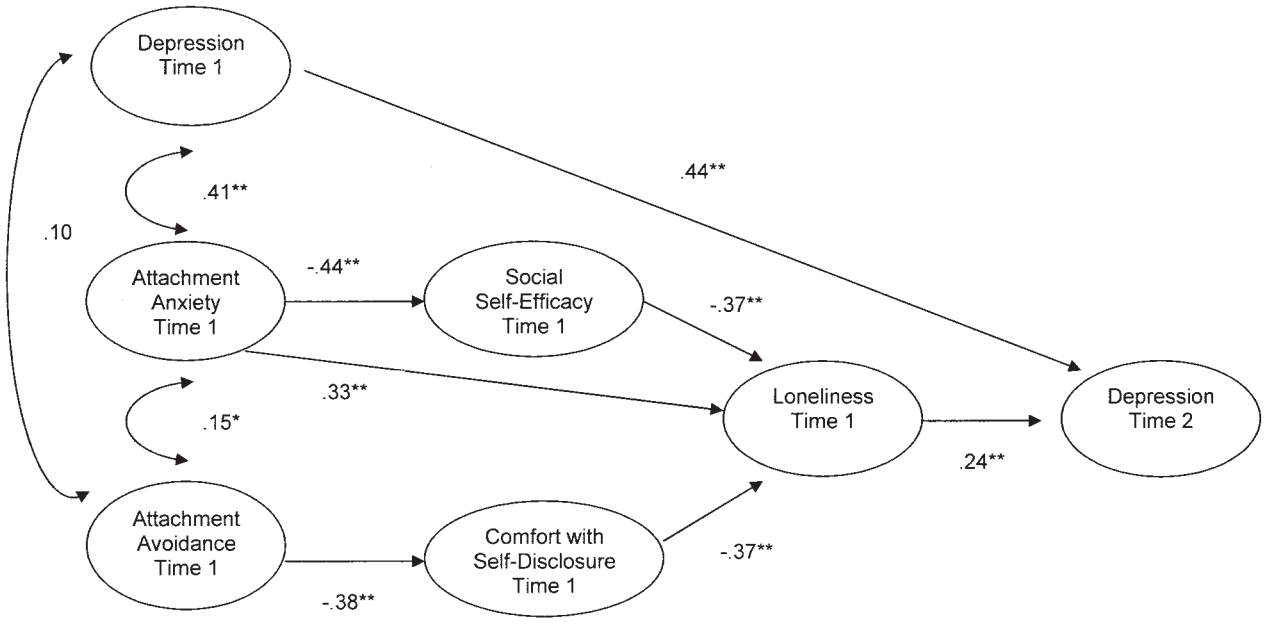

Figure 2. The mediation model. $N = 308$. Not shown in the figure are paths from depression at Time 1 to the two mediating variables of social self-efficacy at Time 1 and comfort with self-disclosure at Time 1 as well as loneliness at Time 1. * $p < .05$; ** $p < .01$.

anxiety to social self-efficacy, (b) from social self-efficacy to loneliness, and (c) from loneliness to subsequent depression. Fourth, we calculated the indirect effect of attachment avoidance on subsequent depression through comfort with self-disclosure and loneliness after controlling for the initial level of depression by multiplying 1,000 triads of path coefficients (a) from attachment avoidance to comfort with self-disclosure, (b) from comfort with self-disclosure to loneliness, and (c) from loneliness to subsequent depression. It can be concluded that the indirect effect is statistically significant at the .05 level if the 95% CI for these four estimates of indirect effects does not include zero (Shrout & Bolger, 2002). As can be seen in Table 4, the 95% CI for all four indirect effects does not include zero, indicating that these indirect effects were statistically significant.

In summary, the results from the present study suggest that attachment anxiety contributes to loneliness (and subsequent depression) through social self-efficacy, whereas attachment avoidance contributes to loneliness (and subsequent depression) through comfort with self-disclosure. These mediation effects occurred even after controlling for the initial level of depression.

Discussion

Freshman college students with high levels of attachment anxiety experienced feelings of loneliness and subsequent depression mainly through one mediator, the lack of social self-efficacy, after controlling for the initial level of depression. Conversely, freshman college students with high levels of attachment avoidance experienced feelings of loneliness and subsequent depression mainly through another mediator, discomfort with self-disclosure, after controlling for the initial level of depression. The present results expand the attachment literature by providing empirical evidence that individuals with high levels of attachment anxiety and attachment avoidance not only have different and distinct deficits in their social competencies (i.e., the lack of social self-efficacy and the discomfort with self-disclosure, respectively) but also experience loneliness and subsequent depression through these different and distinct interpersonal deficits.

The finding that social self-efficacy serves as a mediator between attachment anxiety and loneliness and subsequent depression supports our hypothesis that freshman college students with high attachment anxiety are less competent in their social self-efficacy. The present result is consistent with Mallinckrodt and Wei's (2005) findings that individuals with attachment anxiety tend to feel less social self-efficacy, which in turn contributes to low levels of perceived social support. In addition, the present results support our hypothesis that social self-efficacy does not serve as a mediator between attachment avoidance and loneliness and subsequent depression. This result is not consistent with Mallinckrodt and Wei's (2005) unexpected finding that individuals with high levels of attachment avoidance also reported lower levels of social self-efficacy, which in turn contributed to lower perceived social support. In general, finding that social self-efficacy serves as a mediator for attachment anxiety (but not attachment avoidance) is consistent with attachment theory. Individuals with high levels of attachment anxiety tend to have a negative working model of the self (e.g., for a review, see Pietromonaco & Feldman Barrett, 2000) and are likely to perceive less self-efficacy, whereas individuals with high levels of attachment avoidance tend to be compulsively self-reliant and are likely to report high levels of social self-efficacy.

The finding that comfort with self-disclosing feelings of distress serves as a mediator for attachment avoidance is consistent with previous findings in which self-disclosure was found to be an important factor in the development of new friendships (Laurenceau et al., 1998) and decreasing feelings of loneliness and subsequent depression (e.g., Berg & McQuinn, 1989; Bruch et al., 1988; Mahon, 1982; Schwab et al., 1998; Solano et al., 1982; Stokes, 1987). More specifically, self-disclosure was measured in the present study by one's comfort level with talking with others about personally distressing information. This variable was a distinct mediator for freshman students between attachment avoidance and feelings of loneliness, supporting Laurenceau et al.'s (1998) findings that self-disclosure of emotions or distress was found to be a more important predictor of relationship building than self-disclosure of facts and information. We can imagine that it is particularly risky for freshman college students with high levels of attachment avoidance to disclose their emotions and distress to others. However, when freshman college students are comfortable in disclosing their emotions or distress to others, an opportunity to decrease feelings of loneliness and subsequent depression becomes possible.

This result is consistent with attachment theory, in that individuals with high levels of attachment avoidance are likely to expect that others will not be responsive if they disclose their feelings of distress. As a consequence, such individuals tend to use deactivating strategies to keep distance from others and are less likely to feel comfort in disclosing their distress. This result is also consistent with previous empirical research findings of a positive asso-

Table 4
Bootstrap Analysis of the Magnitude and Statistical Significance of the Indirect Effects

Paths for the indirect effects	β (standardized path coefficient and product)	*b*	95% CI for the indirect effects[a]
Attachment anxiety → SSES → Loneliness	(−.44) × (−.37) = .16	0.07	0.04, 0.10
Attachment avoidance → DDI → Loneliness	(−.38) × (−.37) = .14	0.05	0.03, 0.08
Attachment anxiety → SSES → Loneliness → Subsequent depression	(−.44) × (−.37) × (.24) = .04	0.01	0.00, 0.02
Attachment avoidance → DDI → Loneliness → Subsequent depression	(−.38) × (−.37) × (.24) = .03	0.01	0.00, 0.02

Note. $N = 308$. SSES = Social Self-Efficacy Scale; DDI = Distress Disclosure Index.
[a] These values are based on unstandardized path coefficients (*b*s).

ciation between attachment avoidance and a lack, or dislike, of self-disclosure (Collins & Read, 1990; Dion & Dion, 1985; Kobak & Hazan, 1991; Mikulincer & Nachshon, 1991). In addition, the present results support our hypothesis that comfort with self-disclosure is not a significant mediator for freshman college students between high levels of attachment anxiety and loneliness and subsequent depression. This result is also consistent with attachment theory, in that individuals with high levels of attachment anxiety are expected to use hyperactivation strategies to exaggerate their feelings of distress to others in order to get special attention (e.g., Mikulincer et al., 2003). Thus, we would not expect such students to have a deficit in disclosing their distress or emotions to others. In summary, the present results indicated that social self-efficacy was a distinct mediator for freshman students with a high level of attachment anxiety, whereas comfort with self-disclosure was a distinct mediator for freshman students with high levels of attachment avoidance.

Of interest, the direct relationship between attachment avoidance and loneliness was not statistically significant after the comfort with self-disclosure mediator was added to the model. In other words, the relationship between attachment avoidance and loneliness and subsequent depression was completely mediated by comfort with self-disclosure. This finding suggests that if comfort in disclosing emotions or distress can be increased among freshman college students with high levels of attachment avoidance, their loneliness and subsequent depression may be reduced. By contrast, the direct relationship between attachment anxiety and loneliness remained statistically significant after controlling for the indirect effect of attachment anxiety on loneliness through social self-efficacy. This result shows that social self-efficacy was a partial mediator between attachment anxiety and loneliness. Future studies should examine other variables, such as perspective taking or empathic concerns that may account for the association between attachment anxiety and loneliness. It is important to note, however, that the direct path from attachment anxiety to loneliness was decreased from .55 to .33 when social self-efficacy was added to the model. Thus, we conclude that an important determinant of loneliness and subsequent depression experienced by persons with high attachment anxiety is a lack of social self-efficacy.

The present study was limited to *resources from the self* to enhance freshman college students' social self-efficacy and increase their comfort with self-disclosure in order to decrease their loneliness and subsequent depression. Future studies should explore whether *resources from others* (e.g., mentoring freshman college students or increasing social networks) are also important mediators of this relationship. Mikulincer et al. (2003) argued for a two-stage developmental sequence of attachment-related affect regulation strategies to deal with distress. The two stages are *co-regulation* (with attachment figures' collaboration to handle distress) and *self-regulation* (a sense of self-confidence to handle distress alone). If significant others from school and family can collaborate with freshman college students to co-regulate their distress (e.g., by providing social support), this may help them build a strong sense of self-worth and self-efficacy, which should increase their comfort level with self-disclosure (self-regulation capacity). This may in turn increase their adjustment to college life. Previous cross-sectional research has consistently indicated that self-esteem is a mediator of the effects of social support on adjustment (for a review, see Dubois & Tevendale, 1999). Therefore, future studies should explore the possibility of attachment leading to perceived social support (co-regulation), which in turn could lead to enhanced self-esteem (self-regulation capacity) and thereby enhance subsequent adjustment among freshman college students. We encourage the development of preventive intervention programs designed to target these mediators (e.g., enhancing social self-efficacy and increasing comfort level with self-disclosure) in the context of evaluating college adjustment among freshman students who are high in attachment anxiety and/or attachment avoidance. Another useful future direction would be the assessment of positive mental health outcomes (e.g., satisfaction with interpersonal relationships) in addition to negative mental health consequences such as loneliness and depression (Compas, 1993). Because of the current study's relatively short time frame and restriction of data collection to two waves, future studies should explore a longer time frame and multiple waves of data collection to further examine the process of adjustment among college students who are high in attachment anxiety and/or attachment avoidance.

Several limitations of this study should be noted. First, the majority of participants in the present study were predominantly young adult midwestern Caucasian college students. Therefore, caution must be taken in generalizing these findings to other populations, such as older students or minorities. For example, more collectivist cultures (e.g., Asian) may have different expectations regarding self-disclosure (e.g., restricted emotional self-disclosure) and social efficacy (e.g., competence for maintaining social harmony). It is also important to remember that these results refer to freshman transition experiences. Caution must also be exercised in generalizing to other transition experiences (e.g., getting married, having children). Furthermore, this study only collected data from two time points (the first and second semesters) for freshman college students. It is unclear how the relationships among these variables may fluctuate over longer periods of time. The addition of more data points over an expanded period of time would enhance understanding of these relationships beyond the first year of college life. Moreover, the current study was limited to self-report data, which raises the potential problem of mono-method bias. Self-report data are based on one's own subjective experience, which may differ from other methods of assessment such as observational data, reports from other individuals such as close friends or family members, and clinical interviewers. Finally, the loss of participants from Time 1 to Time 2 was over 50%. Although our analyses did not reveal any differences between those participants who declined to participate at Time 2 and those who chose to continue in the study, it is possible that other factors (e.g., desire to help others) may have influenced whether individuals dropped out of the study. Sills and Song (2002) reported a response rate of 22% after three waves of solicitations in response to a Web-based survey with no incentive offered for participation. In the present study, a response rate of 9% ($.30 \times .30 = .09$) from the original population is not surprising given that we expected the response rate at Time 1 to be about 30% of the original participants and the response rate at Time 2 to be about 30% of participants who participated in Time 1. However, a final sample of only 9% from the original pool of potential participants is clearly a limitation of this study.

Although attachment orientations are not impossible to change, identifying more malleable mediating factors such as social self-

efficacy or comfort with self-disclosure presents a viable alternative for helping individuals with insecure attachment in the context of short-term interventions. Specifically, clinicians may help freshman college students with high levels of attachment anxiety to recognize how their attachment orientation is related to doubts about their ability to connect with others, and how these doubts are in turn related to their feelings of loneliness and subsequent depression. Clinicians may also help students see how they are more capable of connecting with others (including clinicians) than they expect, thereby enhancing their sense of social self-efficacy. Similarly, clinicians may help freshman college students who are high in attachment avoidance to understand how their attachment orientation contributes to their reluctance to self-disclose and how their lack of self-disclosure, in turn, limits their opportunities to develop emotionally fulfilling relationships. Clinicians should work with these students to reduce their fears about self-disclosure and to challenge their negative expectations regarding the consequences of self-disclosure. They should also provide students with corrective emotional experiences in the context of the helping process. In others words, clinicians may provide a safe environment for these students to self-disclose and thereby help them to experience positive outcomes of self-disclosure. Such freshman college students may then be able to increase their capacity for taking risks by self-disclosing to trusted friends in order to increase their comfort level with self-disclosure, thereby decreasing their feelings of loneliness and subsequent depression.

In conclusion, the present study adds important information to the attachment literature by suggesting that freshman college students with attachment anxiety and/or avoidance tend to have different and distinct deficits in their social competencies (i.e., the lack of social self-efficacy and discomfort with self-disclosure, respectively). The results from the present longitudinal study indicated that the impact of attachment anxiety on loneliness and subsequent depression was mediated by the lack of social self-efficacy. Conversely, the impact of attachment avoidance on loneliness and subsequent depression was mediated by discomfort with self-disclosure. These results were found after controlling for the initial level of depression. The present results indicate that freshman college students with high levels of attachment anxiety and/or avoidance may need different and distinct interventions to help them adjust to college life. Freshman college students with high levels of attachment anxiety can be helped to increase their levels of social self-efficacy so as to decrease their loneliness and subsequent depression, whereas freshman college students with high levels of attachment avoidance can be helped to increase their comfort levels with self-disclosure in order to decrease their loneliness and subsequent depression.

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