

## Moderators of Peer Contagion: A Longitudinal Examination of Depression Socialization Between Adolescents and Their Best Friends

Mitchell J. Prinstein

*Department of Psychology, University of North Carolina at Chapel Hill*

*This longitudinal study examined peer contagion of depressive symptoms over an 18-month interval within a sample of 100 11th-grade adolescents. Three types of peer contagion moderators were examined, including characteristics of adolescents (social anxiety, global self-worth), friends (level of friends' peer-perceived popularity), and the relationship between them (friendship quality). Measures were collected using adolescents' and their friends' reports of depressive symptoms, adolescents' reports of social anxiety, global self-worth, friendship quality, and a sociometric assessment of peer-perceived popularity. Results indicated that among girls higher levels of social anxiety were associated with adolescents' greater susceptibility to peer contagion. Among boys, higher levels of friends' peer perceived popularity and lower levels of positive friendship quality each were associated with greater susceptibility to depressive symptom contagion.*

Perhaps one of the most potent and replicable findings in the peer relationships literature pertains to the remarkable similarities between adolescents' and their friends' psychological characteristics. Findings for several decades have determined that such similarities are due to two processes of "homophily" (i.e., selection and socialization; Kandel, 1978). Selection effects suggest that youth are likely to affiliate with and befriend peers who initially are similar to themselves on a variety of behavioral and physical characteristics (e.g., Aseltine, 1995). Socialization effects refer to the process of influence or contagion among peers; substantial longitudinal results indicate that friends' behaviors are significant predictors of youths' own behavior over time (e.g., Keenan, Loeber, Zhang, Stouthamer-Loeber, & Van Kammen, 1995). To date, peer contagion effects have been examined mostly for externalizing (i.e., aggressive, illegal) and health-risk behaviors (i.e., substance use, sexual risk behaviors, weight-management behaviors; Paxton, Schutz, Wertheim, & Muir, 1999; Prinstein, Meade, & Cohen, 2003; Urberg, Degirmencioglu, & Pilgrim,

1997; Vitaro, Tremblay, Kerr, Pagani, & Bukowski, 1997).

An emerging developmental psychopathology literature, however, suggests that peer contagion processes also are relevant for internalizing symptoms, including symptoms of depression in particular. Findings parallel studies that previously have identified depression symptom contagion between mothers and children, romantic/marital partners, and college roommates as well as a body of experimental findings from the social psychology literature (Hammen, Burge, & Adrian, 1991; Joiner, 1994; Strack & Coyne, 1983; Tambs, 1991). Specifically, Hogue and Steinberg (1995) suggested that the average level of friend-reported depressive symptoms among members of adolescents' peer cliques is associated longitudinally with changes in adolescents' own self-reported depressive symptoms. Stevens and Prinstein (2005) revealed that among reciprocated best friends, friend-reported depressive symptoms were longitudinally associated with increases in adolescent girls' own (i.e., self-reported) depressive symptoms over time. Findings underscore the importance of peer relationships in the development of depressive symptoms, particularly among adolescent girls, and extend the notion that adolescents' friendship interactions may have both positive and negative consequences for the development of psychopathology (Rose, 2002). Moderators of depression contagion effects have not been examined previously, however.

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Correspondence should be sent to Mitch Prinstein, University of North Carolina at Chapel Hill, Department of Psychology, Davie Hall, Campus Box 3270, Chapel Hill, NC 27599-3270. E-mail: mitch.prinstein@unc.edu

Indeed, extant findings regarding peer contagion effects offer limited directions for preventive interventions. Past work has demonstrated remarkable difficulty in successfully convincing adolescents to limit interactions with friends who may exert a deleterious influence (La Greca, 1993). Thus, it is important to understand contagion processes from a more sophisticated theoretical level. By elucidating moderators of peer contagion, for instance, it is possible to identify factors that may increase teens' resilience to peer socialization or, conversely, factors that might exacerbate peer contagion effects.

Findings from this emerging area of research suggest that at least four classes of variables may be relevant for understanding youths' susceptibility or resilience to (i.e., moderators of) peer contagion. One of these moderator classes, and the most frequently examined, pertains to psychological characteristics of the individual being influenced (i.e., the target). Target-oriented moderators have included both distal factors that are relevant to overall psychological functioning but are not directly related to behavioral decisions in the peer context (e.g., family functioning, parenting style), as well as additional factors, such as sociodemographics, that may be directly relevant to peer interactions (e.g., gender, ethnicity, peer status). With regard to the former, Mounts and Steinberg (1995) reported that adolescent-reported parenting style altered the magnitude of the association between adolescents' and their friends' drug use. Lower levels of authoritative parenting were associated with a weaker association between adolescents' and their friends' drug use, whereas high levels of authoritative parenting may buffer peer contagion effects (see also Vitaro, Brendgen, & Tremblay, 2000). With regard to the latter, Urberg, Luo, Pilgrim, and Degirmencioglu (2003) reported that adolescents' high-peer acceptance was associated with a stronger longitudinal prediction of their cigarette use from their friends' cigarette use. Prinstein, Boergers, and Spirito (2001) reported that higher levels of adolescents' depressive symptoms were associated with stronger associations between adolescents' and their friends' substance use, deviance, and sexual behavior.

A second class of potential moderators refers to aspects of the individual who exerts influence over a target (i.e., the prototype). Some social psychological theories posit that social influence can be conceived as a function of a target individual's willingness to conform to the attitudes or behavior of a "prototype." Conformity is hypothesized to increase to the extent that this prototype represents an identity that is desirable to the target

(Gerrard et al., 2002; Gibbons & Gerrard, 1997; Gibbons, Gerrard, Blanton, & Russell, 1998). Some prototype-oriented moderators have been revealed in social-psychological research. For instance, the classic Asch (1952) studies suggested that targets were more likely to conform to a group of high-status peers than to lower status peers.

Third, relationship-oriented moderators pertain to the nature of the affiliative association between the target and prototype. At least two different theories have been suggested with regard to the role of relationship-oriented moderators. Some research has suggested that relationships that are characterized by closeness may be especially likely to promote conformity due to individuals' high opportunities for discussion regarding behaviors and attitudes (Rose, 2002). For example, evidence from several investigations has suggested that friendships stronger in quality are associated with a stronger potential for influence between adolescents and their friends (Stevens & Prinstein, 2005; Urberg et al., 2003). A contrasting theory suggests that individuals may be likely to conform to an individual with whom he or she would like to develop a closer relationship. Thus, unreciprocated friendships and relationships characterized by low levels of positive friendship quality, of perhaps by differential levels of power or dominance, may be especially likely to promote peer contagion (e.g., Juvonen, Ho, & Masten, 2006).

Last, *contextual moderators* refer to aspects of the environment in which peer contagion potentially may occur. Although rarely examined empirically, social-psychological theories suggest that behavioral conformity may depend, in part, on the size of the peer group, the presence of an "ally" with similar values or behavioral practices as the target, or the specific type of behavior that is subject to conformity (e.g., Asch, 1952).

Moderators of depression symptom contagion between peers have not been explored previously. This study included an examination of three types of moderators described earlier. First is an examination of target-oriented moderators. In accordance with theories suggesting that adolescents with an underdeveloped sense of self concept, or a hypersensitivity to nonconformity among peers, may be especially susceptible to socialization influences, both self-esteem and social anxiety were examined as person-oriented moderators (La Greca, 1999). In recent experimental work, research has suggested that adolescents with high levels of social anxiety are particularly likely to conform to the attitudes and behaviors of their peers (Cohen & Prinstein, in press). It therefore was anticipated that adolescents with lower levels of self-esteem

and higher social anxiety symptoms would evidence stronger longitudinal associations between their friends' and their own depressive symptoms.

Based on social psychological theories suggesting that individuals tend to conform to perceived norms associated with "role models" of high status, adolescents' friends' peer popularity was examined as a prototype-oriented moderator. Peer popularity is a relevant and salient indicator of status that should be related to adolescents' evaluation of a potential prototype and to the potential influential power of that prototype. Substantial research suggests that adolescents place a high value on reputations and status among peers (Brown, 1990). The adolescent peer context is a primary resource for reflected appraisals during a period of heightened identity development tasks (Harter, Stocker, & Robinson, 1996). Thus, adolescents are especially invested in adopting attitudes and behaviors that may earn them greater status among peers. Recent work has suggested that adolescents' "peer-perceived" or reputation-based popularity is a particularly relevant marker of adolescents' positions in the status hierarchy (as compared to sociometric peer status, a measure of likeability; La Fontana & Cillessen, 2002; Parkhurst & Hopmeyer, 1998; Prinstein & Cillessen, 2003). It was hypothesized that adolescents' friends' levels of peer-perceived popularity would be associated with greater peer contagion. Specifically, adolescents' friends' depressive symptoms would be more strongly associated longitudinally with adolescents' own depressive symptoms when the friend was higher in peer-perceived popularity.

Last, adolescents' friendship quality was examined as a potential relationship-oriented moderator. Given conflicting theoretical predictions regarding the role of friendship quality, no specific hypotheses were offered. To ensure that a range in quality of best friendships would be captured in this study, adolescents' friend was examined as a potential prototype regardless of whether the friend reciprocated friendship nominations. Indeed, the use of all best friends (whether reciprocated or not) as potential sources of peer influence is consistent with past research in this area (Urberg, Cheng, Shyu, 1991; Urberg et al., 1997). In light of increased vulnerabilities to depressive symptoms among adolescent girls as compared to boys and past findings indicating stronger depression contagion effects among girls (Stevens & Prinstein, 2005), gender effects also were examined for all hypotheses.

This study offered a stringent examination of peer contagion, addressing several of the limitations of past work in this area. First, the use of a longitudinal

design helped to parse socialization from selection homophily effects. Epidemiological research suggests that the prevalence of depression increases dramatically at the transition to adolescence, particularly among girls (Hankin & Abramson, 2001). Hypotheses were examined among a sample of adolescents at two time points, separated by 18 months, to capture a critical developmental period associated with increasing levels of depressive symptoms. By mid-late adolescence, both symptoms of depression and depression-related behaviors are prevalent and salient in a manner that might exert maximal potential influence. Second, this study benefits from the assessment of peer contagion using friends' own reports of depressive symptoms as a predictor. Last, in contrast to past work that has examined the effects of unspecified "peers" or "friends" as potential influential agents, peer contagion effects in this study were examined using peer-nominated friends as prototypes. This approach further reduces potential error in the identification of true contagion effects.

## Method

### Participants

A total of 100 adolescents (60 girls and 40 boys) in the 11th grade at a suburban high school in southern New England participated in the study. The ethnic distribution of the sample was 81.0% White, 12.0% African American, 2.0% Hispanic, and 7.0% other or mixed ethnicity within a city of fairly homogeneous, middle-class socioeconomic status (per capita income = \$25,175. According to school records, approximately 23.4% of students were eligible for free or reduced-price lunch. Approximately 17% of adolescents reported that they lived in single-parent families, including one biological parent.

### Procedures

All students in the 11th grade were recruited for participation, with the exception of students in self-contained special education classes ( $n = 372$ ). A letter of consent initially was mailed to each adolescent's family followed by a series of reminders and additional letters distributed directly to teens by school and research personnel. Response forms included an option for parents to grant or deny consent; adolescents were asked to return their signed response form regardless of their parents' decision. Numerous adolescent-, teacher-, and school-based incentives were used to ensure the return of these consent forms.

Consent forms were returned by 85% of families ( $n = 318$ ); of these 93% of parents gave consent for their child's participation ( $n = 297$ ). Data were unavailable for 25 participants due to student absenteeism on the days of testing and missing data, yielding a sample of 272 (73% of all available population). Adolescent assent was requested at the start of data collection, following written and verbal descriptions of the study procedures. All procedures were approved by the university Institutional Review Board.

Hypotheses examined in this study primarily pertained to the prediction of adolescents' self-reported depressive symptoms from friends' depressive symptoms, as reported by friends themselves. Thus, analyses were limited to only those participants who met several criteria. First, participants were included only if they had selected a best friend who also was a participant in the study (i.e., only those participants for whom best friends' actual reported behavior could be determined). Of the 272 adolescents who completed measures for this study, 124 adolescents either failed to select a single "best" friend (approximately 20%) or selected a best friend who was not participating in this study. Second, to eliminate concerns regarding duplication of data and resulting inflated associations, each adolescent was included as a best friend only once within the dataset. Of the 148 adolescents who met the first criteria, 37 adolescents selected a best friend who had been selected by at least 1 other participant. In each instance, 1 adolescent was selected at random for inclusion in the dataset, and the other(s) who selected the same best friend were omitted from analyses. A total of 111 participants met both of these criteria. Although this is a somewhat small subset of the initial sample of participants, the data generally suggested that the subset was fairly representative of the overall sample. Multiple comparisons were conducted to compare the final Time 1 sample of adolescents with those who had been eliminated due to missing data or inadequate best-friend data. No significant differences emerged on any study variable.

Measures were administered at an initial time point and again 18 months later (i.e., Time 2) when all adolescents were in Grade 12. All potential moderators used in analyses were measured at the initial time point. By Time 2, 11 of the Time 1 participants eligible for study analyses were unavailable for further participation. Attrition analyses revealed no significant differences on any study variable. A final sample of 100 adolescents therefore was included in all analyses. All measures were administered in adolescents' classrooms as part of a study on peer relationships and psychological adjustment.

## Measures

**Depressive symptoms.** The Children's Depression Inventory (Kovacs, 1992) is a 27-item measure designed to assess cognitive and behavioral depressive symptoms in children and adolescents. For each item, respondents select from one of three statements, scored 0 through 2, that best describes their level of depressive symptoms in the previous 2 weeks. One item on suicidal ideation was omitted in response to concerns from the Institutional Review Board, and a summed score was computed across the remaining 26 items, with higher scores reflecting more depressive symptoms. Good psychometric properties have been reported for the Children's Depression Inventory as a reliable and valid index of depressive symptoms. Scores on the measure successfully discriminate between youth independently diagnosed as depressed or nondepressed (Saylor, Finch, Spirito, & Bennett, 1984). It can be used with youth between the ages of 7 and 18 years of age (Kazdin, 1990). In this sample, internal consistency was high ( $\alpha = .88$ ) at both time points. Test-retest reliability in past work has been satisfactory (Kovacs, 1992).

**Friendship selection.** A peer nomination procedure was used to identify adolescents' closest friends at Time 1 (Parker & Asher, 1993). Adolescents were asked to select an unlimited number of their "closest friends" from a roster of all grademates alphabetized by first name (or nickname, e.g., Bill/William, as indicated in focus groups), and from this list to select a "very best friend." Adolescents' very best friend's score on the Children's Depression Inventory was used as a measure of friend's depressive symptoms.

**Social anxiety.** The Social Anxiety Scale for Adolescents (La Greca & Lopez, 1998) contains 18 descriptive self-statements and 4 filler items. Each item is rated on a 5-point scale according to how much the item "is true for you," ranging from 1 (*not at all*) to 5 (*all the time*). Items reflect three types of social anxiety symptoms, including fear of negative evaluation (e.g., "I worry about what other kids think of me"), social avoidance and distress for new situations or unfamiliar peers (e.g., "I get nervous when I meet new kids"), and generalized or pervasive social avoidance and distress (e.g., "I feel shy even with peers I know well"). For this study, a total score was computed, ranging from 18 to 90. Psychometric support for the Social Anxiety Scale for

Adolescent has been very satisfactory (see La Greca, 1999). Concurrent validity has been supported by patterns of relations between the scale and youngsters' self-appraisals of perceived sociometric status (for details, see La Greca, 1999). Prior studies have demonstrated good test-retest reliability ( $r$ 's  $> .70$ ) over a 4 month period (La Greca, 1999) and a one year period ( $r = .59$ ; Storch, Masia-Warner, Crisp, & Klein, 2005). Internal consistency in this sample was .89.

**Self-esteem.** The Self-Perception Profile for Adolescents (Harter, 1988) examines adolescents' judgments of competence or adequacy in different areas of self concept. The scale includes eight subscales of self-concept (Social Acceptance, Physical Appearance, Scholastic Competence, Behavioral Conduct, Athletic Competence, Romantic Appeal, Friendship Competence, and Global Self-Worth). Results for the Global Self-Worth subscale are presented in this study. Harter reported considerable support for the validity of this measure. Numerous other investigations also have revealed significant associations between scores from the Self-Perception Profile for Adolescents Global Self-Worth scale and other measures of self-esteem or self-concept (Butler & Gasson, 2005). In this sample, internal consistency was .85.

**Peer-nominated peer-perceived popularity.** A sociometric procedure was used to obtain measures of adolescents' and their friends' reputation-based, peer-perceived popularity. Using an alphabetized roster of all grademates, adolescents were instructed to nominate an unlimited number of peers who were "most popular" (La Fontana & Cillessen, 2002; Parkhurst & Hopmeyer, 1998; Prinstein et al., 2003). A sum of the number of nominations each adolescent received was standardized to yield an index of popularity. This score was available for all participants in the initial larger dataset. Thus, it was possible to use this peer-reported measure to determine the level of peer-perceived popularity for each adolescent's best friend. Sociometric assessments using these administration and scoring procedures yield the most reliable and valid indexes of peer reputations (Coie & Dodge, 1983).

**Friendship quality.** All adolescents were asked to complete the Network of Relationships Inventory (Furman, 1998) to describe the quality

of their relationship with the adolescent they selected as a best friend. This measure includes 30 items designed to assess positive (i.e., companionship, instrumental aid, intimacy, nurturance, affection, admiration, reliable alliance) and negative aspects (i.e., conflict, antagonism, relative power) of friendship quality. Adolescents respond to each item using a 5-point Likert scale (1 = Little or none; 2 = Somewhat; 3 = Very much; 4 = Extremely much; 5 = The most). A mean score was computed for a measure of positive friendship quality (21 items;  $\alpha = .96$ ). Extensive psychometric support for the Network of Relationships Inventory has been provided by Furman as a reliable and valid measure of friendship quality.

### Data Analyses

A series of hierarchical multiple-regression analyses was conducted to examine main study hypotheses.<sup>1</sup> Each model included adolescents' Time 2 level of depressive symptoms as a criterion measure and controlled for adolescents' Time 1 depressive symptoms on an initial step. To examine main study hypotheses, three-way interactions were examined. This required the entry of all hypothesized main effects on a second step of each regression model. Main effects included friends' Time 1 depressive symptoms (as reported by friends) to examine the contagion effect, the selected moderator (i.e., either adolescents' social anxiety, self-esteem, friends' level of peer-reported popularity, or adolescent-friend relationship quality) for each analysis, and adolescents' gender. All possible two-way interactions were entered on a third step, and the three-way interaction was entered on a final step (Friend's Depressive Symptoms  $\times$  Moderator  $\times$  Gender), allowing for an examination of depression contagion moderation as well as whether this moderated association was further moderated by gender. All continuous predictor variables used to compute interaction effects were centered to reduce multicollinearity.

In the presence of a significant moderator effect, Holmbeck's (2002) most recent guidelines were followed for post hoc probing. These measures included (a) computation of new product terms at different levels of the moderator variable, (b) computation of simple slope estimates, and

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<sup>1</sup>To reduce potential data redundancy, all analyses reported here were reconducted using a reduced dataset in which each adolescent was included as either a target participant or a best friend but never both. This reduced dataset included data from 70 adolescents. Analysis of this reduced dataset yielded an identical pattern of findings to the reported results.

**Table 1.** Descriptive Statistics for all Study Variables ( $n = 100$ )

	Time 1					Time 2 Depressive Symptoms
	Depressive Symptoms	Social Anxiety	Self-Esteem	Best Friend's Popularity	Friendship Quality	
<i>M</i>	.25	34.61	3.41	.05	3.48	.37
<i>SD</i>	.33	13.68	.68	1.34	.86	.40
Time 1						
Depressive symptoms	—	.64***	-.66***	-.08	-.01	.38*
Social anxiety	.55***	—	-.61***	-.14	-.29	.13
Self-esteem	-.61***	-.53***	—	.01	.22	-.30
Friends' popularity	-.01	-.23	-.15	—	-.23	-.45***
Friendship quality	-.02	-.25	-.10	-.02	—	-.20
Time 2						
Depressive symptoms	.62***	.63***	-.49***	.00	-.02	—
<i>M</i>	.30	36.04	3.36	-.18	4.04	.30
<i>SD</i>	.27	11.86	.64	.82	.69	.26

Note:  $n = 100$ . Statistics above the diagonal are for boys; below the diagonal for girls.  
\* $p < .05$ . \*\*\*  $p < .001$ .

(c) examination of the statistical significance of these slopes at different levels of the moderator variable. Notably, this procedure for evaluating moderator effects does not require analyses utilizing subsets of the sample. Thus, the sample size and statistical power remained unchanged for post hoc probing of all observed effects.

**Results**

**Preliminary Analyses**

Descriptive statistics, including means, standard deviations, and correlations among all study variables for boys and girls are presented in Table 1.

Correlation analyses indicated that the associations among the four moderator variables were low to moderate, suggesting that the moderator hypotheses under examination were not likely to be redundant with one another.

**Examination of Moderators of Depression Contagion**

The results of hierarchical regression analyses are presented in Table 2. Four regression models were examined, corresponding to the four moderator effects proposed. Significant effects were revealed for social anxiety, best friend's peer popularity, and friendship quality as moderators of the

**Table 2.** Hierarchical Multiple Regression Analyses Examining Moderators of Depression Contagion  
DV for all analyses = depressive symptoms, Time 2.

Moderators <sup>a</sup> :	Social Anxiety		Self-Esteem		Friends' Popularity		Friendship Quality	
	At Step	Final	At Step	Final	At Step	Final	At Step	Final
Step 1 ( $R^2$ )	.22***		.19***		.22***		.22***	
Depressive Symptoms, Time 1 ( $\beta$ )	.47***	.45***	.43***	.35**	.47***	.51***	.46***	.47***
Step 2. Main Effects ( $\Delta R^2$ )	.07*		.09**		.15***		.12* *	
Friend's Depressive Symptoms ( $\beta$ )	.21*	.31	.25**	.22	.21*	.15	.24*	.36*
Gender ( $\beta$ )	-.18*	-.21*	-.15	.24	-.15	-.10	-.22*	-.26**
Moderator <sup>a</sup> ( $\beta$ )	.08	-.26	-.20	-.05	.30***	.38***	-.15	-.48***
Step 3. Two-Way Interactions ( $\Delta R^2$ )	.05		.01		.05*		.09*	
Gender $\times$ Friend's Depression ( $\beta$ )	-.08	-.14	-.11	-.04	.12	.05	-.05	-.11
Gender $\times$ Moderator <sup>a</sup> ( $\beta$ )	.29*	.34*	-.19	-.40	-.20	-.20	.28*	.32*
Friend's Depression $\times$ Moderator <sup>a</sup> ( $\beta$ )	.07	-.29	-.06	.24	.12	.41**	-.30**	-.71***
Step 4. Three-Way Interaction ( $\Delta R^2$ )	.04*		.02		.03*		.07*	
Gender $\times$ Moderator <sup>a</sup> $\times$ Friend's Depression ( $\beta$ )		.41*		-.31		-.35**		.50**

Note: DV = Dependent variable.  
<sup>a</sup> Analyses include the relevant "moderator" in analyses, as defined previously.  
\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

longitudinal association between best friend's Time 1 depressive symptoms and adolescents' own depressive symptoms at Time 2, after controlling for adolescents' initial levels of depressive symptoms. No significant support was offered for adolescents' level of self-esteem as a moderator.<sup>2</sup>

For social anxiety, a significant three-way interaction effect was revealed, suggesting that the moderating effects of social anxiety differed significantly for boys and girls. Post hoc probing therefore first included the examination of separate models by gender. For girls, a two-way interaction (Best Friend's Depressive Symptoms  $\times$  Adolescent's Social Anxiety) was significant, suggesting that social anxiety was a significant moderator,  $\Delta R^2 = .16$ ;  $\beta = .42$ ,  $p < .001$ ; total  $R^2 = .62$ ,  $p < .001$ . This effect was followed by the computation of simple slopes. Results indicated that under conditions of high levels of social anxiety, best friends' depressive symptoms were longitudinally associated with adolescents' depressive symptoms,  $\beta = .47$ ,  $p < .001$ . No significant association was revealed between adolescents' and their friends' depressive symptoms under conditions of low social anxiety,  $\beta = -.10$ , *ns*. For boys, no significant effect was revealed for social anxiety as a moderator, two-way interaction  $\Delta R^2 = .01$ ;  $\beta = .04$ , *ns*; total  $R^2 = .28$ ,  $p < .001$ . The low magnitude of the boys' effect suggests that the lack of significance was not merely due to low statistical power.

A significant three-way interaction also was revealed in analyses examining best friend's level of peer-perceived popularity as a moderator.<sup>2</sup> In separate analyses, a significant two-way interaction effect (Best Friend's Depression  $\times$  Best Friend's Popularity) was revealed for boys,  $\Delta R^2 = .08$ ;  $\beta = .80$ ,  $p < .001$ ; total  $R^2 = .46$ ,  $p < .001$ , but not for girls,  $\Delta R^2 = .00$ ;  $\beta = -.02$ , *ns*; total  $R^2 = .41$ ,  $p < .001$ . Analyses of boys' slopes indicated that under conditions of high levels of best friends' popularity, best friends' Time 1 depressive symptoms were significantly associated longitudinally with adolescents' Time 2 depressive symptoms,  $\beta = .55$ ,  $p < .05$ , after controlling for initial levels of adolescents' depressive

symptoms. Under conditions of low levels of best friends' peer popularity, no significant longitudinal association between best friends' and adolescents' levels of depressive symptoms emerged,  $\beta = -.35$ , *ns*.

Last, friendship quality emerged as a significant moderator. Separate analyses by gender were conducted to follow up the significant three-way interaction effect revealed. For boys, a significant two-way interaction effect (Best Friend's Depressive Symptoms  $\times$  Friendship Quality) was revealed,  $\Delta R^2 = .20$ ;  $\beta = -.49$ ,  $p < .01$ ; total  $R^2 = .48$ ,  $p < .001$ . Analyses of simple slopes indicated that under conditions of high levels of friendship quality, best friends' depressive symptoms were not significantly associated with adolescents' depressive symptoms,  $\beta = -.26$ , *ns*. However, under conditions of low levels of friendship quality, best friends' depressive symptoms were significantly associated longitudinally with adolescents' depressive symptoms,  $\beta = .76$ ,  $p < .001$ . For girls, no significant interaction effect was revealed,  $\Delta R^2 = .02$ ;  $\beta = -.16$ , *ns*; total  $R^2 = .52$ ,  $p < .001$ .

## Discussion

An initial goal of this study was to replicate findings regarding peer contagion effects for depressive symptoms among adolescents (Hogue & Steinberg, 1995; Stevens & Prinstein, 2005). Results from this study, within a different sample than our previous work in this area, offered additional evidence to suggest that peer contagion likely has important implications not only for externalizing symptoms and health risk behaviors but also for internalizing symptoms, such as depression. This finding is relevant for research emphasizing the broad adjustment implications of peer experiences, and also for research examining interpersonal contributors to adolescent depression. Indeed, relatively little research has considered the manner in which the peer context may be important for understanding the increase in depression prevalence that accompanies the transition to adolescence. However, peer experiences may be relevant in several ways. In past social-cognitive work, findings have emphasized the manner in which negative peer experiences at the group level may predict depressive symptoms (Boivin, Hymel, & Bukowski, 1995), adolescents' biased encoding of group-level peer experiences may be affected by depressive symptoms (e.g., De Los Reyes & Prinstein, 2004), and adolescents' negative interpretations of group-level peer experiences may predict future levels of depression

<sup>2</sup>Adolescents typically befriend peers who are of similar levels of popularity. In this dataset, adolescents' and their best friends' levels of peer-perceived popularity were moderately correlated,  $r = .68$ ,  $p < .001$ . Thus, to ensure that best friends' popularity was not merely serving as a proxy for adolescents' own level of popularity in this analysis, this model was reexamined entering adolescents' own level of popularity as a predictor on Step 2. Results revealed virtually identical findings for the effects of adolescents' friends' popularity as a moderator. The three-way interaction term remained significant,  $\Delta R^2 = .04$ ;  $\beta = -.38$ ,  $p < .001$ ; total  $R^2 = .47$ ,  $p < .001$ .

(Prinstein & Aikins, 2004; Prinstein, Cheah, & Guyer, 2005; Quiggle, Garber, Panak, & Dodge, 1992). Findings from this study suggest that depressive symptoms also may be predicted by peer experiences at the dyadic level, as has recently been demonstrated in prior work (Prinstein, Borelli, Cheah, Simon, & Aikins, 2005; Rose, 2002). Overall, attention to peer factors may prove fruitful in prevention or intervention efforts among depressed adolescents. Examination of youth who are at risk for depression should include not only an assessment of overall peer status but also potentially maladaptive interactions occurring within otherwise close and supportive friendships.

An important future direction for work on peer contagion will be to further explore potential mechanisms that explain how peer socialization occurs. With regard to contagion of externalizing and health risk behaviors, several recent models have offered preliminary evidence to suggest that adolescents' perceptions of observable behavior among high-status peers, reinforcement for behavioral engagement, and erroneous attributions for peers' behavioral decisions may drive contagion effects (e.g., Bandura, 1973; Cohen & Prinstein, 2006; Dishion, Spracklen, Andrews, & Patterson, 1996; Prinstein & Wang, 2005). Application of these models to an understanding of depression symptom contagion is somewhat more challenging, however, given that depressive attitudes and behaviors likely manifest differently among peers and are less observable by others.

It may be that depression symptom contagion occurs through somewhat implicit behavioral processes. In other words, although the emulation of others' depressive behavior may not be an explicit goal of, or directive within, adolescents' friendship interactions (as may sometimes be the case for deviant behavior), specific dyadic friendship behaviors may inadvertently contribute to increases in depressive symptoms among both friends. Past theory and research have revealed several specific behaviors that may contribute to depression symptom contagion (e.g., corumination, excessive reassurance-seeking, negative feedback-seeking; Borelli & Prinstein, 2006; Prinstein et al., 2005; Rose, 2002). Findings from this study offer evidence to bolster each of these theories.

It also is possible that a third variable is associated both with friends' depressive symptoms and increases in adolescents' own depressive symptoms. This argument is relevant given that data from this study were not available to determine whether adolescents remained in stable friendships over the 18-month longitudinal interval. Therefore, it is unknown whether friends'

influence remained consistent. This is a limitation of almost all studies of peer influence. However, research suggests that friendship stability is stronger as children become older (Berndt & Hoyle, 1985). Moreover, prior research consistently has demonstrated no effects of friendship stability as a moderator of peer influence effects (Barry & Wentzel, 2006; Urberg et al., 1997).

A second contribution of this study was the examination of several types of moderators of peer contagion effects. A typology was offered to differentiate moderators that pertain to the target of peer contagion, the influential agent (i.e., the prototype), the relation between the target and prototype, and the peer contagion context. Moderators from three of these categories were examined, with significant findings suggesting that aspects of the target, prototype, and their relation may affect the magnitude of peer contagion effects. Results suggested that these moderators differed somewhat by adolescents' gender as well.

It has long been suggested that adolescents' possessing specific sociodemographic or psychological characteristics may be especially susceptible to peer influence; however, this has been examined in an inconsistent manner, yielding equivocal findings. Results from this study suggested that adolescents' higher levels of social anxiety symptoms seemed to be associated with a stronger susceptibility to depression contagion, at least among girls. Findings parallel results from a recent experimental investigation of peer contagion (Cohen & Prinstein, 2006) also indicating that socially anxious youth may be more susceptible to peer conformity, particularly in the context of others. In this past work, the moderating effects of social anxiety were revealed for adolescent boys' peer contagion of aggression and health risk behavior. In this study, social anxiety moderated depression contagion for girls only. Overall, this set of results suggests that adolescents who are particularly fearful of negative evaluations from others may participate in behaviors or adopt attitudes that bring them closer to those of their closest friends. Adolescents' social anxiety symptoms also may be associated with a stronger tendency to engage in depression-related behaviors with friends, such as corumination, excessive reassurance-seeking, or negative feedback-seeking that are longitudinally associated with girls' depression (Borelli & Prinstein, 2006; Prinstein et al., 2005; Rose, 2002).

In contrast to social anxiety, self-esteem did not emerge as a significant moderator of depression contagion effects. As compared to social anxiety, referring specifically to concerns regarding evaluation and acceptance in the peer group, self-esteem

is a multiply-determined index influenced by perceived competence across a range of performance domains. The specificity of findings for social anxiety as a moderator, but not self-esteem, perhaps offers some discriminant validity for the importance of social anxiety as a moderator. Adolescents' general internalized distress seems not to affect susceptibility to peer influence; however, concerns regarding peer evaluation might leave adolescents more vulnerable. This offers a clear and straightforward intervention opportunity for reducing adolescents' vulnerability to peer influence. Adolescents high in social anxiety symptoms may be particularly susceptible to influence from peers and may be at greater risk of difficulties if associating with friends who experience psychological symptoms.

Studies rarely have examined aspects of the influencing peer as a moderator of peer contagion, but social psychological theories routinely suggest that prototypes of high status are likely to exert an especially potent influence (Gerrard et al., 2002; Gibbons & Gerrard, 1997; Gibbons et al., 1998). Results supported this hypothesis, indicating that among boys, higher levels of their friends' peer-perceived popularity was associated with adolescents' increased susceptibility to depression contagion. It is plausible that adolescents are particularly likely to emulate the behaviors of friends who are especially popular among peers. There may be several ways that this would apply to depression-symptom contagion. It may be that adolescents conform to specific behaviors of their friends that are directly associated with depressive symptoms (e.g., adopting similarly biased attributions, shared hopelessness regarding future expectations of events), or adolescents may conform to behaviors of their high-status friends that have an indirect effect on future depressive symptoms (e.g., substance use, deviance; Brook, Brook, Zhang, Cohen, & Whiteman, 2002; Weisner, Kim, & Capaldi, 2005). In support of this latter possibility, past work has suggested that friendships with deviant peers is associated with increases in boys' depressive symptoms (Brendgen, Vitaro, & Bukowski, 2000).

A third possibility explaining the moderating effects of friends' level of popularity might pertain to adolescents' social comparisons between their and their friends' levels of status. It may be that adolescents with popular friends perceive a discrepancy between their popularity and that of their best friend. Among adolescents with elevated levels of depression, perceptions of their own status are likely biased and underestimated (Cillessen & Bellmore, 1999), thus magnifying the perceived discrepancy with friends. This perceived

discrepancy then may serve as a compounding risk factor, exacerbating the effects of their friends' depressive symptoms on their own depression. Future research examining adolescents' perceptions of popularity will be useful for fully exploring this hypothesis.

It was unanticipated that the effects of friends' group-level popularity would be relevant as a peer-influence moderator for boys and not girls. However, this finding generally is consistent with the notion that group-level status may be less important for girls than is the level of status within a friendship network or dyad (Prinstein et al., 2005). Examination of the level of status within a friendship group may be an important direction to understand prototype-oriented moderators of peer influence relevant to girls.

Last, results suggested that adolescents' relationship with their best friend was a significant moderator of depression contagion effects. Previous work has revealed that, among adolescent girls, at least one proxy of relationship closeness (i.e., reciprocity) was associated with increased depression contagion (Stevens & Prinstein, 2005). However, findings from past work have been mixed with regard to whether high or low levels of friendship quality increase susceptibility to peer contagion (cf. Juvonen et al., 2006; Urberg et al., 2003). In this study, adolescent boys' lower levels of positive friendship quality were associated with adolescents' greater susceptibility to peer contagion. Conformity may be motivated by a desire to increase affiliative opportunities or to gain additional emotional intimacy. Alternatively, low levels of positive friendship quality may be a product of engagement in depression-related behaviors. Recent work suggests that engagement in excessive reassurance-seeking and negative feedback-seeking behaviors has negative relationship consequences among friends (Borelli & Prinstein, 2006; Prinstein et al., 2005). The combination of exposure to others' depressive symptoms and the experience of an interpersonal stressor, such as deteriorating relationship quality, may predict increases in adolescents' own depression (Rudolph, 2002). Still another possibility is that low levels of positive friendship quality may serve as a marker for other predictors of depression, such as substance use or deviant behavior. Past work has suggested that adolescents who engage in deviant behavior typically report lower levels of friendship quality (Poulin, Dishion, & Haas, 1999).

Overall, this study offers new avenues for understanding peer contagion of internalizing symptoms and moderator of peer socialization more generally. This investigation offers numerous methodological advantages as compared to past work in this area.

However, several limitations exist that should be addressed in future research. For example, the results from this investigation offer a promising contribution toward understanding the predictors of elevated depressive symptoms but not clinical levels of depression. Recent work suggests that depression is best characterized as a syndromal rather than categorical disorder (Hankin, Fraley, Lahey, & Waldman, 2005); thus, the examination of elevated levels of clinical symptoms has important clinical significance. Nevertheless, the study of adolescents experiencing clinically significant levels of depression, and the use of additional assessment instruments designed to capture clinical depression, would be important in future work.

Future work also might benefit by utilizing samples from larger and broader peer contexts. This research examined friendships occurring in a traditional school setting. The results cannot be extended to inform different socialization processes that may occur within nonschool-based friendships (e.g., within neighborhoods). The use of a school-based sample also limited the sample size, as all participants included in analyses had selected a best friend who also was a member of the participating sample. Although there was no evidence to suggest that this sample was limited in its ability to represent the larger population from which it was drawn, the examination of more complex statistical models was prohibited due to insufficient statistical power. Replication of these findings in larger samples is needed, as is the study of these hypotheses among adolescents at different developmental levels (e.g., preadolescence or early adolescence). In addition, although the longitudinal design of this study offers an important advance over prior work in this area, the examination of more than two time points would offer opportunities for more complex statistical approaches that might yield more accurate estimates of contagion effects. Last, although data used in analyses were based on self- and friend report, as well as peer nominations, it should be noted that no data were based on adult informants, objective records, or observations.

Peer-contagion effects have been revealed in multiple-social science literatures. The potency of these effects presents one of the most intriguing and important challenges for developmental psychopathology scientists, clinical child and adolescent practitioners, and public health professionals interested in reducing adolescents' maladjustment. Continued examination of peer-contagion moderators offers an important and realistic avenue for mitigating the effects of peer influence as well as further elucidating the manner in which peer experiences may be relevant for

understanding adolescent depression. Affiliating with peers who experience psychological symptoms is not necessarily a risk factor for adolescents' own symptoms. Findings from this study suggest that clinical efforts should attend to several aspects of adolescents' and their friends' functioning as well as the relationships between adolescents and their best friend to determine who may be most susceptible to deleterious psychological influence.

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