# Long-term sequelae of subclinical depressive symptoms in early adolescence

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## Abstract

The long-term sequelae of adolescent depressive symptoms were examined in a multimethod, multireporter study of a diverse community sample of 179 adolescents followed from age 14 to 24. Mild to moderate levels of early adolescent depressive symptoms were found to predict lower maternal relationship quality, less positive interactions with romantic partners, and greater loneliness in adulthood even after accounting for prior levels of social functioning and for concurrent levels of adult depressive symptoms. Predictions were partially mediated via late adolescent avoidance of social interactions and poor maternal relationship quality. Results are interpreted as suggesting the potential impact of depressive symptoms on adolescent social development and the need to consider treatment for even mild symptoms and their social concomitants.

A core challenge in developmental psychopathology is understanding the process by which development can lead to pathology; yet, understanding the converse process (the way in which pathology may interfere with future development) has typically received far less attention. This study examines the sequelae of one potentially insidious form of pathology (mild depressive symptoms) experienced at a particularly sensitive period for social development in early adolescence in terms of its long-term effects on adult social functioning.

Although almost all of the long-term outcome research in this area has focused on diagnosable major depression in adolescence (Fergusson, Boden, & Horwood, 2007; Kasen et al., 2001; Lewinsohn, Rohde, Seeley, Klein, & Gotlib, 2000), more minor symptoms of depression may also have significant consequences (Gotlib, Lewinsohn, & Seeley, 1995; Pine, Cohen, Cohen, & Brook, 1999). Although chronically high and increasing levels of depressive symptoms across adolescence are associated with a range of negative adult outcomes (Wickrama & Wickrama, 2010), the long-term social sequelae of milder depressive symptoms in early adolescence have received scant attention. There is good reason, however, to believe that early adolescence is a period that is particularly sensitive to the negative effects of such symptoms. A developmental psychopathology perspective suggests the likelihood that depressive symptoms in adolescence will impinge upon ontogenic development, altering passage through key developmental tasks in ways that are likely to change long-term developmental outcomes (Cicchetti & Toth, 1998). Social development in particular appears to be affected by depressive symptoms, as adolescence is a critical period for the development of mature, adultlike social relationship skills with parents, peers, and romantic partners. These skills appear potentially altered by the presence of depressive symptoms (Aquilino, 2006; Roisman, Masten, Coatsworth, & Tellegen, 2004; Wickrama, Conger, Lorenz, & Jung, 2008). In terms of neurological development, the world of adultlike relationships opens up to the early adolescent as brain structures closely tied to adult social functioning (e.g., the prefrontal and parietal cortex) begin to take on their final form (Blakemore & Choudhury, 2006). The developmental task of learning to establish and maintain increasingly complex and intense peer relationships typically requires and receives extreme levels of attention and energy from the developing adolescent (Collins & Laursen, 2004). Peer relationships are thus likely to be particularly susceptible to disruption by depressive symptoms that leave the adolescent with less energy and perhaps less interest and confidence in pursuing and developing relationships. The ontogenic development principle suggests that such developmental disruptions may become established and remain on their own developmental track, regardless of whether or not the depressive symptoms themselves display long-term continuity (Cicchetti & Toth, 1998). In essence, the ontogenetic principle suggests that heterotypic continuity may be observed in which early adolescent depressive symptoms display continuity with later markers of social dysfunction (Sroufe & Jacobvitz, 1989).

One path by which the ontogenic principle may play out is that difficulties in initial experiences with key social relationships in early adolescence may provide the adolescent with a

template that will partly anchor expectations of relationships going forward. Early relationship experiences are likely to be particularly problematic for depressed adolescents (Connolly, Marton, & Kutcher, 1992; Daley & Hammen, 2002; Stice, Ragan, & Randall, 2004). Most research to date has focused on adolescents with diagnosable major depression. This research finds that depressed individuals tend to recall feedback from others more negatively (Gotlib, Lewinsohn, & Seeley, 1998) and may thus end up wanting to avoid relationships, which in turn may lead to further social deficits. A similar process has been observed in short-term studies of depressed adolescents (Rohde, Lewinsohn, & Seeley, 1994), suggesting a role for avoidance of relationships as a mediator of longer term links between depressive symptoms and social difficulties. Given the uniquely challenging social developmental tasks of early adolescence, even teens experiencing mild depressive symptoms are potentially vulnerable to substantial social impairment in both the short and long term. Because adult social difficulties and loneliness have been linked to a wide array of negative outcomes, ranging from mental health difficulties to physical health problems that include an increased risk for early mortality (Coyne, 1976; Hawkley, Berntson, & Cacioppo, 2003; Holt-Lunstad, Smith, & Layton, 2010; Joiner, 2002), potential links to early adolescent depressive symptoms are crucial to explore.

The potential long-term social sequelae of adolescent depressive symptoms are likely to extend to intimate and enduring relationships. Maintaining supportive relationships with parents, for example, is a complex and critical task in adolescence (Allen, Hauser, Bell, & O'Connor, 1994), and one that may be disrupted by depressive symptoms. Depressive symptoms often create intense needs for symptom relief and for reassurance that cannot be easily met in close relationships and that can lead to substantial frustration and conflict in these relationships (Hammen, 2000). Maintaining strong parent–adolescent relationships during the adolescent phase of renegotiation and reconfiguration of these relationships may be particularly important to the establishment of a supportive parent–adult child relationship beyond adolescence and to adult social functioning more broadly. Parent–adult child relationships have been repeatedly found to be crucial to early adult individuation and adjustment (Aquilino, 2006; Lerner et al., 1996; Powers, Hauser, & Kilner, 1989; Wickrama et al., 2008). Depressive symptoms in adolescence thus have the potential to create disruptions to parent–adolescent relationships at a uniquely important and vulnerable period of renegotiation and reconfiguration. Whether such disruptions might ultimately lead to more problematic long-term relationships with parents in young adulthood has not been previously examined.

Romantic relationships present similarly difficult potential challenges for adolescents experiencing depressive symptoms. Depressed individuals tend to find these relationships dissatisfying, even as they intently seek them out (Gotlib et al., 1998). Adolescence is a key period for learning to form and maintain positive romantic relationships (Collins, 2003), and expectations of relationships from adolescence appear likely to influence relationship qualities going forward (Roisman, Collins, Sroufe, & Egeland, 2007). Because romantic relationships gradually become primary and important sources of social support in adulthood, difficulties learning to establish positive romantic relationships early in adolescence may have substantial long-term consequences (Holt-Lunstad, Birmingham, & Jones, 2008; Zeifman & Hazan, 2008).

In sum, even mild to moderate levels of depressive symptoms in early adolescence have the potential to set the adolescent on a social–developmental pathway that will lead to difficulties in several arenas of adult social functioning. This study examined the role of depressive symptoms as predictors of long-term impairments in social functioning in a socioeconomically diverse community sample followed from age 14 through 23. To avoid confounds from the tendency of depressed individuals to recall relationships more negatively, this study assessed not only self-reported loneliness but also direct observations of interactions with a romantic partner and maternal reports of the quality of the mother–young adult relationship. Four specific hypotheses were examined to assess the relation of early adolescent depressive symptoms to early adult maternal relationship quality, romantic relationship quality and loneliness:

1. Early adolescent depressive symptoms will display long-term continuities with lower maternal and romantic relationship quality and with adult loneliness.
2. Links from depressive symptoms to relationship outcomes will remain even after excluding adolescents with the highest levels of early adolescent symptoms (e.g., those above clinical screening cutoffs in any of three assessments across early adolescence).
3. Links will remain even after accounting for baseline markers of peer and maternal relationship quality and for effects of concurrent depressive symptoms in early adulthood.
4. Predictions from adolescent depressive symptoms to early adult outcomes will be mediated via greater tendencies toward social avoidance and reduced quality of maternal relationships in late adolescence.

## Methods

### Participants

This report is drawn from a larger longitudinal investigation of adolescent social development in familial and peer contexts. Initial participants included 184 seventh and eighth graders (86 male and 98 female) followed over a 10-year period from ages 14 to 24. Adolescents were first assessed annually over a 3-year period in early adolescence (at ages 14.29, $SD = 0.75$, at Wave 1; 15.22, $SD = 0.80$, at Wave 2; and 16.35, $SD = 0.87$, at Wave 3). They were assessed at several points thereafter, up through the final two assessments at ages 22.8 ($SD = 0.96$) and 23.8 ($SD = 0.97$).

Adolescents were recruited from the seventh and eighth grades of a public middle school drawing from suburban

and urban populations in the Southeastern United States. Students were recruited via an initial mailing to all parents of students in the school along with follow-up contact efforts at school lunches. Families of adolescents who indicated they were interested in the study were contacted by telephone. Of all students eligible for participation, 63% agreed to participate either as target participants or as peers providing collateral information. All participants provided informed assent before each interview session, and parents provided informed consent until participants were over age 18, at which point they provided informed consent. Interviews took place in private offices within a university academic building.

The sample was racially/ethnically and socioeconomically diverse: 107 adolescents (58%) identified themselves as Caucasian, 53 (29%) as African American, 15 (8%) as of mixed race/ethnicity and 9 (5%) as being from other identity groups. Adolescents' parents reported an annual median family income in the $40,000–$59,999 range.

### Follow-up and attrition analyses

Follow-up data were obtained for 179 (97.3%) of the original 184 participants at ages 20 to 23 in early adulthood. Ninety-two romantic partners of target participants who were in romantic relationships lasting 3 months or longer between ages 21 and 23 also participated in an observational discussion task. Participants' mothers were surveyed when participants were in early adulthood, and reports from 125 mothers were obtained.

Comparisons of the 179 participants from whom we had follow-up data versus the 5 for whom we did not (1 of whom was deceased and 1 of whom had become intellectually disabled) indicated that those not continuing had lower initial levels of family income but were otherwise statistically indistinguishable from continuing participants. Comparisons of baseline data for participants with and without observational data from romantic partners at follow-up indicated that those without observational data from romantic partners did not differ from those with such data on any baseline measures. Comparisons of baseline data for participants with and without maternal report data in early adulthood indicated that those without maternal report data had lower family incomes in early adolescence than those who had such data but did not differ on any other baseline measures.

To best address any potential biases due to attrition in longitudinal analyses, full imputation maximum likelihood methods were used with analyses, including all variables that were linked to future missing data (i.e., where data were not missing completely at random). Because these procedures have been found to yield the least biased estimates when all available data are used for longitudinal analyses (vs. listwise deletion of missing data), the entire original sample of 184 was utilized for these analyses. This full sample thus provides the best possible estimates of long-term social outcomes and was least likely to be biased by missing data. Alternative longitudinal analyses using just those participants without missing data (i.e., listwise deletion) yielded results that were substantially identical to those reported below. Analyses suggest that, with the exception of romantic partner data (where attrition resulted from individuals who did not have romantic partners but was not related to baseline measures), attrition was quite modest overall and not likely to have distorted any of the findings reported.

### Procedure

In the initial introduction and throughout all sessions, confidentiality was assured to all study participants, and adolescents were told that their parents, friends, and romantic partners would not be informed of any of the answers they provided. Participants' data were covered by a Confidentiality Certificate issued by the US Department of Health and Human Services that protected information from subpoena by federal, state, and local courts. Transportation and childcare were provided if necessary. Adolescent/adult participants, their mothers, and their romantic partners were all paid for participation.

### Measures

*Depressive symptoms (ages 14–16, 23–24).* Adolescents reported the degree of their depressive symptoms using the Child Depression Inventory (CDI; Kovacs & Beck, 1977). This 27-item inventory is based on the Beck Depression Inventory (BDI) and has been well validated as a measure of depressive symptomatology linked to poor self-esteem, hopelessness, and negative cognitive attributions (Kazdin, 1990). Kovacs (1992) recommends that a score of 19 on the CDI be used as a screening cutoff, suggesting the need for further inquiry for individuals who may be experiencing clinically diagnosable major depression. Scores were summed and then averaged across assessments at ages 14, 15, and 16 to produce a baseline depressive symptoms score for early adolescence. Internal consistency for this measure was good (Cronbach $\alpha = 0.93$).

At age 23 and 24, participants completed the BDI, a 21-item measure designed to assess the degree of depressive symptoms in late adolescents and adults (Beck & Steer, 1987). Items were rated on a 0–3 scale and summed to yield a total depression score, with higher scores indicating more severe depressive symptoms. The BDI is a well-validated and widely accepted self-report measure of adult depressive symptomatology (Kazdin, 1990). Scores were summed and averaged across assessments at ages 23 and 24 to produce an overall depressive symptoms score for early adulthood. Internal consistency for this measure was good (Cronbach $\alpha = 0.91$).

Both the CDI and BDI use a continuum/severity versus a threshold approach, recognizing that higher levels of depressive symptoms that do not necessarily meet diagnostic thresholds may still be important in predicting future dysfunction (Lewinsohn, Solomon, Seeley, & Zeiss, 2000).

*Adult maternal relationship quality (age 23).* Adult maternal relationship quality was assessed via maternal report from the

Network of Relationships Inventory (Furman & Buhrmester, 1985), which obtains ratings on a series of 5-point Likert scales. A total positivity score was obtained by summing six 3-item scales for companionship, intimacy, nurturance, admiration, overall support and satisfaction. Internal consistency for this metascale was good (Cronbach α = 0.89) and reliability and validity have been previously documented (Furman, 1998).

*Adolescent maternal relationship quality (ages 14–16, 18–20).* The Inventory of Parent and Peer Attachment (Armsden & Greenberg, 1987) was used to assess adolescents' perceptions of the quality of their overall relationship with their mothers in early and late adolescence. Total attachment quality is calculated as the sum of fourteen 5-point Likert-scale items capturing communication and trust and seven 5-point items (reverse scored) capturing alienation in the relationship. Scores were summed and then averaged across assessments at ages 14, 15, and 16, and ages 18, 19, and 20 to produce overall scores for early and for late adolescence. Internal consistency was good at both points (Cronbach αs = 0.92 and 0.97, respectively).

*Peer relationship quality (age 14–16).* The Inventory of Parent and Peer Attachment (Armsden & Greenberg, 1987) was used to assess adolescents' perceptions of the quality of their overall relationship with their peers in early adolescence. Total attachment was calculated as the sum of fourteen 5-point Likert-scale items capturing communication and trust and seven 5-point items (reverse scored) capturing alienation in the relationship. Scores were summed and then averaged across assessments at ages 14, 15, and 16 to produce an overall score for early adolescence. Internal consistency for this scale was good (Cronbach α = 0.96).

*Social avoidance (age 19–21).* Social avoidance was assessed from the four-item general social avoidance scale from the Social Anxiety Scale for Adolescents (La Greca & Lopez, 1998). This scale has good psychometric properties and has been related concurrently to broad peer group acceptance and close friendship competence (La Greca & Lopez, 1998). Scores were summed and averaged across assessments at ages 19, 20, and 21 to produce an overall score for late adolescence. Internal consistency for this scale was good (Cronbach α = 0.87).

*Loneliness (age 23–24).* Loneliness was assessed via the UCLA Loneliness Scale (Russell, Peplau, & Cutrona, 1980). This 20-item measure assesses loneliness using responses on a 4-point Likert scale. Scores have been related to outcomes ranging from lower life satisfaction to attachment insecurity (Bowlby, 1969/1982; Goswick & Jones, 1982; Kobak & Sceery, 1988; Moore & Schultz, 1983). Scores were summed and then averaged across assessments at ages 23 and 24 to produce an overall score for early adulthood. Internal consistency for this scale was good (Cronbach α = 0.97).

*Observed romantic relationship quality.* Adult-romantic partner dyads participated in an 8-min videotaped task in which partners were presented with a hypothetical "dating court" scenario in which they were asked to separately make judgments about which member of a dating couple was correct in each of a series of hypothetical disagreements over matters ranging from meeting parents to clothing choice to time spent with friends versus partner. After making their decisions separately, target adults and their partners were then brought together in a revealed differences paradigm in which they could compare their answers and then try to come to a consensus (Strodtbeck, 1951).

The Autonomy-Relatedness Coding System was used to code these interactions (Allen, Porter, & McFarland, 2001; Allen, Porter, McFarland, McElhaney, & Marsh, 2007). This system yields a score for partners' behavior toward one another in the interaction. Ratings are molar in nature, yielding overall scores for behavior across the entire the interaction; however, these molar scores are derived from an anchored coding system that considers both the frequency and intensity of each speech relevant to that behavior during the interaction in assigning the overall molar score. The overall score for the quality of the relationship in the interaction sums behaviors of both parties that express warmth and promote collaboration, or are rude and hostile (reverse scored). Interrater reliability, based on double-coding of all interactions, was calculated using intraclass correlation coefficients and was in what is considered the "excellent" range for this coefficient (intraclass $r = .82$; Cicchetti & Sparrow, 1981).

## Results

### Preliminary analyses

Means and standard deviations for all variables examined in the study are presented in Table 1. Initial analyses examined the role of gender and family income in early adolescence on the primary substantive measures used in the study. Several substantive variables were related to income in the adolescent's family of origin and to adolescent gender; hence, these factors are considered and described as covariates in analyses below. We also examined possible moderating effects of these demographic factors on each of the relationships described in the primary analyses below. Moderation effects were assessed by creating interaction terms based on the product of the centered main effect variables. No moderating effects of adolescent gender or family income were found for any of the observed relationships described below.

### Primary analyses

#### Predictions of maternal relationship quality.

*Direct prediction.* Simple correlational analysis, as presented in Table 1, indicated a significant ($r = -.30$, $p < .001$) relationship between depressive symptoms at ages

**Table 1.** *Means, standard deviations, and intercorrelations of substantive variables*

| | M | SD | Depression (23–24) | Loneliness (23–24) | Maternal Relationship Quality (23) | Romantic Relationship Quality (22) | Peer Relationship Quality (14–16) | Maternal Relationship Quality (14–16) | Social Avoidance (19–21) | Maternal Relationship Quality (18–20) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Depression (14–16) | 6.61 | 5.23 | 35*** | 52*** | −30*** | −22* | −29*** | −23** | 46*** | −41*** |
| 2. Depression (23–24) | 5.07 | 5.31 | — | 54*** | 08 | −18 | −08 | 01 | 31*** | −21*** |
| 3. Loneliness (23–24) | 12.3 | 11.9 | | — | −21* | 10 | −28*** | −09 | 51*** | −32*** |
| 4. Maternal relationship quality (23) | 73.9 | 12.2 | | | — | −12 | 17 | 49*** | −13 | 38*** |
| 5. Romantic relationship quality (23) | 0.86 | 0.53 | | | | — | 12 | 19 | −02 | 17 |
| 6. Peer relationship quality (14–16) | 102.8 | 11.9 | | | | | — | 16* | −32*** | 52*** |
| 7. Maternal relationship quality (14–16) | 104.1 | 9.3 | | | | | | — | −27*** | 69*** |
| 8. Social avoidance (19–21) | 6.63 | 2.41 | | | | | | | — | −39*** |
| 9. Maternal relationship quality (18–20) | 102.5 | 16.4 | | | | | | | | — |

*Note:* Correlations are multiplied by 100. The age of assessment is in parentheses.
*$p < .05$. **$p < .01$. ***$p < .001$.

14–16 and lower maternal relationship quality, as reported by mothers, in early adulthood. Analyses next examined whether this relationship was primarily driven by adolescents' experiencing high levels of depressive symptoms. To eliminate the possibility that individuals above the recommended screening cutoff for possible depression (a score of 19) were driving findings, we examined a reduced data set in which adolescents who reached this screening cutoff at any of our assessment points at ages 14, 15, or 16 ($N = 19$) were removed from analyses. In these analyses, the correlation between adolescent depressive symptoms and poorer early adult maternal relationship quality remained, with the correlation actually slightly greater for this subsample ($r = -.31$, $p < .001$). All further analyses for this variable were conducted with the reduced data set including only individuals who did not report levels of depressive symptoms above screening cutoffs at any point in early adolescence.

*Predictions above baseline functioning and current depressive symptoms.* Analyses next examined whether predictions would remain after accounting for both baseline levels of social functioning in adolescence and concurrent levels of depressive symptoms in early adulthood. Although concurrent levels of depressive symptoms and baseline adolescent maternal and peer relationship quality were related to adult maternal relationship quality in simple correlational analyses reported in Table 1, prior levels of symptoms in adolescence continued to predict lower quality maternal relationships, even above concurrent depressive symptoms and adolescent maternal and peer relationship quality ($\beta = -0.34$, $p < .001$). This indicates that the relation of adolescent depressive symptoms to adult maternal relationship quality existed above both baseline social functioning and concurrent adult levels of depressive symptoms.

*Mediated pathways.* The extent to which predictions from adolescent depressive symptoms to adult maternal relationship quality were mediated by a tendency toward avoidance of social interactions and maternal relationship quality in mid- to late adolescence was examined via a path model that assessed the indirect effect of depressive symptoms on future maternal relationship quality via these two intervening variables in mid- to late adolescence. These analyses were conducted within Mplus, version 6.11 (Muthén & Muthén, 2011), using recommended bias-corrected bootstrapping procedures, with 5,000 iterations (MacKinnon, Lockwood, & Williams, 2004; Preacher & Hayes, 2008), with variables at each stage predicted by all variables at the prior stage, and covariances among variables within a stage always accounted for in models. This analysis revealed a nonsignificant degree of mediation of baseline depressive symptoms to adult maternal relationship quality via midadolescent maternal relationship quality ($\beta_{\text{indirect effect}} = -0.05$), just outside the 95% confidence interval (−0.100 to 0.006). The direct effect of adolescent depressive symptoms to adult maternal relationship quality remained in these analyses ($\beta = -0.23$,

$p = .01$). A significant effect was also observed from mid-adolescent maternal relationship quality to early adult depressive symptoms ($\beta = -0.26$, $p = .01$). No mediation via mid-adolescent social avoidance was found. (See Figure 1 for the full model depicting all significant predictors and pathways.)

*Prediction to adult romantic relationship behavior.*

*Direct prediction.* Simple correlational analysis, as presented in Table 1, indicated a significant ($r = -.22$ $p = .03$) relationship between depressive symptoms at ages 14–16 and lower quality interactions in adult romantic relationships at age 23. Analyses next examined whether this link was primarily driven by adolescents experiencing high levels of depressive symptoms. Examining only adolescents who never had scores above 19 on the CDI, as described above, the correlation between adolescent depressive symptoms and later observed quality of romantic partner interactions increased slightly ($r = -.37$, $p < .001$). All further analyses for this variable were conducted with the reduced data set including only individuals who did not report levels of depressive symptoms above screening cutoffs at any point in early adolescence.

*Predictions above baseline functioning and current depressive symptoms.* Analyses next examined whether predictions would remain after accounting for both baseline levels of social functioning in adolescence and for concurrent levels of depressive symptoms in early adulthood. Although concurrent levels of depressive symptoms and baseline adolescent functioning with peers were strongly related to adult romantic relationship behavior in simple correlational analyses reported in Table 1, prior levels of depressive symptoms in adolescence continued to predict lower levels of positive romantic relationship behavior, even above concurrent depressive symptoms and adolescent maternal and peer relationship quality, as shown in Table 2.

*Mediated pathways.* The extent to which predictions of future romantic relationship quality were mediated by a tendency toward avoidance of social interactions and by maternal and peer relationship quality in mid- to late adolescence was examined via a path model that assessed the indirect effect of depressive symptoms on future loneliness via these two intervening variables in mid- to late adolescence using the approach described above. No evidence of such mediation was found, and even when these two variables were included in models with all of the other variables described above, the direct effect of early adolescent depressive symptoms remained significant ($\beta = -0.27$, $p = .03$). This suggests that the relationship between early adolescent depressive symptoms and future romantic relationship behavior was not mediated via the intervening factors examined.

*Prediction of early adult loneliness.* Simple correlational analysis, as presented in Table 1, indicated a large effect size ($r = .52$, $p < .001$) for the relationship between depressive symptoms at ages 14–16 and early adult loneliness at ages 23–24. Analyses then examined whether this relationship was primarily driven by adolescents' experiencing high levels of depressive symptoms. Examining only adolescents who never had scores above 19 on the CDI, as described above, the correlation between adolescent depressive symptoms and later loneliness remained, with the correlation only modestly reduced ($r = .41$, $p < .001$). All further analyses for this variable were conducted with the reduced data set including only individuals who did not report levels of de-
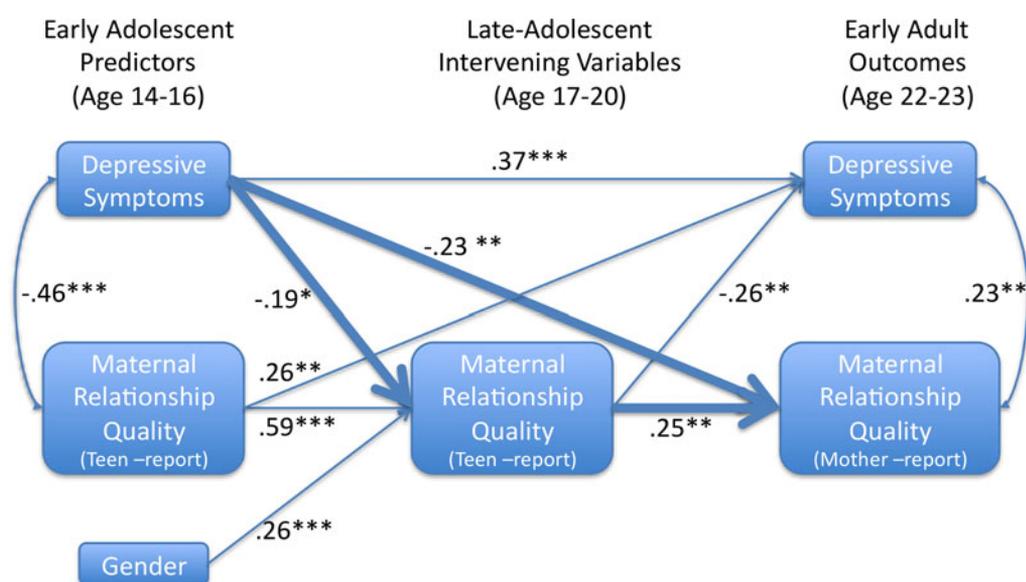


**Figure 1.** (Color online) The mediated relationship between early adolescent depressive symptoms and adult maternal relationship quality.

**Table 2.** *Predicting observed romantic relationship interaction quality (age 23–24)*

| | Romantic Relationship Quality (Age 23–24) | | |
| --- | --- | --- | --- |
| | β | $\Delta R^2$ | Total $R^2$ |
| Step I | | | |
|   Gender (1 = male, 2 = female) | −0.12 | | |
|   Total family income (13) | 0.39*** | | |
|   Statistics for step | | .088 | .088 |
| Step II | | | |
|   Peer relationship quality (14–16) | 0.13 | .092* | .180* |
|   Maternal relationship quality (14–16) | −0.04 | | |
| Step III | | | |
|   Depression (23–24) | 0.02 | .008 | .188* |
| Step IV | | | |
|   Depression (14–16) | −0.30** | .087** | .275** |

*Note:* The βs are from the final model.
*p < .05. **p < .01. ***p < .001.

pressive symptoms above screening cutoffs at any point in early adolescence.

Predictions *above baseline functioning and current depressive symptoms.* Analyses next examined whether predictions would remain after accounting for both baseline levels of social functioning in adolescence and for concurrent levels of depressive symptoms in early adulthood. Although concurrent levels of depressive symptoms and baseline adolescent functioning with peers were strongly related to adult-reported loneliness in simple correlational analyses reported in Table 1, prior levels of depressive symptoms in adolescence continued to predict loneliness above concurrent depressive symptoms and adolescent maternal and peer rela-

tionship quality (β = 0.15, p = .05). This indicates that the relation of adolescent depressive symptoms to adult loneliness existed above both baseline social functioning and concurrent adult levels of depressive symptoms.

*Mediated pathways.* The extent to which predictions of future loneliness were mediated by a tendency toward avoidance of social interactions and by quality of the maternal relationship in mid- to late adolescence was examined via a fully saturated path model that assessed the indirect effect of depressive symptoms on future loneliness via social avoidance and maternal relationship quality in mid- to late adolescence. The effects of baseline depressive symptoms in early adolescence were found to be mediated via a tendency toward
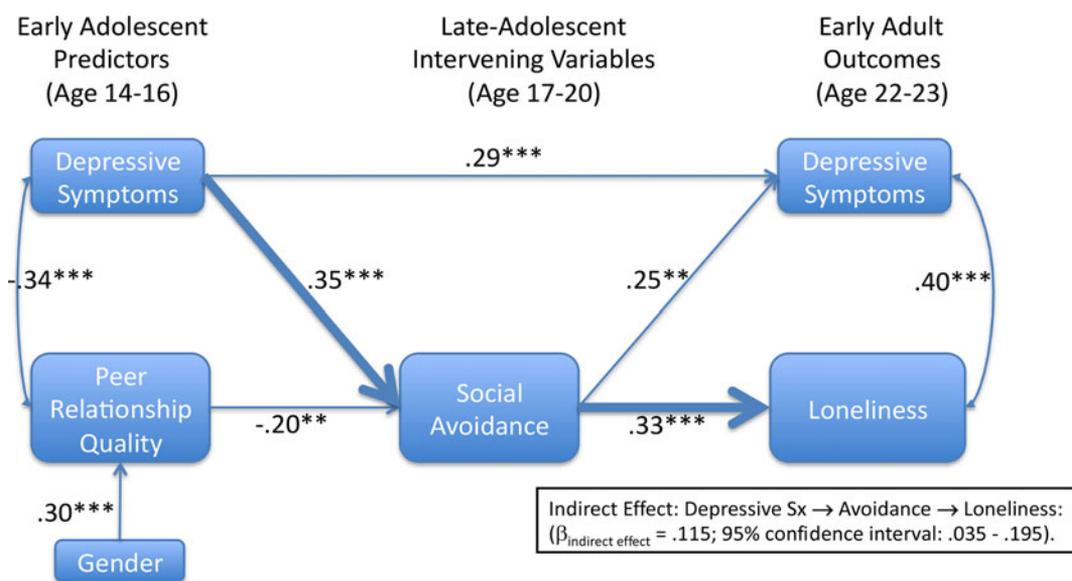


**Figure 2.** (Color online) The mediated relationship between early adolescent depressive symptoms and adult loneliness.

social avoidance in midadolescence, with a significant indirect effect ($\beta_{\text{indirect effect}}$ = 0.115, 99% confidence interval = –0.010–0.220) found from early-adolescent depressive symptoms to midadolescent social avoidance to adult loneliness. The direct effect of early-adolescent depressive symptoms on adult loneliness dropped to the trend level ($\beta$ = 0.13, $p$ =.07). A significant effect was also observed from social avoidance to early adult depressive symptoms ($\beta$ = 0.25, $p$ = .002). No mediation via quality of the midadolescent maternal relationship was found. Figure 2 presents the full model depicting all significant predictors and pathways.

## Discussion

The results of this study show that even depressive symptoms in early adolescence that do not exceed clinical screening cutoffs in repeated assessments can predict a significant risk for social difficulty into early adulthood. Future social difficulties appeared across a variety of domains, including overall levels of loneliness and difficulties in specific family and romantic relationships. Difficulties were observed from a variety of perspectives from self-report to maternal report to direct observation and were found even after accounting for concurrent depressive symptoms in adulthood and for prior levels of social functioning in early adolescence. Although lay conceptions of adolescence as being associated with "moodiness" might lead to a tendency to minimize the importance of milder depressive symptoms during this period, these findings suggest that such symptoms warrant attention as potential markers of a range of future social difficulties.

Although even longitudinal data cannot establish the presence of causal pathways, these findings are consistent with a role for depressive symptoms in early adolescence as interfering with processes of social development at a critical point in such development to create long-term risks of dysfunction. Consistent with this perspective, predictive effects of depressive symptoms appeared partially mediated by intervening qualities of social functioning in late adolescence. In terms of predictions of adult loneliness, links from adolescent depressive symptoms appeared mediated by a tendency toward avoidance of social interactions in late adolescence. Predictions to qualities of maternal and romantic relationships remained after considering concurrent levels of depressive symptoms and potential intervening variables, although they did not appear to be mediated by the intervening variables examined. Together, these findings are consistent with the perspective that early adolescent depressive symptoms may alter social–developmental trajectories in ways that forecast longer term problems in social functioning.

The types of difficulties predicted by early-adolescent depressive symptoms were not trivial. Loneliness and social isolation in adulthood have been related to a host of deleterious mental and physical outcomes (Hawkley, Masi, Berry, & Cacioppo, 2006; Holt-Lunstad et al., 2010; O'Reilly & Emerson Thomas, 1989; Powers et al., 1989). In addition, it is noteworthy that in adulthood social difficulties are likely to contribute

to future depressive symptoms and may be an important factor underlying the observed chronicity of depressive symptoms (Fergusson et al., 2007; Joiner, 2000; Pine et al., 1999). This perspective received some support in the present study, because social avoidance and a lower quality maternal relationship in mid- to late adolescence also predicted depressive symptoms in early adulthood, even after accounting for symptom levels in early adolescence. Although depressive symptoms no doubt have their own endogenous sources of stability, the present results suggest that stability may also be maintained in part via a cumulative continuity process (Caspi, Bem, & Elder, 1989) in which early depressive symptoms impair future social relationship qualities that in turn increase the likelihood of future depressive symptoms. In adulthood, major depression is substantially (25%–30%) comorbid with social phobia and avoidant personality disorder (Alpert, Uebelacker, McLean, & Nierenberg, 1997), and the finding that depressive symptoms predict long-term social impairment may help to explain this comorbidity. One caveat should be noted: potential mediators were examined simply as intervening links in a chain. The data did not exist to permit examination of a more formal mediational model in which change was predicted at each stage of the model from identical variables at the preceding stage (i.e., from social avoidance in early adolescence to midadolescence). These findings cannot rule out the presence of alternative causal pathways (e.g., from early relationship difficulties to later depression, or from unmeasured external variables) in these models.

This study found predictions in a sample that excluded adolescents displaying higher levels of depressive symptoms (i.e., above a standard clinical screening cutoff) at *any* one of the three assessment points from ages 14 to 16. This is consistent with the notion that depressive symptoms in adolescence are best viewed on a continuum, with individuals who consistently appear below clinical diagnostic thresholds vulnerable to long-term impairment in addition to short-term distress (Gotlib et al., 1995; Lewinsohn, Solomon, et al., 2000). These findings cannot be explained as simply reflecting the ongoing effects of a stable depressive pattern from adolescence to adulthood. Not only does the observed instability of adolescent depressive affect and symptoms across this period mitigate against this explanation (Larson, Moneta, Richards, & Wilson, 2003; Lewinsohn, Petit, Joiner, & Seeley, 2003), but also predictions to each examined social outcome remained, even after accounting for concurrent levels of depressive symptoms in adulthood.

A developmental psychopathology perspective offers perhaps the most satisfying explanation of these findings (Cicchetti & Toth, 1998). From this perspective, depressive symptoms may have deleterious effects on critical ongoing social processes, such as the effort to establish adultlike social relationships with peers and family, which is a key developmental task of adolescence. The current findings are consistent with prior research suggesting that early-adolescent depressive symptoms may alter developmental trajectories in ways that then have effects into early adulthood (Wickrama et al., 2008; Wickrama & Wickrama, 2010). By interfering

with this task at a sensitive point in development, even symptoms that will themselves display only modest stability going forward may profoundly alter the adolescent's developmental trajectory in ways that predict long-term social impairment.

These findings suggest the potential importance of early detection and treatment of even milder depressive symptoms in adolescence. By 2020, depression is predicted to be the second largest cause of disability and related costs worldwide (Murray & Lopez, 1996), but these cost analyses do not include many of the secondary social effects of early depression identified in this study. The findings of this study suggest that even so-called minor levels of depressive symptoms may be anything but minor. These findings also suggest the potential importance of interpersonal therapies for adolescent depression (Mufson, Weissman, Moreau, & Garfinkel., 1999). Addressing the social sequelae of adolescent depressive symptoms within these therapies may be as important as addressing the symptoms themselves in terms of enhancing long-term outcomes.

It is notable that there were no gender differences observed in these data, nor did gender moderate any of the effects observed. Whereas major depressive disorder gradually evinces a clear gender difference in prevalence primarily beginning in mid- to late adolescence (Hankin et al., 1998), gender effects on symptom-level reports are typically far more modest. By age 16, females are typically only about 10% above males (e.g., 1 scale point on the CDI) in reported symptom levels (Twenge & Nolen-Hoeksema, 2002). This study found that the pattern of long-term social impairment predicted by adolescent depressive symptoms did not differ significantly for males versus females.

Several limitations to these findings warrant note. As already mentioned, although this study can address causal hypotheses, its design only allows it to potentially disconfirm, not directly support, such hypotheses. In addition, diagnostic interviews were not conducted with this sample. Although, as a community sample, we would expect the incidence of confirmed major depressive disorder to be quite modest, particularly among those who are consistently below clinical screening cutoffs, this cannot be definitively ascertained. Although depressive symptoms were assessed repeatedly on an annual basis, no assessments during the intervening periods were made, leaving open the possibility that substantially higher (or lower) levels of symptoms may have been found during these periods. Future research would be needed to make generalizations to more severely impaired samples. Findings regarding reported loneliness may be somewhat inflated, given the common method variance from use of self-reports to assess both adolescent symptoms and adult loneliness (although by covarying adult reports of depressive symptoms, some of this methods confound is removed from results). Quite similar findings were obtained for other report and observational assessments of adult social functioning where no methods confounds are present. Our understanding of the mediators of long-term predictions from depressive symptoms is still at a quite rudimentary phase. Further research examining microprocesses that occur within early to midadolescence for depressed individuals is needed to flesh out precisely how long-term links to social difficulties are established and maintained.

## References

Allen, J. P., Hauser, S. T., Bell, K. L., & O'Connor, T. G. (1994). Longitudinal assessment of autonomy and relatedness in adolescent–family interactions as predictors of adolescent ego development and self-esteem. *Child Development*, *65*, 179–194.

Allen, J. P., Porter, M. R., & McFarland, C. F. (2001). *The Autonomy and Relatedness Coding System for Peer Interactions*. University of Virginia, Charlottesville.

Allen, J. P., Porter, M. R., McFarland, F. C., McElhaney, K. B., & Marsh, P. A. (2007). The relation of attachment security to adolescents' paternal and peer relationships, depression, and externalizing behavior. *Child Development*, *78*, 1222–1239.

Alpert, J. E., Uebelacker, L. A., McLean, N. E., & Nierenberg, A. A. (1997). Social phobia, avoidant personality disorder and atypical depression: Co-occurrence and clinical implications. *Psychological Medicine*, *27*, 627–633.

Aquilino, W. S. (2006). Family relationships and support systems in emerging adulthood. In J. J. Arnett & J. L. Tanner (Eds.), *Emerging adults in America: Coming of age in the 21st century* (pp. 193–217). Washington, DC: American Psychological Association.

Armsden, G. C., & Greenberg, M. T. (1987). The Inventory of Parent and Peer Attachment: Individual differences and their relationship to psychological well-being in adolescence. *Journal of Youth and Adolescence*, *16*, 427–454.

Beck, A. T., & Steer, R. A. (1987). *Beck Depression Inventory manual*. New York: Psychological Corporation.

Blakemore, S. J., & Choudhury, S. (2006). Development of the adolescent brain: Implications for executive function and social cognition. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *47*, 296–312. doi:10.1111/j.1469-7610.2006.01611.x

Bowlby, J. (1969/1982). *Attachment and loss: Vol. 1. Attachment*. New York: Basic Books.

Caspi, A., Bem, D. J., & Elder, G. H. (1989). Continuities and consequences of interactional styles across the life course. *Journal of Personality*, *57*, 375–406.

Cicchetti, D., & Toth, S. L. (1998). The development of depression in children and adolescents. *American Psychologist*, *53*, 221–241.

Cicchetti, D. V., & Sparrow, S. A. (1981). Developing criteria for establishing interrater reliability of specific items: Applications to assessment of adaptive behavior. *American Journal of Mental Deficiency*, *86*, 127–137.

Collins, W. A. (2003). More than myth: The developmental significance of romantic relationships during adolescence. *Journal of Research on Adolescence*, *13*, 1–24.

Collins, W. A., & Laursen, B. (2004). Changing relationships, changing youth: Interpersonal contexts of adolescent development. *Journal of Early Adolescence*, *24*, 55–62.

Connolly, J., Geller, S., Marton, P., & Kutcher, S. (1992). Peer responses to social interaction with depressed adolescents. *Journal of Clinical Child Psychology*, *21*, 365–370.

Coyne, J. C. (1976). Toward an interactional description of depression. *Psychiatry: Journal for the Study of Interpersonal Processes*, *39*, 28–40.

Daley, S. E., & Hammen, C. (2002). Depressive symptoms and close relationships during the transition to adulthood: Perspectives from dysphoric women, their best friends, and their romantic partners. *Journal of Consulting and Clinical Psychology*, *70*, 129–141.

Fergusson, D. M., Boden, J. M., & Horwood, L. J. (2007). Recurrence of major depression in adolescence and early adulthood, and later mental health, educational and economic outcomes. *British Journal of Psychiatry*, *191*, 335–342.

Furman, W. (1998). The measurement of friendship perceptions: Conceptual and methodological issues. In W. M. Bukowski, A. F. Newcomb, & W. W. Hartup (Eds.), *The company they keep: Friendship in childhood and adolescence* (pp. 41–65). New York: Cambridge University Press.

Furman, W., & Buhrmester, D. (1985). Childrens' perceptions of the personal relationships in their social networks. *Developmental Psychology*, 21, 1016–1024.

Goswick, R. A., & Jones, W. H. (1982). Components of loneliness during adolescence. *Journal of Youth and Adolescence*, 11, 373.

Gotlib, I. H., Lewinsohn, P. M., & Seeley, J. R. (1995). Symptoms versus a diagnosis of depression: Differences in psychosocial functioning. *Journal of Consulting and Clinical Psychology*, 63, 90.

Gotlib, I. H., Lewinsohn, P. M., & Seeley, J. R. (1998). Consequences of depression during adolescence: Marital status and marital functioning in early adulthood. *Journal of Abnormal Psychology*, 107, 686–690.

Hammen, C. (2000). Interpersonal factors in an emerging developmental model of depression. In S. L. Johnson, A. M. Hayes, T. M. Field, N. Schneiderman, & P. M. McCabe (Eds.), *Stress, coping, and depression* (pp. 71–88). Mahwah, NJ: Erlbaum.

Hankin, B. L., Abramson, L. Y., Moffitt, T. E., Silva, P. A., McGee, R., & Angell, K. E. (1998). Development of depression from preadolescence to young adulthood: Emerging gender differences in a 10-year longitudinal study. *Journal of Abnormal Psychology*, 107, 128–140. doi:10.1037/0021-843X.107.1.128

Hawkley, L. C., Burleson, M. H., Berntson, G. G., & Cacioppo, J. T. (2003). Loneliness in everyday life: Cardiovascular activity, psychosocial context, and health behaviors. *Journal of Personality and Social Psychology*, 85, 105.

Hawkley, L. C., Masi, C. M., Berry, J. D., & Cacioppo, J. T. (2006). Loneliness is a unique predictor of age-related differences in systolic blood pressure. *Psychology and Aging*, 21, 152.

Holt-Lunstad, J., Birmingham, W., & Jones, B. Q. (2008). Is there something unique about marriage? The relative impact of marital status, relationship quality, and network social support on ambulatory blood pressure and mental health. *Annals of Behavioral Medicine*, 35, 239–244. doi:10.1007/s12160-008-9018-y

Holt-Lunstad, J., Smith, T. B., & Layton, J. B. (2010). Social relationships and mortality risk: A meta-analysis. *PLoS Medicine*, 7, 1–20. doi:10.1371/journal.pmed.1000316

Joiner, T. E., Jr. (2002). Depression in its interpersonal context. In I. H. Gotlib & C. L. Hammen (Eds.), *Handbook of depression* (pp. 295–313). New York: Guilford Press.

Joiner, T. E., Jr. (2000). Depression's vicious scree: Self-propagating and erosive processes in depression chronicity. *Clinical Psychology: Science and Practice*, 7, 203–218.

Kasen, S., Cohen, P., Skodol, A. E., Johnson, J. G., Smailes, E., & Brook, J. S. (2001). Childhood depression and adult personality disorder: Alternative pathways of continuity. *Archives of General Psychiatry*, 58, 231–236. doi:10.1001/archpsyc.58.3.231

Kazdin, A. E. (1990). Childhood depression. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 31, 121–160.

Kobak, R. R., & Sceery, A. (1988). Attachment in late adolescence: Working models, affect regulation, and representations of self and others. *Child Development*, 59, 135–146.

Kovacs, M. (1992). *Children's Depression Inventory manual*. New York: Multi-Health Systems.

Kovacs, M., & Beck, A. T. (1977). *An empirical clinical approach toward a definition of childhood depression*. New York: Raven Press.

La Greca, A. M., & Lopez, N. (1998). Social anxiety among adolescents: Linkages with peer relations and friendships. *Journal of Abnormal Child Psychology*, 26, 83–94.

Larson, R. W., Moneta, G., Richards, M. H., & Wilson, S. (2003). Continuity, stability, and change in daily emotional experience across adolescence. *Child Development*, 73, 1151–1165.

Lerner, R. M., Lerner, J. V., von Eye, A., Ostrom, C. W., Nitz, K., Talwar-Soni, R., et al. (1996). Continuity and discontinuity across the transition of early adolescence: A developmental contextual perspective. In J. A. Graber, J. Brooks-Gunn, & A. C. Petersen (Eds.), *Transitions through adolescence: Interpersonal domains and context* (pp. 3–22). Hillsdale, NJ: Erlbaum.

Lewinsohn, P. M., Petit, J. W., Joiner, T. E., Jr., & Seeley, J. R. (2003). The symptomatic expression of major depressive disorder in adolescents and young adults. *Journal of Abnormal Psychology*, 112, 244–252.

Lewinsohn, P. M., Rohde, P., Seeley, J. R., Klein, D. N., & Gotlib, I. H. (2000). Natural course of adolescent major depressive disorder in a community sample: Predictors of recurrence in young adults. *American Journal of Psychiatry*, 157, 1584–1591.

Lewinsohn, P. M., Solomon, A., Seeley, J. R., & Zeiss, A. (2000). Clinical implications of "subthreshold" depressive symptoms. *Journal of Abnormal Psychology*, 109, 345–351.

MacKinnon, D. P., Lockwood, C. M., & Williams, J. (2004). Confidence limits for the indirect effect: Distribution of the product and resampling methods. *Multivariate Behavioral Research*, 39, 99–128. doi:10.1207/s15327906mbr3901_4

Moore, D., & Schultz, N. R. (1983). Loneliness at adolescence: Correlates, attributions, and coping. *Journal of Youth and Adolescence*, 12, 95.

Mufson, L., Weissman, M. M., Moreau, D., & Garfinkel, R. (1999). Efficacy of interpersonal psychotherapy for depressed adolescents. *Archives of General Psychiatry*, 56, 573–579.

Murray, C. J., & Lopez, A. D. (1996). Evidence-based health policy: Lessons from the Global Burden of Disease Study. *Science*, 274, 740–743.

Muthén, L. K., & Muthén, B. O. (2011). *Mplus user's guide, version 6.11*. Los Angeles: Author.

O'Reilly, P., & Emerson Thomas, H. (1989). Role of support networks in maintenance of improved cardiovascular health status. *Social Science & Medicine*, 28, 249–260.

Pine, D. S., Cohen, E., Cohen, P., & Brook, J. (1999). Adolescent depressive symptoms as predictors of adult depression: Moodiness or mood disorder? *American Journal of Psychiatry*, 156, 133–135.

Powers, S. I., Hauser, S. T., & Kilner, L. A. (1989). Adolescent mental health. *American Psychologist*, 44, 200–208.

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, 40, 879–891.

Rohde, P., Lewinsohn, P. M., & Seeley, J. R. (1994). Are adolescents changed by an episode of major depression? *Journal of the American Academy of Child & Adolescent Psychiatry*, 33, 1289–1298.

Roisman, G. I., Collins, W. A., Sroufe, L. A., & Egeland, B. (2007). Predictors of young adults' representations of and behavior in their current romantic relationship: Prospective tests of the prototype hypothesis. *Attachment & Human Development*, 7, 105–121.

Roisman, G. I., Masten, A. S., Coatsworth, J. D., & Tellegen, A. (2004). Salient and emerging developmental tasks in the transition to adulthood. *Child Development*, 75, 123–133.

Russell, D., Peplau, L. A., & Cutrona, C. E. (1980). The revised UCLA Loneliness Scale: Concurrent and discriminant validity evidence. *Journal of Personality and Social Psychology*, 39, 472–480.

Sroufe, L. A., & Jacobvitz, D. (1989). Diverging pathways, developmental transformations, multiple etiologies and the problem of continuity in development. *Human Development*, 32, 196–203.

Stice, E., Ragan, J., & Randall, P. (2004). Prospective relations between social support and depression: Differential direction of effects for parent and peer support? *Journal of Abnormal Psychology*, 113, 155–159.

Strodtbeck, F. (1951). Husband–wife interaction over revealed differences. *American Sociology Review*, 16, 463–473.

Twenge, J. M., & Nolen-Hoeksema, S. (2002). Age, gender, race, socioeconomic status, and birth cohort difference on the children's depression inventory: A meta-analysis. *Journal of Abnormal Psychology*, 111, 578–588.

Wickrama, K. A. S., Conger, R. D., Lorenz, F. O., & Jung, T. (2008). Family antecedents and consequences of trajectories of depressive symptoms from adolescence to young adulthood: A life course investigation. *Journal of Health and Human Behavior*, 49, 468–483.

Wickrama, T., & Wickrama, K. (2010). Heterogeneity in adolescent depressive symptom trajectories: Implications for young adults' risky lifestyle. *Journal of Adolescent Health*, 47, 407–413.

Zeifman, D., & Hazan, C. (2008). Pair bonds as attachments: Reevaluating the evidence. In J. Cassidy & P. R. Shaver (Eds.), *Handbook of attachment: Theory, research, and clinical applications* (2nd ed., pp. 436–455). New York: Guilford Press.