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Understanding the Sex Difference in Vulnerability to Adolescent Depression: An Examination of Child and Parent Characteristics

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ABSTRACT
This study examined sex differences in risk factors associated with adolescent depression in a large sample of boys and girls. Moderation and mediation explanatory models of the sex difference in likelihood of depression were examined. Findings indicate that the factors associated with depression in adolescent boys and girls are quite similar. All of the variables considered were associated with depression, but sex did not moderate the impact of vulnerability factors on likelihood of depression diagnosis. However, negative self-perceptions in the domains of achievement, global self-worth, and physical appearance partially mediated the relationship between sex and depression. Further, girls had higher levels of positive self-perceptions in interpersonal domains that acted as suppressors and reduced the likelihood of depression in girls. These findings suggest that girls' higher incidence of depression is due in part to their higher levels of negative self-perceptions, whereas positive interpersonal factors serve to protect them from depressive episodes.

KEY WORDS: adolescence - depression - sex differences - vulnerability factors - protective factors

Many studies have documented that women are two to three times more likely than men to become depressed, and that this sex difference emerges during adolescence, by age 14 or 15 (e.g., Kessler, McGonagle, Swartz, Blazer, & Nelson, *1993*; Wade, Cairney, & Pevalin, *2002*). A number of studies have attempted to explain the emergence of this sex difference by examining a variety of psychosocial risk factors (e.g., see Hankin & Abramson, *2001*; Nolen-Hoeksema & Girgus, *1994*; Rudolph, *2002*, for reviews), but there are still gaps and inconsistencies in the literature. Using a large community sample of adolescents, we examine sex differences in a number of vulnerability factors for depression, including characteristics of the parent, child, and parent–child relationship. Further, we seek to add to the conceptual knowledge of vulnerability factors for depression by examining both moderation and mediation models of the sex difference using the same sample.

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Mediation and moderation are statistical models that test two pathways that explain why adolescent girls have a higher likelihood of depression compared to boys. One pathway proposes that adolescent girls' higher likelihood of depression is due to their greater susceptibility to vulnerability factors (see Nolen-Hoeksema & Girgus, *1994*, for a review). That is, even if boys and girls have the same levels of vulnerability factors, the impact of these vulnerabilities on the likelihood of depression is greater for girls than boys. This explanation for the sex differences in depression represents a moderation model wherein the impact of vulnerability factors on depression likelihood differs for boys and girls (Baron & Kenny, *1986*). A mediation pathway proposes a different relationship between sex and depression. It poses that girls' higher likelihood of depression is due to their higher levels of depression vulnerability factors, compared to males. Thus, this model suggests that even if boys and girls are susceptible to the same vulnerability factors for depression, girls may be more likely to be depressed because they tend to have higher levels of these vulnerabilities. Over time, researchers have distinguished between these two pathways and called for more studies to test mediation models of sex differences in depression, as this approach has been relatively neglected in the past (Hankin & Abramson, *1999*).

Studies of adolescents have examined moderation and mediation pathways with respect to a number of vulnerability factors. The current study's selection of variables is largely driven by an interpersonal perspective on the sex difference in depression. Researchers have proposed that the emergence of the sex difference in adolescence is in part due to a developmental trend for girls to increasingly value relationships at this time, making them increasingly vulnerable to interpersonal difficulties (see Cyranowski, Frank, Young, & Shear, *2000*; Rudolph, *2002*, for reviews of evidence in favor of this perspective; see Nolen-Hoeksema & Girgus, *1994*, for a contrasting view). This line of research draws upon the gender intensification theory of adolescent development (Hill & Lynch, *1983*), which describes increased social pressure to conform to stereotypically male and female roles. Indeed, gender intensification can be described by both moderation and mediation models. From a moderation perspective, adolescence marks a time when boys and girls are increasingly socialized to value different life spheres, so that the same vulnerability domains may differentially affect their susceptibility to depression. A slightly different interpretation of gender intensification theory supports the mediation perspective that boys and girls are increasingly socialized to be different from each other in adolescence, and differences in levels of vulnerability factors in turn predict girls' greater likelihood of depression.

The current study examines two key interpersonal domains: Relationships with parents and peers. It is important to examine both kinds of relationships, as adolescence is characterized by a process of individuation from the family (Furman & Buhrmester, *1992*), and both parent and peer attachments are associated with adolescent depression (Armsden, McCauley, Greenberg, Burke, & Mitchell, *1990*). Specifically, we consider factors related to the quality of adolescents' relationships with parents (e.g., parental depression, parenting practices) as well as their cognitions about peer relationships. Further, we contrast an examination of interpersonal factors with examination of cognitions about achievement, as relational style theories have proposed that whereas females tend to value interpersonal relationships, males value autonomy and goal achievement (Beck, *1987*; Blatt, *1990*). In addition to strictly interpersonal variables, self-perceptions in related domains were examined. For

instance, girls' increased focus on relationships may be accompanied by an increased focus on their appearance, which plays a larger role in girls' ability to attract a romantic partner than boys' (Buss, *1994*; Eagly & Wood, *1999*). Furthermore, it is also important to examine adolescents' global self-perceptions, as one of the main challenges of this developmental period is establishing a sense of competence while maintaining parental attachments (Kobak, Sudler, & Gamble, *1991*).

There has been some empirical support for both moderation and mediation pathways in studies of adolescents with respect to these key parent and child variables. The evidence for the moderation pathway will be considered first. In support of sex as a moderator of parent characteristics, several studies have found that maternal depressive symptoms predict depressive symptoms in adolescent girls but not in boys (e.g., Boyle & Pickles, *1997*; Crawford, Cohen, Midlarsky, & Brook, *2001*; Davies & Windle, *1997*; see Sheeber, Davis, & Hops, *2002*, for a review), although one study found that maternal depression predicted both male and female depression (Hops, *1992*, *1996*). Similarly, paternal depressive symptoms are associated with concurrent internalizing symptoms in boys but not girls (Hops, *1992*, *1996*; Thomas & Forehand, *1991*). However, these studies are limited in that they generally do not use samples of clinically depressed parents. Further, despite calls to examine the role of fathers in child psychopathology (e.g., Phares & Compas, *1992*), the few studies that examined sex differences with respect to paternal depression did not formally conduct moderation analyses (Hops, *1992*, *1996*; Thomas & Forehand, *1991*). There has been mixed support for the moderation model with respect to other parent variables, such as family relationship quality. Some studies provide evidence that poorer family relationship quality is more strongly correlated with depressive symptoms in adolescent girls than in boys (e.g., Davies & Windle, *1997*; Slavin & Rainer, *1990*), whereas others have not found support for moderation (e.g., Lewinsohn et al., *1994*; Lewinsohn, Rohde, & Seely, *1998*).

There is also mixed evidence of moderation with respect to child characteristics. Studies have found a stronger relationship between insecure attachment cognitions and depressive symptoms in girls, as compared to boys (e.g., Kobak et al., *1991*; Leadbeater, Kuperminc, Blatt, & Herzog, *1999*). On the other hand, self-esteem and self-perceptions of attractiveness and social competence do not appear to interact with sex in predicting depressive diagnoses (Lewinsohn et al., *1994*, *1998*).

Fewer studies have tested mediation models to explain the sex difference (Hankin & Abramson, *1999*). There is particularly little relevant research on parent variables. Although adolescent girls report higher levels of family discord than boys (Davies & Windle, *1997*), and adult women diagnosed with depression report higher rates of dysfunctional parenting than depressed men (Wilhelm, Roy, Mitchell, Brownhill, & Parker, *2002*), studies have not explicitly tested a mediation model in which sex influences parenting, which in turn influences adolescent depression.

There is more evidence for mediation models involving child characteristics. For instance, studies have found that negative self-perceptions of physical appearance and global self-worth mediate the sex difference in depressive symptomatology (Allgood-Merten, Lewinsohn, & Hops, *1990*; Marcotte, Fortin, Potvin, & Papillon, *2002*; Ohannessian, Lerner, Lerner, & von Eye, *1999*). Other studies did not explicitly test a mediation model but lend some support to the notion that females have more negative

self-perceptions compared to boys. For instance, there is some evidence that girls have more negative self-perceptions of their social relationships, although the evidence is mixed (e.g., Hagborg, *1993*; Mallet & Rodriguez-Tome, *1999*; O'Dea & Abraham, *1999*; Rose & Montemayor, *1994*). There is also evidence that girls have more negative perceptions of their athletic competence, although it is unclear whether these findings extend to other areas of achievement, such as academic competence (Hagborg, *1993*; Ohannessian et al., *1999*; Rose & Montemayor, *1994*). Similarly, findings regarding sex differences in levels of insecure attachment have been mixed (e.g., Bartholomew & Horowitz, *1991*; Brennan, Shaver, & Tobey, *1991*; Buist, Dekovic, Meeus, & van Aken, *2002*; Kenny & Gallagher, *2002*; Kenny, Moilanen, Lomax, & Brabeck, *1993*; Sund & Wichstrom, *2002*).

In sum, researchers have provided evidence that supports both moderation and mediation models of the sex difference in depression vulnerability. In particular, parental psychopathology, family relationships of poorer quality, insecure attachment cognitions, and negative self-perceptions are all associated with increased vulnerability to depression among adolescent girls. However, the available research has some important methodological and conceptual limitations, which the present study attempts to address. First, while tests of moderation models are relatively common, far fewer studies have examined mediation models. Moreover, to our knowledge, no study of adolescents has simultaneously examined both moderation and mediation models of the sex difference in depression. A major contribution of the present study is the examination of two competing explanatory models (mediation and moderation) of sex differences in adolescent depression, using the same sample.

Second, most previous studies have examined predictors of self-report depressive symptoms, rather than clinician-rated diagnoses. This may be problematic because some studies found only moderate concordance between classifications of adolescents based on self-report measures and diagnostic interviews (Garrison, Jackson, Addy, McKeown, & Waller, *1991*; Roberts, Lewinsohn, & Seeley, *1991*). In addition, there is some evidence that the risk factors for self-reported depressive symptoms differ from those for clinician-diagnosed depressive episodes, although the findings are mixed (see Coyne, *1994*; Moos, *1991*, for reviews). There is controversy surrounding methods of assessing depression, but overall, there is some consensus that clinician ratings are superior to self-reports (see Joiner, Walker, Pettit, Perez, & Cukrowicz, *2005*, for a review), and there is reason to question whether the results of studies of self-reported symptoms are generalizable to clinician-rated diagnoses of depression. As such, our study examines diagnoses based on semi-structured interviews.

Finally, the present study benefits from utilizing a large sample of 15-year-old adolescents, with approximately equal numbers of girls and boys. The large sample size and sex distribution were advantageous in that they provided greater power to detect sex differences. The age of the sample allowed us to examine sex differences soon after their expected emergence at age 14–15 (e.g., Kessler et al., *1993*; Wade et al., *2002*), when the processes involved in the sex difference may be most salient. It is important to examine this age because the factors associated with the emergence of the sex difference in depression may be specific to this developmental stage (Hankin & Abramson, *1999*). Further, while depression is a highly recurrent disorder, there is no evidence for a sex difference in recurrence (Kessler et al., *1993*), suggesting that

the key to understanding the sex difference may lie in understanding why it first emerges in adolescence.

In the present study, we used moderation analyses to determine whether females who have parents with psychopathology, poor quality relationships with their parents, insecure attachment cognitions, and negative self-perceptions had a higher likelihood of current depression than males exposed to the same risk factors. We used mediation analyses to test whether girls are more likely to have poor quality parental relationships, insecure attachment cognitions, and negative self-perceptions, which are in turn associated with greater vulnerability to depression. We did not conduct mediation analyses for parental psychopathology, as we did not expect sex to impact this variable. For instance, a child's female sex is unlikely to cause the parents' psychological disorders, as the mediation model would imply. However, we examined both mediation and moderation pathways for all other study variables.

METHOD

Participants

The participants consisted of 816 youth (413 boys and 403 girls), their mothers, and 522 fathers. Mean age of youth was 15 years, 2 months (*SD*=.29). Participants were selected from the Mater-University of Queensland Study of Pregnancy (MUSP), a birth cohort study of 7775 children born between 1981 and 1984 at the Mater Misericordiae Mother's Hospital in Brisbane, located in Queensland, Australia (Keeping et al., *1989*). The prior investigators conducted a questionnaire follow-up when the youth were 13 years old, identifying 68% of the original birth cohort still in the Brisbane area. Participants in the present study were drawn from this group.

Selection of the youth sample at age 15 was based on mothers' scores on depression checklists that were administered by the previous investigators during pregnancy, after delivery, and when the child was 6 months and 5 years old. Specifically, mothers completed the Delusions-Symptoms States Inventory (DSSI: Bedford & Foulds, *1978*) at each of the four time points. The DSSI is a valid screening instrument for mental health (e.g., Bedford & Foulds, *1977*) that was chosen by the MUSP investigators because it did not include symptoms associated with pregnancy or childbirth. One of the goals of the study was to examine the effects of maternal depression on children, so Hammen and Brennan (*2001*) selected families with diverse histories of maternal depression severity and chronicity between pregnancy and child's age 5, including a history of no depression. Specifically, women were chosen who had severe depression two or more times, severe depression one time, moderate (but not severe) depression two or more times, or low depression scores at all assessments, using this self-report measure. Based on these criteria, an attempt was made to recruit 991 of the 5277 families who had participated in the age 13 assessment. Families were included if both the mother and the child consented to participate, and 816 families consented (82%). Specifically, 103 families chose not to participate, 86 could not be located, 3 had a child with a hearing or visual disability that precluded participation, and 1 family's child had died.

While the DSSI was used in screening families for recruitment, it was not used to diagnose history of maternal depression. In the current study, the SCID interview

(details later) was used to obtain maternal lifetime diagnostic information when the child was 15 years old. The mothers included 458 never-depressed women and 358 women diagnosed with at least one current or past major depressive episode or dysthymic disorder. The median level of mothers' education was grade 10. Most of the mothers (76.8%) were currently married or cohabiting.

All biological fathers in current contact with the child were invited to participate in the study, and stepfathers were invited to participate if they had lived with the child for 5 or more years. There were no cases in which both the father and stepfather had significant contact with the child, so either one or the other participated. Most (87%) of the 522 fathers who participated were biological fathers. Most participating fathers lived with the child: 483 (93%) lived in the home with both the mother and child, and 501 (96%) lived with youth at least some of the time.

The sample of youth was 92% Caucasian and 8% minority (Asian, Pacific Islander, and Aboriginal). Median family income was AU$35,000–45,000, indicating middle and lower middle class. Adolescents who participated in the present study did not differ from the original birth cohort in terms of average family income, $t(7147)=0.81$, $p=.42$, average maternal education, $t(7612)=1.70$, $p=.09$, or sex composition, $\chi^2(1, N=816)=0.53$, $p=.48$.

Procedure

Adolescents, mothers, and participating fathers were administered diagnostic interviews and completed a battery of questionnaires in their homes. Interviewers were graduate students in clinical psychology at the University of Queensland. All interviewers had clinical and research experience and were trained and supervised by the authors (CH, PB). All interviewers were blind to mothers' depression status and history. Participants completed a battery of questionnaires between interviews. These interviews and questionnaires are described in detail later. Both parents and children gave written informed consent and were paid for their participation, which lasted approximately 3.5 hrs.

MEASURES

Youth Diagnostic Evaluation

The Schedule for Affective Disorders and Schizophrenia for School-Age Children—Revised for DSM-IV (K-SADS-E; Orvaschel, *1995*) was used to diagnose current depressive disorders. The K-SADS-E has excellent kappa reliability coefficients for major depression and dysthymia in youth (Orvaschel, *1995*). The interview was administered separately to both mother and child, and diagnostic decisions were reviewed by the clinical rating team based on all the information. If there was disagreement between mother and youth reports, greater weight was given to the youth interview, based on empirical evidence that youth reports of internalizing symptoms are more valid than reports of parents, who may be less aware of their children's internal experience (see Grills & Ollendick, *2002*, for a review).

In the present study, weighted kappas were .82 for clinical and subclinical diagnoses of major depression episode (MDE) and dysthymia. Youth were considered depressed

if they currently met diagnostic criteria for major depression (*n*=16; 5 boys, 11 girls), dysthymia (*n*=13; 3 boys, 10 girls), both major depression and dysthymia (*n*=2; 0 boys, 2 girls), subclinical major depression (*n*=17; 7 boys, 10 girls), or subclinical dysthymia (*n*=26; 12 boys, 14 girls).[1] Youth diagnosed as subclinical met most but not all of the diagnostic criteria for MDE or dysthymia. Specifically, individuals were diagnosed as having subclinical major depression or dysthymia if they met one of the following criteria: (1) They had a sufficient number of symptoms but did not have sufficient duration of symptoms to meet full diagnostic criteria, (2) they had sufficient duration of symptoms but did not have the required number of symptoms to meet full diagnostic criteria (i.e., they met diagnostic criteria for minor depressive disorder), or (3) they had the minimum number of symptoms and minimum symptom duration, but lacked sufficient impairment to meet full diagnostic criteria. A total of 74 adolescents (27 boys, 47 girls) were currently depressed and 742 adolescents (386 boys, 356 girls) did not have current depression.

Maternal Diagnostic Evaluation

The Structured Clinical Interview for DSM-IV (SCID; First, Spitzer, Gibbon, & Williams, *1995*) was used to diagnose current and lifetime maternal depression. Interviewers were blind to mother's prior scores on the DSSI. Reliability was calculated based on diagnoses of 52 women in the sample who were rated by two independent judges. Kappas were .87 for current diagnoses of MDE, dysthymic disorder, and subclinical depression, and .84 for past depression diagnoses. A total of 358 women (44%) were diagnosed with current or past MDE or dysthymic disorder and 454 (56%) had no history of diagnosable depression. Among the depressed women, 271 were diagnosed with at least one MDE and 164 were diagnosed with at least one episode of dysthymic disorder. Four of the depressed women were diagnosed with bipolar spectrum disorders and were excluded from the analyses, as the present paper focuses specifically on parental unipolar depression and dysthymia.

Paternal Diagnostic Evaluation

Information on paternal depression was obtained either directly or indirectly, depending on the father's availability. The SCID for DSM-IV was used to directly interview 522 fathers for lifetime major depression and dysthymia. Inter-rater reliability was calculated for lifetime depressive diagnoses, yielding a kappa of .91. When the father of the child was not available for interview, mother reports of father's psychopathology were obtained using the Family History Research Diagnostic Criteria (FHRDC; Andreasen, Endicott, Spitzer, & Winokur, *1977*). FHRDC reliability was calculated for 55 informants who were rated by independent judges, yielding a kappa of 1.0 for presence or absence of lifetime disorders.

Paternal depression was coded if either the biological father or stepfather (if present) met lifetime diagnostic criteria for major depression or dysthymia based on either the SCID or the FHRDC. A total of 171 youths had a father (*n*=148) or stepfather (*n*=23) with a lifetime diagnosis of depression and 610 youths had a father or stepfather with no depression history. In a small number of cases (*n*=35), neither the mother nor father was able to provide information on fathers' diagnoses, resulting in missing data. Analyses were conducted to assess whether findings for father diagnoses differed depending on whether the information was provided by the father himself

through the SCID or the mother through the FHRDC. Chi-square analyses indicated that there were fewer cases of father depression when the mother was the informant (13% of fathers) than when the father was the informant (27%), $\chi^2=19.94$, $p<.01$. However, it was unclear whether this discrepancy in reporting would affect prediction of youth depression. Logistic regression was used to examine whether the association between youth depression diagnoses and paternal depression differed depending on the informant of paternal depression status. The interaction of paternal depression-by-informant did not predict youth depression, OR=1.09, W=0.02, *ns*. Because paternal depression-by-informant did not predict youth depression, we combined data across the two types of informants to create one paternal depression variable.

Parent–Child Relationship

Two different measures were used to assess the quality of parent–child relationships. First, a chronic stress interview was administered to mothers only (Hammen et al., *1987*). This semi-structured interview was used to assess ongoing difficulties in a variety of domains over the past 6 months, and one of the domains evaluated was the quality of the mother–child relationship. Interviewers systematically obtained information on the quality of the relationship, including closeness, communication, trust, acceptance, and conflict. This information was then used to rate the mother–child relationship on a 5-point scale with behaviorally specific anchors, where 1 indicated an exceptional quality relationship with good conflict resolution, 3 indicated average relationship quality, and a 5 indicated severe and enduring problems relating with the child. Inter-rater reliability (intraclass correlation) for mother–child relationship quality was .82. This interview has been shown to have good convergent and construct validity in other samples (Hammen et al., *1987*; Rao, Hammen, & Daley, *1999*).

In addition to the overall measures of mother–child relationship quality, perceptions of both maternal and paternal parenting were examined as an additional measure of relationship quality. The revised Child Report of Parental Behavior Inventory was administered to adolescents twice, to assess their relationships with their mother and father separately (CRPBI; Schludermann & Schludermann, *1988*). The Acceptance and Psychological Control subscales of the CRPBI were used in the present analyses. The Acceptance scale, which measured the extent to which the parent expressed caring or affection toward the child, included items like “gives me a lot of care and attention” and “enjoys doing things with me.” The Psychological Control scale, which measured the extent to which the parent controlled the child through indirect means such as inducing guilt and anxiety or withdrawing love, included items like “is always telling me how I should behave” and “tells me all of the things she has done for me.” Each scale consisted of 10 items, and each item was scored on a 3-point scale: 1: *not like*, 2: *somewhat like*, 3: *a lot like*. Coefficient alphas in the present sample were .90 for maternal acceptance, .91 for paternal acceptance, .81 for maternal psychological control, and .84 for paternal psychological control. The acceptance scores were reverse-coded and summed with the psychological control scores in order to create a measure of overall parent–child relationship quality, where higher scores indicate a lower-quality relationship (less acceptance and more psychological control). Some youth did not complete the CRPBI for their fathers, as they had not been in significant contact with them. As a result, 105 adolescents have missing data for the CRPBI—father.

Attachment Cognitions

The Relationship Questionnaire (RQ; Bartholomew & Horowitz, *1991*) was administered to adolescents to assess their attachment patterns in close relationships. Participants were presented with four paragraphs describing four prototypical attachment patterns (secure, fearful, preoccupied, and avoidant) and were asked to rate their correspondence to each prototype on a 7-point scale ranging from 1 (*not at all like me*) to 7 (*very much like me*). In the present study, scores on the three insecure scales were averaged in order to get an overall measure of insecure attachment (the secure attachment score was analyzed separately). The RQ has good convergent and construct validity in young adults (e.g., Bartholomew & Horowitz, *1991*; Carnelley, Pietromonaco, & Jaffe, *1994*).

Table I. Means, Standard Deviations, and Correlations of Study Variables

	1	2	3	4	5	6	7	8	9	10	11	12
1. Youth sex	—											
2. Maternal depression	−0.01	—										
3. Paternal depression	0	0.07	—									
4. Mother–child relationship	−0.05	.23**	.12**	—								
5. CRPBI—mother	−.09**	.08*	0.01	.39**	—							
6. CRPBI—father	0.02	0.05	0.07	.17**	.40**	—						
7. Bartholomew—secure	.13**	−0.06†	−0.03	−.13**	−.21**	−.18**	—					
8. Bartholomew—insecure composite	−.13**	0.06†	−0.01	.10**	.24**	.18**	−.20**	—				
9. Harter—Social composite	.14**	−.08*	−0.06	−.09**	−.22**	−.21**	.45**	−.37**	—			
10. Harter—Achievement composite	−.22**	−.02	0.02	−.11**	−.16**	−.13**	.16**	−.08*	.28**	—		
11. Harter—Physical appearance	.32**	−0.04	−0.05	−.06†	−.23**	−.22**	.13**	−.05	.22**	.43**	—	
12. Harter—Global self-worth	−.16**	−.07*	−0.06	−.16**	−.37**	−.31**	.27**	−.17**	.38**	.44**	.67**	—
Means	0.49	0.44	0.21	2.23	−6.51	−4.84	5.13	2.83	16.11	13.34	12.34	14.87
Standard deviations	0.50	0.50	0.41	0.50	7.39	7.93	1.64	1.17	2.67	2.77	3.58	3.28

Note. Means for youth sex translate to percentage of female adolescents. Means for maternal and paternal depression translate to percentages of parent sample with depression.[†] $p<.10$, [*] $p<.05$, [**] $p<.01$, all analyses are two-tailed.

Self-Perceptions

The Self-Perception Profile for Adolescents (Harter, *1988*) was used to measure youth's perceived competence in a variety of domains. The self-report measure consists of eight scales of five items each, for a total of 45 items. Six subscales were included in the present study: Close friendship, social acceptance, physical appearance, scholastic competence, athletic competence, and global self-worth (overall evaluation of the self). Scale totals were computed by summing the five items in each scale, with higher scores representing more positive self-perceptions. Mean internal consistency of these scales, across four samples, was .82, .78, .82, .83, .85, and .80, respectively (Harter, *1988*). Similar figures of internal consistency were obtained in the current sample—.79, .77, .85, .83, .89, and .79, respectively. Social and achievement composites were created in order to test hypotheses related to girls' interpersonal focus and boys' achievement focus (Beck, *1987*; Blatt, *1990*). The social composite was created by averaging the close friendship and social acceptance subscales (social composite, alpha=.83), and the achievement composite was created by averaging the scholastic and athletic subscales (achievement composite, alpha=.79).

RESULTS

Table I presents the means, standard deviations, and correlations among the study variables. Because the families were selected on the basis of mothers' depression history, maternal depression status was entered in all regression analyses to control for its potential impact on youth depression. All continuous predictor variables were standardized to provide both centering and more interpretable odds ratios.

Moderation Analyses

Hierarchical logistic regression analyses were conducted to test whether sex moderated relationships between vulnerability factors and youth depression. For all analyses, sex and maternal depression status were entered in the first step, variable of interest in the second step, and sex-by-variable interaction in the last step. Adjusting for the effect of maternal depression, female sex is still associated with a greater likelihood of youth depression, OR=2.08, $W=9.05$, $p<.01$. Table II presents a summary of the moderation results. Results indicated a significant main effect in the expected direction for all predictors of youth depression. However, adolescent sex did not moderate the effects of any of the vulnerability factors except paternal depression.[2] The likelihood of adolescent girls being currently depressed was unrelated to paternal depression ($\chi^2=.01$, *ns*), whereas adolescent boys were more

likely to be currently depressed if their father had a history of depression (χ^2=21.82, p<.01). Figure 1 presents a graphic illustration of this interaction effect.

Table II. Sex as a Moderator of the Relationship Between Depression Vulnerability and Depression

Predictor	*B*	*SE*	Wald	OR
Parent disorder				
Maternal depression	0.70	0.24	8.64**	2.01
Sex-by-variable interaction	0.36	0.49	<1	1.43
Paternal depression	0.63	0.26	5.92*	1.87
Sex-by-variable interaction	−1.74	0.54	10.23**	0.18
Family relationships				
Mother–child relationship	0.62	0.10	36.47**	1.86
Sex-by-variable interaction	−0.26	0.20	1.62	0.77
CRPBI—mother	0.61	0.11	30.39**	1.85
Sex-by-variable interaction	0.06	0.24	<1	1.06
CRPBI—father	0.48	0.12	15.56**	1.62
Sex-by-variable interaction	−0.11	0.26	<1	0.90
Child cognitions				
Bartholomew—secure	−0.49	0.11	19.21**	0.61
Sex-by-variable interaction	0.01	0.24	<1	1.01
Bartholomew—insecure composite	0.36	0.12	9.18**	1.43
Sex-by-variable interaction	0.28	0.25	1.32	1.33
Harter-social composite	−0.52	0.11	22.02**	0.60
Sex-by-variable interaction	0.21	0.23	<1	1.24
Harter-achievement composite	−0.44	0.12	12.89**	0.65
Sex-by-variable interaction	−0.41	0.26	2.50	0.66
Harter-physical appearance	−0.64	0.13	24.22**	0.53
Sex-by-variable interaction	−0.17	0.27	<1	0.85
Harter-Global	−0.92	0.12	58.85**	0.40
Sex-by-variable interaction	0.04	0.25	<1	1.04

Note. Sex and maternal depression were entered in step 1 of all analyses. * p<.05, ** p<.01.

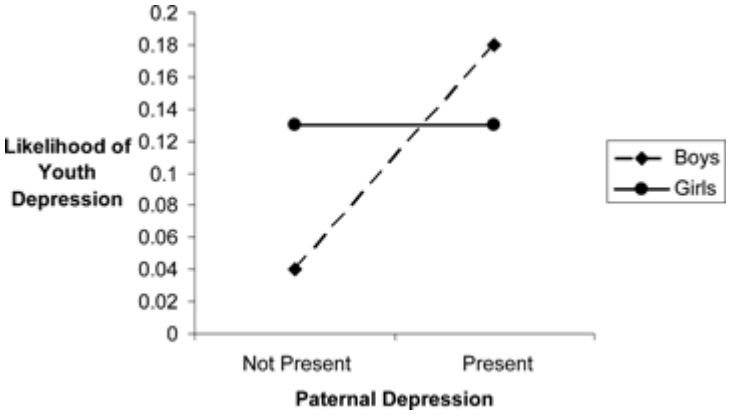
Mediation Analyses

Hierarchical logistic regression analyses were conducted to determine whether a higher likelihood of depression in girls can be explained by the family relationship and child cognition variables. Three regression models were estimated to examine potential mediated effects (MacKinnon & Dwyer, *1993*). Maternal depression status was entered in the first step for all analyses to control for its impact on youth depression. Model 1 was identical for all analyses and examined the relationship between sex and youth depression, controlling for maternal depression status. Maternal depression status predicted a greater likelihood of youth depression,

OR=2.01, W=9.64, p<.01. As reported earlier, after adjusting for the effect of maternal depression, being female still predicted a greater likelihood of youth depression, OR=2.08, W=9.05, p<.01. Model 2 examined the relationship (β) between the mediator and youth depression, controlling for the effects of youth sex and maternal depression status. Model 3 examined the relationship (α) between youth sex and the mediator variable, controlling for the effects maternal depression status. Results from Models 2 and 3 for each potential mediator are presented in Table III. Mediated effects (αβ) were tested for all potential mediators using Sobel's (*1982*) product coefficient method (MacKinnon & Dwyer, *1993*).

Three kinds of results were found. Some variables did not mediate the relationship between sex and depression (no mediation). Some variables mediated or explained why girls had a higher likelihood of depression in the present sample (mediated effect). Other variables had a suppression effect, that is, they reduced the sex differences found in youth depression (suppression effect; MacKinnon, Krull, & Lockwood, *2000*). Instead of explaining why females had a greater likelihood of depression, the presence of this variable actually reduced the likelihood of depression in females. Mediation findings are organized below based on the kind of result detected.

Fig. 1. Likelihood of youth current depression as a function of youth's sex and paternal depression.



No Mediation

The overall quality of the mother–child relationship, as measured by the chronic stress interview, did not mediate the relationship between sex and depression in youth, αβ=−.03, z=−.17, *ns*. Although a poor mother–child relationship was associated with a significantly greater likelihood of youth depression, youth sex was unrelated to the quality of the mother–child relationship (see Table III). Youth report of paternal parenting quality (CRPBI—father) also did not explain the higher likelihood of depression in adolescent girls, αβ=.13, z=.45, *ns*. Similar to the pattern of findings for mother–child relationship, perceptions of paternal parenting as being higher in control and lower in acceptance were associated with a greater likelihood of depression. However, sex was unrelated to perceptions of paternal parenting quality.

Table III. Examining Family Relationship and Child Vulnerability Factors as Mediators of the Sex and Depression Relationship

Relationship tested (potential mediators in bold)	*B*	*SE*	Wald/*T*	OR
Mother–child relationship				
α Sex → Mother–child relationship	−0.05	0.03	−1.51	N/A
β [a] Mother–child relationship → youth depression	0.62	0.1	36.47**	1.86
CRPBI—mother				
α Sex → CRPBI—mother	−1.37	0.52	−2.65**	N/A
β CRPBI—mother → youth depression	0.61	0.11	30.39**	1.85
CRPBI—father				
α Sex → CRPBI—father	0.27	0.59	0.46	N/A
β CRPBI—father → youth depression	0.48	0.12	15.56**	1.62
Bartholomew secure attachment as mediator				
α Sex → Bartholomew secure attachment	0.43	0.12	3.74**	N/A
β Bartholomew secure attachment → depression	−0.49	0.11	19.21**	0.61
Bartholomew insecure attachment index as mediator				
α Sex → Bartholomew insecure attachment	−0.31	0.08	−3.77**	N/A
β Bartholomew insecure attachment → depression	0.36	0.12	9.18**	1.43
Harter—Social as mediator				
α Sex → Harter—Social	0.77	0.19	4.13**	N/A
β Harter—Social → depression	−0.52	0.11	22.02**	0.60
Harter—Achievement (school/athletic) as mediator				
α Sex → Harter—Achievement	−0.44	0.07	−6.44**	N/A
β Harter—Achievement → depression	−0.49	0.12	17.22**	0.61
Harter—Physical appearance as mediator				
α Sex → Harter—Physical appearance	−2.31	0.24	−9.68**	N/A
β Harter— Physical appearance → depression	−0.65	0.13	24.22**	0.53
Harter—Global as mediator				
α Sex → Harter—Global	−1.08	0.23	−4.74**	N/A
β Harter—Global → depression	−0.92	0.12	58.85**	0.40

Note. Tests the relationship between mediator and depression, controlling for effects of sex and maternal depression.** $p < .01$.

Significant Mediated Effect

Perceptions of achievement, as measured on the Harter scale, significantly mediated the relationship between sex and depression, αβ=.22, z=3.42, $p < .01$. Adolescent girls reported poorer self-perceptions in the achievement domain (Harter—Achievement). Poorer self-perceptions in the achievement domain were associated with greater

likelihood of depression (see Table III). Perceptions of physical appearance (Harter—Physical appearance) also significantly mediated the relationship between sex and depression, αβ=1.50, z=4.44, p<.01. Adolescent girls reported poorer self-perceptions regarding their physical appearance that in turn were significantly associated with a higher likelihood of depression in girls (see Table III). Perceptions of global self-worth (Harter—Global) similarly mediated the relationship between sex and depression, αβ=0.99, z=4.00, p<.01. Adolescent girls reported poorer global self-worth that also was associated with a higher likelihood of depression in girls.

Significant Suppression Effect

Perceptions of maternal parenting on the CRPBI suppressed the relationship between sex and depression in youth, αβ=−.84, z=−2.38, p<.05. Adolescent girls reported more positive perceptions of maternal parenting than boys (see Table III), and these more positive perceptions of maternal parenting were related to a lower likelihood of youth depression. The effect of sex on depression was higher (OR=2.39, W=11.93, p<.01) when adjusted for the effect of maternal parenting style, compared to OR=2.08, W=9.05, p<.01 when unadjusted. A similar suppression effect was found for secure attachment, αβ=−.21, z=−2.79, p<.01 and insecure attachment, αβ=−.13, z=−2.91, p<.01. Girls tended to be more securely attached compared to boys using both measures, and secure attachment was associated with a lower likelihood of adolescent depression. Adjusting for the effects of secure attachment and insecure attachment, being female was significantly associated with higher likelihood of depression at OR=2.66, W=14.33, p<.01 and OR=2.45, W=12.58, p<.01, respectively. Lastly, adolescent girls also had more positive self-perceptions in the social domain (Harter—Social composite) which in turn suppressed the effect of sex on youth depression, αβ=−.40, z=−3.08, p<.01. When the sex effect on depression was examined, adjusting for the effect of self-perceptions in the social domain, adolescent girls were 2.5 times more likely to be depressed than boys, W=13.24, p<.01 compared to the unadjusted effect of OR=2.08, W=9.05, p<.01.

DISCUSSION

The purpose of this study was to enhance our understanding of why adolescent girls are more vulnerable to depression than boys, and to identify factors associated with depression in both boys and girls. We examined sex differences in the factors associated with adolescent depression in a variety of domains, including parental depression, parent–child relationship quality, child attachment cognitions, and child self-perceptions. Specifically, we tested two potential explanations for sex differences in depression vulnerability—A moderation model that posits that females are more susceptible to the effects of vulnerability factors compared to boys, and a mediation model that posits that females are higher than boys on vulnerability factors that in turn heighten their likelihood of current depression.

Moderation analyses were conducted to assess whether adolescent girls were more likely than boys to be depressed, at the same high levels of depression vulnerability. Contrary to our predictions, sex did not moderate the impact of most vulnerability factors on the likelihood of current depression. Indeed, the various parent and child characteristics were consistently associated with depressive diagnoses in both boys and girls. The only exception was paternal depression, which was more strongly related to the likelihood of depression in boys than in girls, when the effects of maternal depression status were controlled. This is consistent with previous findings that paternal depressive symptoms are associated with concurrent internalizing symptoms in boys, but not girls (Hops, *1992*, *1996*; Thomas & Forehand, *1991*). The current study expands upon these findings by formally testing moderation and by providing evidence that the effect of paternal depression extends to fathers and sons with diagnosable depression. Identification of a risk factor in boys is important in and of itself, but it does not explain why girls are more likely to be depressed than boys. Indeed, none of the moderation analyses supported the notion that girls were more susceptible to the risk factors examined when compared to boys. As such, the sex difference in the likelihood of experiencing a current depressive episode did not appear to be due to adolescent girls' greater susceptibility to these risk factors for depression.

Our overall lack of significant moderation findings is contrary to a number of studies that have found that different factors are associated with self-reported depressive symptoms in boys and girls (e.g., Boyle & Pickles, *1997*; Crawford et al., *2001*; Davies & Windle, *1997*; Kobak et al., *1991*; Leadbeater et al., *1999*; McCabe, Ricciardelli, & Banfield, *2001*; Slavin & Rainer, *1990*). However, our findings are consistent with a large study of depression diagnoses, which also did not find support for moderation (e.g., Lewinsohn et al., *1994*, *1998*). Our findings provide further evidence that vulnerability factors for boys and girls are similar when clinician-rated diagnoses are examined rather than self-reported depressive symptoms. Nonetheless, it may be premature to conclude a lack of sex difference in vulnerability to diagnosable depression, as many models of depression vulnerability are proposed within the diathesis-framework, and the present study did not examine the role of stressful life events.

In contrast to moderation analyses, mediation analyses examined whether being female is associated with higher levels of vulnerability factors that are in turn associated with greater likelihood of depression. Specifically, we examined whether adolescent girls reported poorer quality parent–child relationships, higher levels of insecure attachment cognitions, and more negative self-perceptions compared to their male counterparts. As predicted, girls reported more negative self-perceptions in the domains of achievement, global self-worth, and physical appearance. For each of these variables, female sex was associated with higher levels of negative self-perceptions. Moreover, these three depression vulnerability factors partially mediated the relationship between being female and the higher likelihood of current depression.

These mediation findings both replicate and expand upon previous research. The physical appearance and global –self-worth findings replicate other studies that have similarly reported that negative self-perceptions of physical appearance and global self-worth mediate the sex difference in depressive symptoms (Allgood-Merten et al., *1990*; Marcotte et al., *2002*; Ohannessian et al., *1999*). Our achievement finding

represents a novel contribution to the literature. While previous studies have provided evidence that girls have more negative perceptions of their achievement in the domain of athletic competence compared to boys (Hagborg, *1993*; Rose & Montemayor, *1994*), we may be the first adolescent study to demonstrate that these negative self-perceptions in the achievement domain increase girls' likelihood of depression and partially explain the sex difference in depression.

In addition, we found evidence that certain vulnerability factors were actually *lower* in adolescent girls compared to boys, which served to make girls *less* susceptible to depression than they would have been otherwise. In particular, the analysis of suppression effects indicated that girls reported more positive perceptions of maternal parenting, more secure attachment cognitions, and more positive self-perceptions in social relationships, compared to boys. Lower levels of these interpersonal vulnerability factors were associated with a reduced likelihood of depression. Stated another way, if girls did not have higher levels of these positive factors compared to boys, the sex difference in likelihood of depression would be even larger than it is. The findings suggest that, interpersonal variables, which are generally perceived as potential causes of the sex difference (e.g., Cyranowski et al., *2000*; Rudolph, *2002*), may actually serve to minimize the sex difference in adolescent depression when the conditions are positive.

Some researchers have suggested that the increased value adolescent girls place on interpersonal relationships puts them at greater risk for depression (e.g., Cyranowski et al., *2000*; Rudolph, *2002*), but our suppression results suggest that adolescent girls' focus on relationships may have a positive influence on their lives under some circumstances, as their positive cognitions about relationships were associated with a reduced likelihood of depression. Our suppression findings represent a novel contribution to the literature, but they are consistent with past research demonstrating that social support is a protective factor for adolescent depression (e.g., Dumont & Provost, *1999*).

It is also notable that positive perceptions of both parental and peer relationships served as protective factors, suggesting that parental factors are still important even as adolescents individuate from the family (Furman & Buhrmester, *1992*). Further, although relational style theories of depression have proposed that females value interpersonal relationships, and males value goal attainment (Beck, *1987*; Blatt, *1990*), our results suggest that both factors are important in understanding adolescent girls' depression. In the current study, being female was associated with both negative self-perceptions of achievement and positive perceptions of relationships, with the former increasing the likelihood of depression and the latter reducing it.

Finally, it is notable that mediation models explained the sex difference in depression better than moderation models in this study, as this may be the first study of adolescents to examine these competing models in the same sample. Our moderation analyses did not support the hypothesis that the higher likelihood of female depression is due to females being more susceptible to depression in the face of the vulnerability factors examined in comparison to males. Rather, being female was associated with more negative self-perceptions in certain non-interpersonal domains, and more positive perceptions in interpersonal domains. These perceptions, in turn, affected the likelihood of current depression in girls, with the negative perceptions serving as risk

factors and the positive perceptions serving as protective factors. The mediation findings are consistent with gender intensification theory (Hill & Lynch, *1983*) which posits that boys and girls are increasingly socialized to be different from each other in adolescence. It is possible that adolescent girls are increasingly socialized to have more negative perceptions regarding their achievement, physical appearance, and global self-worth, which increases their risk of depression, but they are also socialized to value their relationships with parents and peers more, serving to somewhat reduce their depression risk. However, this hypothesis is necessarily speculative, as the current study did not examine socialization practices explicitly, and gender intensification is by nature a prospective question that can only be directly tested in a longitudinal study. Future research should examine these issues prospectively.

While it is possible that mediation models do indeed provide a better explanation for the sex difference in the likelihood of depression, it is also possible that sex may moderate depression vulnerability under specific circumstances not examined in the present study. In particular, some of the variables examined may be more potent predictors of depression in combination with high levels of life stress, in light of evidence that cognitive and interpersonal vulnerabilities may interact with stress to predict depression (e.g., Lewinsohn, Joiner, & Rohde, *2001*; Hammen, Shih, & Brennan, *2004*). Testing this diathesis-stress model was beyond the scope of our study, but future research should examine the three-way interactions between sex, vulnerability factors, and stressors in order to determine if girls are more susceptible to certain vulnerability factors specifically in the face of stressful life events.

There are some important limitations to our findings. First, the study's sample was predominately Caucasian, so it is unclear whether our findings would extend to adolescents from varied demographic backgrounds. Second, a disproportionate number of the adolescents in this sample had a depressed mother. Maternal depression status was controlled statistically in all analyses, but we cannot be certain that our results are generalizable to unselected samples. An extensive examination of the effects of maternal depression was beyond the scope of the present paper (e.g., see Hammen et al., *2004*), but future studies might benefit from examining the impact of maternal depression on sex differences more centrally. Third, the study was cross-sectional, and thus we cannot come to any definitive conclusions about the direction of causality. A strength of mediation analyses is that they enable tests of causal hypotheses, but with the current cross-sectional design, it is not clear that the vulnerability factors examined preceded the depressive episodes. Finally, this study has focused on a few child and parent characteristics thought to be associated with the sex difference in depression, but it is not a comprehensive examination of all potential vulnerability factors. For instance, we have also found that girls' greater exposure to interpersonal stressors partially explains their higher susceptibility to depression (Shih, Eberhart, & Hammen, *2006*), suggesting the need to examine diverse interpersonal factors, as their effects may be varied.

Despite these limitations, the present study provides valuable information on sex differences in vulnerability to depressive episodes. Our most consistent finding was that the predictors of depression in adolescent boys and girls were remarkably similar. Adolescent girls did not seem more susceptible to depression than boys on the vulnerability factors tested. Instead, the study provides support for a mediation model in which the sex difference in vulnerability to depression was partly attributed to

adolescent girls' more negative perceptions of themselves in certain domains. However, the findings did not consistently support the notion that girls would score higher on vulnerability factors associated with current depression. On measures of vulnerability in the interpersonal domain, girls reported more positive self-perceptions and secure attachment compared to boys. In those instances, girls' greater positive perceptions protected them from depression. As such, the current study suggests that the processes through which interpersonal factors affect depression may be more complex than initially thought. The greater value girls place on the interpersonal domain is typically viewed as a vulnerability factor, but the current study provides evidence that valuing relationships may also be viewed as a source of protection from depression. In sum, our findings point to dysfunctional self-perceptions and positive perceptions of relationships as areas for further examination to better understand sex differences in depression risk and resilience.

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