# Assessment of Parental Expressed Emotion: Associations with Adolescent Depressive Symptoms Among Youth with Spina Bifida

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**Objectives** A longitudinal multi-method, multi-informant design was utilized to investigate parental expressed emotion (EE) as a predictor of depressive symptoms among adolescents with spina bifida ($n = 60$) and a matched comparison sample ($n = 65$). **Methods** A newly modified self-administered audiotaped interview methodology was used to assess parental warmth and criticism across the middle adolescent developmental period (ages 14–17). Parent- and youth-reports of adolescent depressive symptoms were obtained at each time point. **Results** Significant cross-sectional associations between parental EE variables and youth depressive symptoms were found for both groups. Significant longitudinal relations between maternal criticism and parent proxy-report of youth depressive symptoms were also found across 2 years for the spina bifida group and across 4 years for both groups. **Conclusions** This modified measure of parental EE can be used in future pediatric research that focuses on precursors or outcomes of this important parenting construct.

**Key words** spina bifida; adolescence; expressed emotion; parenting; family; depressive symptoms.

Expressed emotion (EE) is typically evaluated via an empirically derived assessment method that measures the affective quality within an interpersonal relationship. EE was originally assessed in families of individuals diagnosed with schizophrenia, where EE has proven to be a reliable and robust predictor of symptom relapse (Brown & Rutter, 1966; Leff & Vaughn, 1985). More recently, the EE methodology has been applied to a range of other disorders including depression, bipolar disorder, and eating disorders (see Butzlaff & Hooley, 1998, for a review), and a few studies have identified parental EE as a significant predictor of mood disorders among children (e.g., Asarnow Tompson, Hamilton, Goldstein, & Guthrie, 1994; Asarnow, Tompson, Woo, & Cantwell, 2001) and adolescents (McCleary & Sanford, 2002). Prior studies also suggest that EE is a strong predictor of psychiatric symptomatology among individuals with a chronic illness (Butzlaff & Hooley, 1998). However, no study to date has investigated EE as a predictor of outcomes among adolescents with a chronic health condition.

To improve upon prior methodologies for studying EE, this study included a newly modified version of the original EE data collection and coding methodology to examine the extent to which a parent speaks about their child with high levels of criticism and/or low levels of warmth (i.e., a high EE environment). The coding of EE was based on audiotape data of parental speech samples and focused specifically on the tone of voice, content of speech, and emotional expression (e.g., laughter, crying) of parents while they discussed their children. In addition to improving upon past EE research, maternal and paternal EE were investigated as concurrent and prospective predictors of adolescent depressive symptoms among youth with spina bifida (SB) and a matched comparison sample.

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SB is a relatively common congenital birth defect affecting nearly 18 out of every 100,000 live births (CDC, 2008). It originates during early embryonic development when the neural tube fails to fully close. Children afflicted with this condition are born with a portion of their spinal cord exposed, which necessitates surgical repair shortly after birth. Health complications associated with SB include neurogenic bladder and bowel dysfunction, weakness and paralysis of the lower extremities, endocrine dysfunction, and neurocognitive challenges. The severity of SB varies depending on the location and size of the spinal lesion, number of shunt revisions, and presence of neurologic complications.

Several researchers have found that children with SB are at increased risk for experiencing higher levels of internalizing symptoms, as compared to typically developing youth (Ammerman et al., 1998; Appleton et al., 1994, 1997). Yet, to date, prior research has focused primarily on psychosocial adjustment outcomes among children and preadolescents only.

Given the high rates of depressive symptoms among adolescents in the general population (Kessler, Avenevoli, & Merikangas, 2001), it is essential to further understand the development of depressive symptoms among youth with SB during this developmental period. Furthermore, gender differences in depressive symptoms emerge during the early adolescent years among typically developing adolescents, such that girls report higher levels of depression (Ge, Conger, & Elder, 2001). Previous research conducted on youth with SB has also found that girls within this population are at greater risk for depressive symptoms, as compared to boys with SB (Appleton et al., 1997).

Children with SB also face a number of unique social challenges that increase the salience of the family environment. For example, in a previous study (based on the same sample examined in the present investigation), Holmbeck and colleagues (2003) utilized a cross-sectional multisource, multi-informant research design and found that, in comparison to typically developing children, preadolescents with SB (8 or 9 years old) tend to be socially immature, socially passive, less likely to have social contacts outside of school, and more dependent on adults for guidance and decision making (also see Blum et al., 1991; Holmbeck et al., 2010). A social environment characterized by limited contact with peers and greater dependency on caregivers lend support to the hypothesis that youth with SB would be particularly vulnerable to family-environmental stress, namely, high parental EE.

Family-environmental factors may also contribute to the higher rates of depressive symptoms among adolescent females. Collins and Russell's (1991) review of the parent gender/child gender literature found that typically developing adolescents tend to express greater closeness with mothers, as compared to fathers. Furthermore, the mother–daughter dyad demonstrates a higher frequency of intimate exchanges regarding personal issues and practical matters (e.g., academic achievement). Taken together, the closeness and intimate exchanges typical of mother–daughter dyads and the increased salience of the family environment among youth with SB supports the hypothesis that adolescent girls with SB will be at greatest risk for higher levels of depressive symptoms if the mother–child dyad is disrupted by low levels of maternal warmth and/or high levels of maternal criticism.

In sum, this study investigated a newly modified measure of parental EE (high criticism, low warmth) as a predictor of depressive symptoms in adolescent males and females with SB and in a matched comparison group. Several limitations of previous research on EE were addressed in this multi-method, multi-informant, longitudinal study. First, this study included both a sample of chronically ill adolescents with SB, as well as a matched comparison sample of typically developing adolescents. Second, parental EE data were gathered from both mothers and fathers, in contrast to previous literature that has emphasized maternal report (e.g., Vostanis, Nicholls, & Harrington, 1994). Third, this study utilized a longitudinal design so that temporal associations between variables could be examined. Fourth, rather than using an open-ended interview format with limited probing by the examiner (e.g., Magana et al., 1986), parents were asked to respond to questions that focused on the most salient concerns of families' of youth with SB and typically developing youth, as identified from previous research (i.e., academic performance, peer interactions, autonomy, and perceived future functioning; e.g., Feldman & Elliott, 1990; Holmbeck et al., 2003). Lastly, previous researchers tended to dichotomize families into high and low EE environments by first collapsing the two EE variables (e.g., criticism, warmth) into a single global EE composite and then dichotomizing this continuous composite into ''high'' and ''low'' EE. Unfortunately, such dichotomization results in a considerable loss of variability. Additionally, criticism and warmth are likely to be inherently different constructs and thus, may have differing associations with adolescent outcomes. Thus, this study investigated criticism and warmth separately, with continuous scaling, which eliminated the use of arbitrary cutoff points and thus, maintained the original variability of the scales. Based on previous research, the following hypotheses were tested: (a) high maternal and paternal EE (high criticism, low warmth) was expected to be

concurrently and prospectively associated with adolescent depressive symptoms, and (b) the relation between EE and adolescent depressive symptoms was expected to be most salient for females and for the SB group.

## Methods

### *Participants*

Participants in this study were part of a larger longitudinal investigation that examined psychosocial adjustment and family relationships during the transition to adolescence in children with SB (Holmbeck et al., 2002a, 2003). Data collection occurred every 2 years, beginning when youth were 8 or 9 years old (Time 1). At Time 1, participants included 68 families with an 8 or 9 year old with SB [37 males, 31 females; $M$(age) = 8.34], and a matched comparison sample of 68 families of 8 or 9 year olds without SB [37 males, 31 females; $M$(age) = 8.49]. The matched comparison group was recruited from schools where the youth with SB were enrolled, and the samples were matched at the group level on the following demographic variables: child age, maternal age, paternal age, child gender, child ethnicity, birth order, marital status, family socioeconomic status, and mother and father reports of family income (see Holmbeck et al., 2003, for more information on this matching process). Both the SB and comparison groups completed all questionnaire and interview data. Every participating family in the SB and matched comparison groups had a biological mother who completed questionnaire and interview data; however, only 55 (81%) and 52 (76%) fathers/step-fathers participated in the SB and comparison groups, respectively.

Children with SB were recruited from children's hospitals, a university-based medical center, and a statewide SB association. A comparison between families that agreed to participate and the families that declined ($n = 64$) revealed no significant differences with respect to lesion level [$x^2(2, 116) = 0.62$, $p > .05$] or type of SB [myelomeningocele vs. lipomeningocele; $x^2(1, 119) = 1.63$, $p > .05$]. Among the families of youth with SB that agreed to participate, the following information on several physical status variables was obtained from maternal reports or children's medical records: (a) spinal lesion level: 32% sacral, 54% lumbosacral or lumbar, 13% thoracic, (b) type of SB: 82% myelomeningocele, 12% lipomeningocele, 6% other, and (c) ambulation: 19% no assistance, 63% assistance with braces, 18% assistance with a wheelchair. According to medical records, 71% of the children with SB had a shunt, with an average number of 2.50 ($SD = 2.91$) shunt surgeries prior to Time 1. As expected, there was a significant difference between the SB and comparison groups on receptive language abilities as measured by the Peabody Picture Vocabulary Test – Revised (PPVT-R; Dunn & Dunn, 1981), such that children with SB scored significantly lower ($M = 92.49$; $SD = 18.49$) than the matched comparison group ($M = 108.97$; $SD = 15.06$). Additional demographic and recruitment details have been described previously (Holmbeck et al., 2003).

Only data from Time 4 (youth 14/15 years old) through Time 6 (youth 18/19 years old) were utilized in this study. There was a retention rate of 88% ($n = 60$) from Time 1 (8/9 years old) to Time 4 (14/15 years old) for the SB group and 96% ($n = 65$) for the comparison group. At both Time 5 (16/17 years old) and Time 6 (18/19 years old) the retention rate was 76% ($n = 52$) for the SB group and 90% for the comparison group ($n = 60$). A comparison between families that participated when the adolescents were 14/15, 16/17, and 18/19 years old and families that declined revealed no significant differences with respect to age, gender, race, socioeconomic status for the SB and comparison groups, and type of SB, presence of a shunt, or ambulation status for the SB group.

### *Procedure*

Trained graduate and undergraduate psychology students conducted a three hour visit to the families' homes when the youth were 8/9 through 16/17 years old. An overview of study goals and confidentiality issues were presented to the families at the beginning of each in-home session, and families agreed to be contacted for a follow-up visit. After parental consent and child assent were obtained from the participants, the parents and youth independently completed questionnaire packets. When the youth were 14/15 and 16/17 years old, parents privately answered open-ended questions with regard to their child's functioning into an audiotape recording, and each family was paid $100 for their participation. When youth were 18/19 years old, parents and adolescents were sent questionnaires via mail, and each individual who returned a measure was reimbursed $50.

### *Measures*

#### Parental EE

A modified version of the traditional EE methodology was used in the current study. As opposed to the traditional five minute open-ended EE speech sample methodology (Magana et al., 1986), parents were given a list of questions to answer, based on past research regarding the most salient concerns of parents of youth with SB and typically developing youth (e.g., Feldman & Elliott, 1990; Holmbeck et al., 2002). Mothers and fathers separately and privately audiotaped their answers to these

16 questions that assessed several areas of their child's functioning: future functioning (e.g., What do you think your child's future will be like?), peer interactions (e.g., How would you describe your child's relationship with other children his/her age?), academic performance (e.g., What skills does your child have that help him/her succeed in school?), and autonomy (e.g., In what areas is your child independent?). Parents in the SB group were given an additional four questions (for a total of 20 questions) to address health and self-care, which were not examined in the present study. A copy of the EE coding system and manual are available from the second author upon request.

Trained coders rated each of the caregivers' responses separately for criticism and warmth, and a composite score for each of these constructs was created for maternal and paternal caregivers across the 16 open-ended questions. For the criticism variable, responses were coded as 1 (neither critical nor hostile) to 3 (moderately critical or hostile) to 5 (severely critical or hostile) depending on the degree that the parent expressed distaste for or anger towards their child. For the warmth variable, a response was coded as 1 (not at all warm) to 3 (moderately warm) to 5 (extremely warm) depending on the degree that the parent expressed fondness for and interest in their child. Consistent with the traditional EE approach, coders were instructed to account for content, tone of speech, and emotional expression (e.g., laughter, crying) for each response. In addition to a description of criticism and warmth, the following guidelines were also provided for the coders: (a) do not code the overall EE across all responses; instead, coding should be based on each question separately, (b) do not code what the responder ''meant'' to convey, and (c) do not make assumptions about the types of feelings that motivated the responder's answer. Each coder received a minimum of three hours of training, in which their responses were required to reach at least 90% agreement with the responses of an expert coder.

To assess *interrater reliability*, intraclass reliability correlations (ICCs) were computed for each group, with .60 or above considered adequate (Kieffer, Cronin, & Fister, 2004; Table I). All ICCs were adequate, except in the case of paternal warmth when youth in the comparison

Table I. *Descriptive Statistics and Scale Reliabilities Across Samples for Depressive Symptoms and Expressed Emotion Variables*

| | Spina Bifida | | | Comparison | | |
|---|---|---|---|---|---|---|
| | Mean (SD) | Coefficient α | ICC | Mean (SD) | Coefficient α | ICC |
| Parent proxy-report depressive symptoms | | | | | | |
| 14/15 years old (CBCL-D) | 3.43 (3.13) | 0.82, 0.74[a] | | 2.56 (3.02) | 0.83, 0.79[a] | |
| 16/17 years old (CBCL-D) | 3.98 (3.74) | 0.85, 0.78[a] | | 2.76 (3.51) | 0.86, 0.82[a] | |
| 18/19 years old (CBCL-D) | 4.71 (4.43) | 0.87, 0.77[a] | | 2.75 (3.32) | 0.89, 0.86[a] | |
| Youth-report depressive symptoms | | | | | | |
| 14/15 years old (CDI) | 7.46 (5.57) | 0.82 | | 8.30 (6.93) | 0.87 | |
| 16/17 years old (CDI) | 7.98 (8.07) | 0.92 | | 9.08 (7.10) | 0.86 | |
| 18/19 years old (YSR-D) | 5.66 (4.81) | 0.84 | | 6.15 (5.25) | 0.87 | |
| Maternal criticism | | | | | | |
| 14/15 years old | 1.49 (0.36) | 0.79 | 0.70 | 1.59 (0.42) | 0.84 | 0.82 |
| 16/17 years old | 1.42 (0.38) | 0.85 | 0.72 | 1.45 (0.34) | 0.80 | 0.82 |
| Paternal criticism | | | | | | |
| 14/15 years old | 1.38 (0.30) | 0.79 | 0.69 | 1.33 (0.26) | 0.75 | 0.69 |
| 16/17 years old | 1.33 (0.47) | 0.92 | 0.91 | 1.31 (0.26) | 0.81 | 0.80 |
| Maternal warmth | | | | | | |
| 14/15 years old | 2.15 (0.51) | 0.86 | 0.61 | 2.33 (0.66) | 0.94 | 0.72 |
| 16/17 years old | 1.88 (0.47) | 0.88 | 0.82 | 2.07 (0.46) | 0.87 | 0.72 |
| Paternal warmth | | | | | | |
| 14/15 years old | 2.08 (0.64) | 0.85 | 0.70 | 2.13 (0.54) | 0.90 | 0.42 |
| 16/17 years old | 1.86 (0.59) | 0.95 | 0.85 | 1.92 (0.48) | 0.93 | 0.71 |

*Note*. 14/15 = adolescent 14 or 15 years old; 16/17 = adolescent 16 or 17 years old; 18/19 = adolescent 18 or 19 years old; ICC = intraclass reliability correlation; CBCL-D = Child Behavior Checklist—Depression Scale; CDI = Child Depression Inventory; YSR-D = Youth Self Report – Depression Scale; PPVT-R = Peabody Picture Vocabulary Test – Revised.

[a]Coefficient alphas for maternal and paternal reports, respectively.

group were 14/15 years old. Thus, paternal warmth was excluded from all analyses. Next, alpha coefficients were employed to assess the *scale reliability* of the EE variables; a Cronbach's alpha of .60 or above was considered adequate. The resulting scale alpha coefficients were all adequate for the criticism and warmth scales (Table I). Taken together, a total of six parental EE predictor variables were included in subsequent analyses: maternal criticism (when youth were 14/15 and 16/17 years old), maternal warmth (14/15 and 16/17 years old), and paternal criticism (14/15 and 16/17 years old).

#### Receptive Vocabulary

The PPVT-R (Dunn & Dunn, 1981) provided an assessment of child receptive vocabulary abilities at 8/9 years old. Given the significant difference between the SB and comparison group on receptive language abilities, the PPVT-R was used as a control variable in all statistical analyses. Specifically, standardized scores were computed and utilized as a proxy for verbal intelligence. The PPVT-R is frequently used for research purposes if a more comprehensive test of intelligence is not feasible, such as the Wechsler Intelligence Scale for Children. Strong correlations have emerged between the PPVT-R and verbal IQ scores derived from other tests (Dunn & Dunn, 1981).

#### Adolescent Depressive Symptoms

Because parents were the respondents for the EE interviews, and to rule out common source variance explanations for significant findings, both parent proxy- and youth-reports of adolescent depressive symptoms were assessed. Parents completed the Child Behavior Checklist (CBCL/4-18; Achenbach, 1991) at each data collection point to provide a proxy-report of adolescent symptomatology. For this study, the Depression Scale (CBCL-D; Clark, Lewinsohn, Hops, & Seeley, 1992) was employed to assess for adolescent depressive symptoms. The CBCL-D is comprised of 15 items from the CBCL/4-18 that assess for core symptoms of a depressive disorder (e.g., Cries a lot; Thinks about suicide; Feels worthless). Each item was scored on a 3-point scale: 0 (not true) to 1 (sometimes true) to 2 (often true).

The Child Depression Inventory (CDI; Kovacs, 2001) was used to assess adolescent-report of depressive symptoms when youth were 14/15 and 16/17 years old. Adolescents rated 27 depressive symptoms on the following rating scale: 0 (symptom is absent) to 1 (symptom is present some of the time) to 2 (symptom is present most of the time). Since the CDI is only valid for use among children that are 7 to 17 years old, the Depression Scale of the Youth Self Report (YSR-D; Clark et al., 1992) was used for adolescents 18/19 years old, which included the same 15 items of the CBCL-D scale discussed above (Clark et al., 1992). Scale reliabilities for the depressive symptoms scales were all adequate (i.e., Cronbach's alpha above .60; refer to Table I).

### *Approach to Data Analyses*

As a result of high correlations between mother- and father-reports of depressive symptoms, composite scores for the depression questionnaires were created by computing means across reporters. Correlations between mother- and father-reports of depressive symptoms met a criterion of $r \geq 0.40$ for collapsing across reporters at each time point (*r*s ranged from 0.45 to 0.69; Holmbeck et al., 2002b). However, the correlation between father- and youth-reports of depressive symptoms when youth were 14/15 years of age failed to meet the $r \geq 0.40$ criterion ($r = 0.26$). Thus, a composite score for parent-proxy reports of adolescent depressive symptoms was created based on means across mother- and father-reports, and totals for youth-reports of depressive symptoms were computed separately. In other words, two depressive symptoms scales were employed as outcomes in the analyses (i.e., parent proxy- and youth-reports).

To compare mean EE and depression scores across time, groups, and gender of the child, repeated measures analyses of variance (ANOVAs) were conducted. PPVT-R scores were controlled in all analyses. Follow-up univariate ANOVA analyses were conducted to determine the nature of significant findings.

A series of hierarchical regression analyses were conducted to examine cross-sectional and longitudinal associations between parental EE (criticism, warmth) and adolescent depressive symptoms (parent proxy- and youth-reports), and to determine whether these relationships differed as a function of group membership (SB, comparison) or gender of the child. To do so, all continuous predictor variables (i.e., EE variables) were centered by subtracting the appropriate sample means; thus, variables had a revised sample mean of 0 (Aiken & West, 1991; Holmbeck, 2002). Dichotomous variables (i.e., group, gender) were dummy coded as 0 and 1, in which 0 = SB and 1 = matched comparison for the group variables and 0 = female and 1 = male for the gender variables.

For all EE regression analyses, independent variables and interactions among the independent variables were entered in the following order: (a) PPVT-R, (b) group main effect, (c) gender main effect, (d) EE main effect, (e) Group × Gender interaction, (f) Group × EE interaction, (g) Gender × EE interaction, and (h) Group × Gender × EE

interaction (Aiken & West, 1991; Holmbeck, 1997). More specifically, PPVT-R was entered as the first step to control for verbal intellectual abilities of each child. Next, the three main effects were entered, followed by the interaction variables, based on guidelines established by Aiken and West (1991) and Holmbeck (1997). For all longitudinal regression analyses, the prior wave of adolescent depressive symptoms was entered before the PPVT-R variable. Specifically, a residual was created by first controlling for previous depressive symptoms and, therefore, represents change in depressive symptoms over time. In general, if a significant two-way or three-way interaction emerged in the regression analyses, then simple slopes and relevant significance tests were computed for the different levels of the group and gender variables to determine the nature of the association between parental EE and adolescent depressive symptoms (Aiken & West, 1991; Holmbeck, 2002).

Power analyses were conducted based on guidelines established by Cohen (1992). Cohen (1992) recommends that quantitative behavioral science research strive to obtain power of .80. Given the number of predictors in the multiple regression models (i.e., eight) and an alpha value set at .05, a sample size of 107 is required to detect a significant medium effect size ($f^2 = .15$) at .80 power. Although the sample size of maternal participants was sufficient to detect a medium to large effect size when youth were 14/15 ($n = 108$) and 16/17 years old ($n = 98$), an insufficient number of fathers completed the EE measures when youth were 14/15 ($n = 75$) and 16/17 years old ($n = 65$). Due to the small number of fathers that completed the EE measure, interaction effects were removed from paternal EE regression analyses. Utilizing only two predictors in the multiple regression models for fathers was sufficient to detect a medium to large effect size (e.g., $n$ of 67 for medium effect size and $n$ of 30 for large effect size; Cohen, 1992). For these father analyses, the independent variables were entered in the following order: (a) PPVT-R and (b) EE main effect. Similar to the maternal EE longitudinal analyses, the prior wave of adolescent depressive symptoms was entered before the PPVT-R when assessing the longitudinal effects of parental EE.

## Results

### *Preliminary Analyses*

Pearson correlations were conducted to assess the relationship between the mother and father criticism and warmth variables and to provide support for investigating these variables independently (Table II). Non-significant correlations emerged at several time points among parents of youth with SB; thus, observed maternal and paternal EE variables were investigated separately in each analysis. Pearson correlations also revealed non-significant associations between criticism and warmth variables at several time points for the SB and comparison groups (Table II). Thus, the criticism and warmth variables were kept separate for all analyses.

Means and standard deviations for the adolescent depressive symptoms and EE variables are presented on Table I. The percentage of youth exhibiting clinically significant levels of depressive symptoms was computed separately for maternal, paternal, and youth-reports across the different time points. Clark et al. (1992) recommended a clinical significance cutoff of 6 for maternal-report and 4 for paternal-report on the CBCL-D measure. Based on maternal-report of youth depressive symptoms for the SB and the comparison groups, 20.7 and 13.6%, 29.4 and 20.3%, and 32.7 and 15.8% of youth were above the cutoff score of 6 for clinically significant levels of depressive symptoms at 14/15, 16/17, and 18/19 years of age, respectively. Based on paternal-report of youth depressive symptom for the SB and the comparison

Table II. *Correlations Between Parental Expressed Emotion Variables for the Spina Bifida and Comparison Groups*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| 1. Maternal criticism (14/15) | – | .21 | −.25 | .27 | .44** | −.08 | −.06 | .15 |
| 2. Paternal criticism (14/15) | .53** | – | −.11 | −.25 | .33 | .77** | −.24 | −.03 |
| 3. Maternal warmth (14/15) | −.33** | −.39* | – | −.13 | −.21 | −.05 | .49** | .34 |
| 4. Paternal warmth (14/15) | −.33* | −.40** | .40** | – | .09 | −.20 | .22 | .29 |
| 5. Maternal criticism (16/17) | .42** | .21 | −.17 | −.02 | – | .19 | −.34* | −.18 |
| 6. Paternal criticism (16/17) | .34* | .37* | −.17 | −.31 | .45** | – | −.29 | −.10 |
| 7. Maternal warmth (16/17) | −.11 | −.02 | .60** | .39* | −.21 | −.23 | – | .56** |
| 8. Paternal warmth (16/17) | −.27 | −.26 | .26 | .52** | −.41* | −.33* | .58** | – |

*Note*. Correlations for the spina bifida group are above the diagonal, and correlations for the comparison group are below the diagonal. 14/15 = adolescent 14 or 15 years old; 16/17 = adolescent 16 or 17 years old.

*$p < .05$; **$p < .01$.

groups, 41.0 and 22.9%, 36.4 and 32.6%, and 48.3 and 28.9% of youth were above the cutoff score of 4 for clinically significant levels of depressive symptoms at 14/15, 16/17, and 18/19 years of age, respectively. Based on youth-report of depressive symptoms on the CDI at 14/15 and 16/17 years of age, 21.4 and 24.0% of youth with SB and 20.3 and 26.7% of youth in the comparison group were above the cutoff score of 13 for clinically significant levels of depressive symptoms, respectively. Based on YSR-D scores for the SB and comparison groups, 25.5 and 25.4% of youth were above the cutoff score of 8 for clinically significant levels of depressive symptoms at 18/19 years of age, respectively.

Skewness analyses were conducted for all variables using guidelines established by Tabachnick and Fidell (2001). Conservative alpha levels (.001) were employed to evaluate the significance of skewness, in which *z*-score values of 3.30 or higher were considered significantly skewed and transformations were conducted to create approximate normal distributions. These analyses revealed that the depressive symptoms (i.e., parent proxy- and youth-reports), maternal criticism, and paternal criticism variables were significantly skewed. First, square root transformations were conducted on these variables. Youth-report of depressive symptoms (14/15 and 16/17 years old only) and parental criticism variables continued to be significantly skewed after square root transformations; thus, logarithm transformations were conducted on these variables only. After square root and logarithmic transformations, all parental criticism variables (except maternal criticism at 14/15 years old) continued to demonstrate significant skewness, which is likely the result of restricted ranges on these variables (maternal criticism range = 1.62–2.00; paternal criticism range = 1.34–2.18; possible range = 1–5). The log transformed variables were utilized in our analyses with the awareness that the restricted range of the parental criticism variables reduced the power of our analyses.

## *Group, Gender, and Time Effects for EE and Depression Variables*

With maternal criticism and warmth and paternal criticism as the dependent variables, a total of three Group (SB vs. comparison) × Gender (of the child) × Time (14/15, 16/17 years old) repeated measures ANOVAs were conducted, with PPVT-R controlled. There were no significant effects for the parental criticism or parental warmth variables.

For the depression variables, Group (SB vs. comparison) × Gender (of the child) × Time (14/15, 16/17, 18/19 years old) repeated measures ANOVAs were conducted, with PPVT-R controlled. A significant main effect of Group emerged for parent proxy-report of youth depressive symptoms [$F(1, 98) = 5.56$, $p < .05$]. Follow-up univariate ANOVA analyses were run to examine the effect of group membership at each time point. A significant effect of Group emerged at 16/17 [$F(1, 111) = 3.93$, $p < .05$] and 18/19 years of age [$F(1, 109) = 4.31$, $p < .01$]. For all significant group effects, youth with SB demonstrated higher levels of parent proxy- report of depressive symptoms (refer to Table I). There were no significant effects for youth-report of depressive symptoms.

## *Cross-Sectional Associations between EE and Adolescent Depressive Symptoms*

A series of four cross-sectional hierarchical regression analyses were conducted for each of the maternal criticism, paternal criticism, and maternal warmth variables, resulting in a total of 12 cross-sectional hierarchical regression analyses (refer to Tables III and IV). Specifically, separate analyses were computed to examine the influence of the parental EE variables on each dependent variable (i.e., parent proxy- and youth-reports of adolescent depressive symptoms) when youth were 14/15 and 16/17 years old, and to examine whether the nature or magnitude of the association differed as a function of group membership (SB vs. comparison group) or gender (of the child).

### Maternal Criticism

Significant positive main effects for maternal criticism predicting depressive symptoms emerged for all four analyses including parent proxy-report of youth depressive symptoms at 14/15 [$t(106) = 4.13$, $p < .001$] and 16/17 years old [$t(96) = 6.00$, $p < .001$] and youth-report of depressive symptoms at 14/15 [$t(106) = 4.20$, $p < .001$] and 16/17 years old [$t(95) = 3.29$, $p < .01$], such that higher levels of maternal criticism were associated with higher levels of youth depressive symptoms. Moreover, for parent proxy-report of youth depressive symptoms at 14/15 years old, this finding was qualified by a significant Group × Gender × Criticism interaction, $t(106) = -2.01$, $p < .05$ (Figure 1). Follow-up simple slope analyses revealed a significant positive effect of maternal criticism on depressive symptoms at 14/15 years old for females in the comparison group only, $t(106) = 4.69$, $p < .001$.

### Paternal Criticism

Significant positive main effects for paternal criticism predicting adolescent depressive symptoms emerged for all four analyses including parent proxy-report of depressive symptoms at 14/15 [$t(70) = 3.56$, $p < .001$] and 16/17 years old [$t(63) = 3.03$, $p < .01$] and youth-report

Table III. *Cross-Sectional Regression Analyses for Parental Expressed Emotion and Moderator Variables as Predictors of Adolescent Depressive Symptoms at 14/15 Years Old*

| Parental Criticism Variable | Parent Proxy-Report of Depressive Symptoms (14/15) | | | Youth-Report of Depressive Symptoms (14/15) | | |
|---|---|---|---|---|---|---|
| | R | β | FΔ | R | β | FΔ |
| Maternal criticism (14/15 years) | | | | | | |
| Step 1: PPVT-R | .04 | −.04 | .15 | .07 | −.07 | .47 |
| Step 2: Group | .17 | −.19 | 3.08 | .10 | .09 | .67 |
| Step 3: Gender | .17 | −.02 | .03 | .21 | −.19 | 3.80 |
| Step 4: Criticism | .41 | .38 | 17.05*** | .43 | .38 | 17.62*** |
| Step 5: Gr × Gen | .42 | −.18 | 1.04 | .43 | .09 | .26 |
| Step 6: Gr × Cr | .44 | .18 | 1.55 | .43 | −.01 | .00 |
| Step 7: Gen × Cr | .46 | .20 | 2.85 | .45 | −.21 | 2.25 |
| Step 8: Gr × Gen × Cr | .49 | −.46 | 4.06* | .45 | −.10 | .19 |
| Paternal criticism (14/15 years) | | | | | | |
| Step 1: PPVT-R | .27 | −.27 | 5.53* | .18 | −.18 | 2.26 |
| Step 2: Criticism | .47 | .38 | 12.65** | .33 | .28 | 6.01* |
| Maternal warmth (14/15 years) | | | | | | |
| Step 1: PPVT-R | .04 | −.04 | .15 | .07 | −.07 | .47 |
| Step 2: Group | .17 | −.19 | 3.08 | .10 | .09 | .67 |
| Step 3: Gender | .17 | −.02 | .03 | .21 | −.19 | 3.80 |
| Step 4: Warmth | .35 | −.31 | 10.53** | .42 | −.37 | 15.70*** |
| Step 5: Gr × Gen | .35 | −.10 | .31 | .42 | −.15 | .74 |
| Step 6: Gr × Wa | .35 | −.07 | .18 | .42 | −.13 | .62 |
| Step 7: Gen × Wa | .43 | .34 | 7.90* | .48 | .30 | 6.35* |
| Step 8: Gr × Gen × Wa | .45 | .30 | 2.12 | .48 | −.04 | .04 |

*Note*. Both spina bifida and comparison groups were included in these analyses. *N*'s for these vary somewhat due to missing data. 14/15 = adolescent 14 or 15 years old; PPVT-R = Peabody Picture Vocabulary Test – Revised; Gr = Group membership; Gen = Gender of the child; Cr = Criticism; Wa = Warmth; blank = analyses non-significant.
*$p < .05$. **$p < .01$. *** $p < .001$.

Table IV. *Cross-Sectional Regression Analyses for Parental Expressed Emotion and Moderator Variables as Predictors of Adolescent Depressive Symptoms at 16/17 Years Old*

| Parental Criticism Variable | Parent Proxy-Report of Depressive Symptoms (16/17) | | | Youth-Report of Depressive Symptoms (16/17) | | |
|---|---|---|---|---|---|---|
| | R | β | FΔ | R | β | FΔ |
| Maternal criticism (16/17 years) | | | | | | |
| Step 1: PPVT-R | .02 | .02 | .03 | .02 | .12 | 1.13 |
| Step 2: Group | .24 | −.27 | 5.89* | .12 | .00 | .00 |
| Step 3: Gender | .24 | −.01 | .02 | .15 | −.11 | 1.02 |
| Step 4: Criticism | .57 | .51 | 35.95*** | .35 | .32 | 10.85** |
| Step 5: Gr × Gen | .57 | −.02 | .01 | .40 | .33 | 3.33 |
| Step 6: Gr × Cr | .58 | .20 | 2.64 | .40 | .05 | .13 |
| Step 7: Gen × Cr | .57 | .08 | .43 | .40 | .10 | .46 |
| Step 8: Gr × Gen × Cr | .59 | −.12 | .48 | .42 | −.20 | 1.10 |
| Paternal criticism (16/17 years) | | | | | | |
| Step 1: PPVT-R | .23 | −.23 | 3.51 | .07 | .07 | .34 |
| Step 2: Criticism | .42 | .35 | 9.16** | .28 | .27 | 4.88* |
| Maternal warmth (16/17 years) | | | | | | |
| Step 1: PPVT-R | .02 | .02 | .03 | .11 | .11 | 1.13 |
| Step 2: Group | .24 | −.27 | 5.89* | .11 | .00 | .00 |
| Step 3: Gender | .24 | −.01 | .02 | .15 | −.11 | 1.02 |
| Step 4: Warmth | .37 | −.29 | 8.37** | .23 | −.18 | 2.95 |
| Step 5: Gr × Gen | .37 | .03 | .02 | .30 | .36 | 3.54 |
| Step 6: Gr × Wa | .38 | .10 | .43 | .31 | .15 | .91 |
| Step 7: Gen × Wa | .38 | .02 | .01 | .31 | −.01 | .00 |
| Step 8: Gr × Gen × Wa | .38 | .11 | .20 | .32 | −.19 | .61 |

*Note*. Both spina bifida and comparison groups were included in these analyses. Ns for these vary somewhat due to missing data. 16/17 = adolescent 16 or 17 years old; PPVT-R = Peabody Picture Vocabulary Test – Revised; Gr = Group membership; Gen = Gender of the child; Cr = Criticism; Wa = Warmth; blank = additional analyses non-significant.
*$p < .05$; **$p < .01$; *** $p < .001$.

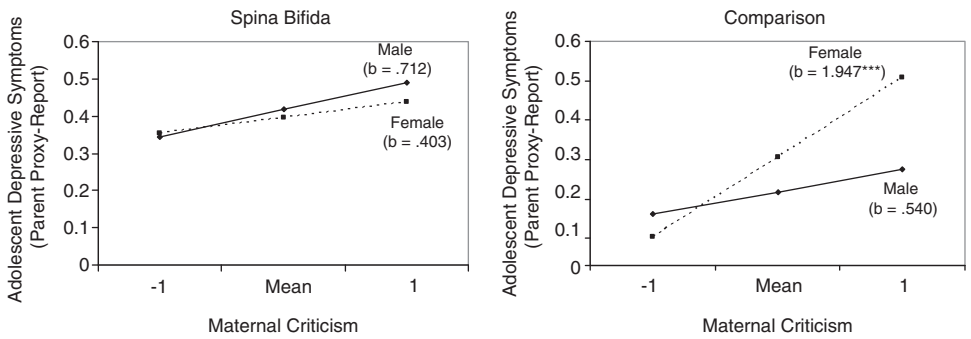


**Figure 1.** Maternal criticism (when youth were 14/15 years old) × child gender × group membership interaction predicting adolescent depressive symptoms at 14/15 years old (based on parent proxy-report), after controlling for child receptive vocabulary. (*b* = unstandardized regression coefficient; ***$p < .001$).

of depressive symptoms at 14/15 [$t(71) = 2.45$, $p < .05$] and 16/17 years old [$t(62) = 2.21$, $p < .05$], such that higher levels of paternal criticism were associated with higher levels of youth depressive symptoms.

### Maternal Warmth

Significant negative main effects for maternal warmth predicting depressive symptoms emerged for three of the four regression analyses including parent proxy-report

of youth depressive symptoms at 14/15 [$t(106) = -1.25$, $p < .01$] and 16/17 years old [$t(96) = -2.43$, $p < .05$] and youth-report of depressive symptoms at 14/15 years old [$t(106) = -3.96$, $p < .001$], such that higher levels of maternal warmth were associated with lower levels of youth depressive symptoms. When youth were 14/15 years old, these relationships were qualified by significant Gender × Warmth interactions for parent proxy- [$t(106) = 2.81$, $p < .01$] and youth-reports [$t(106) = 2.52$, $p < .05$] of depressive symptoms (refer to Figure 2 for findings based on youth-report of depressive symptoms). Follow-up simple slope analyses revealed a significant negative effect of maternal warmth on parent proxy- and youth-reports of depressive symptoms at 14/15 years old for females only, [$t(44) = -4.24$, $p < .001$ and $t(44) = -4.39$, $p < .001$, respectively].

### *Longitudinal Associations between EE and Adolescent Depressive Symptoms*

A series of six longitudinal hierarchical regression analyses were conducted for each of the maternal criticism, paternal criticism, and maternal warmth variables, resulting in a total of 18 longitudinal hierarchical regression analyses. Specifically, longitudinal regression analyses were conducted across 2 years (parental EE at 14/15 years old to adolescent depressive symptoms at 16/17 years old; parental EE at 16/17 years old to adolescent depressive symptoms at 18/19 years old) and 4 years (parental EE at 14/15 years old to adolescent depressive symptoms at 18/19 years old) for each dependent variable (i.e., parent proxy- and youth-reports of adolescent depressive symptoms). Furthermore, analyses examined whether the nature or magnitude of the relationship between parental EE and adolescent depressive symptoms differed as a function of group membership (SB vs. comparison) or gender (of the child).

#### Maternal Criticism

Significant effects for maternal criticism predicting an increase in depressive symptoms across 2 and 4 years emerged only for parent proxy-report of adolescent depressive symptoms. Specifically, a significant Gender × Criticism interaction emerged for the association between maternal criticism predicting an increase in parent proxy-report of adolescent depressive symptoms across 2 years from 14/15 to 16/17 years old, $t(96) = 1.99$, $p < .05$. Follow-up simple slope analyses revealed no significant effects, which may be the result of limited power due to a small sample size. Significant positive main effects of maternal criticism predicting an increase in depressive symptoms emerged across 2 years from 16/17 to 18/19 years old [$t(93) = 2.27$, $p < .05$] and across 4 years from 14/15 to 18/19 years old [$t(95) = 4.53$, $p < .001$]. However, the significant effect of maternal criticism predicting an increase in depressive symptoms across 2 years from 16/17 to 18/19 years old was qualified by a significant Group × Criticism interaction, $t(93) = -2.18$, $p < .01$. Follow-up simple slope analyses revealed a significant positive association between maternal criticism when youth were 16/17 years old and an increase in parent proxy-report of adolescent depressive symptoms across 2 years for the SB group only, $t(40) = 3.61$, $p < .01$ (Figure 3).

#### Paternal Criticism

No significant relationships between paternal criticism and an increase in youth depressive symptoms emerged across 2 or 4 years.

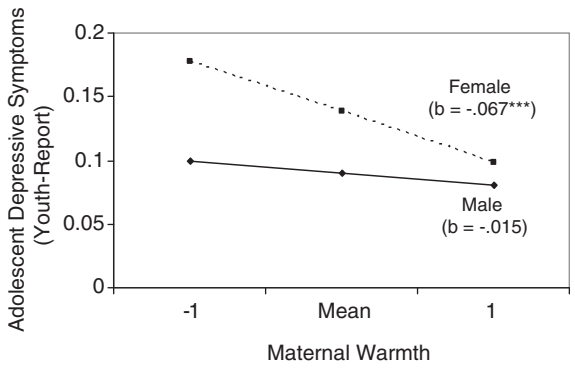


**Figure 2.** Maternal warmth (when youth were 14/15 years old) × child gender interaction predicting adolescent depressive symptoms at 14/15 years old (based on youth-report), after controlling for child receptive vocabulary. ($b$ = unstandardized regression coefficient; ***$p < .001$).

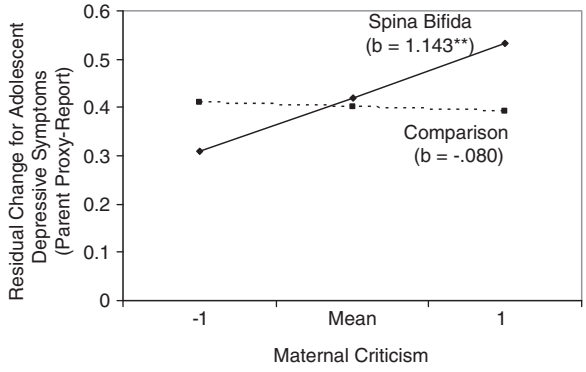


**Figure 3.** Maternal criticism (when youth were 16/17 years old) × group membership interaction for predicting residual change in depressive symptoms from 16/17 to 18/19 years old (based on parent proxy-report), after controlling for child receptive vocabulary. ($b$ = unstandardized regression coefficient; **$p < .01$).

### Maternal Warmth

A significant Warmth × Gender interaction emerged for the association between maternal warmth when youth were 14/15 years old and an increase in parent proxy-report of adolescent depressive symptoms over 2 years from 14/15 to 16/17 years old, $t(97) = -2.03$, $p < .05$. Follow-up simple slope analyses revealed no significant effects, which may be the result of limited power due to a small sample size. Additional information regarding longitudinal findings is available from the authors upon request.

## Discussion

The purpose of this study was to improve upon prior methodologies for examining components of parental EE (criticism, warmth) and to investigate parental EE as a predictor of depressive symptoms among youth with SB and a matched comparison sample. Both concurrent and prospective analyses were conducted in this multisource, multimethod study to examine the hypothesis that high parental EE (i.e., high levels of parental criticism, low levels of parental warmth) would predict higher levels of depressive symptoms among youth across the adolescent years (14/15, 16/17, and 18/19 years of age). Given that youth with SB tend to be more dependent on adults and have less contact with peers (Holmbeck et al., 2003), it was hypothesized that the negative effects of high parental EE would be more pronounced among adolescents with SB, as compared to youth without SB. Furthermore, given that greater closeness and intimate exchanges are more typical of the mother–daughter dyad (Collins & Russell, 1991), it was hypothesized that the negative effects of high maternal EE would be more pronounced among females. In general, high parental EE concurrently predicted adolescent depressive symptoms at 14/15 and 16/17 years old, based on parent proxy- and youth-reports for both groups. Additionally, maternal criticism predicted an increase in adolescent depressive symptoms across 2 years for the SB group and 4 years for both groups, based on parent proxy-report.

With respect to the measurement of EE, maternal and paternal EE variables were investigated separately with continuous scaling to maintain the original variability of the scale. Moreover, the primary components of EE, namely, criticism and warmth, were also investigated separately, rather than being collapsed into a composite. Adequate rater and scale reliabilities were obtained from both the SB and comparison groups for the parental criticism and maternal warmth variables at different time points. Nonetheless, inadequate scale reliability emerged for paternal warmth among fathers of 14- to 15-year-old adolescents in the comparison group. As a result, the paternal warmth variables were not included in analyses. These findings likely emerged because of the lack of variability in observer reports of parental warmth for this group. Thus, additional research is necessary to understand the paternal warmth variable and potential factors that may have undermined the reliability of this measure for father data. In addition, correlation analyses revealed non-significant associations between the warmth and criticism variables at several different time points, particularly for parents of youth in the SB group. These findings support our decision to analyze criticism and warmth as separate variables. Given the ease of data collection (e.g., parents independently answering questions into an audio recording) and the differing patterns of associations for maternal versus paternal and warmth versus criticism variables on adolescent outcomes, this modified EE measure is believed to be an improvement over previous methodologies.

Cross-sectional regression analyses revealed that maternal and paternal criticism and maternal warmth were positively associated with youth depressive symptoms. Generally, the cross-sectional relationship between parental EE and adolescent depressive symptoms was reliable and robust, as significant relationships emerged at different time points (i.e., 14/15 and 16/17 years old) and across groups (i.e., SB and comparison groups). Additionally, these relations could not be explained by the influence of common method or common source variance, as associations were consistent across parent proxy- and youth-reports of depressive symptoms. Partial support was found for the hypothesis that females would be more vulnerable to the negative effects of parental EE. At 14/15 years of age, females in the SB and comparison groups, but not males, exhibited higher levels of depressive symptoms (based on parent proxy- and youth-reports), in the context of lower levels of warmth. These findings support prior research that has found pronounced differences between parent–child dyads based on gender (Collins & Russell, 1991). Follow-up analyses also revealed that 14/15 year old females were more likely to exhibit higher levels of depressive symptoms (based on parent proxy-report), in the context of high levels of maternal criticism. However, in contrast to the study hypotheses, this effect was only significant for females in the comparison group. The presence of SB may buffer against the negative influence of maternal criticism on psychosocial adjustment during mid-adolescence. In support of this interpretation, previous research has found qualitative differences in family relationships between youth with SB and medically healthy youth. For example, families of

typically developing youth tend to demonstrate a decrease in cohesion and an increase in conflictive arguments as youth transition through puberty, yet these effects have not been demonstrated consistently among families of youth with SB (Coakley, Holmbeck, Friedman, Greenley, & Thill, 2002, Jandasek et al., 2009). On the other hand, given that the buffering effect of group membership only emerged for one of the analyses in this study, more research is needed to further our understanding of this finding.

Analyses also provided support for the longitudinal influence of maternal criticism on subsequent increases in parent proxy-reports of youth depressive symptoms. However, follow-up analyses revealed that significant associations between maternal criticism when youth were 16/17 years old and an increase of youth depressive symptoms across 2 years were only significant for the SB group; whereas, significant associations across 4 years (i.e., 14/15 to 18/19 years old) were evident for both the SB and comparison groups. The significant longitudinal effects from 16/17 to 18/19 years old for the SB group only are consistent with prior research that has found EE to be a stronger predictor of symptomatology among individuals with a longstanding illness (Butzlaff & Hooley, 1998). However, it is noteworthy that maternal criticism failed to predict increased rates of youth depressive symptoms at 16/17 years old, which may suggest that youth may not experience a significant negative psychosocial impact of earlier maternal criticism until they are 18 or 19 years old. On the other hand, analyses revealed no significant increases in depressive symptoms across the adolescent years (e.g., 14/15 to 16/17 to 18/19 years old), thus limiting our ability to detect changes in depressive symptoms across adolescence. An increase in depressive symptoms across the adolescent years may have been more evident if this was a sample of clinically depressed youth with higher initial rates of depressive symptoms. Also, a small sample size, particularly for fathers, reduced the power of our analyses. Finally, inconsistent rates of depressive symptoms were reported across parent proxy- and adolescent-reports, suggesting that youth with SB may not have adequate insight into the severity of their depressive symptoms, which may have impacted the results of these analyses.

There are several limitations of this study that will be important to address in future research. First, a small sample size, particularly among fathers, and significantly skewed parental criticism data limited the power of our analyses. Second, the sample was predominantly Caucasian; thus, future research should strive for a more representative sampling of Spanish-speaking families, given the high rates of SB in Latino populations (Lary & Edmonds, 1996). Third, this study sampled youth within a single illness group (i.e., SB). Although there are several advantages to conducting research within a single illness group (Holmbeck et al., 2003), this methodology limits the degree to which we can generalize our findings to groups with other chronic health conditions. Third, this study does not provide information regarding factors that contribute to high EE among parents (e.g., sociocultural factors). Fourth, given that only limited support was provided for the longitudinal influence of parental EE predicting adolescent depressive symptoms, future research is necessary to further investigate the directionality of the significant associations that emerged across the parental EE and adolescent depression variables. For example, it is possible that adolescents that exhibit higher rates of depressive symptoms elicit higher levels of negative parental emotional expressions (e.g., high criticism, low warmth). Lastly, this study employed a modified version of the EE assessment measure. Future research is necessary to further validate this new EE measure. For example, research that directly compares this EE measure to more traditional approaches will further our understanding as to whether this modified approach is a marked improvement over other traditional EE assessment methods.

Despite these potential limitations, there were also significant strengths of this study. Most relevant to this special issue, we provide initial findings for a modified version of the parental EE measure that may be useful in future pediatric research focused on the precursors and outcomes of this important parenting construct. Additionally, this study suggests that mothers and fathers play an important role in the emotional lives of their children. Both mother and father emotional expressions regarding their children consistently predicted concurrent depressive symptoms across reporters and at different time points. Preliminary support was also provided for the long-term effects of parental expressions of high criticism. Although this study highlights the challenges of conducting research on fathers (e.g., low recruitment rates), it will be important to continue to study the impact of fathers on the psychosocial adjustment of children and adolescents. Moreover, this study suggests that adolescents may benefit from inclusion of both mothers and fathers in interventions focused on adolescent depression. Specifically, parents may benefit from psycho-education to understand the detrimental, and possible long-term effects, of their emotional expressions directed toward their child. Parent training programs that foster healthy communication between parent and child, characterized by high warmth and low

criticism, may facilitate positive psychosocial adjustment among youth.

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