Relations with Parents and with Peers, Temperament, and Trajectories of Depressed Mood During Early Adolescence

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The present study examined (a) whether groups of children can be empirically identified with distinct longitudinal profiles of depressed mood from late childhood through early adolescence, (b) to what extent these different longitudinal depression profiles are predicted by problematic relations with parents, same-sex peers, and other-sex peers, and (c) what role individuals' temperamental characteristics play in this context. Based on a sample of 414 early adolescents (197 girls), four groups were identified with distinct longitudinal profiles of depressed mood between ages 11 and 14: One group with consistently low levels of depressed mood, another with consistently moderate levels of depressed mood, a third group whose depressed mood increased sharply from late childhood through early adolescence, and a fourth group who already showed clinical-range levels of depressed mood during late childhood and whose depressive feelings increased even slightly more thereafter. Subsequent analyses revealed that rejection by same-sex peers was related to the odds of following an increasing trajectory of depressed mood, but only for girls with a highly reactive temperament. A problematic relationship with parents increased the odds of an elevated trajectory of depressed mood regardless of individual temperament. The theoretical and practical implications of these findings are discussed.

KEY WORDS: trajectories; depressed mood; early adolescents; parent and peer relations; temperament.

Early adolescence can represent a challenging and stressful developmental phase. Apart from rapid physical and biological changes, this period entails significant changes in youngsters' social relations with parents and peers. Although early adolescents' relations with their parents remain a primary source of support (Blyth, Hill, & Thiel, 1982), their growing desire for autonomy is often associated with a notable deterioration in the parent–child relationship (Steinberg, 1987). At the same time, relations with peers gain in importance as peers exert increasing influence on early adolescents' attitudes and behavior in a variety of life domains (Berndt, 1979). In addition, youngsters move away from the largely sex-segregated peer group of middle childhood and increasingly seek acceptance among other-sex peers (Brown, 1999; Furman & Shaffer, 1999; Sippola, Bukowski, & Noll, 1997). In light of these sometimes challenging developmental changes, it is not surprising that many studies report a significant increase in depressed mood from late childhood through early adolescence, especially in girls (e.g., Angold, Erkanli, Silberg, Eaves, & Costello, 2002; Cole et al., 2002; Ge, Lorenz, Conger, Elder, & Simons, 1994; Holsen, Kraft, & Vittersø, 2000; Twenge & Nolen-Hoeksema, 2002). By the same token, these studies suggest that there is considerable variance in the extent of early adolescents' depressive symptoms. It is unclear, however, how many early adolescents have individual trajectories of depressive symptoms that indicate emotional difficulties and how many follow trajectories that suggest less emotional distress. Moreover, it is not known to what extent differences in longitudinal trajectories of depressed mood are related to early adolescents' social experiences with parents and with peers and what role individuals' personal characteristics play in this context. Examining these questions would significantly further our

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understanding of youngsters' emotional adjustment during early adolescence.

Longitudinal Course of Depressed Mood From Late Childhood Through Early Adolescence

Studies examining longitudinal trends in depressed mood have used either categorical taxonomies or, more recently, latent growth curve modeling based on continuous scores of depressive symptoms. Categorical taxonomies have usually examined the prevalence of depressive disorders such as dysthymia and major depression during childhood and adolescence (e.g., Costello et al., 2002; Hankin et al., 1998; Lewinsohn, Hops, Roberts, Seeley, & Andrews, 1993). Overall, these studies show that a small minority of youth (less than 2%) already has a history of depression during childhood. An additional 20% of individuals experience an onset of depressive disorder during adolescence. Girls are more likely than boys to be diagnosed with depression during adolescence although prevalence rates of depressive disorders do not differ between boys and girls during childhood. The vast majority of individuals, however, pass through adolescence without a diagnosis of depression.

The studies using categorical taxonomies yield important information about the age of onset and the stability of depressive disorders. At the same time these studies are limited in so far as they capture only the development of extreme (i.e., clinical) levels of depression. Consequently, several scholars have suggested that a quantitative approach, which includes sub-clinical levels of psychopathology, may provide a more comprehensive assessment of depression in childhood as well as in adulthood (e.g., Caron & Rutter, 1991; Flett, Vredenburg, & Krames, 1997; Hartman et al., 2001; Ruscio & Ruscio, 2000). According to this view, an individual's mood can be positioned on a continuum, somewhere between a state of complete emotional well-being and happiness and a state of severe depression. Longitudinal studies based on such continuous data of depressed mood have used either hierarchical linear modeling (HLM; Bryk & Raudenbusch, 1992) or latent growth curve analysis (Willet & Sayer, 1994). These studies revealed that overall levels of depressed mood are rather low during middle childhood but increase significantly over the course of early adolescence, albeit mainly in girls (Cole et al., 2002; Garber, Keiley, & Martin, 2002; Ge et al., 1994). In contrast to the traditional categorical taxonomies, longitudinal analytical methods based on continuous scores, which use HLM or latent growth curve analysis, do capture the full range of depressed mood. At the same time, these methods

are also limited because they are best suited to describe the average longitudinal course of depressed mood in an early adolescent population. In other words, this approach mainly describes normative developmental patterns of depressed mood during early adolescence. However, it does not provide information on how many youngsters deviate from this general course and in which way. As noted by several researchers, a failure to consider this heterogeneity may yield results that fail to accurately depict the relationships that hold within any one of the subgroups, including important predictive relationships (e.g., Bauer & Curran, 2003; Muthén, 1989). This concern is especially important as different etiologic factors might operate to produce different levels of severity or different developmental trajectories of problems (Zahn-Waxler, Klimes-Dougan, & Slattery, 2000).

One way to circumvent the problems inherent in the previously mentioned categorical and continuous approaches is to use growth-mixture models for continuous longitudinal data (for a detailed description, see, e.g., Muthén & Muthén, 2000; Nagin, 1999). In contrast to hierarchical and latent curve modeling, growth mixture models can test if subgroups of individuals exist within the population that follow qualitatively distinct developmental trajectories on a specific variable of interest (i.e., latent trajectory groups). This approach permits to examine the latent trajectory groups' unique relations to predictors or outcome measures, which, in turn, provide evidence for the validity of the groups (e.g., Bauer & Curran, 2003). Using a continuous measure of depression, the present study employed the growth mixture model approach to empirically test (a) whether and how many different groups of children exist with distinct longitudinal profiles of depressed mood over the course of early adolescence, and (b) what these profiles look like. Based on the previously mentioned findings about the longitudinal course of depressed mood from late childhood through early adolescence, we expected to identify three trajectory groups: (1) One group with consistently low levels of depressed mood, which should make up at least 70% of the sample, (2) another group whose depressed mood increases from late childhood through early adolescence, which should comprise about 20% of youth, and (3) a small group of youth with consistently high levels of depressed mood. As mentioned, previous evidence shows that girls experience a steeper increase of depressed mood than boys, and some studies even reported no increase in depression in early adolescent boys (e.g., Hankin et al., 1998). Consequently, we expected that more boys than girls would belong to the group showing consistently low levels of depressed mood. In contrast, more girls than boys should belong to the group experiencing an increase in depression. The

group showing consistently high levels of depressed mood from childhood onward should consist of fairly equal proportions of girls and boys. This last hypothesis was based on findings that the number of children suffering from clinical levels of depression already during childhood is fairly similar in boys and girls (e.g., Birmaher et al., 1996; Cole et al., 2002).

Links Between Depressed Mood, Early Adolescents' Relations with Parents and Peers, and Individual Temperament

The second objective of the present study was to examine to what extent the different profiles of depressed mood would be related to early adolescents' relations with parents and with peers. A multitude of studies have shown the significant role of a problem-laden parent–child relationship and of problematic peer relations, especially rejection by peers, in the development of depressive feelings (Dekovic, Buist, & Reitz, 2004; Ge et al., 1994; Hirsh & DuBois, 1992; McFarlane, Bellissimo, & Norman, 1995; Panak & Garber, 1992; Papini & Roggman, 1992; Reinherz et al., 1993). However, in order to better understand the role of parents and peers for the development of early adolescents' depressed mood, it is important to consider that depression is also significantly influenced by individuals' temperamental characteristics (e.g., Compas, Connor-Smith, & Jaser, 2004). Temperament is broadly defined as an individual's emotional and behavioral style that is stable across time and situations and that has a biological basis, although it can be modified by the environment (Prior, 1992; Rothbart & Bates, 1998). Temperamental characteristics are believed to play a role in the development of depressed mood through—among other things—their influence on individual differences in arousal, reactivity, and recovery in response to a threat or challenge (Strelau, 2001). A temperamental aspect that seems to play an important role in this context is reactivity/negative emotionality, which is conceptually related to neuroticism and involves a tendency to discomfort, fear, anger, sadness, and low soothability (Compas et al., 2004; Sanson, Hemphill, & Smart, 2004).

There are three principal ways in which temperamental vulnerability, in conjunction with environmental factors such as problematic relations with parents and peers, may lead to depressive feelings (Compas et al., 2004; Rothbart & Bates, 1998; Sanson et al., 2004). The first potential way describes an *Additive or Direct Effects model*. Here, a difficult temperament and difficult relations with parents or peers constitute additive risk factors, which directly and independently increase the risk

of depressive feelings. The second potential way refers to a *Mediational Process* whereby a difficult temperament leads to a negative reaction from parents and peers, which, in turn, fosters depressive feelings. The third pathway, which corresponds to a *Diathesis-Stress model*, describes an interaction effect whereby a difficult temperament amplifies the effect of a problematic relation with parents or peers on depressive feelings. Although conceptually different, the three potential pathways may not necessarily be mutually exclusive (Compas et al., 2004). Although only few studies have examined the roles of temperament and of problematic relations with parents and peers in the development of depressed mood during adolescence, the existing evidence indeed supports each of the three possible pathways. For example, both neuroticism and a difficult relationship with the father have been shown to predict directly and independently adolescents' level of depressive feelings, especially in girls (Heaven, Newbury, & Mak, 2004). In a related vein, negative emotionality as well as a lack of family support in mid-adolescence have been found to predict individuals' depressive feelings five years later, again mainly in girls (Katainen, Räikkönen, & Keltikangas-Järvinen, 1999). Some support for a mediational model comes from findings that the link between a global measure of difficult temperament and depression has been found to be at least partially mediated by low levels of perceived social support by the family and friends (Windle, 1992). Finally, the notion of an interaction between a difficult temperament and problematic social relations has been supported by findings that parental rejection was related to depressive symptoms only in youth who were characterized by a lack of positive emotionality (Lengua, Wolchik, Sandler, & West, 2000).

Despite the seeming support for all three possible pathways linking temperament and problematic relations with parents or peers with adolescents' depressed mood, the existing studies in this context suffer several limitations. Most notably, previous research was either based on cross-sectional data or has focused on longitudinal links across only two points in time, and often included adolescent samples with a relatively broad age range from pre-adolescence to late adolescence and even young adulthood. However, given the change in depression levels over the course of early adolescence, it seems important to examine these links in regard to longitudinal trajectories of depressed mood during that period. Moreover, many youngsters experience a problematic relationship both with parents and with peers (Ladd, 1992; Kerns, Klepac, & Cole, 1996). As such, the relative contribution of parent and peer relationships to depressed mood remains unclear unless both types of social relations are assessed simultaneously. So far, only two studies on depressed

mood have investigated temperament with parent and peer relations, and one of these studies was based entirely on cross-sectional self-reported data (Windle, 1992) whereas the other examined depressive feelings in young adulthood (Katainen et al., 1999). Finally, none of the existing studies differentiated between youths' relations with same-sex and other-sex peers despite evidence that both types of peer relations may uniquely contribute to adolescents' emotional well-being (Bukowski, Sippola, & Hoza, 1999; Kovacs, Parker, & Hoffman, 1996).

To address these issues, the present study examined to what extent a problematic parent–child relationship and rejection by same-sex peers and by other-sex peers—in conjunction with a difficult temperament—are related to different depression profiles from late childhood through early adolescence. In line with the theoretical models outlined previously, three different pathways were tested: (1) An additive or direct effects model, where all predictors have independent direct effects on the depression trajectories, (2) a mediation model, where a problematic relation with parents and rejection by same-sex and other-sex peers mediate the effect of a difficult temperament on the depression trajectories, and (3) an interaction model, where a difficult temperament moderates the effect of a problematic relation with parents and of rejection by same-sex and other-sex peers on the depression trajectories. These models were tested controlling for the effect of family adversity on individuals' depression trajectories. This decision was based on previous findings that problematic familial circumstances such as a low SES, single family status, or a young maternal age at the birth of the first child are related to elevated levels of depressed mood in the offspring (e.g., Aseltine, 1996; Fergusson, Wanner, Vitaro, Horwood, & Swain-Campbell, 2003; Goodman, Slap, & Huang, 2003; McLeod & Shanahan, 1996).

An additional objective was to examine the possibility of gender differences in the links of temperament, a problematic relation with parents, and rejection by same-sex and other-sex peers with youngsters' trajectories of depressed mood. In this context, two alternative theoretical models were tested (see e.g., Nolen-Hoeksema & Girgus, 1994, for a discussion of this issue): The first model suggests that girls are more sensitive than boys to certain risk factors, such as problems with parents and peers (e.g., Cyranowski, Frank, Young, & Shear, 2004). Consequently, these factors should impact more on girls' than boys' depressed mood. Based on this model, we should expect interactive effects between these risk factors and gender in the prediction of the depression trajectories. An alternative model postulates that factors that increase the risk of depression may simply be more prevalent in girls than in boys, which in turn would explain the higher

levels of depressed mood observed in girls (e.g., Hankin & Abramson, 2001). Based on this model, no interactions with gender would be expected but the link between gender and the depression trajectories should disappear once the risk factors are taken into account. To date, none of these models has received clear empirical support over the other (Rudolph, 2002) and we therefore examined both alternative hypotheses.

METHOD

Sample

Participants of the present study were 550 early adolescents (292 boys and 258 girls) from a small city in northwestern Quebec, Canada. Participants came from families with low to average socio-economic status based on the Blishen, Carroll, and Moore (1987) occupational prestige scale and more than 90% were Caucasian and French-speaking. The study sample was part of an ongoing longitudinal study on children's behavioral and emotional adjustment. First time of data collection was in kindergarten, when participants were 6 years of age. At that time, at least 90% of all the students in the targeted classrooms participated in the study. Follow-up data collections for this study were conducted in grade 1, and then again each year starting in grade 5 (age 11) through grade 8 (age 14). Until grade 6, participants attended elementary schools, after which they transferred directly to high school.[5] The schools were relatively homogeneous in size, number of classes, socioeconomic status of the children in the classes, and socioeconomic status of the neighborhood. All children attended regular classrooms. To retain as many children as possible from the initial data collection, the study design aimed to follow all children who were originally assessed in kindergarten over time, regardless of whether they were grade-retained or not. Of the study sample, 15% were grade-retained during the assessment period. Despite our efforts, 136 (25%) of the children originally assessed in kindergarten were lost from the study because they moved away or were absent from school at the day of testing, leading to a sample of 414 participants (197 girls) for the present study. The participants who were included in the analyses did not

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[5]In the province of Québec, there is no middle school system and children transfer to high school immediately after grade 6 of elementary school. Moreover, in the participating community, classroom composition remained stable in grade 7 (i.e., the first year of high school) throughout the whole school year, which made within-classroom sociometric testing possible at least during the first year after transition to high school.

significantly differ from those who were excluded on the measures taken at age 6 (i.e., temperament, sex, and SES).

Measures

Temperament

When the children were 6 and 7 years of age, mothers rated their child's temperament by means of the Dimensions of Temperament Survey (*DOTS*; Lerner, Palermo, Spiro, & Nesselroade, 1982). The DOTS consists of five subscales based on 34 items with a dichotomous response format ranging from 0 "does not apply" to 1 "does apply." Only the *Reactivity* subscale (six items) was used for the present study because it closely maps onto the temperamental construct of negative emotionality. Sample items for the Reactivity subscale are "My child reacts intensely when hurt," "When my child reacts to something, his/her reaction is intense," or " Sunlight bothers my child's eyes." Item scores were summed to yield a *Reactivity* score for each participant. Test–retest reliability of the *Reactivity* subscale from age 6 to age 7 years was $r = .62$, $p < .001$. A total Reactivity scale across ages 6 and 7 was computed for each participant by averaging the individual item scores across the two times of measurement (Cronbach's $\alpha = .74$, $M = 2.72$, $SD = 1.47$).

Relation with Parents

The quality of the relationship with their parents was measured through participants' self-reports from age 11 through age 13 years. For this purpose, five items were used that were part of a larger scale designed to measure family relations and developmental adjustment (Le Blanc & Fréchette, 1989): Four items (i.e., "Do your parents know about your feelings and thoughts?" "How often do you engage in conversations with your parents?" "Do your parents reveal their feelings to you?" "Do your parents encourage and compliment you?") were chosen because they closely resembled the Massey and Krohn (1986) measure of attachment to parents. A fifth item from the same scale (i.e., "Do you talk with your parents about what you want to be when you grow up?") was used as an additional indicator of communication and self-disclosure with parents. Participants' responses on each item referred to their overall relationship with the adult caretaker(s) they lived with in the same household, regardless of parental gender or biological relationship. The participants answered those items on a four-point scale that ranged from 1 (*never*) through 4 (*always*). Individual total scores were calculated by averaging across item scores (Cronbach's alphas

ranging from .68 to .76, *means* ranging from $M = 2.81$, $SD = .56$, at age 11 to $M = 2.43$, $SD = .60$, at age 13).

Social Preference Among Same-sex and Among Other-sex Peers

When they were aged 11 through 13 years, each participant was given a classroom roster with all same-sex and other-sex classmates' names. Each participant was then asked to nominate three classmates he or she would like most to invite to a birthday party (positive nominations) and three classmates he or she would like least to invite to a birthday party (negative nominations). This anchor was chosen instead of "liked most" and "liked least" scores to encourage cross-gender nominations for both items, given our objective to assess social preference among same-sex and among other-sex peers. The criteria outlined by Coie, Dodge, and Copotelli (1982) were used to compute a same-sex social preference score for each participant. Specifically, separately for positive and negative nominations, the total number of nominations received by same-sex classmates was calculated for each participant. These sum scores were then z-standardized within the number of same-sex peers in the classroom minus one (i.e., the participant him- or herself). A social preference score among same-sex peers was then calculated by subtracting the z-standardized score of negative nominations received from same-sex peers from the z-standardized score of positive nominations received from same-sex peers. This score was again z-standardized within the number of same-sex peers in the classroom (minus one). The corresponding procedure, using positive and negative nominations received by other-sex peers, was used to compute a social preference score among other-sex peers for each participant. As such, a highly positive social preference score is indicative of popularity among peers. A highly negative social preference score is indicative of rejection by peers.

Control Variable: Family Adversity

For each year when the participants were aged between 11 and 13 years, information regarding family adversity was collected based on mother reports on: (a) Family structure (two parent or single), (b) educational level of both parents (or the parent with whom the child was living), (c) occupational status of both parents (or occupation of the parent with whom the child was living) based on the Blishen et al. (1987) occupational prestige scale, and (d) mother's and father's age at birth of the first child, respectively. A score of 0 was attributed to family structure if the child was living with both natural parents and a

score of 1 was attributed to all other cases. Parental educational level, parental occupational status, and mother's or father's age at birth of the first child were scored 1 when the individual scores were in the lower quartile of the respective variable distribution. A score of 0 was given to scores above the first quartile of the distributions. A total family adversity index was then computed, separately for each year, by averaging the individual variable scores. As such, a high value in this newly created variable indicated exposure to a high level of family adversity (means ranging from $M = .30$, $SD = .22$, at age 11 to $M = .29$, $SD = .23$ at age 13). A similar global family adversity index has been shown to predict depressive symptoms in offspring in previous research (Fergusson et al., 2003).

Depression

Participants' depression was assessed from age 11 through age 14 using the Children's Depression Inventory (CDI; Kovacs, 1992). The CDI is a self-rated 27-item scale assessing affective, cognitive, motivational, and somatic symptoms of depression. In the present study, the suicidal ideation item was dropped due to concerns by the school administration. Individual item scores ranged from 0 to 2 with higher ratings indicating more severe symptoms. The psychometric properties of the CDI are well-documented (Kovacs, 1992; Saylor, Finch, Spirito, & Bennett, 1984). The CDI has relatively high internal consistency and stability and has been validated using normative and clinic-referred samples (Finch, Saylor, & Edwards, 1985; Fundulis et al., 1991). Internal consistency of the 26-item global scale, which was calculated by summing the individual item scores, was also satisfactory in this sample (Cronbach's α ranging from .85 to .87; means ranging from $M = 9.94$, $SD = 6.73$, at age 11 to $M = 11.85$, $SD = 7.56$, at age 14).

Procedure

All instruments were administered in French. Following the procedure suggested by Vallerand (1989), instruments that were originally written in English were translated into French and then translated back into English. Bilingual judges verified the semantic similarity between the back-translated items and the original items in the questionnaire. Mothers filled out the questionnaires regarding children's temperament and with respect to family adversity at home. For the other measures, participants spent 1 hr of classroom time answering the questionnaires. Trained research assistants administered and collected the questionnaires. After informing students about the pur-

pose of the study, they were told that all of their answers would be confidential and that they did not have to answer any of the questions, if they did not want to. The students were encouraged to keep their answers confidential and not to talk with classmates about their answers. The research assistants remained present while students filled out the questionnaires to answer any questions related to the study. Teachers were asked to leave the classroom during the assessment time to emphasize that students' answers would not be revealed to their teachers. Parental written permission was obtained each year for all participants. The research questions and instruments were submitted to, and approved by the Institutional Review Board and the school board administrators.

RESULTS

Identification of Groups with Distinct Longitudinal Profiles of Depressed Mood

In the first block of analyses, we examined whether groups with distinct longitudinal trajectory profiles of depressive feelings could be empirically identified. For this purpose, we used TRAJECTORIES (henceforth referred to as TRAJ), a semi-parametric analytical procedure for continuous longitudinal data (e.g., Broidy et al., 2003; Nagin, 1999). Using maximum-likelihood estimation, the TRAJ procedure (a) empirically tests whether different groups with distinct trajectories exist in the population, and (b) provides an empirical basis for determining the number of groups as well as the shapes of the trajectories in the different groups that best fit the analyzed data. A detailed description of the statistical rationale underlying the TRAJ procedure is given elsewhere (Nagin, 1999).

A Censored-Normal distribution was used as the basis of model estimation because higher scores on the CDI were rarer than lower scores at all ages, although the distributions of depression scores were relatively normal (skewness = 1.06, 1.10, 0.91, 0.93; kurtosis = 0.75, 1.17, 0.17, 0.56 for ages 11 years to 14 years, respectively). As outlined previously, we expected a three-group model. Nevertheless, we employed a comprehensive test of possible multiple-group models to examine whether a three-group model indeed provided the best fit to the data. Specifically, we tested two models that comprised more than three groups (i.e., four and five groups) and a two-group model. In addition, a model comprising only one group was estimated to assess whether the data could indeed be better represented through several groups with distinct longitudinal depression patterns. Initial model specification included cubic trajectories for all groups,

which allowed for temporal variability of depressive feelings and avoided excessive restriction of trajectory shapes in the initial models. Following previous applications of the TRAJ procedure (e.g., Lacourse et al., 2002; Nagin & Tremblay, 2001), the Bayesian information criterion (BIC) was used as a basis for selecting the optimal number of trajectory groups. Under fairly general circumstances and when prior information on the correct model is limited, the model with the maximum BIC (i.e., closest to zero) is selected (for a rationale of this fit index, see e.g., Nagin, 1999). The BIC rewards parsimony and, thus, tends to favor models with fewer groups.

The results from the TRAJ procedure revealed that a four-group model showed the best fit to the data ($BIC = -4299.27$) compared to the two-group model ($BIC = -4340.77$), the three-group model ($BIC = -4321.19$), the five-group model ($BIC = -4327.74$), and the one-group model ($BIC = -4478.62$). Moreover, the BIC-based model probability calculations (Nagin, 1999) provided strong support for the four-group model over all alternative models. The BIC-based model probabilities provide an estimate of the probability that a given model is the correct one while taking into consideration all other tested models. Specifically, the probability of being the correct model was 1.00 for the four-group model while the corresponding probabilities for each of the remaining models were zero. As such, the four-group model was retained as the one that best represented the data. On the next step, the trajectory parameters from the four-group model were examined with respect to (a) whether the modeling of a cubic trend was necessary to adequately fit the trajectory in each group, or (b) whether the trajectories of some groups could be defined by a more parsimonious pattern (e.g., constant only, a linear trend, or a quadratic trend). Using backward elimination of higher-order trends (i.e., cubic trends were eliminated first, then quadratic trends, and finally linear trends), a simpler model was estimated whenever a specific higher-order growth coefficient did not reach statistical significance in a specific group. As such, not only the specific values but also the number of growth parameters could differ between groups in the final model. The results from the final parsimony model regarding the estimated trajectories of depressive feelings for each of the four groups are depicted in Fig. 1. The observed mean values of depressive feelings from age 11 through age 14 are also presented for each of the four trajectory profile groups in the figure. A comparison with the initial four-group model, which comprised cubic trends for all four groups, showed that the final parsimony four-group model indeed had a better fit to the data ($BIC = -4270.85$ for the final model compared to $BIC = -4299.27$ for the initial four-group model).

As can be seen in Fig. 1, the first group showed a zero-order trend of CDI scores, which indicated that this group had consistently low depressive feelings across the investigated age range, $Constant = 6.69$, $SE = 0.36$, $p < .001$, $Slope = 0.00$. This group, which we called '*Consistently Low group*' comprised an estimated 47.7% of the population and included 214 children (84 girls, 130 boys) from the study sample. The second group (Consistently Moderately Depressed) showed also a flat line regarding their longitudinal depressive feelings, $Constant = 12.49$, $SE = 0.63$, $p < .001$, $Slope = 0.00$. These youngsters had somewhat elevated depressive feelings already by age 11 years compared to the low group and they retained the same level of depression throughout early adolescence. The *Consistently Moderately Depressed group* constituted an estimated 30.3% of the population and included 119 children (67 girls, 52 boys) from the study sample. The third group (Increasingly Depressed) made up an estimated 12.7% of the population and included 45 children (26 girls, 19 boys) from the study sample. This group showed a linear increase in depressed mood across the investigated age range, $Constant = 8.59$, $SE = 1.03$, $p < .001$, $Slope = 4.31$, $SE = 0.80$ $p < .001$. More specifically, at age 11 years, children in the *Increasingly Depressed group* had rather low CDI scores, which lay between the Consistently Low group and the Consistently Moderately Depressed groups. However, in the subsequent year, these children's depressive feelings were as high as those of the Consistently Moderately Depressed group and by the end of the investigated age range their depressive feelings approached the levels of the '*Consistently Highly Depressed*' group. The Consistently Highly Depressed group represented the fourth and last group. These youngsters' depressive feelings were already very high (above 20 on the 26-item CDI) at age 11 and they even increased somewhat more across the investigated age range, $Constant = 20.85$, $SE = 1.22$, $p < .001$, $Slope = 1.74$, $SE = 0.59$, $p < .01$. This group comprised an estimated 9.3% of the population and included 36 children (20 girls, 16 boys) from the study sample.

Predictive Links of Temperament and Relations with Parents, Same-Sex Peers, and Other-Sex Peers to Depression Trajectories

Preliminary Analyses

In the next set of analyses, we examined to what extent (a) the relationship with parents, and social preference/rejection by same-sex and other-sex peers between 11 and 13 years of age would predict membership in
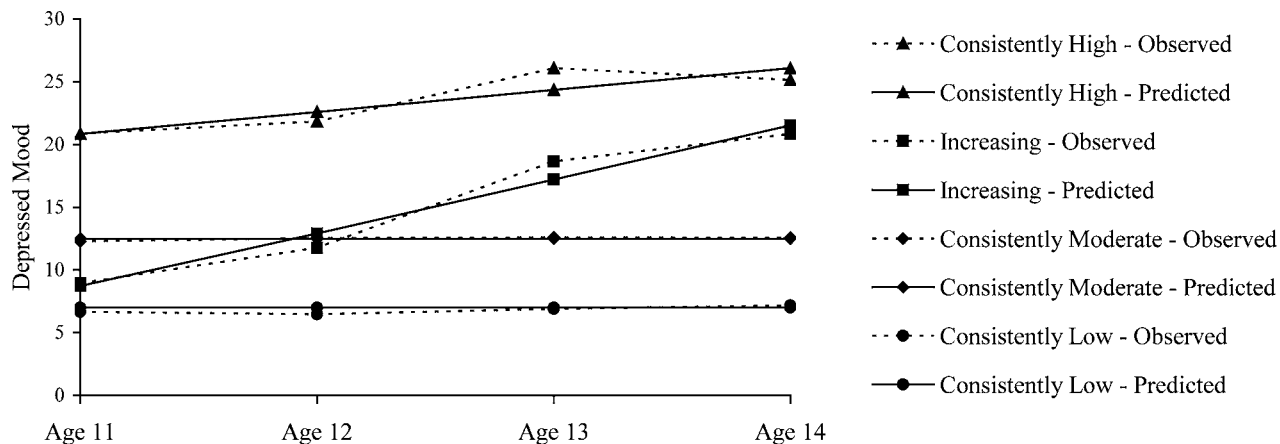
Fig. 1. Longitudinal profiles of depressed mood over the course of early adolescence. The *solid lines* represent predicted trajectories and the *dashed lines* represent observed trajectories of depressed mood in the four identified trajectory groups. The predicted trajectories are based on the trajectory coefficient estimates obtained from the TRAJ procedure for each of the four groups (see text). The observed trajectory of a given group is based on the mean value of depressed mood at each time of measurement of all individuals assigned to this group.

the established depression trajectory groups, and (b) what role individuals' level of reactivity at 6 and 7 years of age would play in this context. Specifically, we examined (1) an additive model, where all predictors would have independent direct effects on the depression trajectories, (2) a mediation model, where a problematic relationship with parents and peers would mediate the effect of a difficult temperament on the depression trajectories, and (3) an interaction model, where a difficult temperament would moderate the effect of a problematic relationship with parents and with peers on the depression trajectories. Prior to these tests, preliminary analyses were conducted to examine the general trends observed in participants' relationship with parents, and their social preference among same-sex and other-sex peers between the ages of 11 and 13 years. Specifically, unconditional linear growth curves were fitted using the LISREL 8.52 software package (Jöreskog & Sörbom, 1996), with age 11 values serving as initial levels. A growth curve analysis was also performed for family adversity between ages 11 and 13 years. Model fit indices, mean initial values and mean linear rates of changes as well as variability in initial levels and linear rates of change are provided in Table I. Results revealed significant inter-individual variability with respect to initial age 11 levels in the examined variables. However, although significant mean changes were found for some variables, the linear rates of change did not vary significantly in any of the examined variables. As such, only general mean differences—but not individual rates of change—in these variables could constitute meaningful predictors of the established depression trajectories. We therefore calculated average scores across

ages 11 through 13 for each of the social relations variables. Similarly, individual family adversity scores were averaged across ages 11 through 13 years. As a result, we obtained a more parsimonious representation of these variables from late childhood through early adolescence. These average scores were then used as predictors of the established depression trajectory groups in the next set of analyses. Table II shows the means and standard deviations as well as the zero-order correlations of all predictor variables.

Predictive Analyses

Next, a hierarchical multinomial logistic regression analysis was performed to predict membership in the four depression trajectory groups, using the Consistently Low Depression group as reference category. On the first step of the logistic regression we included Sex, Family Adversity, and Reactivity as predictors in the model. On the second step, we added the Relation with Parents, Same-Sex Peer Social Preference, and Other-Sex Peer Social Preference. On the third step, we tested whether the predictive effects of these latter variables were moderated by reactivity and whether the moderated links would differ between boys and girls. For example, in order to test an interactive effect between Reactivity and Relation with Parents and potential sex differences in this respect, we added the following two-way and three-way interaction terms on step 3a: Reactivity × Relation with Parents, Sex × Relation with Parents, Sex × Reactivity, and Sex × Reactivity × Relation with Parents. The same rationale was employed

Table I. Model Fit Indices and Growth Curve Parameters for Perceived Relation with Parents, Same-Sex and Other-Sex Social Preference, and Family Adversity From Age 11 Through Age 13 Years

	χ^2 (df)	p	RMSEA	IFI	NFI	Mean intercept	Mean slope	Variance intercept	Variance slope
Relation with parents	0.34 (3)	0.95	.00	1.00	1.00	2.70 (88.94)***	−0.14 (−7.64)***	0.22 (6.58)***	0.03 (1.85)
Same-sex social preference	1.29 (3)	0.73	.00	1.00	.99	0.45 (8.95)***	−0.03 (−0.81)	0.43 (5.54)***	0.06 (1.78)
Other-sex social preference	22.48 (3)	0.00	.13	.91	.90	−0.39 (−11.28)***	0.02 (1.10)	0.24 (5.90)***	0.00 (0.28)
Family adversity	2.27 (3)	0.52	.00	1.00	.99	0.43 (26.46)***	0.06 (16.50)***	0.05 (9.36)***	0.00 (0.15)

Note. T-values are presented in parentheses below their respective associated growth curve parameter.
*** $p < .001$, two-tailed tests.

Table II. Means, Standard Deviations, and Zero-Order Correlations of Predictor Variables

	1	2	3	5	6	7	Mean (SD)
1. Sex	—						
2. Family adversity	−.04	—					0.34 (0.19)
3. Reactivity	.07	.23***	—				2.72 (1.47)
5. Relation w. parents	−.04	−.12*	−.03	—			2.62 (0.45)
6. Same-sex social preference	−.10	−.20***	−.19**	.12*	—		0.37 (0.83)
7. Other-sex social preference	−.07	−.16***	−.20***	.11*	.61***	—	−0.38 (0.62)

Note. Sex is coded such that 0 indicates girls and 1 indicates boys.

*$p < .05$; **$p < .01$, two-tailed tests.

to test interactive effects between Reactivity and either Same-Sex Peer Social Preference or Other-Sex Peer Social Preference on steps 3b and 3c, respectively. Notably, steps 3a through 3c were tested in a mutually exclusive sequence to keep the number of model predictors to a minimum. Moreover, to protect against an inflated family-wise error rate, a Bonferroni-corrected alpha of .016 was used for the overall χ^2-change test associated with each of the three separate steps 3a-c. In Table III we present the overall model fit and χ^2-change associated with each step, the overall χ^2 (i.e., likelihood ratio test) associated with each predictor, as well as the specific odds ratios associated with each predictor with respect to membership in the different depression trajectory groups (i.e., membership in the Consistently Moderate group, the Increasing group, and the Consistently High group, respectively, compared to the Consistently Low group).

The results from the first step of the logistic regression showed that sex, family adversity, and reactivity contributed to the odds of following a depression trajectory other than being consistently low depressed. Boys were significantly less likely than girls to follow any elevated depression trajectory (*odds* = .48, $p < .05$, for a moderate depression trajectory, *odds* = .43, $p < .05$, for an increasing depression trajectory, and *odds* = .45, $p < .05$ for a high depression trajectory). A high level of family adversity increased the odds of a consistently high depression trajectory (*odds* = 1.83, $p < .001$) but was unrelated to the odds of following an increasing or consistently moderate depression trajectory. Finally, a high reactivity also increased the odds of following either an increasing or a consistently high depression trajectory (*odds* = 1.59, $p < .01$, and *odds* = 2.74, $p < .001$, respectively).

Of the variables entered on the second step, only the relation with parents had a main effect. Specifically,

Table III. Multinomial Logistic Regression Analysis Predicting to CDI Trajectory Groups

	Overall model statistics					Group-specific odds ratio estimates		
	χ^2-change (df)	p	Nagelkerke R^2-change	Predictor χ^2 (df)	p	Consistently high	Increasingly depressed	Consistently moderate
Step 1	60.89 (9)	.001	.15					
Sex				14.10 (3)	.01	0.45*	0.43*	0.48*
Family adversity				11.33 (3)	.01	1.83***	1.22	1.02
Reactivity				28.63 (3)	.001	2.74***	1.59**	1.18
Step 2	50.42 (9)	.001	.11					
Relation w. parents				36.87 (3)	.001	0.33***	0.56***	0.61***
S-sex social preference				5.11 (3)	ns	0.61	0.70	0.88
O-sex social preference				6.09 (3)	ns	1.08	1.62*	0.91
Step 3b[a]	36.29 (12)	.001	.07					
Em. Reac. × S-sex soc. pref				11.88 (3)	.008	0.77	2.42**	1.14
Em. Reac. × Sex				23.06 (3)	.001	0.30*	2.75	0.51
Sex × S-sex soc. pref.				3.11 (3)	ns	0.47	1.21	0.73
Sex × Em. Reac. × S-sex soc. pref				11.88 (3)	.008	1.34	0.25**	1.10

Note. Sex is coded such that 0 indicates girls and 1 indicates boys. The Consistently Low group serves as comparison group for model tests and odds ratios.

[a]The χ^2-change test on step 3 refers to a comparison with the fit statistic obtained on step 2, based on a corrected $\alpha \leq .016$ (see text). Only the step were significant interactions were found is reported (i.e., step 3b with interactions regarding same-sex social preference).

*$p < .05$; **$p < .01$; ***$p < .001$, two-tailed tests.

a good relationship with parents decreased the odds of following any elevated depression trajectory (i.e., consistently moderate: $odds = 0.61$, $p < .001$; increasing: $odds = 0.56$, $p < .001$; or consistently high: $odds = 0.33$, $p < .001$). In contrast to the relation with parents, none of the peer relationship variables had a significant direct effect on the distinction between children with elevated depression trajectories and consistently low depressed youth. Moreover, the direct effect of reactivity on the odds of following an increasing or a high depression trajectory did not decrease in strength compared to what had been observed on the previous step ($odds = 1.74$, $p < .01$, for the increasing trajectory group and $odds = 2.93$, $p < .001$, for the high trajectory group on the second step). Based on the criteria for mediation proposed by Barron and Kenny (1986), these results thus disconfirm the hypothesis of a mediating effect of social relations with parents and peers on the link between temperament and the depression trajectories.

Interaction terms entered on the third step showed a significant two-way interaction between reactivity and sex on the odds of following an increasing depression trajectory. Moreover, a significant three-way interaction revealed that social preference among same-sex peers interacted with reactivity in predicting the odds of following an increasing depression trajectory and this interactive effect differed for boys and girls.

Decomposition of Interaction Effects

We broke down the observed interaction effects following suggestions by Jaccard (2001) for interaction effects in logistic regressions. The results for the two-way interaction between reactivity and sex revealed that a high level of reactivity increased the odds of following an increasing depression trajectory only for girls but not for boys ($odds = 5.52$, $p < .001$, for girls versus $odds = 1.63$, *ns.* for boys). To break down the three-way interaction between social preference among same-sex peers, reactivity, and sex we examined the effect of same-sex social preference on membership in the increasing depression trajectory group at three levels of reactivity: at an average level (i.e., at the mean), at a low level (i.e., 1 *SD* below the mean) and at a high level (i.e., 1 *SD* above the mean). These analyses were conducted once with sex coded as 0 = *boys* and 1 = *girls* and once with sex coded as 0 = $\textbf{\textit{girls}}$ and 1 = $\textbf{\textit{boys}}$ and all coefficients were interpreted after inclusion of the three-way interaction term involving sex and the associated two-way interaction terms (see Jaccard, 2001). For girls, the results showed that social preference among same-sex peers was

unrelated to the odds of following an increasing depression trajectory when they had a low or average level of reactivity. However, for girls with a high level of reactivity, a high social preference among same-sex peers significantly decreased the odds of becoming increasingly depressed (or, conversely, a low social preference among same-sex peers significantly increased these odds), $odds = 0.34$, $p < .01$. In contrast to these findings for girls, social preference among same-sex peers was unrelated to the odds of following an increasing depression trajectory for boys, regardless of their level of reactivity.

DISCUSSION

The present study examined (a) whether groups of individuals can be empirically identified with distinct longitudinal profiles of depressed mood over the course of early adolescence (i.e., from 11 through 14 years of age), (b) to what extent these different longitudinal depression profiles are predicted by youngsters' relations with their parents and with same-sex and other-sex peers during that period, and (c) what role individual levels of reactivity play in this context.

Longitudinal Trajectories of Depressed Mood From Late Childhood Through Early Adolescence

With respect to the first goal, four distinct trajectory profiles were identified. The largest group, which made up almost 50% of the sample, had consistently low levels of depression throughout the assessed period. Another 30% of children showed a consistently moderate level of depressed mood from 11 through 14 years of age. Although this group's estimated consistent mean level of 12.5 on the CDI was notably higher than that of the first group, it was still well within what is considered a normal range (Kovacs, 1992). A more alarming pattern was observed for the last two identified groups, each of whom comprised around 10% of the population. One group, the Consistently High Depressed children, showed a level of depression that is normally found in clinically depressed youth (i.e., a CDI score above 19; Knight, Hensley, & Waters, 1988) already in late childhood. In contrast, the Increasingly Depressed children's level of depressed mood at age 11 resembled that of the Consistently Low group but skyrocketed thereafter until it approached the clinical range of depression displayed by the Consistently High Depressed group at age 14 years.

Overall, these longitudinal patterns are in line with existing literature suggesting that the majority of early

adolescents live through this developmental period without much emotional distress and that only a small percentage of youth evince clinical levels of depression already during childhood (Birmaher et al., 1996; Cole et al., 2002). The fact that the Consistently High Depressed children retained their high level of emotional distress throughout the assessment period is reminiscent of the considerable stability of clinical depression found in previous studies (e.g., Kovacs et al., 1984). Our results also suggest that the mean increase in depression over the course of early adolescence might be mainly due to a relatively small group of youngsters, mainly girls, who experience a dramatic rise in depressed feelings during that period. To be sure, the trajectory patterns found in the present study do not exclude the possibility that a pronounced surge in depression rates may be observed in a larger subgroup from mid-adolescence onward. Indeed, some studies have found that the strongest increase in depressed mood as well as the greatest escalation in gender difference in this respect occurs starting at age 15 years (e.g., Hankin et al., 1998). Nevertheless, the finding that girls were more likely than boys to follow any elevated depression trajectory is in line with studies showing that girls are more likely than boys to be diagnosed with depression during adolescence (Costello et al., 2002; Hankin et al., 1998; Lewinsohn et al., 1993) and that girls experience a steeper increase of depressed mood than boys (Cole et al., 2002; Garber et al., 2002; Ge et al., 1994). By the same token, our finding that boys are more likely than girls to follow a consistently low depression trajectory supports previous results that many boys show no increase in depression during early adolescence (e.g., Hankin et al., 1998).

Predictive Links of Temperament and of Relations with Parents and Peers to Depression Trajectories

Our second objective was to examine to what extent the different longitudinal depression profiles are predicted by youngsters' relationship problems with their parents and with same-sex and other-sex peers and what role temperamental reactivity plays in this context. Three potential pathways were tested: (1) An additive or direct effects model, where all predictors have independent direct effects on the depression trajectories, (2) a mediation model, where a problematic relationship with parents and peers mediate the effect of a difficult temperament on the depression trajectories, and (3) an interaction or moderation model, where a difficult temperament moderates the effect of a problematic relationship with parents and with peers on the depression trajectories. Although the results did not support a mediation model,

both the additive model and the interaction model were supported by the data.

In concordance with an additive or direct effects model, a reactive temperament increased the risk of following a Consistently High Depression trajectory or an Increasing Depression trajectory. However, reactivity was unrelated to a Consistently Moderate Depression trajectory. These results are also in line with a vulnerability or trait thesis of depression whereby a highly reactive temperament serves as a vulnerability factor predisposing children to high levels of depressed mood independently of environmental stressors (e.g., Clark, Watson, & Mineka, 1994). Further support for an additive or direct effects model was found in regard to problems in the relationship with parents, which was the only variable other than sex that predicted all three elevated depression trajectories. Moreover, the effect of a problematic relationship with parents was independent of children's temperamental characteristics. This finding supports previous results on the link between the parent–child relationship and early adolescents' depressed mood (e.g., McFarlane et al., 1995; Papini & Roggman, 1992) and emphasizes the continued importance of parents during the early adolescent transition phase. In this context it is interesting to note that the relationship with parents showed a decline for most youth over the course of early adolescence. This pattern is in line with the notion that some strain in the parent–child relationship during early adolescence might constitute a normative change (Steinberg, 1987). As such, the 'initial' quality of the parent–child relationship during middle childhood seems to be crucial for children's emotional well-being even during the early adolescent phase.

In contrast to the additive effect of the parent–child relationship on individuals' depression trajectories, the results obtained for social preference/peer rejection support an interactional mechanism between temperament and social experiences. Specifically, rejection by same-sex peers predicted the odds of following an Increasing Depression trajectory—but not a Consistently Moderate or Consistently High trajectory—from 11 through 14 years of age. This predictive link, however, was only true for girls who were highly emotionally reactive. This finding is consistent with a diathesis-stress model of depressed mood whereby pre-existing temperamental vulnerabilities amplify the effect of an environmental stressor on depressive feelings. The finding that same-sex peer rejection had rather specific effects on depressed mood, compared to the more general effects of a problematic relationship with parents, may be interpreted as a further indicator of the importance of the parent–child relationship during early adolescence. At the same time, however, the significance of same-sex peers for early adolescents' emotional

well-being should not be underestimated. Thus, same-sex peer rejection was associated with almost a three-fold increase in odds of following an Increasing Depression trajectory for highly reactive girls, compared to a two-fold increase in odds for a problematic relationship with parents. The fact that this pattern was only found for girls may reflect a greater significance of and orientation toward social relationships for girls than for boys. It is also possible that the most common manifestations of peer rejection, such as ostracism, ridicule, or the destruction of social reputation through rumors, have a specifically negative impact on girls' emotional well-being (Crick, Bigbee, & Howes, 1996; Paquette & Underwood, 1999). At least with regard to the assessed risk factors, our results are thus more in line with the notion that girls are more sensitive than boys to certain risk factors of depression than with the idea that a higher prevalence of risk factors can explain the increase in depressed mood observed in early adolescent girls. Our results nevertheless suggest that even rejected girls only seem to show a significant increase in depressive feelings during early adolescence if they are particularly emotionally reactive. The link between a reactive temperament and depression may be mediated by maladaptive coping styles (Mckernon, 2003). Emotionally reactive girls may thus simply be less able than others to cope with the negative experiences associated with same-sex peer rejection.

Why was same-sex peer rejection associated with the risk of following an Increasing Depression trajectory, but not a Consistently High or a Consistently Moderate trajectory? It is possible that children following a Consistently High Depression trajectory already face so many liabilities—including high reactivity, a problematic relationship with parents, and family adversity—that rejection by same-sex peers may not significantly add to their level of distress. In contrast, a Consistently Moderate Depression trajectory was not only unrelated to family adversity but children following this pattern also were not particularly emotionally reactive. As a consequence, children in the Consistently Moderate Depression group may not experience an increase in depressed mood even if they are rejected by their same-sex peer group. It is interesting to note that rejection by other-sex peers did not contribute above and beyond same-sex peer rejection to the prediction of early adolescents' trajectories of depressed mood. One reason for this finding may be that interactions with other-sex peers are relatively new at this developmental stage (Feiring, 1999). Contact with other-sex peers at this stage normally takes place in a larger group context comprised of several peers of either sex and is thus limited for youth who are rejected by their same-sex peers (Brown, 1999). The potential role of other-sex peer relations for depressed mood may thus become more apparent later in adolescence, when other-sex peer relations become more independent of youngsters' success with same-sex peers.

Strengths, Limitations, and Conclusions of the Present Findings

The present study is among the first to employ growth mixture models in an attempt to discern distinct trajectory classes of depressed mood during early adolescence and to examine the predictive effect of individuals' temperamental vulnerabilities and of the relations with parents and with peers in this context. In examining these issues, the present study avoided several of the limitations of previous research. First, the problem of shared method variance was largely avoided by using different raters for each variable. The only exception was the measure of the parent–child relationship, which was assessed by the same source as depressed mood, namely the children themselves. Second, there was no conceptual confound between measures (e.g., when the temperament measure includes items also used to assess depressed mood), which further reduced the possibility of shared method variance. Third, the use of a longitudinal design, with an early measure of temperament and the remaining variables assessed from late childhood through early adolescence, provided a broader picture of the development of depressed mood than in many previous studies.

Despite these strengths, the present study also has some limitations. For example, our measure of depressed mood from age 11 through age 14 years covered only a limited temporal window, and some evidence suggests that the most significant rise in depressed mood can be observed between mid- and late adolescence (e.g., Hankin et al. 1998). Similarly, one trajectory group showed very high levels of depressed mood already by age 11, but it is unclear at what age depression levels began to rise for children in this group. Future studies thus need to extend the time frame from middle childhood through late adolescence to provide a complete picture of the distinct longitudinal trajectory profiles of depressed mood. By the same token, extending the developmental time frame in future research may reveal a different pattern in regard to the predictors of depressed mood than the one found in the present study, as parents' influence may wane while that of same and other-sex peers may increase. Moreover, experiences in one social context may offset the effects of negative experiences in another context on adolescents' trajectories of depressed mood and future studies need to consider such possible interaction effects. Another limitation concerns the use of a self-reported continuous

measure of depressed mood instead of a clinical diagnosis. Although it has been argued that a quantitative approach provides a broader assessment of depressive symptoms (e.g., Caron & Rutter, 1991; Flett et al., 1997), the present findings might not necessarily generalize to clinical depression according to DSM-IV criteria. The present findings thus need to be replicated in future studies using continuous measures and diagnostic criteria based on a variety of sources. Finally, it needs to be kept in mind that despite the longitudinal nature of our study, the causality or even the directionality of effects could not be assessed. At least in regard to the link between social relations and depressed mood, reciprocal influential processes are likely (Coyne, 1976) and previous research has indeed demonstrated that depression may lead to interpersonal difficulties and rejection (Segrin & Dillard, 1992).

These limitations notwithstanding, we believe our findings provide important new insights regarding the development and the specific correlates of depressed mood during early adolescence. Moreover, if replicated in other samples, our findings might have important implications for intervention programs with youth at risk for depression. Of specific importance in this context seems to be a focus on individuals' emotion regulation strategies and the implication of parents. In addition, social skills training designed to boost relations with peers may further offset the risk of an increase in depressed mood during early adolescence, especially in girls. A systematic evaluation of such interventions in future research may not only illuminate the processes involved in the development of different trajectories of depressed mood, but might also ultimately help reduce the upsurge of depression during adolescence.

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