



Published in final edited form as:

J Child Psychol Psychiatry. 2009 November ; 50(11): 1419–1427. doi:10.1111/j.1469-7610.2009.02148.x.

Dynamics of Affective Experience and Behavior in Depressed Adolescents

Lisa B. Sheeber¹, Nicholas B. Allen², Craig Leve¹, Betsy Davis¹, Joann Wu Shortt^{1,3}, and Lynn Fainsilber Katz⁴

¹ Oregon Research Institute

² University of Melbourne

³ Oregon Social Learning Center

⁴ University of Washington

Abstract

Background—Depression is often characterized as a disorder of affect regulation. However, research focused on delineating the key dimensions of affective experience (other than valence) that are abnormal in depressive disorder has been scarce, especially in child and adolescent samples. As definitions of affect regulation center around processes involved in initiating, maintaining, and modulating the *occurrence*, *intensity*, and *duration* of affective experiences, it is important to examine the extent to which affective experiences of depressed youth differ on these dimensions from those of healthy youth.

Methods—The affective behavior and experience of adolescents with Major Depressive Disorder (MDD; $n=75$) were compared to a demographically matched cohort of healthy adolescents ($n=77$). Both samples were recruited from community high schools. A multi-source (parents and adolescent), multi-method (interviews, behavioral observations, questionnaires) assessment strategy was used to examine positive and negative affects.

Results—Depressed youth had significantly longer durations, higher frequency, and greater intensity when experiencing angry and dysphoric affects and shorter durations and less frequency of happy affect when compared to healthy youth. The most consistent, cross-method results were evident for duration of affect.

Conclusions—Clinically depressed adolescents experienced disturbances in affective functioning that were evident in the occurrence, intensity, and duration of affect. Notably, the disturbances were apparent in both positive and negative affects.

Keywords

Depression; adolescence; affective dynamics; affect regulation

The ability to successfully regulate affective states is central to mental health. Indeed, diverse forms of psychopathology are associated with disturbances in affective processes, which may well reflect the capacity to regulate emotional experiences (Cole, Michel, & Teti, 1994; Gross, 1998). However, despite both awareness of the potential role of affective dysregulation in psychopathology and the substantial research base on normative affective development, there is a pressing need for more research examining affective processes in

clinical samples of children and adolescents (Chaplin & Cole, 2005; Mullin & Hinshaw, 2007). This need is perhaps most notable in the case of unipolar depressive disorder, where the prominence of affective symptomatology and the apparent dysfunction in both positive and negative affects has lead researchers and theorists to conceptualize it as a disorder of emotion regulation (Gross & Munoz, 1995).

The ways in which affects are dysregulated in depression have most often been described in terms of the two fundamental systems (i.e., appetitive versus aversive) that determine the valence of affective states. Several lines of work have coalesced around the idea that emotions are fundamentally organized by these two motivational systems (Lang, Bradley, & Cuthbert, 1997) thought to map onto underlying brain systems responsible for consummatory/approach and defensive behaviors, respectively. Clark and Watson (1991) proposed that depression is associated with heightened activity and sensitivity of aversive emotional systems, and lowered activity and sensitivity of appetitive emotional systems. Indeed, research supports the presence of heightened negative affect and reduced positive affect in depressive disorders (Klein, Dougherty, Laptook, & Olinio, 2008). Comparatively limited research, however, has examined how depression impacts on other key dimensions of affective experience, namely intensity, duration, and frequency (Larsen, 2000). As definitions of affect regulation have centered around processes involved in initiating, maintaining, or modulating the occurrence, intensity, and duration of affective experiences (e.g., Eisenberg & Zhou, 2000), it would seem incumbent to examine the extent to which the affective experiences of depressed youth diverge from those of healthy youth on these dimensions.

Hence, the goal of this investigation was to delineate the aspects of affective functioning that are disrupted in depressed youth. Our focus here was not on identifying disturbances in regulatory *processes* that may be hypothesized to result in abnormal affective experience, but rather to *describe* the nature of the affective dynamics that characterize depressive disorder in youth. As we discuss briefly below, models of affective processes suggest that measures of frequency, intensity, and duration will provide a more comprehensive assessment of affective dynamics than has previously been conducted in this population.

Although this study does not explicitly address neurobiological mechanisms, it is relevant that the dimensions of frequency, intensity and duration can be plausibly, albeit speculatively, linked to differential neurobiological mechanisms known to be disrupted in depression. For example, the affective dimension that has been associated most consistently with depression is duration, especially the failure to sustain positive affects and interrupt negative affects. Research on the functions of the prefrontal cortex (PFC) has indicated that depression is associated with hypoactivation of regions in the left PFC (Davidson and Irwin, 1999). These regions are thought to guide behavior towards future goals and thus sustain the positive affects that motivate goal-directed behaviors (Davey, Yucel & Allen, 2008). Consequently, hypoactivity of the left PFC in depression might be associated with a relative inability to sustain positive affective states in the absence of explicit stimuli. Accordingly, Tomarken and Keener (1998) predicted that depressed individuals should display less continuity of positive emotions as well as greater continuity of negative emotions. Studies using self-report methodologies have shown that depression is associated with greater temporal continuity of negative affects in response to laboratory-induced depressed mood (Gilboa & Gotlib, 1997) in adults and naturalistic stressors in both adults (Goplerud & Depue, 1985) and adolescents (Silk, Steinberg, & Morris, 2003). In a study of depressed adolescents, Sheeber and colleagues (2000) reported that dysphoric, and to a lesser extent aggressive behaviors, were maintained for longer durations by depressed than healthy adolescents during family problem solving interactions.

Relevant to the dimensions of frequency and intensity, it is notable that depression has also been associated with hyperactivity in brain structures thought to be responsible for the initiation and escalation of negative affective responses to eliciting stimuli, and may, therefore, be expected to result in greater frequency and intensity of negative affective states. The amygdale, in particular, is hyperactive during depressed states in both adults (Whalen, Shin, Somerville, McLean, & Kim 2002) and children (Thomas et al., 2001). With regard to positive affect, recent neuroimaging research has revealed that depressed youth evidence diminished responding in reward-related neural structures (Forbes et al., 2006).

Questionnaire and naturalistic data also suggest disturbances in the intensity and frequency of affective states amongst depressed persons. For instance, it is well demonstrated that depressed persons report greater intensity of negative mood states and lower intensity of positive mood states (Clark & Watson, 1991). Similar findings have emerged with regard to negative affect in questionnaire and experience sampling (ESM) studies with adolescents (Joiner, Catanzaro, & Laurant, 1996; Silk et al., 2003). On the other hand, it should be noted that the way in which depression affects the intensity of immediate affective responses to explicit stimuli (as contrasted with longer, less object-linked mood states) may be more complex. As summarized in a recent meta-analysis (Bylsma, Morris, & Rottenberg, 2007), depression appears to be associated with less intense immediate reactions to both positive and negative stimuli.

Though this review suggests the potential fruitfulness of examining dimensions of affective dynamics in depressed youth, the work to date is limited and there are a number of important issues that require future investigation. First, much of the available work has focused on adults and very little research has included adolescent samples with clinically diagnosed disorders. This is a significant gap given both that dysregulation is likely to be at its most severe in samples with clinically significant levels of symptomatology, and that adolescence constitutes a time of particular risk for the onset and experience of depressive disorders (e.g., Lewinsohn, Hops, Roberts, Seeley, & Andrews, 1993). Moreover, as adolescent development is characterized by changes in both affective competencies and contextual demands for such (Larson & Sheeber, 2008), it is critical to assess disruptions in affect during this developmental period. A comprehensive assessment of the manner in which the dynamics of affect are disrupted could yield important directions both for understanding the emergence of affective disorders during this period and for intervention development (Allen & Sheeber, 2008).

Second, though depressive conditions are considered to be uniquely characterized by failure to achieve and maintain positive affect (Clarke & Watson, 1991; Joiner, et al., 1996), available literature has generally emphasized disturbances in negative affects (Forbes & Dahl, 2005). It is thus important to examine whether depressed adolescents evidence dysregulation of positive affects. Moreover, there has often been a lack of specificity in the nature of negative affects examined. Depression in youth is defined by increases in both dysphoric and irritable affects, a distinction that has been made only rarely in the literature (e.g., Sheeber, Allen, Davis, & Sorensen, 2000), and is important for a clear understanding of affective difficulties. This is particularly the case as dysphoric and irritable affects have divergent effects on social interactions (Sheeber, Hops, Andrews, Alpert, & Davis, 1998) and thus, the nature of difficulties may inform efforts to improve social impairments associated with depression.

Hence, in order to delineate the aspects of emotion regulation that are disturbed in adolescent depressive disorder, we compared a sample of depressed adolescents to a demographically-matched sample of healthy adolescents on indices of the frequency, duration and intensity of dysphoric, angry, and happy affects. We hypothesized that

depressed adolescents would experience and display greater frequency, intensity, and duration of dysphoric and angry affects, and lower frequency, intensity and duration of happy affect. As well, because gender differences have been reported during adolescence in both normative affective experiences (Larson & Sheeber, 2008) and depressive symptoms (Lewinsohn et al., 1993), we examined gender as a potential moderator of between- group differences.

The investigation was characterized by a multi-source and multi-method assessment. The use of parent- and adolescent-report instruments provide a window into affective dynamics as experienced across real-world time and context. The behavioral observations, obtained during parent-adolescent interactions, provide a real-time assessment of emotional responses in affectively laden situations. They thus provide a narrower, but more specific measurement that is less subject to biases associated with retrospective recall and summary. Because interpersonal contexts are strong elicitors of emotional states, and interpersonal stressors are amongst the most powerful precipitants of depressed states (e.g., Brown, Harris, & Hepworth, 1995; Monroe, Rohde, Seeley, & Lewinsohn, 1999) social interactions provide etiologically relevant contexts in which to examine adolescent affect. Evidence that family relations are among the most salient interpersonal predictors of depressive symptomatology in adolescents (Sheeber, Hops, & Davis, 2001), suggests, moreover, that family interactions provide an especially appropriate context.

Methods

Participants

Participants were 152 adolescents (52 boys), ages 14–18, and their parents. To be included in the investigation, adolescents had to meet research criteria for placement in one of two groups (Depressed, $n = 75$ or Healthy, $n = 77$) and live with at least one parent/permanent guardian. Adolescents were excluded if they evidenced comorbid externalizing or substance dependence disorders or were taking either Serotonin Norepinephrine Reuptake Inhibitors or Tricyclic antidepressants; these exclusion criteria were put in place because of the potential of these factors to influence psychophysiological measures collected as part of this investigation, though not the subject of this report.

Depressed adolescents met DSM IV criteria for current MDD based on a diagnostic interview. The median disorder duration was 13.5 weeks (range 2–284). Approximately 43% of the depressed adolescents had experienced a previous episode. The median age at first onset was 14.67 (range 7–18). Rates of current and lifetime comorbidity were 28% and 39%, respectively. Healthy adolescents had no lifetime history of psychopathology. To the extent possible, healthy participants were matched to depressed participants on adolescent age, gender, ethnicity, and the socioeconomic characteristics of their schools. Demographic data are presented in Table 1.

Recruitment and Assessment Procedures

Families were recruited using a two-gate procedure consisting of an in-school screening and an in-home diagnostic interview. To facilitate recruitment of a representative sample, we used a combined passive parental consent and active student assent protocol for the school screening. Active parent consent and adolescent assent for the full assessment were obtained prior to the diagnostic interview.

School screening—Students ($N = 4182$) from area high schools completed the Center for Epidemiological Studies-Depression Scale (CES-D, Radloff, 1977) and a demographic data form during class. Approximately 70% of eligible students participated, 12% declined or

had parents decline their participation and 18% were unavailable on the day of the assessment. CES-D cutoff scores for selecting potential participants were based on the distribution of scores obtained in an earlier screening of high school students (N= 4495) in the same area (Sheeber et al., 2007). Relatively high scores (≥ 31 for males and ≥ 38 for females) were selected to maximize the positive predictive power to identify adolescents experiencing depressive disorder. Approximately 8% of the students scored above these cut-offs. The pool for the healthy group was defined as students not more than $\frac{1}{2}$ SD above the mean in the earlier sample (< 21 for males and < 24 for females).

Diagnostic assessment—Interviewers conducted the Schedule of Affective Disorders and Schizophrenia-Children's Version (K-SADS, Orvaschel and Puig-Antich, 1994) with adolescents who had elevated CES-D scores. Subsequent to the interviews, families of adolescents who met criteria for MDD were invited to participate in the lab-based assessment. After each adolescent in the depressed group completed the laboratory assessment, a healthy, demographically matched participant was recruited.

Approximately 9% of families contacted by phone were not eligible to participate (e.g., did not live with a parent/permanent guardian). Of families invited to participate, approximately 26% declined. Rates of decline did not vary as a function of pre-interview group status (i.e., elevated or healthy CES-D score), age, or race, though more males than females declined (31.6% vs. 23%), $\chi^2(1, n=498)=4.57, p<.05$. Of adolescents with elevated CES-D scores, 38% met criteria for MDD. Of adolescents with CES-D scores in the healthy range, approximately 76% met criteria for inclusion.

Lab assessment—Families who met research criteria after the diagnostic interview were invited to participate in the lab assessment. Approximately 4% of families declined. The decline rate did not vary as a function of group status, age, race, or gender. In approximately 93% of two-parent families, both parents participated.

The lab assessment included adolescent and parent questionnaires and interviews as well as three family-interaction tasks designed to elicit varying degrees of happy, angry, and dysphoric affect. Each interaction lasted 18 minutes, evenly divided across two discussions. During the three tasks, families were instructed to: 1) plan a vacation and then reminisce about a fun time; 2) discuss and resolve two areas of conflict; and 3) identify and describe the best and most difficult years the adolescent had experienced, and the most challenging and most rewarding aspects of parenting the adolescent.

Measures

Depression screener—The CES-D is a widely-used, self-report measure of depressive symptomatology that is well-established as a screener for depressive symptomatology in adolescent samples (e.g., Asarnow et al., 2005; Sheeber, Davis, Leve, Hops, & Tildesley, 2007).

Diagnostic interview—The K-SADS was conducted with the adolescents to obtain current and lifetime diagnoses. Adolescent-only diagnostic interviews have been used successfully in past research (e.g., Lewinsohn et al., 1993; Sheeber et al., 2007). Reliability, based on randomly selected 20% of the interviews, was $\kappa = .94$.

Behavioral observations—The Living in Family Environments system (LIFE; Hops, Biglan, Tolman, Arthur, & Longoria, 1995) was used to code adolescent affective behavior during family interactions. Observers, blind to diagnostic status, coded the adolescents' nonverbal affect and verbal content in real time. Three constructs, angry, dysphoric, and

happy were derived from individual affect and content codes. Angry behavior included aggressive or contemptuous nonverbal behavior and cruel or provoking statements. Dysphoric behavior was defined by sad nonverbal behavior or complaining statements. Happy behavior reflected happy nonverbal behavior or humorous statements. Approximately 25% of videos were coded by a second observer for reliability. Kappas were .73, .70, and .88 for adolescent angry, dysphoric, and happy, respectively. Though coders also rated the intensity of affect displayed, the reliabilities were unacceptably low and hence, observational measures of intensity were not used in analyses.

Frequency of each construct was operationalized as rate per second (RPS). Duration per episode (DPE) was defined as the average number of seconds that the behavior was maintained each time it was displayed. The validity of the LIFE system has been established in numerous studies of adolescent depression (e.g., Katz & Hunter, 2007; Sheeber et al., 2007).

Questionnaire and interview measures—Adolescents and their parents completed questionnaire measures of adolescent affective behavior (Affect Intensity Measure [AIM], Larsen & Diener, 1987; Positive and Negative Affect Scale–Expanded Version [PANAS-X], Watson & Clark, 1994) and participated in Meta-Emotion Interviews (MEI/Child-MEI, Katz & Gottman, 1986; Katz & Windecker-Nelson, 2004). The questionnaire measures were adapted in order to obtain parent reports about the adolescent. As reports of each respondent were positively and significantly correlated, scores on questionnaires and interviews were averaged across respondents.

The PANAS-X and the AIM were included as indices of affective frequency and intensity respectively, recognizing that the PANAS-X likely captures aspects of both. The joviality, hostility, sadness, and guilt scales were used as indices of happy, angry, and dysphoric affect, respectively. The structure of the AIM is not as fine-grained, so the positive and negative subscales were used to index intensity of affect across these broader dimensions. Both scales have demonstrated acceptable psychometric properties in adolescent samples and all subscale scores demonstrated acceptable reliability (i.e., $\alpha > .80$).

The MEI and Child MEI are semi-structured interviews for obtaining information about family members' experience with emotions. The sections of the interviews addressing sadness and anger have been used successfully in research on adolescent emotional development and depression (Katz & Hunter, 2007; Stocker, Richmond, Rhoades & Kiang, 2007). The sections addressing happiness were developed for this study. Interviewers were BA/MA level research staff who participated in a 2-day training led by Dr. Katz, and conducted practice interviews prior to commencing the study.

The interviews were conducted with each adolescent and parent individually, and were recorded for subsequent coding. Interviewers were blind to the adolescents' diagnostic status. Each respondent answered questions regarding the adolescent's experience of each emotion. Sample questions included: "What is it like for you/your child to be sad"; "Give me a recent example of one time that you/your child were sad?"; "What would I see if you/your child were sad?" Trained BA/MA level research staff, blind to diagnostic group, coded the interviews using standardized protocols. Coders demonstrated reliability on practice interviews prior to coding research tapes. Global ratings, based on information derived from the portion of the interview dealing with the adolescent's experience of each emotion, were made on 5-point likert scales tapping the intensity, frequency, and duration of each emotion. Separate ratings were done for each respondent's interview. As coders had considerable difficulty coding intensity of happiness from participants' responses, this domain was

dropped. Approximately 33% of interviews were coded by a second interviewer for reliability; the average correlation between coders was $r=.58$ (range .23–.85).

Results

ANOVAs were performed to examine group and group by sex effects (see Table 2)¹.

Duration

Depressed participants demonstrated longer durations of anger on both the observed and MEI variables. Group by sex interactions emerged for dysphoric affect on both measures, such that depressed females evidenced longer durations than their healthy counterparts, but depressed males were not different from healthy males. With regard to happy affect, MEI ratings indicated that healthy participants experienced longer duration of happiness than depressed participants, but no differences emerged in the observational data.

Frequency

Depressed participants demonstrated greater frequency of anger than healthy participants on both the PANAS-X Hostility subscale and the observational data. A significant sex by group interaction effect was evident in the MEI ratings of anger such that the difference between depressed and healthy adolescents was significantly greater for girls. For dysphoric affect, the PANAS-X Guilt and Sadness subscales, and the MEI ratings of sadness frequency all reflected a significant effect of group, with depressed participants experiencing more frequent dysphoria than healthy participants. Similarly for happy affect, the PANAS-X joviality subscale and the MEI ratings of happiness frequency indicated that depressed participants experiencing less frequent happiness than healthy participants. No differences in the rate of dysphoric or happy affects were observed in the lab interaction.

Intensity

The MEI anger intensity ratings, as well as the AIM negative emotion subscale demonstrated significant group effects, with depressed participants experiencing more intense anger than healthy participants. For dysphoric affect, the MEI ratings of intensity reflected a main effect of diagnostic group such that depressed participants experienced more intense sadness than healthy participants. The groups were not different on the AIM positive affect intensity scale.²

Discussion

This study provided a detailed delineation of the affective dynamics associated with adolescent depression. At the broadest level, the current findings suggest abnormalities in each aspect of affective dynamics examined, with between group differences emerging in duration, frequency, and intensity of affect. The most consistent findings emerged relative to duration, with strong group or group by sex interactions across method of assessment for both dysphoric and angry affects. In particular, depressed boys and girls remained in angry states longer, and depressed girls also remained in dysphoric states longer, than did their healthy peers. With respect to happy affect, findings varied across assessment method. Though the interview measure indicated that depressed adolescents didn't maintain happy

¹Descriptive statistics and intercorrelations between measures are available in the electronic appendix (Supplementary Tables 1 & 2).

²As a subset of the adolescents (n=21) evidenced concurrent comorbid disorders, the question arose as to whether the between group differences were attributable to these comorbid conditions. To address this question we conducted post-hoc between group analyses excluding adolescents with comorbid conditions. All of the observed group effects continued to be statistically significant.

affective states for as long a time as their healthy peers, this phenomenon was not observed in the lab setting.

The findings regarding duration of negative affect substantiate previous research, providing important replication of earlier behavioral findings showing longer duration of dysphoric and aggressive behavior in depressed youth (Sheeber et al., 2000) and demonstrating that these effects generalize to descriptions of adolescents' behavior outside the lab. These findings are consistent, moreover, with recent models that have posited longer duration of physiological responses associated with negative affect to be a critical mechanism in depression (Siegle & Thayer, 2004). Importantly, the results extend previous work by demonstrating a deficit in depressed adolescents' maintenance of positive affect, at least according to interview-based ratings. This is consistent with hypotheses based on neurobiological mechanisms (Tomarken & Keener, 1998).

The results are also supportive of hypotheses related to frequency and intensity of anger, which were greater in depressed adolescents, with greater frequency of interview-rated anger being particularly pronounced in depressed girls. Results regarding the frequency of dysphoric and happy affect varied by method with between-group differences in frequency emerging in questionnaire and interview-rated measures, but not in the observational task. Findings with regard to intensity of dysphoria and happiness were less robust, in part because as noted earlier, inadequate reliability on observational indices across affects and MEI ratings of happiness intensity, as well as the global nature of the AIM (i.e., positive/negative) cost us the intended multi-method by affect assessment on this domain. Nonetheless, as expected, questionnaire and interview data indicated that depressed adolescents experienced more intense globally negative as well as specifically sad affect. Though we had hypothesized that depressed adolescents might evidence less intense positive affect, the questionnaire data did not support that conclusion. An important direction for future work will be to examine the intensity of depressed adolescents' affective experiences with a wider and more robust set of measures.

Overall, these results are consistent with ESM studies regarding the quality of affective states in depressed youth (e.g., Silk et al., 2003). However, the multiple measures and greater specificity of affective valence, including distinguishing between dysphoric and aggressive affect provided a more detailed and nuanced description. In particular, the specificity enabled us to observe that the most consistent difference between depressed adolescents and their peers was in the experience and expression of angry affects. Given the prominent role that dysphoria and anhedonia have had in conceptualizations of depression, this finding is notable, and suggests that greater attention to the irritability component of depressive disorders in adolescence may be warranted, as has been suggested by recent biological models of depression (Carver, Johnson, & Joorman, 2008).

An additional advantage of the multi-method design is that while points of convergence provide for confidence in the robustness of the phenomenon, discrepancies between methods, provide directions for future research. In particular, there were several domains, described earlier, where effects emerged in family-report but not observational data. The current design does not enable us to discern whether the absence of observational findings reflects constraints of the task (e.g., narrow context and limited sampling of behavior), or if the self-report data reflects differences in how people recall and summarize their experiences, rather than in their actual affective experience. Distinguishing between these possibilities is an important task for future work. Experience sampling methods which provide a broad sampling of behavior without biases inherent in retrospective reports would be well-suited to this question.

It is very important to note the contextualized nature of both our assessment approach and, more generally, of the affective experiences being examined. As we obtained parent, as well as adolescent reports, and coded adolescent affective behavior during parent-adolescent discussions, our findings speak most directly to adolescent affect as it occurs within (and likely, as it is influenced by) the family context. As noted earlier, because interpersonal contexts are particularly strong elicitors of emotional states, and as one could argue that emotions are largely interpersonal in function and experience (Keltner & Krieg, 1998), the external validity obtained by studying adolescents' affect in ecologically relevant contexts, provides an important complement to studies that use standardized contexts. Nonetheless, an important goal for future work will be to examine these emotional dynamics within different interpersonal contexts. This is particularly important given evidence that the family environments of depressed adolescents differ from those of healthy adolescents (Sheeber et al., 2001). Convergence in findings across contexts would thus provide more robust evidence with regard to the affective dynamics associated with adolescent depression. Conversely, divergence across contexts would provide insight into the extent to which particular contexts elicit or maintain maladaptive emotional behaviors.

Limitations of this study, also point to directions for future research. The cross-sectional design precludes conclusions regarding the etiological significance of the findings. Depressed mood is apparent both before and after depressive episodes and appears to be a risk factor for disorder onset and relapse (Klein et al., 2008). Whether differences in affective dynamics would also be apparent before the onset of depressive disorder and whether they reflect stable differences in adolescents' regulatory capacities is unclear. Research examining at-risk youth prior to onset and longitudinal studies tracking adolescents through recovery, would be informative in this regard.

Another issue is that the construct of affective dysregulation is extremely broad and our examination was in no way exhaustive. We examined variables that tap the behavioral and experiential components of emotion. Future plans include the examination of physiological components as well as of trajectories of emotion over time. Another dimension, that has received a great deal of interest in the adult literature is that of emotional reactivity or the extent to which depressed persons differ in their emotional responses to affectively evocative stimuli (Bylsma et al., 2008). This remains an important area for work in affective disorders in youth. Finally, the generalizability of our results is unclear given the relative lack of racial and ethnic diversity in the sample, suggesting the need for replication in more diverse samples.

Finally, at a conceptual level, it is important to reiterate that our goal was to describe the nature of affective dynamics characterizing depressive disorders rather than the regulatory processes, psychological or neurobiological, that might underlie them. Adolescents' affective experience and behavior is likely a function of both reactivity and regulatory processes. It will be useful to examine the extent to which adolescents' responses (as well as the responses of others in their social environments) relate to the dynamics of their affective experiences. Evidence from earlier work suggests that the nature of adolescents' own responses (e.g., Silk et al., 2003) as well as that of their parents (Sheeber et al., 2000) relate to the duration of negative emotions. However, the extent to which such responses influence the intensity or frequency of particular emotions or the duration of happy affect are unclear. In this paper, we have also speculated about specific neural structures and systems that might be associated with the duration versus the intensity and frequency of affect. Further exploration of how such systems are associated with specific dimensions of affective dynamics is likely to shed new light on the etiology and maintenance of these disorders.

Key Points

- Depression is characterized by disturbances in affective processes, which may reflect the capacity to regulate emotions.
- Limited research has been directed toward delineating the key dimensions of affective experience (other than valence) that are abnormal in adolescent unipolar depressive disorder.
- Depressed adolescents evidenced abnormalities in the frequency, duration, and intensity of both positive and negative affect.
- Results point to the potential for interventions aimed at improving depressed adolescents abilities to modulate the occurrence, frequency, and intensity of their affective experiences.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

This study was funded by an NIMH R01 Award (MH65340) to Lisa B. Sheeber. We thank the families and schools who participated.

References

- Allen, NB.; Sheeber, LB. Adolescent emotional development and the emergence of depressive disorders. Cambridge, UK: Cambridge University Press; 2008.
- Asarnow JR, Jaycox LH, Duan N, LaBorde AP, Rea MM, Tang L, Anderson M, Murray P, Landon C, Tang B, Huizar D, Wells KB. Depression and role impairment among adolescents in primary care clinics. *Journal of Adolescent Health*. 2005; 37(6):477–483. [PubMed: 16310125]
- Brown GW, Harris TO, Hepworth C. Loss, humiliation and entrapment among women developing depression: A patient and non-patient comparison. *Psychological Medicine*. 1995; 25:7–21. [PubMed: 7792364]
- Bylsma LM, Morris BH, Rottenberg J. A meta-analysis of emotional reactivity in major depressive disorder. *Clinical Psychology Review*. 2008; 28(4):676–691. [PubMed: 18006196]
- Carver CS, Johnson SL, Joorman J. Serotonergic function, two-mode models of self-regulation, and vulnerability to depression: What depression has in common with impulsive aggression. *Psychological Bulletin*. 2008; 134(6):912–943. [PubMed: 18954161]
- Chaplin, TM.; Cole, PM. The role of emotion regulation in the development of psychopathology. In: Hankin, BL.; Abela, JR., editors. *Development of psychopathology: A vulnerability-stress perspective*. Thousand Oaks, CA: Sage; 2005. p. 49-74.
- Clark LA, Watson D. Tripartite model of anxiety and depression: Psychometric evidence and taxonomic implications. *Journal of Abnormal Psychology*. 1991; 100:316–336. [PubMed: 1918611]
- Cole PM, Michel MK, Teti LO. The development of emotion regulation and dysregulation: A clinical perspective. *Monographs of the Society for Research in Child Development*. 1994; 59:73–100. [PubMed: 7984169]
- Davey CG, Yucel M, Allen NB. The emergence of depression in adolescence: Development of the prefrontal cortex and the representation of reward. *Neuroscience and Biobehavioral Reviews*. 2008; 32(1):1–19. [PubMed: 17570526]
- Davidson RJ, Irwin W. The functional neuroanatomy of emotion and affective style. *Trends in Cognitive Sciences*. 1999; 3:11–21. [PubMed: 10234222]
- Eisenberg N, Zhou Q. Regulation from a developmental perspective. *Psychological Inquiry*. 2000; 11:166–171.

- Forbes EE, Christopher MJ, Siegle GJ, Ladouceur CD, Ryan ND. Reward-related decision-making in pediatric major depressive disorder: An fMRI study. *Journal of Child Psychology and Psychiatry and Allied Disciplines*. 2006; 47:1031–1040.
- Forbes EE, Dahl RE. Neural systems of positive affect: Relevance to understanding child and adolescent depression? *Development and Psychopathology*. 2005; 17:827–850. [PubMed: 16262994]
- Gilboa E, Gotlib IH. Cognitive biases and affect persistence in previously dysphoric and never-dysphoric individuals. *Cognition and Emotion*. 1997; 11:517–538.
- Goplerud E, Depue RA. Behavioral response to naturally occurring stress in cyclothymia and dysthymia. *Journal of Abnormal Psychology*. 1985; 94:128–139. [PubMed: 3998281]
- Gross JJ. The emerging field of emotion regulation: An integrative review. *Review of General Psychology*. 1998; 2:271–299.
- Gross JJ, Munoz RF. Emotion regulation and mental health. *Clinical Psychology: Science and Practice*. 1995; 2:151–164.
- Hops, H.; Biglan, A.; Tolman, A.; Arthur, J.; Longoria, N. *Living in Family Environments (LIFE) coding system: Manual for coders (Revised)*. Eugene, OR: Oregon Research Institute; 1995.
- Joiner TE Jr, Catanzaro SJ, Laurent J. Tripartite structure of positive and negative affect, depression, and anxiety in child and adolescent psychiatric patients. *Journal of Abnormal Psychology*. 1996; 105:401–409. [PubMed: 8772010]
- Katz, LF.; Gottman, JM. *The Meta-Emotion Interview*. University of Washington; Seattle, WA 98195: 1986.
- Katz LF, Hunter EC. Maternal meta-emotion philosophy and adolescent depressive symptomatology. *Social Development*. 2007; 16:343–360.
- Katz LF, Windecker-Nelson B. Parental meta-emotion philosophy in families with conduct-problem children: Links with peer relations. *Journal of Abnormal Child Psychology*. 2004; 32(4):385–398. [PubMed: 15305544]
- Keltner D, Krieg AM. Emotion, social function, and psychopathology. *Review of General Psychology*. 1998; 2(3):320–342.
- Klein, DN.; Dougherty, LR.; Laptook, RS.; Olinio, TM. Temperament and risk for mood disorders in adolescents. In: Allen, NB.; Sheeber, LB., editors. *Adolescent emotional development and the emergence of depressive disorders*. Cambridge, UK: Cambridge University Press; 2008. p. 238-261.
- Lang, PJ.; Bradley, MM.; Cuthbert, B. Motivated attention: Affect, activation, and action. In: Lang, P.; Simons, R.; Balaban, M., editors. *Attention and orienting: Sensory and motivational processes*. Mahwah, NJ: Lawrence Erlbaum; 1997.
- Larsen RJ. Towards a science of mood regulation. *Psychological Inquiry*. 2000; 11:129–141.
- Larsen RJ, Diener E. Affect intensity as an individual difference characteristic: A review. *Journal of Research in Personality*. 1987; 21(1):1–39.
- Larson, RW.; Sheeber, LB. The daily emotional experience of adolescents: Are adolescents more emotional, why, and how is that related to depression?. In: Allen, NB.; Sheeber, LB., editors. *Adolescent emotional development and the emergence of depressive disorders*. Cambridge, UK: Cambridge University Press; 2008. p. 11-32.
- Lewinsohn PM, Hops H, Roberts RE, Seeley JR, Andrews JA. Adolescent psychopathology: I. Prevalence and incidence of depression and other DSM-III-R disorders in high school students. *Journal of Abnormal Psychology*. 1993; 102:133–144. [PubMed: 8436689]
- Monroe SM, Rohde P, Seeley JR, Lewinsohn PM. Life events and depression in adolescence: Relationship loss as a prospective risk factor for first onset of major depressive disorder. *Journal of Abnormal Psychology*. 1999; 108:606–614. [PubMed: 10609425]
- Mullin, BC.; Hinshaw, SP. Emotion regulation and externalizing disorders in children and adolescents. In: Gross, JJ., editor. *Handbook of emotion regulation*. New York, NY: Guilford; 2007. p. 523-541.
- Orvaschel H, Puig-Antich J. *Schedule for Affective Disorder and Schizophrenia for School-Age Children: Epidemiologic Version*. 1994 Unpublished manual.

- Radloff LS. A CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*. 1977; 1:385–401.
- Sheeber L, Allen N, Davis B, Sorenson E. Regulation of negative affect during mother-child problem-solving interactions: Adolescent depressive status and family processes. *Journal of Abnormal Child Psychology*. 2000; 28:467–479. [PubMed: 11100920]
- Sheeber LB, Hops H, Andrews J, Alpert A, Davis B. Interactional processes in families with depressed and nondepressed adolescents: Reinforcement of depressive behavior. *Behavior Research and Therapy*. 1998; 3:417–427.
- Sheeber LB, Hops H, Davis B. Family processes in adolescent depression. *Clinical Child and Family Psychology Review*. 2001; 4:19–35. [PubMed: 11388562]
- Sheeber LB, Davis B, Leve C, Hops H, Tildesley E. Adolescents' relationships with their mothers and fathers: Associations with depressive disorder and subdiagnostic symptomatology. *Journal of Abnormal Psychology*. 2007; 116:144–154. [PubMed: 17324025]
- Siegle, GJ.; Thayer, JF. Physiological aspects of depressive rumination. In: Papageorgiou, C.; Wells, A., editors. *Depressive rumination: Nature, theory and treatment*. England: Wiley; 2004. p. 79-104.
- Silk JS, Steinberg L, Morris AS. Adolescents' emotion regulation in daily life: Links to depressive symptoms and problem behavior. *Child Development*. 2003; 74(6):1869–1880. [PubMed: 14669901]
- Stocker CM, Richmond MK, Rhoades GK, Kiang L. Family emotional processes and adolescents' adjustment. *Social Development*. 2007; 16(2):310–325.
- Thomas KM, Drevets WC, Dahl RE, Ryan ND, Birmaher B, Eccard CH, Axelson D, Whalen PJ, Casey BJ. Amygdala response to fearful faces in anxious and depressed children. *Arch Gen Psychiatry*. 2001; 58:1057–1063. [PubMed: 11695953]
- Tomarken AJ, Keener AD. Frontal brain asymmetry and depression: a self-regulatory perspective. *Cognition and Emotion*. 1998; 12:387–420.
- Watson, D.; Clark, LA. *Manual for the Positive and Negative Affect Schedule -Expanded Form*. Iowa City: University of Iowa; 1994.
- Whalen, PJ.; Shin, LM.; Somerville, LH.; McLean, AA.; Kim, H. *Seminars in Clinical Neuropsychiatry*. Vol. 7. 2002. Functional neuroimaging studies of the amygdala in depression; p. 234-242.

Table 1

Demographic Data

Demographic Category	Depressed (n = 75)	Healthy (n = 77)	Test Statistic
Gender			
Male	23	29	$\chi^2=0.83$, ns
Female	52	48	
Age			
Mean (SD)	16.22 (1.11)	16.14 (1.05)	t=0.44, ns
Family Structure			
Dual parent family	47	60	$\chi^2=4.24$, (p<.05)
Single parent family/other	28	17	
Income			
Median	\$37,500	\$42,500	$\chi^2=6.37$, (p<.05)
Ethnicity			
Caucasian	49	57	$\chi^2=0.46$, ns
African American	2	2	
Asian	0	1	
Native American	1	0	
More than one race	18	15	
Unknown	5	2	

Table 2

Analyses of Variance for Frequency, Duration, and Intensity Data

	Group		Sex		Group × Sex	
	F(df)	η^2	F	η^2	F	η^2
Duration						
Angry						
LIFE Angry DPE	9.61** (147)	.06	4.10*	.03	1.91	.01
MEI: Anger Duration	20.80*** (148)	.12	1.57	.01	3.49	.02
Dysphoric						
LIFE Dysphoric DPE	2.42 (147)	.02	1.04	.01	4.55*	.03
MEI: Sadness Duration	33.84*** (148)	.19	16.05***	.10	4.40*	.03
Happy						
LIFE Happy DPE	0.60 (147)	.00	0.12	.00	2.21	.02
MEI: Happiness Duration	7.99** (148)	.05	0.09	.02	2.56	.02
Frequency						
Angry						
PANAS-X Hostility Subscale	75.23*** (148)	.34	0.00	.00	0.32	.00
LIFE Angry RPS	7.19* (147)	.05	6.28*	.04	0.04	.00
MEI: Anger Frequency	8.56** (147)	.06	4.19*	.03	5.08*	.03
Dysphoric						
PANAS-X Guilt Subscale	75.08*** (148)	.34	0.22	.00	3.28	.02
PANAS-X Sadness Subscale	102.64*** (148)	.41	10.78**	.07	2.70	.02
LIFE Dysphoric RPS	0.08 (147)	.00	1.40**	.01	3.58	.02
MEI: Sadness Frequency	17.80*** (148)	.11	6.43*	.04	2.02	.01
Happy						
PANAS-X Joviality Subscale	35.04*** (148)	.19	0.33	.00	2.18	.02
LIFE Happy RPS	2.22 (147)	.02	1.03	.01	1.62	.01
MEI: Happy Frequency	13.76*** (148)	.09	0.01	.00	0.67	.00

Intensity	Group		Sex		Group × Sex	
	<i>F</i> (<i>df</i>)	η^2	<i>F</i>	η^2	<i>F</i>	η^2
Angry						
MEI: Anger Intensity	29.22*** (148)	.17	3.40	.02	0.27	.00
AIM: Negative Emotion	18.74*** (148)	.11	19.80***	.12	1.19	.01
Dysphoric						
MEI: Sadness Intensity	32.10*** (148)	.18	9.66**	.06	2.05	.01
Happy						
AIM: Positive Emotion	0.18 (147)	.00	2.05	.01	0.09	.00

* Note. $p < .05$

** $p < .01$

*** $p < .001$