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Mapping the Frequency and Severity of Depressive Behaviors in Preschool-Aged Children

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Abstract

Depressive emotions and behaviors, such as sadness, irritability, and sleep difficulties, are often early-emerging, impairing, and persistent. However, these behaviors are normative in early development, so it is critical to identify the spectrum of behaviors that may be relevant to the development of depression. This study characterizes the frequency and severity of depressive behaviors and impairment in preschool-aged children using a novel daily diary method with 291 parents. A coherent depression dimension was identified, and the specific frequency at which individual behaviors were identified as severe is reported. Behaviors such as sadness, irritability, and tearfulness/sensitivity were found to be relatively normative, whereas other behaviors (e.g., low interest/pleasure, low self-worth) were less normative. These are the first known data to delineate empirical information about the frequency and severity of behaviors that may be relevant to the development of depression; such data provide quantitative information for child practitioners to make distinctions between developmentally typical and problematic behavior, which is essential for improving assessment and minimizing impairing developmental trajectories.

Keywords

Preschool; Depressive behaviors; Development; Daily diary

Introduction

Behaviors relevant to depression, such as sadness, irritability, and sleep difficulties, can emerge during early childhood [1–4] and predict continued psychopathology [5–9]. In addition, earlier onsets may contribute to long-term impairment and chronicity [10]. However, mood difficulties can be developmentally normative in young children [11, 12]. Therefore, it is critical to clarify the range of normative mood experiences to non-normative pathological mood problems in early childhood [11–15]. In a sample of 3–5-year-old children, the present study examined the spectrum of the frequency of behaviors relevant to

Compliance with Ethical Standards

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depression. These data can improve the assessment of normative mood behaviors in young children to better understand which children may be at risk. In addition, these data can clarify issues pertinent to controversies associated with the distinction between pathologizing normative behavior and under-recognizing clinically significant behavior problems [16, 17], and provide quantitative information for child practitioners to make these distinctions.

Although research on preschool psychopathology has made substantial contributions to developmental psychopathology, several conceptual and methodological challenges remain. First, despite great strides in developing diagnostic interviews for assessing psychopathology in preschool-aged children [18, 19] and growing knowledge about the proportion of preschool-aged depressive disorders [1, 3], these methods only rate children's behavior that meets a certain diagnostic threshold. However, it is unclear whether these thresholds optimally identify children at risk for or experiencing psychopathology. This approach may best capture children displaying the most extreme behavior, but behaviors that fall below these limits (i.e., subthreshold behaviors) may still be impairing, increase risk for psychopathology, and warrant clinical intervention [20–22]. Alternatively, it is possible that the diagnostic phenotypes may be too broad and pathologize normative behavior. It is essential to characterize children's depressive behaviors dimensionally to better understand variation in behavior that pertains to the development of early-emerging psychopathology [11, 12, 23–25]. Practitioners have little data to guide their evaluation of the level at which behaviors are normative or potentially problematic in the preschool period.

Second, although there are well-established measures to assess depressive behavior from a dimensional perspective during the preschool period (e.g., Child Behavior Checklist 1½–5 [26]; Early Childhood Inventory [27]), most measures ask parents to report about children's behavior over a period of two or more months of retrospective recall. This period of recall can bias estimates of the frequency of children's behavior, making it difficult to accurately estimate the level of behavior that may be problematic. Therefore, a daily measure in which parents report the frequencies of children's behaviors each day would reduce bias, and allow for more precise empirical mapping of the spectrum of the frequency and severity of normative to problematic levels of behavior. Importantly, this precision has the potential to offer specific, concrete guidelines for cutoffs to child practitioners who assess depressive behaviors in young children.

Third, terms used in both diagnostic and dimensional measures to characterize children's behavior, such as “often”, “recurrent,” “persistent,” and “excessive,” have not been operationally defined. These measures can require interviewers or parents to determine the relative, often subjective frequency of a behavior by deciding, for example, whether the behavior occurs “sometimes” or “often”. Such judgements may vary widely across parents due to many factors, such as level of experience with similarly aged children, cultural background and expectations, and parents' history of psychopathology. Without established, empirically-based developmental norms available for those assessing or reporting these behaviors, it can be difficult to accurately determine the threshold for a behavior and whether a child exhibits behaviors more frequently than other children. This issue is

particularly problematic when assessing internalizing behaviors in young children given that “symptoms” such as irritability [12] are developmentally normative in early childhood.

Finally, Wakschlag and colleagues have made very significant advances in documenting the range of externalizing behaviors in young children [25, 28–30]. However, although their work has included behaviors related to irritability (e.g., [25]), the range of depressive behaviors in young children have received relatively less attention. Emerging evidence points to the sizable frequency of problematic mood difficulties in children [31–33] and the long-term problems associated with chronic distress [34]. Therefore, mood difficulties can be early-emerging, impairing and chronic, and more attention should be devoted to these behaviors in young children.

The objective of this study is to empirically characterize the frequency and severity of behaviors relevant to depression in preschool-aged children using a parent-report daily diary method across 14 days in a community sample of children. We hypothesized that theoretically high base rate depressive behavior (e.g., irritability) will occur at greater frequencies to be considered severe, whereas theoretically non-normative depressive behavior (e.g., low self-worth) will occur less frequently to be considered severe. In addition, we also hypothesized that severity/frequency of behaviors would be associated with children’s and parents’ distress, and children’s impairment in psychosocial functioning and relationships. Documentation of the frequency and severity of these behaviors is an important step toward establishing cutoffs for empirically-based developmental norms for depressive psychopathology.

Methods

Participants

The sample included 291 parents of 3–5-year-old children without medical or developmental disabilities (see Table 1). Participants were recruited from a 20-mile radius around two regions: San Marcos, CA and College Park, MD. Flyers advertising the study were sent to local pediatricians, preschools/daycares, and community institutions. Participants were eligible if they had nightly Internet access, could read English, and were the primary caregiver with at least 50% custody of the child. Most respondents (93.8%) were mothers. The Institutional Review Boards of both universities approved the study, informed consent was obtained from participating parents, and parents were compensated.

Measures

Depressive Behaviors—To assess behaviors and reduce retrospective recall, an electronic daily diary measure was created. Items were derived from two validated, reliable measures, the Early Childhood Inventory (ECI) [27, 35] and the Preschool Age Psychiatric Assessment [18]. Parents were asked to report the daily frequency of each of twelve depressive behaviors across the 14-day diary period; the reported frequencies were summed across the diary period for each item. Once examining the distribution of the imputed data (see below), categories were created for data analyses. The frequencies of behaviors across categories are reported in Table 2.

Impairment and Distress—Three sets of questions derived from the ECI and the PAPA assessed impairment. First, for each of the twelve depressive behaviors endorsed, parents reported how problematic that behavior was that day (e.g., child and/or parent distress; child's routine disrupted; relationships with others affected) on a 1–5 scale (1: not at all to 5: a great deal). These ratings were averaged across depressive behaviors across all 14 days ($M = 1.18$, $SD = 0.15$, *Range* 1–5). Second, parents provided an overall rating of impairment due to depressive behaviors that day on the same scale; these ratings were averaged across all 14 days ($M = 1.48$, $SD = 0.44$, *Range* 1–5).

Finally, parents also reported more generally about the extent to which the day felt stressful. However, the diary also included questions about other non-depressive behaviors; therefore, these responses were not necessarily specific to depressive behaviors and reflected general daily feelings of distress. Parents completed three questions each day, each on a 1–5 scale (1: not at all stressful to 5: extremely stressful), and scores were averaged across the 14-day diary period: parenting was difficult/stressful ($M = 1.54$, $SD = 0.40$, *Range* 1–5), the extent to which the parent–child relationship was stressful ($M = 1.64$, $SD = 0.46$, *Range* 1–5), and level of stress for the child ($M = 1.50$, $SD = 0.39$, *Range* 1–5).

Procedure

Eligible parents were trained by research staff on the completion of the electronic daily diary. Participants were instructed to complete each diary after their child's bedtime and report about their child's behavior/impairment that day. All participants started their first diary on a Monday evening and were instructed to complete a diary entry each evening for 14 consecutive nights. Links were sent to participants at 6:00 pm each evening. Study staff checked for completed diary entries each morning; if the diary had not been completed, staff called participants to request completion of the diary by noon that day (based on their child's behaviors from the previous day). If the parent could not complete the diary by noon, that diary entry was considered missed.

In total, 291 (100%) participants completed at least 7 of the 14 diary entries; 271 (93.1%) completed at least 10 days, and 200 (68.7%) completed all 14 days. Rates of completion were consistent with or higher than other daily diary studies with children [36–38].

Data Analysis

As not all participants completed the full 14-day protocol, we imputed the total number of behaviors displayed using the frequency of the specific behavior on all available days. We used Markov Chain Monte Carlo estimation to impute ten datasets. Analyses are based on estimates pooled across the multiple imputations. To make the data suitable for analysis, we recoded the frequency distribution for each item across the 14-day diary period into ordinal variables with four categories reflecting whether children displayed behaviors below the 50th percentile, between the 51st and 80th percentile; between the 81st and 95th percentile; and above the 95th percentile for specific behaviors over the 14-day period (Table 2). We sought for uniformity in these categories; however, some items had relatively restricted ranges. Thus, some modifications to these ranges were made.

Dimensionality for the depression dimension was tested using confirmatory factor analysis (CFA). Model fit was evaluated using the chi-square test, the comparative fit index (CFI), and the root mean square error of approximation (RMSEA); CFI values >0.90 and RMSEA values <0.08 suggest good fit [39, 40]. Next, Item Response Theory (IRT) [41] analyses were conducted to examine item characteristics using a graded response model (GRM). Discrimination values reflect the extent to which items relate to the latent construct. Difficulty parameters (b1–b4) reflect the estimated severity level of the latent trait at which there is a transition in reporting the next higher category (e.g., reporting the behavior occurred three to five times across 14 days instead of zero to two times); the average of these parameters is also reported for each item as well as total test information assessed by the depression items. Finally, depression factor scores estimated from IRT calibration were extracted from the model and correlations between depression factor scores and indicators of impairment were computed.

Results

Table 2 shows the frequencies of each depressive behavior across the 14-day period within each category. The percentile and frequency categories correspond such that children within each percentile group were reported to demonstrate the behavior within the range of frequency presented. For example, youth up to the 50th percentile and below demonstrated sadness 0–7 times; youth between the 50th and 80th percentiles demonstrated sadness 8–15 times; youth between the 80th percentile and 94th percentile demonstrated sadness 16–30 times; and youth at greater than the 94th percentile demonstrated sadness 31 or more times in the 2-week period.

First, to test dimensionality of the depressive behaviors and model fit, we conducted CFA. The original model was constructed with no modifications: $\chi^2(54) = 247.624$, $p < 0.001$; CFI = 0.83; RMSEA = 0.11. The final model that best fit the data included the one factor model with three modifications. Residual correlations between three pairs of items that were theoretically expected to be associated beyond the factor were included: (1) sadness and tearfulness, (2) sadness and irritability, and (3) irritability and tantrums. The pairing of sadness and tearfulness reflects that younger children may have difficulty modulating their sadness and would be more likely to demonstrate this emotion outwardly as tearfulness in comparison to older children who may be able to better conceal their feelings and avoid becoming tearful [14, 42]. Similarly, irritability may reflect the underlying distress/mood dysregulation that contributes to outward displays of tantrums [43–45]. The pairing of sadness and irritability is consistent with research in youth as sad or irritable mood can be used to fulfill the mood criterion for depression in children and adolescents [46]; in addition, there is evidence to suggest sadness and irritability are particularly sensitive indicators of depression in young children [47]. Statistically, this model yielded an excellent fit to the data: $\chi^2(51) = 128.30$, $p < 0.001$; CFI = 0.93; RMSEA = 0.07. The inclusion of these residual correlations improved model fit and did not appear to bias the results; the intraclass correlation coefficient comparing model parameters with and without the residual correlations was 0.87.

Next, we conducted GRM to evaluate item functioning. Table 3 displays item discrimination values, difficulty parameters, and average difficulty parameters for each item. Nine of the 12 discrimination values exceeded 1, indicating that they provided acceptable amounts of information about the latent trait. Difficulty parameters indicated items assessed a range of severity. In addition, six items had average difficulty parameters greater than 1.65, indicating that these items best assessed information at high levels of severity (>95th percentile). Figure 1 displays the test information curve, which reveals the extent to which items provided information across the underlying severity trait. These data show that the items provide reliable information, corresponding to an alpha of 0.80 from approximately 0.5 standard deviations (SD) below the mean to about 3.50 SDs above the mean. This demonstrates that the items assess clinical severity well.

Here, we highlight how difficulty parameters inform which response options reflect severity at or greater than the 95th percentile (Table 3) on levels of depressive behaviors. For example, sadness had to occur at least 31 times over 14 days (approximately twice per day) for the behavior to be considered severe/rare; irritability had to occur at least 23 times over 14 days for the behavior to be considered severe/rare; and tantrums had to occur at least nine times over 14 days for the behavior to be considered severe/rare. Other behaviors occurred less frequently to be considered severe. Low interest/pleasure had to occur at least three times over 14 days for the behavior to be considered severe/rare; low self-worth had to occur at least two times over 14 days for the behavior to be considered severe/rare; and difficulty concentrating had to occur at least three times over 14 days for the behavior to be considered severe/rare.

Finally, we examined associations between impairment variables and the imputed dimensional depressive behavior score extracted from the GRM model. Significant associations were found between each measure of impairment (higher scores reflect greater levels of impairment) and the depression score (all p s < 0.001): average rating of the extent to which each depressive behavior was problematic each day ($r = 0.66$), average overall rating of impairment due to depressive behaviors each day ($r = 0.53$), average rating of the extent to which parenting was difficult/ stressful each day ($r = 0.46$), average rating of the extent to which the parent–child relationship was stressful each day ($r = 0.24$), and the average level of stress for the child each day ($r = 0.51$).

There were no differences in depression factor scores in relation to child ethnicity and sex, and parental income, education level, and marital status. Child age was significantly associated with depression factor scores ($r = -0.16$, $p = 0.01$) such that parents of younger children reported more depressive behaviors than parents of older children. In addition, the total number of hours the caregiver reported spending away from the child each day ($M = 2.85$, $SD = 2.50$, $Range$ 0.00–16.07) was significantly associated with depression factor scores ($r = -0.13$, $p = 0.02$) such that children who spent more time with their caregivers on average were rated as showing more frequent depressive behaviors than children who spent less time with their caregivers. Given the correlation between child age and time away ($r = 0.13$, $p = 0.03$), we examined their unique effects and both remained significant ($p < 0.05$).

Discussion

The goal of this study was to assess the frequency and severity of behaviors in preschool-aged children that may be relevant to the development of depression. These emotions and behaviors, such as sadness, irritability, and sleep difficulties, can emerge during early childhood [1–4] and, at some level, typically reflect normative functioning in young children [11]. Therefore, it is necessary to clarify the range of normative mood experiences to non-normative pathological mood problems in early childhood. To our knowledge, the data in the present study are the first to delineate empirical information about the frequency and severity of early childhood behaviors relevant to the development of depression. Such data are necessary to determine whether behaviors pertinent to typical development may be clinically concerning. We found that sadness, irritability, and tearfulness/sensitivity are more normative during this developmental period compared to other behaviors related to depression such as low interest/pleasure, talking about death/suicide, low self-worth, appetite/weight changes, and difficulty concentrating/making decisions.

The CFA indicated good model fit. Therefore, items assessed on a daily basis reflect a coherent underlying dimension. Most item discrimination values indicated that they provided acceptable amounts of information about the latent trait (however, discrimination values did not exceed 1 for tantrums, talk about death/suicide, and low self-worth). This indicates that these items provide limited information about the overall level of depression in these assessments. In addition, six of the 12 items (irritability, tantrums, low interest/pleasure, talk about death/suicide, low self-worth, and difficulty concentrating/making decisions) had average difficulty parameters greater than 1.65, indicating that these items best assessed information at high levels of severity. Overall, these results suggest that the items assessed clinical severity well.

Difficulty parameters reflect the level of severity required to endorse a specific item at a given response level. Consistent with the hypothesis, patterns of the frequency of particular behaviors varied such that some behaviors were more frequent than others to be considered severe. For example, tantrums had to occur at least 9 times over 14 days for the behavior to be considered severe/rare, low interest/pleasure had to occur 3–4 times, and low self-worth had to occur at least two times over 14 days to be considered severe. Other behaviors had to occur much more frequently to be considered severe. For example, sadness had to occur at least 31 times (approximately twice per day or more), irritability had to occur at least 23 times, and tearfulness/sensitivity had to occur at least 32 times over 14 days (approximately twice per day) to be considered severe.

These data suggest that behaviors such as sadness, irritability (which is potentially related to normative displays of temper tantrums/loss [29]), and tearfulness/sensitivity are relatively normative during this developmental period, whereas other behaviors (e.g., low interest/pleasure, talking about death/suicide, low self-worth, appetite/weight changes, difficulty concentrating/making decisions) are less normative. Although these findings mirror existing knowledge of early childhood development, these data are the first of which we are aware to empirically delineate specific frequencies of behaviors that may be clinically meaningful. Such data can be useful to child practitioners, with whom parents consult to inquire about

the nature of their children's behavior, to more accurately assess risk for or presence of psychopathology. Frequency of behavior is only one component of defining abnormal behavior; other factors, such as duration of behavior, the extent of the dysfunction associated with the behavior, and social values influence the manner in which abnormal behavior is defined [48]. Nevertheless, the present study clarifies the range of frequencies and statistical severity of behaviors relevant to depression, which is a necessary first step toward understanding the degree to which such behaviors may be problematic.

Finally, as predicted, significant associations were identified between the depressive behavior score and impairment and children's and parents' distress. These findings are consistent with other studies that investigated depression and impairment in young children [1, 4]; the magnitudes of associations between depressive behavior and impairment in the present study are larger than the previous studies, suggesting that the daily assessment of children's behavior and associated impairment may yield stronger associations between these constructs than assessments that require longer time frames of retrospection. These data suggest the behaviors assessed contribute to distress and/or impairment in children's and parent's functioning, which add to the data on the frequency and severity of behavior in this study.

Demographic variables were generally not associated with the extracted depressive behavior score. However, younger children and children who spent more time with their caregivers were rated as showing more frequent depressive behaviors than older children and children who spent less time with their caregivers. With regard to time spent with caregivers, this finding may reflect a measurement issue (methodological explanation) and/or an accurate assessment of children's behavior (phenomenological explanation). Caregivers were asked to check in with daycare/preschool teachers and babysitters about the child's behavior each day to improve the accuracy of the estimate of the frequency of behavior. Some participants may not have used this information in their reports or neglected to inquire, which would artificially reduce the reported number of depressive behaviors when children were in these settings compared to when they were with a parent. Alternatively, these differences may reflect an accurate evaluation of the frequency of behavior given that children may be more likely to display mood difficulties (e.g., sadness, irritability) with caregivers than with others. Consistent with this explanation, in most studies that require parents and other informants to report about children's behavior across settings, differences are frequently reported [49]. We are not aware of any research that has examined preschool-aged children's depressive symptoms and time spent with caregivers; across broadly related studies, there is mixed evidence regarding this association with child problem behaviors and related physiology [50–53].

Although these data enhance understanding of the normative range of behavior in early childhood that may be relevant to the development of depression, as with most assessment research, these data do not clarify the etiology of these behaviors. The items assessed were selected given their relevance to the development of depression; however, these behaviors (e.g., difficulty concentrating, fatigue, appetite changes) may be related to other forms of pathology (e.g., attention-deficit/hyperactivity disorder; medical conditions), or, as this paper addresses, may reflect normative functioning. Only longitudinal follow-up will permit

clarification of these questions. Relatedly, the behaviors measured in this study likely also reflect children's temperament, or biologically-based levels of emotional reactivity. Temperament traits, such as high negative emotionality, low positive emotionality, and low inhibitory control, have been linked to depression in children [2, 54–58]. Therefore, the behaviors assessed in the present study may reflect variation in behavior relevant to depression and/or variation in temperament or risk for depression via temperament.

Limitations

First, caregivers were from primarily middle-income, two-parent households in which more than half of parents graduated college; the study required that participants had Internet access and that the parent was fluent in English, which may have biased the sample toward more educated, higher-income families. Therefore, although the sample was ethnically diverse (43.6% of children were from ethnic minority backgrounds), the results of the present study may not generalize to other types of households with parents with even less education and lower incomes. There were no associations identified between depression factor scores and parental level of education and income in this sample; however, given evidence that lower family income may be associated with increased rates of depression in youth [9, 59] and problematic socioemotional development in general [60], possibly due to increased stress and adversity, the spectrum of depressive behavior should be examined among children from an even wider array of socioeconomic backgrounds. Second, behaviors assessed map onto DSM depressive symptoms, but other behavioral phenotypes may be important as well. Finally, it is possible that other samples may yield data with different categories. In addition, less frequently displayed behaviors may be underestimated. These issues could be improved in future research with even larger samples that include children showing less common behaviors across a greater range of frequencies.

Conclusions and Implications

We have several suggestions for future research. First, the addition of behavioral reports by preschool teachers, daycare providers, and/or other caregivers would complement parent-reported data and further enhance the accurate estimation of the frequency of children's behavior. Second, children should be followed longitudinally to identify the frequencies of depressive behaviors that suggest risk for clinically significant psychopathology and, as mentioned above, the continuity and discontinuity of behavior over time. These data will enable investigation of the extent to which the parameters identified in the present study are useful in clinical assessment and intervention. Third, time series analyses would permit more fine-grained evaluation of associations between children's behavior, distress, and impairment in functioning and relationships. Finally, contextual influences (e.g., parenting behavior, stressful life events) that may influence the frequency and severity of these behaviors should be investigated.

Developmentally sensitive information in early childhood about the development of depression is essential to delineate the level at which normative behaviors may reflect clinically significant risk. Data collected using this novel daily diary approach minimized biases in retrospective reporting and enabled documentation of the full range of normative

behaviors in young children relevant to depression, rather than limiting data collection to behaviors that only meet clinical symptom thresholds. Data from the present study can be translated for use in clinical practice by providing concrete information about the frequency at which behaviors may be problematic rather than relying on subjective interpretation of behaviors; these efforts can enhance empirically-driven assessment of early-emerging depression. In addition, this work can impact diagnostic criteria for young children given the limited empirically-derived developmental information. Finally, this research can guide prevention/early intervention efforts to preempt or treat early-emerging psychopathology and minimize the potential negative developmental trajectories associated with emotional and behavioral problems.

Summary

We examined the frequency and severity of depressive behaviors in preschool-aged children using a novel daily diary method. Although other studies have identified that emotions and behaviors relevant to depression, such as sadness, irritability, and sleep difficulties, can be early emerging, impairing, and persistent, previous research is limited by sole reliance on parents' judgment and memory to report the subjective frequency of children's behavior and the use of often arbitrary cutpoints. This study characterized children's depressive behaviors dimensionally to better understand variation in behavior that pertains to the development of early-emerging psychopathology. Using a novel daily diary method, 291 primary caregivers reported about their 3–5-year-old children's depressive behaviors and impairment for 14 consecutive days. A coherent depression dimension was identified, and the specific frequency at which individual behaviors were found to be severe is reported. Behaviors such as sadness, irritability, and tearfulness/sensitivity were found to be relatively normative, whereas other behaviors (e.g., low interest/pleasure, low self-worth, difficulty concentrating/making decisions) were less normative. In addition, these behaviors were associated with impairment across domains of functioning.

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Fig. 1.
 Test information curve for latent depression dimension. Total information. Information = 5 corresponds to $\alpha = 0.80$

Table 1

Demographic characteristics of the study sample

Demographic variable	
Child mean age: years (SD; range)	4.3 (0.8; 3–5)
Age 3% (<i>n</i>)	43.6 (127)
Age 4% (<i>n</i>)	34.4 (100)
Age 5% (<i>n</i>)	22.0 (64)
Mother mean age: years (SD; range)	33.6 (5.6; 21–49)
Father mean age: years (SD; range)	35.9 (6.7; 21–60)
Child sex: female % (<i>n</i>)	52.9 (154)
Child race/ethnicity: % (<i>n</i>)	
Caucasian/White	56.9 (165)
Hispanic	16.6 (48)
African-American/Black	8.6 (25)
Asian	6.6 (19)
Multi-ethnic/other	11.4 (33)
Biological parents' marital status: % (<i>n</i>)	
Married	84.9 (247)
Family income: % (<i>n</i>) ^a	
<\$40,000	21.5 (61)
\$40,000–\$70,000	19.7 (56)
>\$70,000	58.8 (167)
Parents' education: % graduated college (<i>n</i>) ^b	
Mothers	67.8 (196)
Fathers	59.8 (171)
Parents' employment: % working outside the home (<i>n</i>)	
Mothers	48.5 (141)
Mean number of hours per week (SD; range)	31.6 (13.3; 1–50)
Fathers	92.1 (258)
Mean number of hours per week (SD; range) ^c	43.6 (10.4; 8–81)
Childcare/school settings: % (<i>n</i>) ^d	
Preschool	81.1 (236)
Mean number of hours per week (SD; range)	12.8 (13.1; 1–50)
Daycare	56.4 (164)
Mean number of hours per week (SD; range)	11.5 (17.2; 1–54)
Other childcare setting (e.g., babysitter)	44.3 (129)
Mean number of hours per week (SD; range)	4.5 (11.0; 1–72)

N = 291

^a2.4% of the sample (*n* = 7) did not indicate their family income level

^bLevel of education was not reported for 0.7% (*n* = 2) of mothers and 1.7% (*n* = 5) of fathers

^c3.8% of the sample ($n = 11$) did not indicate whether fathers worked outside the home

^dCategories overlap as some children are in multiple childcare settings

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Table 2

Frequencies of each depressive behavior item across the 14-day diary period

	Category 1	Category 2	Category 3	Category 4
Sadness				
Frequency of behavior	0–7	8–15	16–30	31+
Percentile range	<50%	50–80%	80.1–94.2%	>94.3%
Irritability				
Frequency of behavior	0–9	10–22	23–44	45+
Percentile range	<50%	50.1–80%	80.1–95%	>95.1%
Tantrums				
Frequency of behavior	0–2	3–8	9–20	21+
Percentile range	<50%	50.1–80%	80.1–95%	>95.1%
Low interest/pleasure				
Frequency of behavior	0	1–2	3–4	5+
Percentile range	<65%	65–91%	91.1–96%	>96.1%
Talked about death/suicide				
Frequency of behavior	0	1	2–3	4
Percentile range	<80%	80.1–90%	90.1–97.5%	>97.5%
Low self-worth				
Frequency of behavior	0	1	2–5	6+
Percentile range	<65%	65.1–80%	80.1–95%	>95%
Fatigue				
Frequency of behavior	0	1	2–4	5+
Percentile range	<75%	75.1–90%	90.1–95.2%	>95.3%
Appetite and/or weight changes				
Frequency of behavior	0	1	2	3+
Percentile range	<66%	66.1–90%	90.1–95%	>95.1%
Sleep difficulties				
Frequency of behavior	0	1–2	3–5	6+
Percentile range	<50%	50.1–75%	75.1–95%	>95.1%
Change in activity level				

	Category 1	Category 2	Category 3	Category 4
Frequency of behavior	0	1	2–6	7+
Percentile range	<60%	60.1–75%	75.1–95%	>95.1%
Difficulty concentrating/making decisions				
Frequency of behavior	0	1–2	3–4	5+
Percentile range	<80%	80.1–90%	90.1–95%	>95.1%
Tearfulness/sensitivity				
Frequency of behavior	0–6	7–16	17–31	32+
Percentile range	<50%	50.1–80%	80.1–95%	>95.1%

Table 3

Item parameters for each depressive behavior

	Discrimination a	Difficulty			Average difficulty
		b1	b2	b3	
Sadness	1.91	-0.02	1.32	3.07	1.46
Irritability	1.40	-0.02	1.89	3.76	1.88
Tantrums	0.55	-0.32	3.59	7.37	3.54
Low interest/pleasure	1.54	0.56	1.98	2.60	1.71
Talked about death/suicide	0.42	3.36	5.34	8.88	5.86
Low self-worth	0.73	0.81	1.79	4.17	2.26
Fatigue	1.87	0.78	1.51	2.25	1.51
Appetite and/or weight changes	1.38	0.65	1.41	2.27	1.44
Sleep difficulties	1.25	-0.52	0.92	2.60	1.00
Change in activity level	2.08	0.29	0.74	2.05	1.03
Difficulty concentrating/making decisions	1.36	1.15	1.97	2.63	1.92
Tearfulness/sensitivity	2.37	-0.05	1.54	3.05	1.51

Item thresholds (difficulty parameters) indicating severity greater than the 95th percentile (i.e., $t(291) > 1.65$) are displayed in bold. Difficulty parameters reflect the level of severity required to endorse a specific item at a given response level/category. See Table 2 for frequency categories. Difficulty parameter b1 corresponds to category 2, b2 to category 3, and b3 to category 4. For example, tantrums had to occur at least nine times over 14 days for the behavior to be considered severe/rare