Increased Early Life Stress and Depressive Symptoms in Patients With Comorbid Substance Abuse and Schizophrenia

by Geraldine Scheller-Gilkey, Shannon M. Thomas, Bobbi J. Woolwine, and Andrew H. Miller

Abstract

Early adverse events have been associated with increased rates of substance abuse and depression. To investigate the association between early adverse events and comorbid substance abuse in schizophrenia patients, early life stress, depressive symptoms, positive and negative symptoms, anxiety, and cognitive function were measured in an age-, sex-, and race-matched sample of 40 schizophrenia patients with and without comorbid substance abuse. Compared to patients without substance abuse, patients with schizophrenia and a history of substance abuse had a significantly higher incidence of early life trauma, as well as significantly higher scores on the Modified Hamilton Rating Scale for Depression and the Psychiatric Epidemiology Research Interview Life Events Scale. No differences between groups were found in positive or negative symptoms, anxiety, or cognitive function. The results emphasize the importance of early life stress and affective symptoms and their potential relationship to substance abuse disorders in schizophrenia patients.

Keywords: Schizophrenia, substance abuse, early trauma, depression.


Substance abuse in patients with schizophrenia represents a significant public health concern. Schizophrenia patients exhibit a marked increase in the relative risk for substance abuse (4.6 times higher than the general population), and as many as 60 percent of all schizophrenia patients have a history of having abused drugs at some time during the course of their illness (Regier et al. 1990; Khalsa et al. 1991; Westermeyer 1992). In keeping with the malignancy of this comorbidity, studies have consistently found that patients with schizophrenia and substance abuse exhibit higher rates of violence (Lindqvist and Allebeck 1989; Cuffel and Chase 1994; Smith and Hucker 1994; Eronen et al. 1996; Tardiff et al. 1997), suicide (Drake and Wallach 1989; Krausz et al. 1996; Heila et al. 1997), hospitalization (Brady et al. 1990; Bartels et al. 1993; Gupta et al. 1996; Swofford et al. 1996), noncompliance with treatment (Miller and Tanenbaum 1995), tardive dyskinesia (Bowers et al. 1990), relative neuroleptic refractoriness (Bowers et al. 1990), tardive dyskinesia (Lopez andJeste 1997), and homelessness (Drake et al. 1998).

In attempts to understand the mechanisms involved in the pathophysiology of this comorbidity, a great deal of attention has been paid to the clinical variables that are associated with substance abuse in schizophrenia patients. For example, studies have suggested that comorbid patients exhibit a greater prevalence of positive symptoms (Cleghorn et al. 1991; Soyka 1994) and a shift from predominantly negative to positive symptoms over the course of the illness (Rosenthal et al. 1994). Moreover, deficit patients have been found to have less severe current use of alcohol and other drugs (excluding cannabis) (Kirkpatrick et al. 1996). Nevertheless, Brunette et al. (1997) found only a weak relationship between the severity of schizophrenia symptoms (including hallucinations and delusions) and the severity of substance abuse, and Van Ammers et al. (1997) reported no association between substance use and positive or negative symptoms.

Another clinical variable that may be involved in the high incidence of substance abuse in schizophrenia patients is early life stress. Recently, there has been increasing interest in the relationship between early adverse events and substance abuse, possibly via an association with depressive symptoms. A number of studies have demonstrated a significant association between early adverse events, including sexual assault/abuse, and the later onset of addictive and mood disorders (Rohsenow et al. 1988; Briere and Zaidi 1989; Winfield et al. 1990; Swett et al. 1991; Mullen et al. 1993; Moncrieff et al. 1996; Kessler et al. 1997). For example, Moncrieff et al. (1996)...
found high rates of lifetime sexual abuse among individuals with alcohol problems. A similar association has been reported in community samples between self-reported incidence of sexual abuse or assault at any age and higher rates of alcohol and drug abuse (Roheenow et al. 1988; Winfield et al. 1990; Swett et al. 1991; Mullen et al. 1993). A strong association has also been found between childhood adversity, including childhood incest, and lifetime onset of a broad range of adult psychiatric disorders, including addictive, mood, and anxiety disorders (Pribor and Dinwiddie 1992; Kessler et al. 1997). Relevant to this relationship between early physical or sexual abuse and substance abuse is that high rates of traumatic events (at all ages) have been reported among patients with severe mental illnesses, especially women (Beck and van der Kolk 1987; Craine et al. 1988; Briere et al. 1997; Mueser et al. 1998). Nevertheless, as noted by Goodman et al. (1997), the association between early trauma and substance abuse in patients with schizophrenia remains unclear.

Given the relationship between mood disorders and substance abuse (Regier et al. 1990), the presence of mood symptoms in schizophrenia patients is also relevant to comorbid substance abuse (Kovasznay et al. 1993). Although depressive signs and symptoms have long been known to accompany schizophrenia (Bleuler 1950), there has been increasing appreciation that affective symptoms have a distinct course independent of the positive and negative symptoms of the disorder (Siris et al. 1991; Hafner et al. 1999).

Several groups have found an association between affective disturbance and substance abuse in schizophrenia patients (Cuffel et al. 1993; Kovasznay et al. 1993; Cuffel and Chase 1994; Krausz et al. 1996; Brunette et al. 1997). For example, compared to nonabusing schizophrenic patients, schizophrenia patients identified as polysubstance abusers were more likely to endorse depressive symptoms (Kovasznay et al. 1993; Krausz et al. 1996). Moreover, in a prospective study, greater numbers of depressive symptoms were associated with the initiation of substance abuse in schizophrenia subjects over a 1-year period (Cuffel and Chase 1994). Schizophrenia patients with comorbid substance abuse also have been found to have a greater "depressive tendency" as determined by the self-report Paranoid Depressive Scale (Krausz et al. 1996). Finally, a strong correlation between depressive symptoms and the severity of substance abuse has been described (Brunette et al. 1997).

It remains unclear, however, whether depression in schizophrenia subjects who are comorbid for substance abuse is a function of ongoing drug abuse and drug withdrawal or a byproduct of the associated stress of the often-chaotic drug abuse lifestyle. Moreover, in studies reporting increased depressive symptoms in substance-abusing schizophrenia patients, the relevant distinction between negative symptoms and depressive symptoms often has not been made (Cuffel and Chase 1994). Finally, the relative contributions of age, sex, race, and socioeconomic status to the expression of psychotic, mood, and substance abuse disorders in comorbid patients is unknown. For example, substance abuse may be more likely associated with poverty, which may itself lead to depression or demoralization, or both.

To further evaluate the high rate of comorbid substance abuse and schizophrenia, we examined systematically the presence of early adverse events, affective symptoms, and substance abuse in matched groups of patients with schizophrenia. To limit the potentially confounding influence of age, sex, race, and socioeconomic status, schizophrenia subjects with and without substance abuse were carefully matched on these variables.

Methods

Subjects. Forty subjects with a schizophrenia spectrum diagnosis were recruited from a local inner-city mental health center: 20 with and 20 without a history of substance abuse. All patients were screened using the Structured Clinical Interview for DSM–III–R Patient Version (SCID–P) (Spitzer et al. 1989). Only patients with a diagnosis of schizophrenia spectrum disorder (schizophrenia or schizoaffective disorder) as determined by use of the SCID–P were eligible for the study. After recruitment, subjects were assessed using the Addiction Severity Index (ASI) (McLellan et al. 1992) to determine their substance abuse status. In addition, urine drug screens and blood alcohol concentrations were obtained to confirm the patient's self-reported substance use. Lifetime experience with substance abuse was taken into consideration, so that someone who was currently not using substances but had a history of substance abuse was assigned to the substance abuse group. It should be noted that approximately 10 percent (7 of 65) who signed informed consent and were originally considered non-substance abusers based on chart reviews were found to have a history of substance abuse upon screening with the ASI.

Subjects were recruited for the substance abuse group first, and then an equal number of matched subjects were recruited for the non–substance abuse group. Subjects were matched on age (± 5 years), sex, and race. In terms of socioeconomic status, 95 percent of subjects were receiving some form of public disability benefit for their psychiatric disorder, only one worked full-time, and 45 percent were in day treatment programs or sheltered employment programs. All subjects were inner-city residents of a large metropolitan area.

Rating Instruments and Procedures. The SCID–P and ASI were administered to diagnose and determine sub-
stance abuse status. The substance abuse group was further subdivided into inactive and active abusers, as defined by a positive composite score on the ASI indicating use in the previous 30-day period or a positive urine, drug, or blood alcohol screen—or both. Dividing the sample in this manner allowed us to evaluate the effect of current substance use/abuse on clinical measures. Data on early life adverse events (before 18 years of age) were gathered using a brief interview and a modification of the Childhood Traumatic Events Scale (CTES) (Pennebaker and Susman 1988). As per the CTES, traumatic life events assessed included death of a family member, sexual or physical abuse, exposure to violence and illness or injury, and other major upheavals, including experiences such as a major fire in the home. Because of the high prevalence of divorce, separation, and single parenthood in this population, these potential sources of early life stress were not included in the scores from this instrument.

The Psychiatric Epidemiology Research Interview (PERI) (Dohrenwend et al. 1978) life events scale was used to determine the number and severity of recent stressful life experiences, followed by the Davidson Post-Traumatic Stress Disorder (PTSD) Scale (Davidson et al. 1997), which was used to assess level of distress over traumatic life events. Affective symptoms were measured by the Modified Hamilton Rating Scale for Depression (MHRSD) (Hamilton 1960). The Structured Clinical Interview for the Positive and Negative Syndrome Scale (SCI-PANSS) (Opler et al. 1986) was used to assess positive and negative symptoms. The Spielberger State Trait Inventory (Speilberger et al. 1977) was also administered to assess anxiety. To provide a gross measure of cognitive function, the Mini-Mental Status Exam (MMSE) (Folstein et al. 1975) was used.

Finally, to evaluate neuroleptic relevant side effects in the study sample, the Abnormal Involuntary Movement Scale (AIMS) (Guy 1976) and the Simpson-Angus Neurological Rating Scale (Simpson-Angus) (Simpson et al. 1979) were performed.

**Statistical Analysis.** Descriptive statistics, including the mean and the standard deviation (SD), were calculated to characterize the sample. Independent t tests were used to analyze between-group differences on appropriate continuous variables. Levene’s test was used to determine whether equality of variance should be assumed. Chi-square tests were used to analyze data on the percentage of subjects reporting early trauma and presence or absence of PTSD symptomatology.

**Results**

Demographic characteristics of the sample are presented in table 1. Consistent with other studies, which report a higher incidence of substance abuse among males (DeQuardo et al. 1994), a larger proportion of males than females were represented in the sample. The two groups of subjects were equal with respect to income source and amount. The number of subjects who listed themselves as disabled was similar in the two groups (substance abuse, 11; non–substance abuse, 12). The ASI revealed alcohol to be the most frequently abused substance in this sample, followed by marijuana and cocaine. The mean ASI-alcohol score for actively abusing schizophrenia subjects over the previous 30 days was 0.20 (SD = 0.20). The mean ASI-drug (not including alcohol) score for the previous 30 days was 0.11 (SD = 0.008).

Results of clinical assessments by group are presented in table 2. Substance abusers had a significantly higher incidence of early life trauma (before the age of 18). The majority of early adverse events in both groups were accounted for by the death of a parent or caretaker (51%) or physical and sexual abuse (36%). A small num-

### Table 1. Sample demographics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Non–substance abusers (n = 20)</th>
<th>Substance abusers (n = 20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (SD)</td>
<td>39.40 (7.67)</td>
<td>38.95 (7.54)</td>
</tr>
<tr>
<td>Sex (M/F)</td>
<td>14/6</td>
<td>14/6</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>African-American/Caucasian</td>
<td>19/1</td>
<td>19/1</td>
</tr>
<tr>
<td>Education (yrs), mean (SD)</td>
<td>11.57 (1.77)</td>
<td>11.55 (1.73)</td>
</tr>
<tr>
<td>Monthly income, mean (SD)</td>
<td>548.38 (395.61)</td>
<td>501.11 (88.81)</td>
</tr>
<tr>
<td>Days worked in last 30-day period, mean (SD)</td>
<td>3.20 (8.24)</td>
<td>3.65 (7.98)</td>
</tr>
</tbody>
</table>

*Note.—SD = standard deviation.*
Table 2. Clinical variables in schizophrenia patients with and without comorbid substance abuse

<table>
<thead>
<tr>
<th>Variable</th>
<th>Non–substance abusers (n = 20)</th>
<th>Substance abusers (n = 20)</th>
<th>t/χ²</th>
<th>df</th>
<th>p (effect size)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early trauma, n (%)</td>
<td>6 (30)</td>
<td>15 (75)</td>
<td>8.12</td>
<td>1</td>
<td>0.005 &lt; p &lt; 0.001 (0.52)</td>
</tr>
<tr>
<td>MHRSD, mean (SD)</td>
<td>5.35 (4.68)</td>
<td>13.55 (7.16)</td>
<td>4.29</td>
<td>38</td>
<td>p &lt; 0.001 (1.11)</td>
</tr>
<tr>
<td>PERI, mean (SD)</td>
<td>8.05 (7.73)</td>
<td>18.67 (18.40)</td>
<td>2.36</td>
<td>36</td>
<td>p &lt; 0.025 (0.72)</td>
</tr>
<tr>
<td>PANSS (positive), mean (SD)</td>
<td>17.70 (3.87)</td>
<td>19.10 (4.46)</td>
<td>1.06</td>
<td>38</td>
<td>ns (0.29)</td>
</tr>
<tr>
<td>PANSS (negative), mean (SD)</td>
<td>24.60 (6.22)</td>
<td>21.60 (6.41)</td>
<td>-1.50</td>
<td>38</td>
<td>ns (0.50)</td>
</tr>
</tbody>
</table>

Note.—MHRSD = Modified Hamilton Rating Scale for Depression; ns = not significant; PANSS = Positive and Negative Syndrome Scale; PERI = Psychiatric Epidemiology Research Interview; SD = standard deviation.

ber of substance abusers were also exposed to violence in the home. Of the 15 substance abuse subjects who reported early life trauma, 40 percent had more than one trauma. None of the non–substance abuse subjects who reported early life stress described multiple traumatic experiences. The percentage of non–substance abuse subjects reporting early trauma (30%) is similar to that found in black males in the general population (Felitti et al. 1998). The high rate of early trauma in substance abuse is similar to the prevalence of victimization (including child abuse) among seriously mentally ill women (Muenzenmaier et al. 1993; Goodman et al. 1995; Cloitre et al. 1996; Davies-Netzley et al. 1996).

Substance abusers also had significantly higher scores on the MHRSD, exhibiting scores more than 2-fold higher than those of their matched controls (table 2). These differences were apparent for both active and inactive substance abusers (the difference between the active [mean = 13.36, SD = 8.17] and inactive [mean = 14.00, SD = 4.56] groups was not statistically significant [t = -0.179; df = 18; p = ns]), although cell sizes in the active (n = 14) and inactive (n = 6) groups limit the statistical power for comparisons between these two groups. An item analysis of the MHRSD revealed a significant difference on four items (depressed mood, worthlessness, guilt, and helplessness). No differences were found on the PANSS negative symptom scale. Of note was that 5 of 20 substance abuse subjects were diagnosed as schizoaffective, compared to 1 of 20 of the non–substance abuse group. Differences between groups in MHRSD scores were preserved with schizoaffective patients eliminated from the analysis (substance abuse group mean = 12.8, SD = 7.78, vs. non–substance abuse group mean = 5.16, SD = 4.73; t = 3.54; df = 32; p = 0.001).

Although the substance abuse group, compared with the non–substance abuse group, was found to have significantly higher scores on the PERI Life Events Scale (see table 2), differences between active (mean = 22.42, SD = 20.90) and inactive (mean = 11.17, SD = 9.45) substance abusers did not reach statistical significance (t = 1.57; df = 16; p = ns).1

Of note, 26 of the schizophrenia patients in this study were able to give information regarding substance abuse of their parents. Within the group of substance abusers who were able to provide information (n = 14), 10 (71.4%) reported parental substance abuse compared to 4 (33.3%) in the group of non–substance abusers who were able to provide information (n = 12) about parental substance abuse. Within the group of patients with early trauma who were able to provide information (n = 13), 9 (69.2%) reported parental substance abuse compared to 5 (38.5%) in the nontrauma group who were able to provide information (n = 13) about parental substance abuse. Cell sizes limit statistical analysis of these data.

It was hypothesized that the high incidence of early trauma might be associated with increased symptoms of PTSD. Scores on the Davidson PTSD Scale were not normally distributed; therefore, scores were dichotomized based on whether each subject had a score on this scale. A chi-square test for significance revealed a trend for more schizophrenia patients with a history of substance abuse to report PTSD symptoms on the Davidson PTSD Scale (χ² = 3.58; df = 1; p = 0.058).

1 Although the within-group variances in the active and inactive substance abuse groups were unequal, the results were the same (i.e., non-significant) whether equal or unequal variance was assumed. Degrees of freedom are low because of the adjustment made for inequality of within-group variances between the two subgroups.
distinct pathophysiology (e.g., involving alterations in the general population and may not be a function of the abuse in patients with schizophrenia evolves as it does in finding in more general samples of substance abusers. this sample of schizophrenia patients are consistent with that a single childhood adversity is not specifically predic-

No differences were found between patient groups in positive symptoms or baseline MMSE scores. There was not a significant difference between the two groups in mean medication dose using the standard formula for chlorpromazine equivalents (Hollister 1973) (substance abuse group mean = 1,405.07, SD = 2,055.61, vs. non–substance abuse group mean = 670.29, SD = 579.63; t = 1.53; df = 22.49; p = ns).² Nor was there a significant difference in neuroleptic relevant side effects on the AIMS (substance abuse group mean = 1.60, SD = 1.10, vs. non–substance abuse group mean = 1.47, SD = 0.96; t = 0.126; df = 36; p = ns) or the Simpson-Angus (sub-

Discussion

In this study, individuals with schizophrenia and a history of substance abuse were found to have a significantly higher incidence of childhood and adolescent trauma. In addition, the substance abuse group had significantly higher scores on the MHRSD compared to patients without a substance abuse history. These findings were apparent in both the presence and absence of active substance abuse (as determined by the ASI and urine/blood screening) and were not accompanied by an increase in negative symptoms. Finally, significantly higher levels of life stress, as measured by the PERI Life Events Scale, were found among the substance abuse group of patients.

Although Kessler et al. (1997) report data indicating that a single childhood adversity is not specifically predictive of one adult psychiatric disorder versus another, their data show early traumatic experiences to be closely associated with onset of addictive, mood, and anxiety disorders. Moreover, trauma and adverse life events have been shown to be associated with increased risk for both substance abuse and psychiatric disorders (Strakowski et al. 1995; Turner and Lloyd 1995). Therefore, our findings in this sample of schizophrenia patients are consistent with findings in more general samples of substance abusers. Given these data, it may be that vulnerability to substance abuse in patients with schizophrenia evolves as it does in the general population and may not be a function of the distinct pathophysiology (e.g., involving alterations in dopamine reward pathways) of schizophrenia.

Because parents who abuse drugs may be more likely to abuse or neglect their children, it could be that both early trauma and substance abuse are a function of parental (genetic) transmission of a predisposition for substance abuse rather than that the experience of early trauma per se leads to later substance abuse. Indeed, Dixon et al. (1991) have reported a higher incidence of family history of drug abuse in patients with comorbid schizophrenia and substance abuse (Dixon et al. 1991). Nevertheless, animal studies examining environmental stressors indicate that early life stress alone is sufficient to increase rates of self-administration of drugs of abuse (Piazza et al. 1990). In our sample, schizophrenia patients with a history of substance abuse exhibited a high incidence of both parental substance abuse and early trauma, and therefore, the relative contribution of these factors cannot be resolved.

Relevant to early trauma, we also found the substance abusers to exhibit a trend for a higher prevalence of PTSD symptomatology as measured by the Davidson, although differences in scores were not significant. Nevertheless, this trend is consistent with a number of studies that have documented the positive association between PTSD and substance abuse (Helzer et al. 1987; Cottler et al. 1992; Bremner et al. 1996), and a larger sample size may be required to detect significant differences.

It is well known that substance abuse disorders are highly correlated with symptoms of mood disorders, such as depression (Brown et al. 1995; Prescott et al. 1997). Nevertheless, although the capability of alcohol and other drugs to cause depression is well documented, when recency of substance use (abuse in last 30 days as indicated on the ASI) was evaluated in this study, there was not a significant difference in the degree of depressive symptoms in active versus inactive substance abusers. The small number of subjects in this analysis precludes more definitive conclusions. However, one possible explanation is that depressive symptomatology in this sample may be a trait-related phenomenon and not solely a function of active substance abuse.

The MHRSD is often used in studies to measure changes in depression over time. Nevertheless, in a recent study by Ferro et al. (1998), 8 was used as a cutoff score for depression. Other studies have used a score of 12 (not including items for paranoia or derealization) as a thresh-

² Although the within-group variances in the substance abuse and non–substance abuse groups were unequal, the results were the same (i.e., nonsignificant) whether equal or unequal variance was assumed. Degrees of freedom are low because of the adjustment made for inequality of within-group variances.
groups, it is reasonable to conclude that the differences in depressive symptoms are not confounded by the presence of significant differences in negative symptoms. The lack of differences in negative symptoms is consistent with previous work by Van Ammers and colleagues (1997). Moreover, the items that were significant in the item analysis of the MHRSD (depressed mood, worthlessness, guilt, and helplessness) suggest that depressive symptoms were not confounded by negative symptoms (i.e., avolition, affective flattening, or alogia).

Of note, our results contrast with DeQuardo et al. (1994) and, to a lesser extent, Kovasznay et al. (1993). DeQuardo et al. (1994) found comorbid patients to have lower scores on the Hamilton Rating Scale for Depression, both pre- and posttreatment, compared to noncomorbid patients. However, in this study (DeQuardo et al. 1994), patients with "insignificant substance abuse" were included in the non–substance abuse group. Moreover, the vast majority of patients in the DeQuardo et al. (1994) study were Caucasian, whereas our sample was predominantly African-American. Although Kovasznay et al. (1993) found increased depression in psychotic substance abusers as measured on the Hamilton, the difference did not reach statistical significance. In contrast, they did report statistically significant differences on the Brief Psychiatric Rating Scale (BPRS) subscale for depression. Nevertheless, both substance abusers and non–substance abusers in the Kovasznay et al. study (1993) had Hamilton Rating Scale for Depression scores above 18, and subjects with affective psychoses (i.e., bipolar disorder and major depression) were included in the analysis.

It should be noted that recent studies have raised questions regarding the use of the ASI in chronically mentally ill subjects (Corse et al. 1995; Lehman et al. 1996; Carey et al. 1997; Zanis et al. 1997). Specific concerns revolve around the reliability of self-report instruments with schizophrenia subjects. More recently, the Dartmouth Assessment of Lifestyle Inventory (Rosenberg et al. 1998) has been developed to provide higher levels of reliability and validity with this population and should be used in future research efforts with this population.

No differences were found between the groups in positive symptoms as measured by the PANSS. Although some studies have reported a higher incidence of positive symptoms among substance abusers (Soyka 1994; Kirkpatrick et al. 1996), other studies report a lack of differences in these symptoms (Kovasznay et al. 1993). We also did not find differences in levels of anxiety as measured by the Spielberger State Trait and Anxiety Scale. These results contrast with Kovasznay et al. (1993), who reported higher levels of anxiety among substance abusers. However, Kovasznay et al. (1993) used the BPRS anxiety and depression subscale in their analysis, and the most common substances of abuse were marijuana, cocaine, stimulants, and hallucinogens (all of which can be anxiety producing).

Finally, it is possible that the group of subjects in our study who did not have a history of substance abuse might be deficit symptom patients with impaired cognitive (memory) function who might be unable to recall early life stress. Nevertheless, as noted above, no differences in negative symptoms were found between groups, and MMSE scores were similar, indicating no gross differences in cognitive functioning. Inclusion in future studies of a more specific test of memory function would clarify this issue.

In summary, the findings of our study extend the reported association between substance abuse, early life trauma, and depression in the general population to schizophrenia patients. Furthermore, the results emphasize the importance of addressing affective symptoms in comorbid patients and of early intervention in response to adverse life events that occur during childhood and adolescence. In addition, given the availability of newer atypical antipsychotic agents, which may have independent effects on mood, it will also be important to determine the impact of these agents and standard antidepressant treatment on drug abuse in schizophrenia patients.

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Acknowledgments

This work was supported by grants from the Emory Medical Care Foundation (to A.H.M.) and NIMH #5 K01 MH01534 (to G.S.-G.). The authors thank the following individuals for their assistance: Nan Chadwick, R.N., M.S.; Theresa Lane, R.N., M.S.; and Justin Wiley.

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