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LONGITUDINAL STUDY OF THE SYMPTOM CHECKLIST 90-REVISED IN MULTIPLE SCLEROSIS PATIENTS

Amanda Schurle Bruce and Peter A. Arnett
The Pennsylvania State University, Providence, RI, USA

The current study examined the 3-year longitudinal course of psychopathology reported by 53 definite MS patients, then assessed for clinical elevations. Across SCL-90-R scales, only 9–21% of patients’ scores changed. Intercorrelations among Time 1 and Time 2 were significant (p < .01). Clinical elevations on the scales ranged from 26% (anxiety) to 52% (somatization). Consistent with studies of depression, results demonstrated that other types of psychopathology are very stable over time. Because a relatively high percentage of patients displayed clinical elevations across the scales over time, this study suggests that the stability of psychopathology in MS patients is of clinical concern.

INTRODUCTION

Multiple sclerosis (MS) is a chronic demyelinating disease of the central nervous system. This demyelination serves as an anatomical barrier that interferes with neural transmission. MS most commonly affects individuals between the ages of 20 and 40 years, and women are affected more often than men by nearly a 2:1 ratio (Arnett, 2003). The exact etiology of MS is unclear, and there is no known cure. However, some pharmacological treatments reduce exacerbations and slow disease progression (Fischer et al., 2000).

The demyelination of axons in MS produces numerous physical symptoms such as loss of function or feeling in the extremities, incontinence, muscle pain, fatigue, visual anomalies, dysarthria, and balance and coordination difficulties. In addition to the salient physical disabilities experienced by MS patients, cognitive or emotional changes are common (Diaz-Olavarrieta, Cumming, Velazquez, & Garcia de al Cadena, 1999). Neuropsychological or cognitive difficulties typically involve memory, information processing speed, and executive functioning (Benedict & Zivadinov, 2004; Rao, 1995; Rao et al., 1993; Rao, Leo, Bernardin, & Unverzagt, 1991). Attention, language, and visuospatial skills are also commonly affected. An expert consensus statement was published on the recommendations of accurate assessment of cognitive functioning (Benedict et al., 2002). Psychological problems, which are not simply a reaction to the physical symptoms, can take the form of affective...
disturbances, anxiety, psychosis, and personality changes (Benedict, Carone, & Bakshi, 2004; Dalos, Rabins, Brooks, & O'Donnell, 1982; Fishman, Benedict, Bakshi, Shaikh, Miletich, Priore, & Weinstock-Guttman, 2004; Peterson, 1989). Due to such difficulties, an MS patient’s quality of life is inevitably negatively affected (Benedict et al., 2005).

Of the psychological problems experienced by MS patients, depression has been studied most extensively, most often through the use of self-report measures. Lifetime prevalence estimates of depression in MS patients are high, typically reaching 50% (Feinstein & Feinstein, 2001; Joffe, Lippert, Gray, Sawa, & Horvath, 1987; Patten & Metz, 1997; Sadovnick et al., 1996). Research to date indicates that depression does not remit spontaneously, and in fact may worsen over time if left untreated (Mohr & Goodkin, 1999). Depression in MS is associated with difficulties in a number of important domains, such as cognitive dysfunction (Arnett et al., 1999a, 1999b; Gilchrist & Creed, 1994; Krupp, Sliwinski, Masur, Friedberg, & Coyle, 1994; Landro, Celius, & Sletvold, 2004; Schiffer & Caine, 1991; Thornton & Raz, 1997). Depressed MS patients also score lower on standardized measures of quality of life (Benedict et al., 2005; Gulick, 1997; Jonsson, 1996; Wang, Reimer, Metz, & Patten, 2000). Relatedly, depressed MS patients experience disruption of their social support systems, above and beyond what can be attributed to the disease itself (King & Arnett, 2005; McIvor, Riklan, & Reznikoff, 1984; O’Brien, 1993). Finally, the comorbidity of depression and MS may negatively impact long-term physical health by decreasing compliance to neuromedical treatments (Mohr et al., 1997).

Although depression has been extensively researched, little attention has been devoted to exploring other types of psychopathology in MS. Although mood changes are the most frequent type of psychopathology reported, MS patients experience distress in other areas such as anxiety, personality changes, generalized psychological distress, and, rarely, psychosis (Benedict et al., 2002; Diaz-Olavarrieta et al., 1999; Jean, Beatty, Paul, & Mullins, 1997; Maurelli et al., 1992). One study observed generalized anxiety in only 5%, and panic attacks in only 6%, of MS patients (Joffe et al., 1987). Another study, however, reported that although only 8% of MS patients met criteria for an anxiety disorder prior to the onset of their MS, 24% met criteria after the onset (Minden, Orav, & Reich, 1987). A study using a semi-structured interview reported a similar prevalence of anxiety symptoms (20%) (Arias, Vazquez-Barquero, Pena, Miro, & Berciano, 1991; Goldberg, Cooper, Eastwood, Kedward, & Shepherd, 1970). This same study found that the prevalence of global psychopathology reached as high as 54%, with affective lability being the most common symptom profile (30%) (Arias et al., 1991). Anxiety symptoms have been reported to be as high as 37% in MS samples, indicating that anxiety may be much more common than previously thought (Diaz-Olavarrieta et al., 1999).

Psychosis, however, has been found to be relatively uncommon in MS patients (Diaz-Olavarrieta et al., 1999).

Very few studies have examined psychopathology longitudinally in MS. One study found that most aspects of psychological adjustment to MS take place in the first 10 years following diagnosis (Matson, 1977). Another longitudinal study determined that an individual’s self-concept, defined by how that individual perceived and evaluated him/herself, tends to remain stable after the initial period of
adjustment even though MS symptoms worsen over time (Brooks & Matson, 1982). There have been a few longitudinal studies of depression in MS that suggest levels remain quite stable over time. Beck Depression Inventory (BDI) ratings over 1 year were found to be highly correlated ($r = .72$) (Schreurs, de Ridder, & Bensing, 2002). Another study reported that MS patients showed a mild increase in depression over a 4-year period but then remained stable through a 10-year follow-up study (Amato et al., 1995; Amato, Ponziani, Siracusa, & Sorbi, 2001).

Emerging longitudinal studies have begun to contribute to our understanding of the course of depression in MS. However, to the best of our knowledge, no published studies have examined other types of psychopathology longitudinally in MS. In addition to characterizing the natural history of psychopathology in MS over time, longitudinal studies facilitate an exploration of factors that may contribute to changes that occur over time. Gaining a better understanding of such factors is likely to be important in the development of interventions and treatments for psychopathology in MS.

In the current study we examined the longitudinal course of varying forms of psychopathology in MS patients and then evaluated the extent to which patients' scores were clinically elevated. Our goals were first to investigate the amount of change in self-ratings of psychopathology over time and next to determine whether those levels at either time point were of clinical concern. Finally, we endeavored to evaluate characteristics that might differentiate those individuals with higher versus lower levels of psychopathology in MS.

Because of the paucity of longitudinal research on psychopathology besides depression in MS, this study was mainly designed to be an exploratory, descriptive one. Based on the few longitudinal studies of depression that have been conducted with MS patients, however, it was tentatively hypothesized that the levels of reported psychopathology would be relatively stable over time. Taking into account the high prevalence of depression and anxiety that past studies have reported, it was also hypothesized that the levels of psychopathology, particularly depression and anxiety, would be high relative to population base rates. A past study did not find any neurological or sociodemographic characteristics that increase patients’ risk for psychological distress (Arias et al., 1991). These investigators proposed, however, that more studies examining predictors of distress, preferably using longitudinal designs, be conducted (Arias et al., 1991). Our final aim of the study was to accomplish precisely that.

**METHOD AND MATERIALS**

**Sample**

A subset of 53 of the 79 definite MS patients described in detail elsewhere returned for testing approximately 3 years after their initial participation (Arnett et al., 1999a). Participants were recruited from neurologists and MS support groups in the Northwestern United States. Participants were excluded if they: (a) had a history of substance abuse or nervous system disorder other than MS; (b) had severe motor or visual impairment that might interfere with cognitive testing; (c) had a premorbid history of a learning disability; (d) could not easily be evaluated at our
university because of severe physical or neurological impairment; or (e) did not live reasonably close to our testing centers. Each MS participant was diagnosed as having definite or probable MS based on Poser et al.’s (1983) criteria by a board-certified neurologist who also determined disease course using standard criteria (Lublin & Reingold, 1996; Poser et al., 1983). The sample of MS patients recruited for the study can be considered representative of the population of MS patients. Duration of illness from symptom onset and from diagnosis, and neurological disability using Kurtzke’s Expanded Disability Status Scale (EDSS) were also assessed (Kurtzke, 1983). Symptom duration was measured based on taking the difference from the year of testing minus the year of the first symptom onset based on careful questioning during the psychosocial interview. None of the patients included in the current study was experiencing a clinical exacerbation at the time of the evaluation at either time 1 or time 2 of the study. All participants were provided with $75 compensation, a written neuropsychological screening evaluation and verbal feedback in return for their participation, gave informed consent according to institutional guidelines, and were treated in accordance with established ethical standards.

Measures

The Symptom Checklist 90-Revised (SCL-90-R) (Derogatis, 1983). The SCL-90-R is a self-report questionnaire that was designed to + lect the psychological symptom patterns of psychiatric and medical patients. Respondents are asked to report on a 5-point Likert scale ranging from 0 (not at all) to 4 (extremely) the extent to which they have experienced various psychological symptoms within the past 7 days. All nine symptom subscales and all three global indices were included. The nine clinical subscales are Somatization, Obsessive-Compulsive, Interpersonal Sensitivity, Depression, Anxiety, Phobic Anxiety, Psychoticism, Paranoid Ideation, and Hostility. The global indices include the Global Severity Index (GSI), the Positive Symptom Distress Index (PSDI), and the Positive Symptom Index (PSI). Overall, the SCL-90-R subscales have demonstrated excellent internal consistency (.77 to .90) and test–retest reliability (.78 to .90) (Payne, 1985). A brief description of the subscales is given in Table 1. The SCL-90-R provides t-scores that can be examined

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Brief description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Somatization</td>
<td>Bodily dysfunction (e.g., cardiovascular, headaches, pain)</td>
</tr>
<tr>
<td>Obsessive-compulsive</td>
<td>Unremitting thoughts and uncontrollable repetitive behavior</td>
</tr>
<tr>
<td>Interpersonal Sensitivity</td>
<td>Feelings of personal inferiority</td>
</tr>
<tr>
<td>Depression</td>
<td>Depressive symptomatology (e.g., dysphoria, suicidality)</td>
</tr>
<tr>
<td>Anxiety</td>
<td>Nervousness, tension, worry, panic attacks</td>
</tr>
<tr>
<td>Hostility</td>
<td>Aggression, irritability, rage</td>
</tr>
<tr>
<td>Phobic Anxiety</td>
<td>Fearful response of a specific person, place, object</td>
</tr>
<tr>
<td>Paranoid Ideation</td>
<td>Disordered thinking including suspiciousness, delusions</td>
</tr>
<tr>
<td>Psychoticism</td>
<td>Ranges from Schizoid personality to clinical psychosis</td>
</tr>
<tr>
<td>Global Severity Index</td>
<td>Overall level of psychopathology</td>
</tr>
<tr>
<td>Positive Symptom Distress</td>
<td>Measure of intensity of psychopathology</td>
</tr>
<tr>
<td>Positive Symptom Total</td>
<td>Count of number of symptoms patient endorses ≥1</td>
</tr>
</tbody>
</table>
in relation to level of clinically significant psychological distress. An individual is said to meet criteria for clinically significant psychological distress, or caseness, if the GSI $t$-score is greater than or equal to 63 or if the $t$-score on any other two clinical subscales is greater than 63.

**Shipley Institute of Living Scale (Zachary, 1986).** Current intellectual functioning was estimated from the Shipley Institute of Living Scale. This scale allows for the determination of an estimated WAIS-R Full Scale IQ Score (Wechsler, 1981). A measure of current intellectual functioning was also included to evaluate whether any of the elevations or changes in SCL-90-R scores over time were associated with intelligence.

**Beck Depression Inventory–2nd edition (BDI-II; Beck, Steer, & Brown, 1996).** The BDI-II is one of the most commonly used self-report measures of depression. The BDI-II consists of 21 items on which participants rate themselves on a 0–3 scale. Higher scores reflect greater depression. The suicidality item was not included in the measure we used, so 20 instead of 21 items were used. Total scores were pro-rated to be consistent with 21-item versions of the BDI-II.

**Chicago Multiscale Depression Inventory (CMDI; Nyenhuis et al., 1995).** The CMDI is a self-report questionnaire that was specifically designed for use in MS and other medical patient groups and has vegetative, mood, and evaluative scales consisting of 14 items each. Examinees are asked to rate on a scale of 1 to 5 the extent to which each word or phrase (e.g., “sad,” “glum,” “low,” “worthless,” “a failure,” “unwanted,” “easily awakened,” “exhausted,” “poor appetite” for the vegetative subscale; “sad,” “glum,” “low,” “worthless,” “a failure,” “unwanted,” “easily awakened,” “exhausted,” “poor appetite” for the vegetative subscale) describes them during the past week, including today, where 1 is “Not at All” and 5 is “Extremely.” Total scores for each scale are computed by simply summing together the participants’ scores. To facilitate their interpretation, we further converted these raw scores into $t$-scores using healthy control norms from Nyenhuis et al.’s (1995) validation study of the CMDI.

**Procedure**

Participants completed the measures described as part of a study of cognitive and emotional changes in MS. A brief psychosocial interview was conducted on the same day as, and prior to, the cognitive testing. Patients completed the SCL-90-R as part of a questionnaire packet sent to them approximately 1 week prior to testing.

**RESULTS**

**Preliminary Analyses**

First, the 53 patients who participated in the study at time 2 were compared to the 23 patients who did not return for testing, using $t$-tests on the following variables: age, education, EDSS, WAIS-R IQ estimate, symptom duration, and diagnosis duration. Furthermore, chi-square analyses were conducted to determine if the groups differed on the categorical variables of sex and disease course. The groups did not
differ significantly \( (p > .05) \) on any of these variables. Thus, there did not appear to be any systematic bias in participants who returned for testing versus those who did not.

**Primary Analyses**

Means and standard deviations for the SCL-90-R indices are included in Table 2 along with demographic and illness information. For comparison we have also included the normative sample characteristics from the SCL-90-R manual. It should be noted that the means for the Positive Symptom Index are different from the other indices because the PSI is calculated by a sum of the responses, not an average. Some of the averages are less than 1 because of the range of SCL-90 response scores (0 to 4). Next, SCL-90-R index scores at Time 1 were correlated with SCL-90-R index scores at Time 2 (see Table 2). Note that all but one of the correlations

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**Table 2** Participant and normative sample characteristics at Time 1 and Time 2 and correlations

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean T1</th>
<th>SD T1</th>
<th>Mean T2</th>
<th>SD T2</th>
<th>Mean Norm</th>
<th>SD Norm</th>
<th>Intracorr T1 &amp; T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCL-90 Somatization</td>
<td>1.16</td>
<td>0.75</td>
<td>1.00</td>
<td>0.63</td>
<td>0.36</td>
<td>0.42</td>
<td>.81**</td>
</tr>
<tr>
<td>SCL-90 Obsessive-Compulsive</td>
<td>1.20</td>
<td>0.81</td>
<td>1.07</td>
<td>0.79</td>
<td>0.39</td>
<td>0.45</td>
<td>.81**</td>
</tr>
<tr>
<td>SCL-90 Interpersonal Sensitivity</td>
<td>0.72</td>
<td>0.63</td>
<td>0.50</td>
<td>0.51</td>
<td>0.29</td>
<td>0.39</td>
<td>.78**</td>
</tr>
<tr>
<td>SCL-90 Depression</td>
<td>0.93</td>
<td>0.68</td>
<td>0.77</td>
<td>0.53</td>
<td>0.36</td>
<td>0.44</td>
<td>.72**</td>
</tr>
<tr>
<td>SCL-90 Anxiety</td>
<td>0.54</td>
<td>0.63</td>
<td>0.45</td>
<td>0.52</td>
<td>0.30</td>
<td>0.37</td>
<td>.66**</td>
</tr>
<tr>
<td>SCL-90 Hostility</td>
<td>0.51</td>
<td>0.54</td>
<td>0.40</td>
<td>0.48</td>
<td>0.30</td>
<td>0.40</td>
<td>.44*</td>
</tr>
<tr>
<td>SCL-90 Phobic Anxiety</td>
<td>0.26</td>
<td>0.41</td>
<td>0.17</td>
<td>0.30</td>
<td>0.13</td>
<td>0.31</td>
<td>.55**</td>
</tr>
<tr>
<td>SCL-90 Paranoid Ideation</td>
<td>0.46</td>
<td>0.58</td>
<td>0.33</td>
<td>0.39</td>
<td>0.34</td>
<td>0.44</td>
<td>.62**</td>
</tr>
<tr>
<td>SCL-90 Psychoticism</td>
<td>0.42</td>
<td>0.52</td>
<td>0.28</td>
<td>0.36</td>
<td>0.14</td>
<td>0.25</td>
<td>.67**</td>
</tr>
<tr>
<td>SCL-90 Global Severity</td>
<td>0.77</td>
<td>0.53</td>
<td>0.62</td>
<td>0.41</td>
<td>0.31</td>
<td>0.31</td>
<td>.81**</td>
</tr>
<tr>
<td>SCL-90 Positive Symptom</td>
<td>33.87</td>
<td>21.16</td>
<td>31.69</td>
<td>18.64</td>
<td>19.29</td>
<td>15.48</td>
<td>.72**</td>
</tr>
<tr>
<td>SCL-90 Positive Symptom Distress</td>
<td>1.74</td>
<td>0.49</td>
<td>1.66</td>
<td>0.42</td>
<td>1.32</td>
<td>0.42</td>
<td>.63**</td>
</tr>
<tr>
<td>Age</td>
<td>46.6</td>
<td>7.6</td>
<td>49.5</td>
<td>7.7</td>
<td>46.0</td>
<td>14.7</td>
<td></td>
</tr>
<tr>
<td>Education (years)</td>
<td>14.9</td>
<td>2.3</td>
<td>15.4</td>
<td>2.5</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>WAIS-R Full Scale IQ Estimate</td>
<td>104.8</td>
<td>7.3</td>
<td>105.4</td>
<td>7.9</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Kurtzke (1983) EDSS</td>
<td>4.5</td>
<td>1.4</td>
<td>4.7</td>
<td>1.6</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Symptom Duration (years)</td>
<td>14.0</td>
<td>9.4</td>
<td>16.9</td>
<td>9.2</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Diagnosis Duration (years)</td>
<td>7.6</td>
<td>5.9</td>
<td>10.4</td>
<td>6.0</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>N (T1)</td>
<td>% (T1)</td>
<td>N Norm</td>
<td>% Norm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>12</td>
<td>23</td>
<td>494</td>
<td>51</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>41</td>
<td>77</td>
<td>480</td>
<td>49</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical Course</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relapsing-Remitting</td>
<td>31</td>
<td>58</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary Progressive</td>
<td>15</td>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary Progressive</td>
<td>6</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Progressive Relapsing</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\*\*p < .01.

\**p < .001.

T1 refers to Time 1; T2 refers to Time 2; Mean and SD Norm refer to the mean and the standard deviation of the normative sample; Intercorr refers to the intercorrelations among SCL-90 indices at Time 1 and Time 2.
between the same measures at time 1 and time 2 were highly significant ($p < .001$). The majority of the correlations were above .60, with correlations for the Depression, Interpersonal Sensitivity, Somatization, Obsessive-Compulsive, and Psychoticism scales being greater than .70. The Global Severity index and the Positive Symptom index were also above .70.

To evaluate the reliable changes in scores from time 1 to time 2, Speer’s guidelines for an adaptation of a reliable change index originally proposed by Jacobson and Truax were used for the patients’ SCL-90-R symptom index scores as well as for the global index scores (Jacobson & Truax, 1991; Speer, 1992). The 95% confidence interval was used to determine change. Because there was evidence of regression to the mean as per Speer’s guidelines, participants’ scores at time 1 were adjusted by calculating their estimated true scores accordingly before computing reliable change indices. For the individual symptom scales, test–retest reliabilities from the SCL-90 manual were used. Because no test–retest reliability data were available for the global indices, Cronbach’s alpha values were derived from the current sample as the reliability indices in calculating true score estimates.

As Table 3 indicates, for all of the indices, there was substantial consistency from time 1 to time 2. For all scales, there were an insufficient number of participants who increased or decreased over time to perform analysis of variance to explore group differences. It is worth noting, however, that on all of the subscales except for Anxiety, more participants reported a decrease in their level of psychopathology.

Table 4 displays the number and proportion of participants showing clinical elevations on the SCL-90-R indices when using the criteria outlined in the manual for clinically significant psychological distress. A substantial number of participants showed clinical elevations compared with a normative sample, with as many as 52% of participants meeting criteria for clinically elevated levels of psychopathology. The clinical scales with the highest clinical elevations were Somatization and Obsessive-Compulsive, both with greater than 45% of patients showing clinical elevations at both time points. The Somatization subscale was also correlated significantly with
the EDSS ($r = .23; p = .055$) and ($r = .35; p = .01$) at time 1 and time 2 respectively. The Psychoticism scale was the only other individual scale that showed greater than 30% of patients elevated at both time points. For the remaining clinical scales, no more than 25% of patients were elevated at time 2, and with the exception of Depression, the remaining scales hovered around 20–30% of patients elevated at time 1. At time 1, 42% of patients were elevated for Depression. Finally, for the summary scales, for both the Positive Symptom Distress Index and the Global Severity Index, over 30% of patients were elevated at both time points. Although we did not have a control group for direct comparison, the fact that we had between 20% and 52% of MS participants elevated on all but two of the scales (paranoid ideation and phobic anxiety) is much higher than the 9% (equivalent to a $t$-score of 63 in a normal distribution) that would be expected in a normal healthy control sample.

### Follow-up Analyses

Because the gender distribution in the normative sample was approximately equal but skewed toward women in our sample, we conducted follow-up analyses to evaluate the extent to which gender contributed to the $t$-scores for the clinical scales. Point-biserial correlations revealed that at time 1, gender did not significantly contribute to the elevation of $t$-scores for any of the SCL-90-R subscales. Point-biserial correlations revealed that at time 2, however, gender did significantly correlate with the $t$-score for one clinical subscale: the somatization scale ($r = -.29; p = .043$). For the majority of the SCL-90-R clinical subscales at both time 1 and time 2, it appears as though gender was not a major factor.

Follow-up analyses were also conducted to evaluate possible predictors that would increase a patient’s likelihood of having more clinically elevated SCL-90-R subscales. A linear variable was created that measured the number of clinically elevated symptom subscales each participant had. Correlations were then performed between the newly created variable and various demographic and disease variables at both time 1 and time 2. The correlation between symptom duration and the

### Table 4 Clinical elevations in SCL-90-R index scores at Time 1 and Time 2

<table>
<thead>
<tr>
<th>Index</th>
<th>Time 1</th>
<th>Time 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Somatization</td>
<td>25/48</td>
<td>52</td>
</tr>
<tr>
<td>Obsessive-compulsive</td>
<td>25/50</td>
<td>50</td>
</tr>
<tr>
<td>Interpersonal Sensitivity</td>
<td>16/50</td>
<td>32</td>
</tr>
<tr>
<td>Depression</td>
<td>21/50</td>
<td>42</td>
</tr>
<tr>
<td>Anxiety</td>
<td>13/50</td>
<td>26</td>
</tr>
<tr>
<td>Hostility</td>
<td>14/50</td>
<td>28</td>
</tr>
<tr>
<td>Phobic Anxiety</td>
<td>13/50</td>
<td>26</td>
</tr>
<tr>
<td>Paranoid Ideation</td>
<td>9/50</td>
<td>18</td>
</tr>
<tr>
<td>Psychoticism</td>
<td>19/50</td>
<td>38</td>
</tr>
<tr>
<td>Global Severity Index</td>
<td>22/48</td>
<td>46</td>
</tr>
<tr>
<td>Positive Symptom Index</td>
<td>19/53</td>
<td>36</td>
</tr>
<tr>
<td>Positive Symptom Distress Index</td>
<td>19/48</td>
<td>40</td>
</tr>
</tbody>
</table>
number of clinically elevated subscales was found to be significant \((p < .05)\) at time 1, and a statistical trend \((p = .06)\) was observed at time 2. Somewhat surprisingly, in light of prior research, longer symptom duration was associated with more clinical elevations.

Because this study was focused on examining psychopathology, it is relevant to include the percentage of patients who were taking a psychotropic medication such as a tricyclic antidepressant, benzodiazepine, or selective serotonin reuptake inhibitors. At Time 1, 39.6\% of the participants were taking at least one of these medications. At Time 2, 41.5\% of the patients were taking at least one of these medications. These results are consistent with our finding that a significant percentage of MS patients experience clinically elevated levels of psychopathology and may have been receiving treatment for their distress at the time they participated in our study.

Regarding how well the SCL-90-R measures MS-associated depression and anxiety, in our sample we found that at time 1, the SCL-90-R depression subscale was correlated at \(r = .69\) \((p < .001)\) and \(r = .61\) \((p < .001)\) with the Mood and Evaluative scales of the CMDI, respectively. At time 2, the SCL-90-R depression subscale was correlated at \(r = .46\) \((p = .001)\) and \(r = .34\) \((p = .02)\) with the Mood and Evaluative scales of the CMDI. We also found that the BDI and the depression scale from the SCL-90-R were highly correlated \(r = .75\) \((p < .001)\) and \(r = .72\) \((p < .001)\) at time 1 and 2, respectively. In terms of anxiety, the SCL-90-R anxiety subscale correlated at \(r = .53\) \((p < .001)\) and \(r = .54\) \((p < .001)\) with the STAI-state and STAI-trait anxiety scales, respectively, from our sample at time 1.

**DISCUSSION**

Individuals with MS are affected in a variety of ways, ranging from salient physical disabilities to cognitive and psychological problems. Although depression has been extensively studied because of its prevalence among MS patients, other forms of psychopathology have been largely overlooked. Even less time and attention has been devoted to longitudinal studies of psychopathology in individuals diagnosed with MS. To the best of our knowledge, this is the first longitudinal study to examine psychopathology other than depression.

First we examined the longitudinal course of varying forms of psychopathology measured by the MS patients’ self-report, to determine the amount of change in scores over a 3-year period. Consistent with expectations, we found that the levels of reported psychopathology were fairly stable over time. Our data were consistent with past depression and MS literature based on two different statistical analyses. Correlations between SCL-90-R subscale scores from Time 1 to Time 2 were all significant with large effect sizes. Additionally, the reliable change in scores demonstrated substantial consistency, with only a few patients showing any reliable increase or decrease in scores over time. It was noteworthy that, although few patients’ scores increased or decreased, more reported a decrease in the level of psychopathology they experienced. The “increased” and “decreased” group sizes were too small to perform meaningful further analyses to determine which, if any, variables would predict an increase or decrease in the level of psychopathology reported. Future studies that include a greater number of participants should examine this
issue in closer detail. It appears for the most part, however, that the level of psychological distress MS patients experience remains quite stable over time.

In exploring this issue further, MS patients’ scores were compared to a normative sample of non-psychiatric patients of similar age to evaluate the extent to which their self-reported psychopathology was clinically elevated at both time points. As previously mentioned, little research has been done on psychopathology other than depression in MS, but based on the depression literature, it was speculated that the levels of psychopathology would be considerable. Consistent with our expectations, up to 52% of patients’ scores were clinically elevated. These results are particularly clinically significant, because they suggest that high levels of distress do not spontaneously remit over time. It is well known that there are numerous physical symptoms associated with MS. Because of this, it is not surprising that the clinical scale with the highest clinical elevation at both time points was the Somatization index. In addition, the Somatization index correlated significantly with patients’ scores on the EDSS, our measure of physical/neurological disability. Interestingly, results showed that a high percentage of MS patients also reported clinical elevations on the Psychoticism scale at both time points. Very few studies have examined the incidence of psychotic symptoms among MS patients and those that have found relatively low incidence. It will therefore be beneficial for future research to explore this construct’s relationship to MS further. High percentages of the MS patients also showed clinical elevations on the Depression, Anxiety, and Obsessive-Compulsive subscales at both time points. This is consistent with previous studies that have examined depression and anxiety in MS samples (Diaz-Olavarrieta et al., 1999; Joffe et al., 1987; Peterson, 1989). It should be noted that the OCD subscale does include items that could potentially be related to cognitive dysfunction, including trouble remembering things, difficulty making decisions, and trouble concentrating. Finally for both the PSDI and GSI, over one-third of patients were elevated at both time points. If our results, showing high levels of a wide range of psychopathology in MS patients, can be replicated, it will be important to create effective interventions to address these problems more specifically. In particular, different types of interventions, in addition to the psychotropic medication that almost half were taking, may be most appropriate depending on the type of psychopathology (e.g., depression, anxiety, obsessive-compulsive symptoms) reported by individual patients.

Finally, we tried to identify predictors of higher levels of psychopathology. This was done in an attempt to define the characteristics of those individuals who may be at higher risk for experiencing psychological distress. One past study was unable to identify any neurological or sociodemographic characteristics that increased MS patients’ risk for psychopathology (Arias et al., 1991). Follow-up analyses were conducted to examine whether certain demographic and disease variables corresponded with the number of clinically elevated symptom subscales a patient had at both Time 1 and Time 2. At Time 1 a significant positive correlation was found between symptom duration and a number of clinically elevated symptom scales, and at Time 2 there was a statistical trend for this relationship. In both cases, longer symptom duration was associated with more clinical scale elevations on the SCL-90-R subscales. This finding is opposite to what prior MS depression studies have reported, that longer symptom duration is associated with less depression. A potential explanation for this discrepancy is that the majority of patients in our
study had a much longer symptom duration than is typical of many other studies (Feinstein, O'Connor, & Feinstein, 2002; Patten & Metz, 2001). It is possible that, initially the level of self-reported psychopathology in these patients is high, gradually lessens over time as patients learn to cope with the illness, then increases again as they struggle with the symptoms for many years. Further longitudinal studies looking at symptom duration and level of psychopathology will be necessary to clarify this relationship further.

Future research on psychopathology in MS should also consider employing a variety of different methods of evaluating psychopathology. It would be worthwhile to include documented psychiatric histories, diagnostic criteria, and caregiver or significant other ratings in addition to self-report measures like the SCL-90-R, as self-report measures do have some inherent weaknesses. Nonetheless, as some authors have asserted, exclusive focus on employing diagnostic criteria in evaluating psychopathology in MS, in particular depression, may result in clinicians and researchers missing clinically important subsyndromal problems in emotional functioning (Feinstein & Feinstein, 2001). In addition, to the extent that the CMDI Mood and Evaluative scales, the BDI, and the STAI scales measure MS-associated depression and anxiety, the SCL-90-R scales measuring these constructs appear to be reasonably good. One specific weakness of the SCL-90-R is that it does not assess euphoria, pathological laughing and crying, or other personality changes that are more unique to MS. In addition, a study using a sample of patients with traumatic brain injuries suggested caution in the interpretation of the SCL-90 in neurological samples, due to the concern that results on clinical measures of psychological distress from neurological samples may be distorted because many of the questions can be answered based on physical or emotional perspectives (Leathem & Babbage, 2000). Future studies examining the longitudinal course of psychopathology in MS should take care to examine such experiences. Future studies should also consider using more updated norms to interpret both the Shipley and the SCL-90-R responses.

Another limitation of our study is that the attrition rate was relatively high—33%. However, those participants who did not return for testing did not differ significantly in demographic or illness characteristics from those who did, so there did not appear to be anything systematic bias in the sample of participants tested at both time points. Nonetheless, future work in this area would be strengthened by additional methodological attempts to reduce attrition. The compensation offered for participation in the study, $75 and a neuropsychological evaluation, may present a selection bias toward people who might just be participating because of financial reasons or desire for a screening evaluation. However, because many studies in this literature involve financial incentives for participation, this type of selection bias is one that affects many studies in MS and is not unique to the current study.

This study makes several contributions to the MS literature. First, ours appears to be the first to examine the longitudinal course of different types of psychopathology in MS. Second, it demonstrates further evidence for the stability of psychopathology over time in MS patients. Finally, it provides results consistent with previous work showing that many MS patients suffer from significant psychopathology. Overall, this study reveals the power of longitudinal design in extending our knowledge of psychopathology in MS.
REFERENCES


LONGITUDINAL STUDY OF SCL-90-R IN MS PATIENTS


